AVIATION WEEK

A McGRAW-HILL PUBLICATION

NOV. 28, 1955

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TARGET: SUBMERGED SUB The protecting cloaks of night, foul weather, and ocean are stripped from a submarine by the detection gear and skill of an S2F Navy crew. Pinpointed, the sub is sent to a point of no return—the bottom of the sea. All this equipment required a two plane hunter-killer team until Grumman packaged it into a single aircraft. Grumman S2F's are now operational with the Navy.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION BETHPAGE • LONG ISLAND • NEW YORK

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First in Constant Speed Drives...

SUNDSTRAND

NEW CONTROL

provides

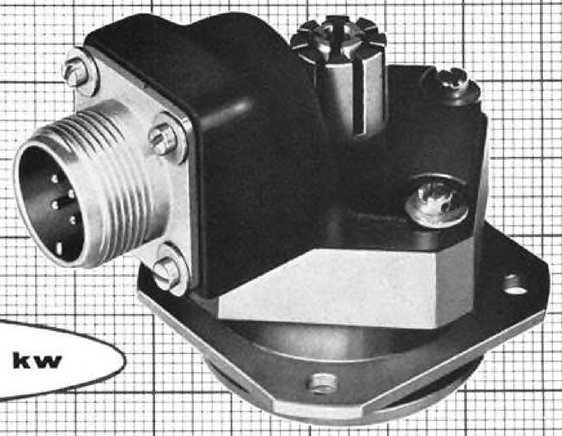
400± 1/10 cps

Load division within 1 kw

is

rugged, reliable,

smaller, lighter



New magnetic trim control just developed for the governor on Sundstrand Aviation's Constant Speed Drive marks another substantial advance in aircraft constant frequency electrical systems. Smaller than former trim controls, rugged and reliable, the new control has no moving parts, is unaffected by temperature or oil contaminants. Applied to the flyball governor, magnetic trim gives the governor faster than normal response, makes minute speed adjustments. These characteristics, plus a new frequency and load controller, make possible average steady-state bus frequency of 400± 1/10 cps, load division between paralleled alternators within 1 kw, and greatly increased stability. All of these benefits are derived from a controlling system considerably smaller and lighter than present systems. Find out how a Sundstrand-driven electrical system can help *you!*

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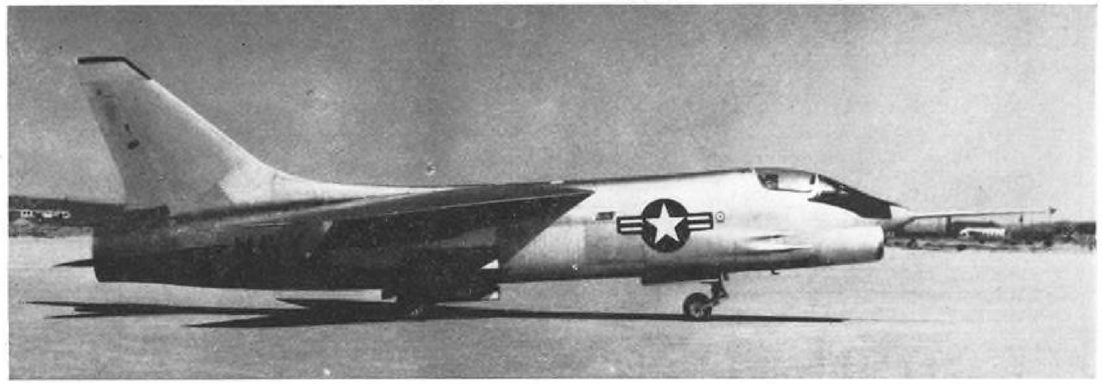

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Two of the latest models in both military and civilian aircraft are now equipped with B. F. Goodrich Tubeless Tires. The Navy's newest jet fighter Chance Vought Crusader, which flies at supersonic speeds in level flight, is equipped with B. F. Goodrich Tubeless to help it withstand the punishment of high-speed take-offs and landings on carrier flight decks. And a Pan American World Airways Clipper® now uses BFG Tubeless in overseas service.

The big reason: *more pay load.* B. F. Goodrich Tubeless Tires save weight. Airlines are saving as much as 120 pounds, can carry that much more pay load. Fighters can add more fighting equipment. Both save time and money in warehousing and maintenance. Instead of a tire and tube, there's only the tire to purchase and stock — only the tire to mount and service.

The use of B. F. Goodrich Tubeless is a gratifying recognition of the safety factors inherent in the BFG Tubeless Tires, in aircraft uses as well as automotive. Among the features that make the BFG Tubeless Tire safer is the special patented inner liner, developed first by B. F. Goodrich. It eliminates the conventional inner tube, retains correct inflation pressure much longer. There's no tube to chafe or leak. No tube to bunch or shift during take-offs or landings.

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The B. F. Goodrich Company, Tire & Equipment Division, Aeronautical Sales, Akron, Ohio.

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New York 36—330 W. 42nd St., Phone LOngacre 4-3000 (Night LO 4-3035)
Washington 4, D. C.—National Press Bldg., Phones: National 8-3414, Republic 7-6630
Los Angeles 17—1111 Wilshire Blvd., Phone MAdison 6-4323

PUBLISHER.....Robert W. Martin, Jr.
EDITOR.....Robert B. Hotz

MANAGING EDITOR.....Alpheus W. Jessup
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RESEARCH AND MARKETING

Irina Nelidow, Mary Whitney Fenton, Elinore Eisenson.

Regional Carriers Make Further Gains..... 12
▶ Delta, Braniff are awarded new routes to New York; Capital's service to south is expanded again.

Martin B-57 Proves To Be Versatile Performer..... 13
▶ Twin-jet B-57s provide most-important air action in Exercise Sagebrush with their accurate night atomic missions.

New Equipment Boosts Test-Flight Cycle..... 22
▶ Boeing plans equipment to facilitate testing of 707, KC-135 tanker and advanced B-52 versions.

Boeing, Douglas Swap Design Techniques..... 29
▶ Design of Boeing's 707 was influenced by earlier Douglas models; DC-8 has Boeing look.

MISSILE ENGINEERING
North American Missile Tests..... 16
F-105 Exceeds Mach 1..... 18
USAF-Army Missile Feud Flares..... 18

AERONAUTICAL ENGINEERING
Napier Schedules Oryx Type Test.... 37

AVIONICS
Special Tube Tests Can Backfire..... 45
New Avionic Facilities..... 51
Avionic Bulletins..... 51
Filter Center..... 51

BUSINESS FLYING
RATO Trend in Business Aircraft..... 60
Private Lines..... 65

EQUIPMENT
New Aviation Products..... 71
What's New..... 57
Also on the Market..... 74

SAFETY
CAB Reports on 4-0-4 Crash..... 80

TRANSPORT
Riddle, Aaxico Win Cargo Routes.... 107
Irregular Ruling Stirs Controversy... 109
'Third-Class' Fare Urged..... 111
CAA on Braniff, PAA, NWA Crashes.. 115
Death Penalty Urged for Sabotage... 115
Less Route Authority Approved..... 117
Centerline Lighting for Idlewild..... 117
CAB Orders..... 117
Shortlines..... 117

MANAGEMENT
McDonnell Aircraft Expands Facilities 21
Cornell Building Gun-Rocket Range.. 35
Who's Where.....9, 104
News Digest..... 7
Industry Observer..... 9
Washington Roundup..... 11

FINANCIAL
North American Has Record Year.... 15
USAF Contracts..... 39
Calendar..... 8
Letters..... 66

EDITORIAL
An Integral Part of the Arsenal..... 122

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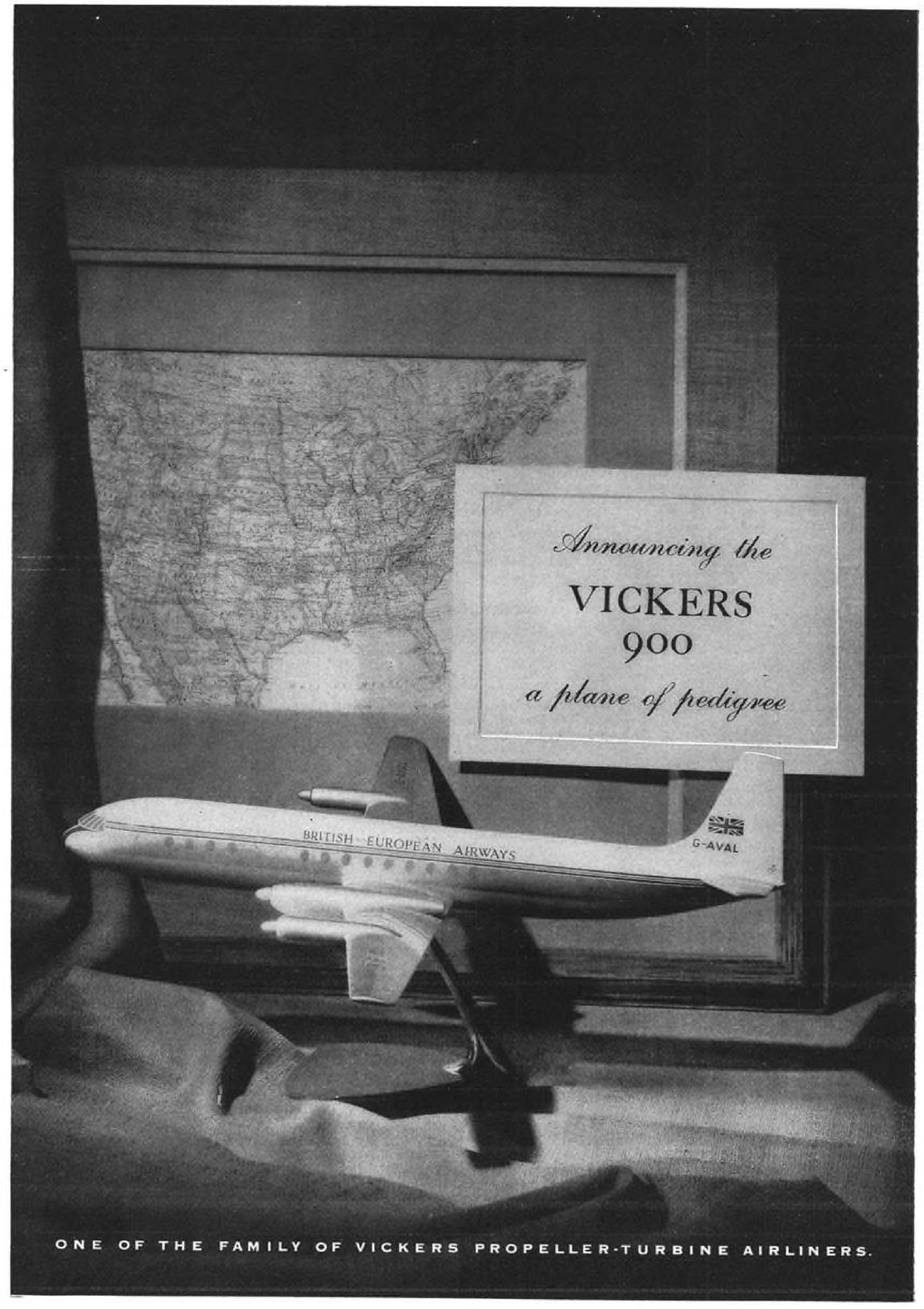

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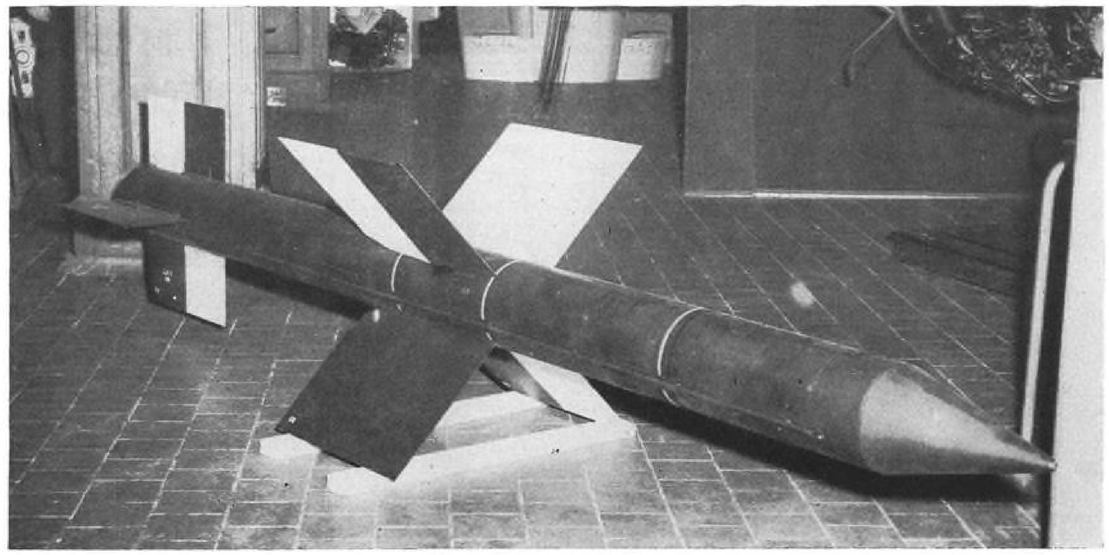


The Velvet Glove

The first published picture of the Velvet Glove Canadian air-to-air missile is shown above. The supersonic missile, manufactured by Canadair, has been successfully fired from both F-86 Sabres and CF-100s (AW Nov. 21, p. 7). Performance details are classified.

Domestic

Bomarc guided missile will be produced at Boeing Airplane Co.'s Wichita, Kan., plant. Defense Department said the decision followed its directive on industrial dispersion (see p. 18). Experimental and developmental engineering will continue at Seattle, Wash.

Dr. Clifford C. Furnas, 55, Chancellor of the University of Buffalo, has been appointed Assistant Secretary of Defense for Research and Development (AW Oct. 24, p. 7). He fills the post vacated by Donald A. Quarles when he was named Secretary of the Air Force. Dr. Furnas, a chemical engineer, is a former director of the Cornell Aeronautical Laboratory and director of research for Curtiss-Wright at Buffalo.

U.S. Army plans to ring major German cities and Army installations with Nike surface-to-air missile units.

Ryan Aeronautical Co. Latest Air Force contract "will assure production" of its Q-2A Firebee target missile "well into 1956." The contract, plus a previously-announced $3.5-million order, rounds out the USAF's present schedule for the Firebee, but Ryan is negotiating "additional quantity orders."

Piasecki Helicopter Corp. has been awarded a contract for 168 H-21 Work Horse helicopters for the U. S. Army. The new order increases the company's backlog to $140 million as compared with $100 million at the end of 1954, according to Don R. Berlin, Piasecki president.

Hamilton Standard Division of United Aircraft Corp. plans to construct an additional 210,000 sq. ft. of manufacturing space and 40,000 sq. ft. of office space at its Windsor Locks, Conn., plant. The present floor area (approximately 1,000,000 sq. ft.) was designed to accommodate 6,000 employes; Hamilton now has 7,000 and plans to add another 500 production employes and 150 engineers within the immediate future.

Pan American World Airways, Inc. flew a total of 899,165,000 passenger-miles and 23,046,028 plane-miles during the third quarter of the year. Figures for the same period of 1954: 731,565,000 passenger-miles and 19,463,476 plane-miles. This year's second-quarter figures were 742,332,000 and 20,990,433, respectively.

Financial

General Dynamics Corp. estimated its backlog of unfilled orders as of Sept. 30 at $1,415 million, the highest in the corporation's peacetime history. Net sales for the nine-month period ending on that date totaled $506,133,306 and net income (after U.S. and Canadian taxes), $13,754,390. Net sales for the same period of 1954 were $477,829,633; net income, $14,161,038.

Chance Vought Aircraft, Inc. declared a dividend of 40 cents a share payable Dec. 15 to common stockholders of record Dec. 1.

National Airlines' operating revenues reached a new high of $50,173,474 during the 12-month period ending Sept. 30. It was the first time they had exceeded the $50 million mark. NAL also reported that the three-month period ending Sept. 30 was the most profitable first quarter in its history, with net earnings at $468,344 (46 cents a share).

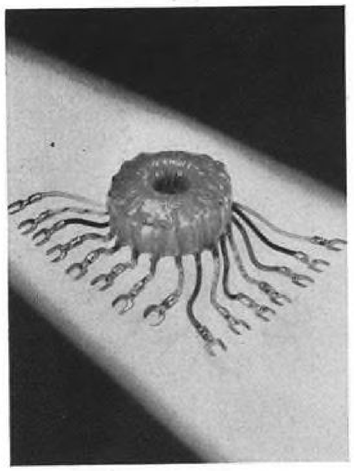
International

British European Airways scheduled plans for Britain's first inter-city helicopter network, London-Birmingham-Leicester-Nottingham, with service to begin in the spring.

The Dominican Republic will construct a $9 million airport capable of handling jet transports at Punta Caucedo, 15 miles east of Cuidad Trujillo. Preliminary plans for the airport, tentatively scheduled for completion sometime in 1958, were drawn by B. Perini & Sons, Framingham, Mass.

Royal Australian air force chose the DH-115 two-seat Vampire and a dual-control version of the English Electric Canberra as the basic planes for its jet training program. Orders were placed for approximately 100 Vampires and nine dual-control Canberras.

Inside and out...



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AVIATION CALENDAR

Nov. 30-Dec. 2—Air Transport Assn., Airline Finance & Accounting Conference, St. Charles Hotel, New Orleans, La.

Dec. 1—American Astronautical Society, 2nd Annual Meeting, American Museum of Natural History, New York, N. Y.

Dec. 1-2—California Association of Airport Executives Meeting, Paso Robles Inn, Paso Robles, Calif.

Dec. 2-3—Eighth Annual Aviation Conference & Flight Clinic, sponsored by Tucson Chamber of Commerce and Tucson Airport Authority, Tucson, Ariz.

Dec. 6-7—Professional Race Pilots' Assn., convention, Carter Hotel, Cleveland.

Dec. 7-9—National Association of Manufacturers, 60th Annual Congress of American Industry, Waldorf-Astoria Hotel, New York.

Dec. 12-16—Nuclear Engineering & Science Congress & Atomic Exposition, sponsored by Engineers Joint Council, Public Auditorium, Cleveland, Ohio.

Dec. 15-17—Fall Meeting, USA National Committee, URSI (International Radio Scientific Union), University of Florida, Gainesville, Fla.

Dec. 17—Nineteenth Wright Brothers Lecture, U. S. Chamber of Commerce Bldg. Auditorium, Wash., D. C. Wright Day Dinner at Sheraton Park Hotel.

Jan. 9-10—Second National Symposium on Reliability and Quality Control in Electronics, sponsored by Institute of Radio Engineers, Hotel Statler, Washington.

Jan. 9-13—Society of Automotive Engineers, Annual Meeting, Sheraton-Cadillac and Statler Hotels, Detroit.

Jan. 19-21—National Simulation Conference sponsored by Dallas-Fort Worth Chapter of Institute of Radio Engineers' Group on Electronic Computers, Dallas, Tex.

Jan. 23-26—Institute of the Aeronautical Sciences, 24th annual meeting, Sheraton-Astor Hotel, New York, N. Y. **Jan. 23**—Honors Night Dinner.

Jan. 23-26—Plant Maintenance & Engineering Show and Conference, Convention Hall, Philadelphia.

Feb. 2-3—National Symposium on Microwave Techniques, sponsored by Institute of Radio Engineers' Antenna & Propagation Group and Theory & Techniques Group, Philadelphia.

Feb. 7-9—Society of the Plastics Industry, 11th annual Reinforced Plastics Div., conference, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J.

Mar. 19-21—Society of Automotive Engineers, national production meeting and forum, Hotel Statler, Cleveland, Ohio.

Apr. 9-12—Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum and aircraft engineering display, Hotel Statler, New York, N. Y.

May 2—Society of Aeronautical Weight Engineers, 14th annual conference, Fort Worth, Tex.

May 14-17—First Design Engineering Show, Convention Hall, Philadelphia. Managed by Clapp & Poliak, Inc., 341 Madison Ave., New York, N. Y.

June 17-21—American Society of Mechanical Engineers, semi-annual meeting, Hotel Statler, Cleveland, Ohio.

as others see us . . .

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—by John Stambaugh
President
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WHO'S WHERE

In the Front Office

John H. Clemson, vice president of Passenger Service Dept. of Trans World Airlines.

Richard S. Mitchell, vice president of Guided Missiles Range Div. of Pan American World Airways.

Sir Arnold Hall, former director of the Royal Aircraft Establishment, Farnborough, technical director of Hawker Siddeley Group, London, England.

Sir Ronald Weeks will retire as chairman of Vickers, Ltd next May and will be succeeded by **Lord Knolly**, who ran British Overseas Airways from 1943 to 1947.

William H. Rea, board member of Crucible Steel Company of America.

Olin D. Blessing, vice president of Dow Corning Corp.

Robert J. Quinn, Jr., vice president of the Monitor Controller Div. of Industrial Electronics Co., Inc., Rockland, Mass.

Honors and Elections

Ernest H. Moncrieff, president of Standard Aero Engine Ltd., Winnipeg, elected president of the Air Industries and Transport Association of Canada. **Richard W. Ryan**, Canadian Pacific Airlines, Vancouver, and **J. W. R. Drummond**, Canadian Pratt & Whitney Aircraft Co. Ltd., Montreal, elected vice presidents. **Fred T. Wood**, Trans-Canada Airlines, Montreal, honorary secretary; **D. W. Kendall**, Photographic Survey Co. Ltd., Toronto, honorary treasurer.

R. S. Northington, vice president of Piedmont Aviation, Inc., elected president of Aviation Distributors and Manufacturers Association; **J. Turner Moore**, Reading Batteries, Inc. and **Francis L. Hine**, Airwork Corp. elected vice president.

Edward K. Foster, vice president of Bendix Aviation Corp., named Man of the Year for 1955 by The Towson Town Association.

George V. Caldwell, director of Safety at the Academy of Aeronautics, LaGuardia Airport, New York, named to the Air Transport Section of the National Safety Council as head of the Sub-Committee on Schools.

Changes

Arthur J. Fallon, chief of the Air Terminal Properties Div. of The Port of New York Authority; **Warren C. Cooper**, assistant chief.

Orville M. Dunning, director of engineering and production division of Airborne Instruments Laboratory, Inc. Dunning is former vice president-engineering of Hazeltine Electronics Corp., Little Neck, N. Y.

Harold H. McIntosh, chief of missile projects of Goodyear Aircraft Corp.

Lord Rennel of Rodd, deputy chairman of British Overseas Airways Corp.

Marion Maxfield, assistant director of customer relations of Fairchild Engine and Airplane Corp.

F. A. Cleveland, preliminary design engineer at Lockheed Aircraft Corporation's Georgia Div.

(*Continued on page 104*)

INDUSTRY OBSERVER

► Avro Vulcan's stability problem is one reason for the new planform with leading edge modified (AW Nov. 21, p. 7). Instability shows up during high speed level bombing attacks at altitude.

► **Lear and Narco engineers are studying the possibility of designing weather radar units for small twin-engine business planes such as the Piper Apache. Narco says antenna design is one of the most critical problems. The company also has studied simplified radar circuitry for this type of set and is considering adoption of some of the circuitry from its Distance Measuring Equipment.**

► Later versions of the Vickers Swift Mk. 5 photo-reconnaissance plane are under development. One production PR 5 has been converted for long range missions, incorporating additional fuel internally and externally.

► **Production tooling for the four-place, low wing Piper PA-24 Comanche business plane, which is scheduled to reach the market in 1957, is being built to coincide with the construction of the first prototype. This system is an innovation for Piper Aircraft Corp. The Comanche, with a cruising speed of approximately 160 mph., retractable tricycle landing gear and a swept tail, will be priced to compete with the Cessna 180.**

► Ryan Firebee, powered by a 1,000-lb. thrust Fairchild J44, has flown for 20 minutes at 45,000 ft. altitude. The F9F chase plane was operated at near maximum performance to keep up with the target drone which was exceeding 450 knots. Target drones with altitude and speed performance comparable to or better than the Ryan Firebee are required to replace towed targets for evaluation of new weapons systems such as the F-102A armed with Falcon air-to-air missiles.

► **Swedish J35 double-delta interceptor will be armed with guided air-to-air missiles and 30-mm. cannon, both developed and manufactured by Bofors.**

► National Advisory Committee for Aeronautics is seeking bids for a Mach 6 blowdown supersonic wind tunnel which will be part of the blowdown tunnel complex for the gas dynamics facility at Langley (Va.) Aeronautical Laboratory. Test section of the tunnel is 20 by 20 inches, and cost is approximately $100,000.

► **U. S. Navy has accepted two Westinghouse PD-33 turbojet engines in the 6,500 lb. thrust class for test and evaluation (AW Aug. 12, p. 12). Navy has designated the engine J54, and the tests will be made at the new Naval Air Turbine Test Station at Trenton, N. J. The engine was developed without cost to the Government by Westinghouse in cooperation with Rolls-Royce and made available to the Navy at nominal sum of $1.**

► USAF has increased the time between major overhauls of the Piasecki H-21 helicopter from 120 to 150 hours and has recommended that castings be changed at overhaul time and sent to Air Materiel Command depot for checking to relieve the burden on field maintenance.

► **Messerschmitt will be licensed to build 300 CM-170R Magister trainers by the French firm, Etablissements Fouga & Cie.**

► Trans-World Airlines is the first airline to order the new completely transistorized PB-20 automatic pilot developed by Eclipse-Pioneer. The order is for 25 sets.

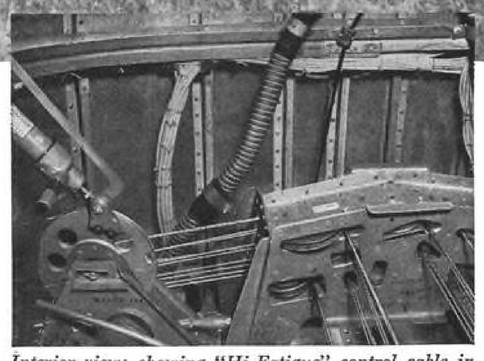
► **British Ministry of Supply has cancelled the Avro-720 rocket-turbojet powered interceptor project leaving the Saunders-Roe SR 53 as the sole continuing project in this field.**

► Short Brothers and Harland have a new vertical take off research aircraft designated the PD-11.

First light twin to use supercharged engines has "Hi-Fatigue" — Cable installations!

New Aero Commander 680 Super, by Aero Design and Engineering Company. This new executive plane carries 6-7 passengers, cruises at 230 mph.

NEW AERO COMMANDER 680 SUPER!



Interior view: showing "Hi-Fatigue" control cable installation in the Aero Commander 680.

The Aero Commander 680 Super is the first light twin-engine executive plane to offer supercharged performance. The new model has a useful load capacity of 2,750 lbs., a single-engine ceiling of 15,000 feet, a cruising speed of 230 mph., and a one-stop, coast-to-coast range. The Aero Commander 680 is equipped with Macwhyte "Hi-Fatigue" control cable.

"Hi-Fatigue" control cable is widely used by leading manufacturers. A complete line of sizes and types is supplied in Galvanized, Tinned, and Stainless Steel. "Safe-Lock" Terminals for swaging may be purchased loose or attached. Macwhyte Aircraft Products meet the requirements of aircraft manufacturers, airlines, and military specifications.

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Portland 9, 1603 N.W. 14th Ave.
Seattle 4, 87 Holgate St.
San Francisco 7, 188 King St.
Los Angeles 21, 2035 Sacramento Street

Washington Roundup

Copter Controversy

Back of the Army-Air Force controversy over use of helicopters in Exercise Sagebrush (AW Nov. 21, p. 17) lies a basic argument over joint doctrine. Sagebrush maneuver director USAF Gen. Otto P. Weyland, was overruled by USAF Secretary Donald Quarles when he tried to block Army's experiments with its new sky cavalry.

Quarles, in effect, said Weyland was right in his interpretation of the doctrine, but added that Army still should be allowed to test its new reconnaissance ideas. Sky Cav still may or may not violate the Key West agreement. Quarles emphasized that he acted in the Sagebrush crisis "without prejudice" to the basic issue of whether the Army should operate aircraft as it sees fit. His action followed conferences with Army Secretary Wilber Brucker. Unexplained last week was AVIATION WEEK's report that some Army officers at Sagebrush refused to fly in USAF helicopters on a short hop from England AFB, La. to Fort Polk, Lt., maneuver headquarters. Seriousness of the dispute was attested by flat refusal of Army officers to discuss the matter, following position of Brucker, who would not answer newsmen's questions.

Renegotiation Future

Watch for the Joint Congressional Committee on Internal Revenue Taxation to recommend to the next Congress sharp curtailment of the Renegotiation Act powers, perhaps termination when the law ends in 1956.

The committee has been meeting recently with industry and Government representatives to obtain their views on extending, modifying on terminating the act. Industry groups have been forceful in urging an end to renegotiation, but the views of individual companies on administration of the act probably will be tempered by the fact the renegotiation will apply to profits earned through 1956 even if the law expires.

Some Capitol Hill observers feel that renegotiation is being used as a political countermeasure to take the steam out of any Democratic investigations of excessively high defense profits.

The committee's report is due May 31, 1956.

More Permanent Airlines?

Congress is going to consider legislation directing Civil Aeronautics Board to grant more permanent certificates next session. Last session, legislation ordered permanent certificates for local service lines, despite Civil Aeronautics Board opposition. Senate Commerce Committee's Chairman, Sen. Warren Magnuson (D.-Wash.), already has announced in favor of an amendment to the local service legislation which would direct a permanent certificate for Pacific Northern Airlines which operates between his home state of Washington and Alaska.

Congressional Investigations

Plans now are to open public hearings on two congressional investigations—both underway for several months—before Congress meets in January. They are:

• **On the U. S.-German bilateral agreement**, which some U. S. airlines consider a "giveaway" to the German line, Lufthansa, by the Senate Commerce Subcommittee headed by Sen. George Smathers (D.-Fla.).

• **On military aviation contracts and profits** by the House Armed Services Investigating Subcommittee headed by Rep. Edward Hebert (D.-La.). Airframe manufacturers will be scheduled first. The subcommittee also plans to call in aircraft engine companies, as well as major subcontractors.

Rizley's New Campaign

Civil Aeronautics Board Chairman Ross Rizley can count on substantial support from Congress in his aim to have airline industry representation on U. S. teams negotiating bilateral air agreements with foreign governments (AW Nov. 21, p. 105). Airlines have repeatedly taken their complaint to congressional committees that bilaterals were sealed without their having had an opportunity to express their opinions. "I wouldn't by any means let the airline industry dictate final policy," Rizley said, "but I think their cooperation would be helpful for all."

Sabotage Committee

A thorough survey to develop preventive measures against a repetition of the recent crash of a United Air Line's DC-6B due to sabotage has been undertaken by a Civil Aeronautics Administration committee headed by Fred B. Lee, CAA Administrator. Lee established the committee after consultation with J. Edgar Hoover, Director of the Federal Bureau of Investigation, when it was determined the crash was caused by sabotage.

The committee is exploring four major areas. They are legislation, inspection, insurance, and aircraft structure.

Aviation insurance companies have been asked to review the way their policies are written and make any changes necessary to remove the collection of insurance as an inducement to a saboteur.

Aircraft engineers are investigating methods for strengthening the structure of cargo bins with an eye to minimizing explosions. The idea of any form of manual inspection of passengers and their baggage already has been discarded but a mechanical inspection of baggage is still under consideration. The major problem confronting this method is that installations would have to be made at all 554 air carrier airports and the cost could be prohibitive.

Capital Victory

Capital Airlines has won its struggle with the Civil Aeronautics Administration for additional hangar space at the CAA-operated Washington National Airport where Capital makes its headquarters.

Louis Rothschild, Under Secretary of Commerce for Transportation, ruled in favor of Capital which will get a fourth hangar, now jointly occupied by CAA and the Coast Guard. Capital takes possession of the hangar as soon as plans are completed for CAA to move its aircraft in with the Air Force and the Coast Guard to a nearby naval installation.

Rothschild's position is that the field must be considered primarily as a civil installation despite the fact CAA owns it or might be inconvenienced. Capital has needed additional space for some time and the advent of its Viscount program compounded the situation.

—Washington staff

AVIATION WEEK VOL. 63, NO. 22
NOVEMBER 28, 1955

Regional Carriers Make Further Gains

Delta, Braniff are awarded new routes to New York; Capital's service to south is expanded again.

By Craig Lewis

Washington—In its third move in three months to strengthen regional trunk airlines, the Civil Aeronautics Board has granted Braniff Airways, Delta Air Lines and Capital Airlines important new routes in the Southwest-Northeast Service Case.

The CAB decision gives Braniff and Delta their first entry to the New York air travel market, the largest in the world.

The Board reversed recommendations for greater competition among the big four and keyed its awards to building the smaller carriers as more effective competitors of the four carriers which dominate the industry—American Airlines, Eastern Air Lines, Trans World Airlines and United Air Lines.

This policy follows a trend which has developed in two earlier major route cases, the New York-Chicago and the Denver Service Cases (AW Sept. 12, p. 139; Nov. 21, p. 99).

New Routes

Here are the routes awarded:

• **Braniff Airways** gets a new route between Ft. Worth/Dallas and New York and Washington via Memphis, Nashville and Chattanooga.

• **Delta Air Lines** will operate a new route between Houston and New York through route extension north from Atlanta to New York/Newark via Charlotte, Washington, Baltimore and Philadelphia, and west from New Orleans to Houston.

• **Capital Airlines'** route pattern is amended to extend Route 51 from Washington to New York/Newark via Baltimore and Philadelphia and amend Routes 51 and 55 to permit service between New Orleans and Atlanta via Birmingham and Mobile. Capital is also authorized to operate local service between Pittsburgh and Philadelphia.

• **Trans World Airlines'** Transcontinental route is amended to add Tulsa and Oklahoma City as intermediate points, subject to a long-haul restriction, and TWA is authorized to serve Washington, Baltimore, Philadelphia and New York on flights serving the Oklahoma cities.

• **American Airlines** is authorized to serve Pittsburgh, and Houston is added to American's Route 4 with the restriction that flights serving Houston must serve Pittsburgh. Flights serving Pittsburgh must start or stop at Tulsa, Dallas or a point to the west or at Houston. Columbus, Ohio, is added to American's Route 4.

• **Eastern Air Lines'** closed door restriction at Pittsburgh is removed to permit service between that point and Atlanta, Birmingham, Mobile and New Orleans.

Object: to Strengthen

The Board pointed to earlier findings in the New York-Chicago and Denver cases to illustrate its objectives.

"It is vital, in our opinion," said CAB, "to so develop the national air route structure as to tend to decrease rather than increase the gap between the relative size of the big four carriers and the smaller trunks.

"We recognize that most of the smaller trunks are now operating on a service rate basis and are competing effectively in many markets with the larger carriers. However, in many instances, the margin between a commercially self-sufficient operation and one that would require subsidy assistance is a close one," the Board said.

"Our objective is to so strengthen the smaller trunks as to insure that they will in the future be able to continue operations without subsidy even during periods of economic adversity."

The Board feels that closing the present enormous gap between the size of the Big Four trunk airlines and the remaining nine carriers will bring about improved service to points where a small carrier has to compete with a large one and will enable the smaller carriers to make a stronger effort to promote air coach service on their shorter route segments.

Problems of the small trunklines in competing with the Big Four and staying on a service rate basis are accentuated now as the airlines go into a period of transition into the turboprop and turbojet field with its allied financial complications, the Board noted.

"Unless the relative economic opportunity—and basically this means route systems—of the smaller carriers approaches more closely that of the Big Four, their competitive position and ability to weather economic adversity are bound to suffer," said the Board.

CAB rejected the argument that the smaller carriers are unable to compete with the Big Four on monopoly routes and competition would weaken them. The Board says this would lead to stagnation for the small trunklines.

The Board reasons that the New York-Dallas/Ft. Worth route award to Braniff will supply the carrier's need for access to a long-haul, high-density market. The route is, in terms of passenger-miles, the largest non-competitive market in the country. The decision in favor of competition is based on the premise that the size of the market warrants competition rather than any finding that American's service is inadequate.

The Board estimates that next year the Dallas/Ft. Worth-New York routes will be worth $37 million; it figures that Braniff's share can be $11 million.

Routes Evaluated

Braniff's new service will be protected by a restriction on Delta which requires Delta flights between Dallas/Ft. Worth and the northeast to stop at Atlanta.

The route awards to Delta follow the same pattern as the Braniff award. CAB feels Delta should have access to more high-density markets and that such points as New Orleans and Atlanta need better service to the northeast. The Board figures Delta will have access to new markets worth $42 million.

Capital's new routes come in part as the result of untangling a complex route system which barred the carrier from competing effectively in the Atlanta and New Orleans markets. The Capital and Delta routes will add two competitors to Eastern's services on these routes.

The new Capital services are designed to improve air service at such midway points as Chattanooga, Greensboro-High Point and Charlotte as well as the major terminal points. National Airlines contentions that Capital will divert revenues from National's Norfolk-New York services are rejected by the CAB since Capital will serve the market on long-haul operations and will have to stop at Washington.

Addition of Tulsa and Oklahoma City to TWA's route gives those cities new services to numerous cities. With this action, and the addition of Pittsburgh to American's route, the two Oklahoma cities will have their first direct service to Pittsburgh. The TWA service is restricted to protect Continental Air Lines between Tulsa, Oklahoma City and Albuquerque and to protect Braniff between Tulsa and Oklahoma City and Wichita, Topeka and Kansas City.

The CAB agreed with its examiner that Eastern's closed door restriction at Pittsburgh should be lifted, but it denied applications for Louisville-Paducah-Memphis service and decided in favor of Braniff for Eastern's proposed service between Dallas/Ft. Worth and the northeast.

Addition of Pittsburgh to American's route system is designed to improve service from that city to the west and southwest, just as addition of Pittsburgh to United Air Lines' system in the New York-Chicago Case was made to improve service to the Midwest and Pacific Northwest areas.

Houston is added to American's system to provide one-carrier service from Pittsburgh. A restriction requiring all flights serving Houston to serve Pittsburgh is designed to specifically protect Delta's new Houston-New York service.

Irregulars Turned Down

The Board authorized Capital to operate local service between Pittsburgh and Philadelphia in a decision deferred from the New York-Chicago Case.

National's request for new routes in the case is denied by CAB on the grounds that the carrier's system is confined to the East Coast and new routes would result in fewer public benefits than the Capital and Delta awards.

Applications of two irregular carriers—Aero Finance and North American Airlines—were denied.

The Board refused to take sides in the Ft. Worth-Dallas airport controversy, but it said that the new services awarded in the case should provide adequate service to Ft. Worth.

Three dissents were filed by CAB members on various issues. Vice Chairman Joseph P. Adams wrote a brief dissent on the handling of the North American application, following his stand in the New York-Chicago and Denver Service Cases.

CAB Member Josh Lee disagrees with the decision to give American a route from Houston to the Northeast, favoring Braniff and Capital for the service.

Lee doesn't feel the Board consistently followed its stated policy of cutting the differential between American and the smaller carriers.

In the third dissent, Members Chan Gurney and Harmar Denny disagree with the majority decisions to extend Braniff to New York and strengthen Capital's southern routes. They feel that the awards will result in uneconomic competition.

SHOTGUN STARTER CARTRIDGES throw-off black smoke in starting B-57's engines on Exercise Sagebrush bombing mission.

Martin B-57 Proves Versatile Performer

By Claude Witze

Fort Polk, La.—Night atomic bombing and reconnaissance missions by twin jet Martin B-57s were the most important and provocative air actions in the first week of Exercise Sagebrush. The planes were operated by Aggressor's 461st Light Bomb Wing and 363rd Tactical Reconnaissance Wing.

They knocked out 80% of the air bases housing tactical units of the U.S. or Friendly forces within hours after the big Louisiana maneuver started. Their blows permitted Aggressor's mechanized and armored ground troops to roll for many miles unimpeded by air strikes.

Success of Aggressor's early Sagebrush missions clearly were due to two major factors:

• **Low level approach to targets,** below line of sight for most radar.

• **Effective electronic jamming** of U.S. radar warning equipment.

B-57 'A Pilot's Aircraft'

Starting point of all this action, it now can be revealed, is at Randolph AFB, near San Antonio, Tex., where the 461st and 363rd were based the night they operated north as far as Norfolk, Va., leaving a path of simulated destruction over more than half of the Friendly air bases.

The B-57 is new to USAF. In its original design it was the British Canberra.

The plane is powered by two Wright J65-W-5 jet engines rated at 7,200 lb. thrust.

Sagebrush is the first real exercise given to the B-57. For the maneuver, the 461st and 363rd were formed from parent units of the Tactical Air Command located at Hill AFB, Utah, and Shaw AFB, S. C.

Lt. Charles Deitsch, a 461st bomber pilot, told AVIATION WEEK he has nothing but praise for the plane, "A pilot's aircraft if I ever saw one."

Deitsch's only criticism is that there are times when the B-57's speed makes him a bit outmoded as a pilot. He

Sagebrush Raises Serious Defense Questions

Fort Polk, La.—Reaction to successes of the Martin B-57 light jet bomber in the opening stage of Exercise Sagebrush may be reverberating for many months.

Before the Aggressor air action was more than two days old there were signs that the public will raise serious questions about the performance of high-priced defense equipment.

What is more important, from the military viewpoint today, is that the skepticism arising from Sagebrush may spread to Capitol Hill, where the Defense Department budget will be examined next spring.

Some of this reaction will be offset by the final critiques and evaluations of Exercise Sagebrush. Gen. Otto P. Weyland, maneuver director, says it will be February or March before these papers are ready. That will be just in time for them to come to the attention of congressional appropriations committees.

Meanwhile, the criticisms have started. There is more talk about Sagebrush in this section of the U. S. than in areas remote from the roaring planes and tanks.

The editor of a Shreveport newspaper has devoted a column to the lesson that Sagebrush proves "neither distance nor radar is a foundation for complacency." He fears now that a real enemy attack would see even more of the enemy's planes penetrate the radar screen.

Similarly, a San Antonio newsman has concluded that our money is wasted on a $1 billion radar network that can be crippled by the flick of a switch on enemy jamming equipment.

Military men here point out that the air capabilities of Aggressor and Friendly (U. S.) forces in Sagebrush were not evenly balanced.

- U. S. forces have inflight refueling capabilities, Aggressor forces do not.
- Aggressor has high altitude bombing capability, U. S. does not.
- U. S. has two control and reporting centers, Aggressor has only one.
- At the beginning of the first tactical phase, Aggressor had numerical superiority in combat jet aircraft.
- U. S. forces have no all-weather fighter capability.
- Aggressor has no Matador missile capability.

moved to his present job from flying a piston-driven B-26.

"This plane goes too fast for me on night low-level missions," he said. "You go for something, maybe like a locomotive and, boy, there's just one pass. With the B-26 I could turn around and come back at it again. But this baby has me so far away it doesn't make sense even to look for the thing again."

Needs Airborne Radar

Deitsch also points out that a light jet bomber on a low-level operation consumes fuel at a high rate. At 45,000 ft., this situation is corrected and the speed is very fast.

"I run away from fighters," Deitsch says. "The B-57 would make a good interceptor at that altitude." On most missions, he carries fuel for about six hours. Oxygen is carried in liquid form; the supply will last eight hours.

Deitsch's navigator is Lt. Joe Yanovitch, who shares his enthusiasm for the B-57, but has reservations about some of the equipment.

Present B-57s carry SHORAN, which Yanovitch says is fine electronic goods for his actual bombing runs. But he misses a good airborne radar, feels strongly that there would be an improvement in the plane's potential if he had it.

Yanovitch believes radar would permit better utilization of the B-57s maximum range possibilities and still do a good job on the target when linked to the bombing system.

His idea has endorsement from higher levels. The Martin Company has offered a proposal to USAF for incorporation of a bombing and navigational radar to be carried along with SHORAN. Accuracy of the present equipment makes USAF reluctant to drop it.

While SHORAN's range is limited, a competent operator can hit within a 400-ft. circle from 40,000 ft.

A second Martin proposal, it was learned, is for the installation of a rudder boost to make the B-57 more maneuverable at low speeds, particularly when performing on one engine. Single-engine performance is reported good, but speed is critical.

Restricted to VFR Weather

Deliveries have been under way for about a year and a half. Early versions are being returned to the factory for some modification, mainly an improved engine.

Until this is done, the B-57 is restricted to VFR weather. The change involves a shroud ring on which the clearance has proven inadequate for B-57 missions where the aircraft is subjected to turbulent air, moisture and high G-loads. Both changes in the clearance and the material from which the shroud ring is made are being considered as fixes. The new ring, maintenance men say, will be "Sanforized."

Another improvement will be in the black paint that covers the fuselage. On the planes at Randolph it was severely crazed from temperature changes. This cuts down on speed, demands a craze-proof paint.

Mobile Photo Units

Reconnaissance pilots of the 363rd find the B-57 a big improvement over the B-26, mainly because of its speed. Typical Sagebrush mission involves a flight of about 1,500 miles over five targets, lasts four and a half hours. Some 15 to 20 pictures are taken of each target from flares at an altitude of 20,000 ft.

The prints are made at Randolph in mobile air-transportable trailers, brought here from Shaw AFB, S. C., in C-124's of the 18th AF. Twice-a-day courier service flies the finished prints to Aggressor headquarters at England AFB, La., nearly 400 miles away.

It takes eight C-124s to move the reconnaissance outfit, partly because the trailers are not economical packing cases.

On the other hand, the darkroom equipment is set up ready for action and finished prints can be supplied quickly once they are unloaded at a new base.

Maintenance crews on the B-57 at Randolph AFB are equipped to take care of their aircraft for 30 days. Major overhauls are done at a simulated rear maintenance base at Blytheville AFB, Ark.

Crew chiefs have the common complaint that parts are in short supply, but there is no evidence of missions being aborted for this reason. They say the B-57 is easy to work on.

Valuable Experience

TAC's constant emphasis on mobility and flexibility (AW Nov. 21, p. 16) is not without its effect on the maintenance problem and it is here that Sagebrush is proving profitable.

"Back at Shaw," one crew chief said, "the boys call too often for a specialist, mostly because he's there. Well, down here we haven't got the specialist, so they go out and do the job themselves. That's where we pick up a lot of maintenance capability on a maneuver like this.

"What we lack in personnel, now we are making up in experience."

The same man took time out to praise the Martin Company technical field representative, Frank Train. He said Train "has worked around the clock and is the biggest help we have to solve problems."

Is that unusual?

"It is when the outfit is stateside," he replied.

Major role of the RB-57s in Sagebrush probably has been to bring in reports on damage inflicted by the bombers. Joint Operations Center, where Aggressor air commander Maj. Gen. Edward J. Timberlake has his headquarters, picks the targets and demands a bomb damage assessment report.

The missions necessitate continuing reconnaissance over recurring targets. New bombing raids are ordered to keep as many as possible of the U. S. air bases out of commission.

Bombers of the 461st carry a single weapon of the type used in Sagebrush and are started on missions in order of the priority given the target by JOC. Back at Randolph, they get a fast turnaround, fuel and fresh bomb for another mission while the crews are briefed on the next targets. Some of the aircraft have aerial refueling capability, some do not.

Air Defense 'Sketchy'

Striking success of the B-57 missions in Exercise Sagebrush set off a torrent of comment and discussion at maneuver headquarters here.

Gen. Weyland said frankly that the background of Sagebrush's organization left the Friendly forces "sketchy on air defense." This was inevitable if the exercise was not to interfere with the regular day-to-day mission of the Air Defense Command.

However, Gen. Weyland added, "a good bit of realism was involved insofar as the limitations or vulnerability of the radar warning system is concerned.

"As of right now the equipment we have is susceptible to jamming."

Then he pointed out that an enemy attack on the United States, if it were real, would be a strategic bomber attack. Fuel limitations would curb any attempt to do this from low altitudes. "Because big bombers face a hard time on the deck."

Chess Game

Electronics experts observing the Sagebrush operation added that countermeasures can be piled on countermeasures.

"It's a bit like a game of chess," one of them said, "each side making a move and the opposition trying to find a new out."

It was made clear, as admitted by Gen. Weyland, that existing U. S. equipment is limited by its vulnerability to jamming. The experts say it is possible to constantly shift frequencies to evade countermeasures and radar with this capability is being built. Some of them will shift automatically to another frequency when jamming is started.

An additional factor in Sagebrush, Gen. Weyland said, was the obvious fact that Aggressor was well posted on the characteristics of U. S. radar, an advantage that would be lacking to a real enemy.

Another factor strongly favoring the B-57 units in the Aggressor force was the makeup of the opposing air power in Sagebrush.

While it was not emphasized by military spokesmen for either the Army or Air Force, Gen. Timberlake's 29th (U. S.) Air Force did not have all-weather fighter capability, being equipped with six squadrons of F-84F's.

North American Has Record Year; Diversification Program Pays Off

Los Angeles—North American Aviation reports that the fiscal year ended Sept. 30, 1955, was the most successful in its history with a record profit of $32,349,176. This is equal to $9.42 per share and compares with $6.46 a share in 1954 and $3.72 in 1953.

Board Chairman J. H. Kindelberger lists these accomplishments for the 1955 fiscal year:

- **Highest net income** in history, $10-million above last year.
- **Highest sales** in company history, with a total of more than $816 million.
- **Payment of more in wages** and salaries than in any previous year, with a payroll of $323.5 million.
- **Highest peacetime employment,** totaling 61,336. The wartime peak was 91,000 in October, 1943.

Heavy Backlog

The airframe company gives its unfilled backlog as of Sept. 30 at $1,156 million with another $300 million still being negotiated. The report predicts that sales during the coming fiscal year will be approximately equal to those reported for the 1955 year.

Kindelberger also reports that recent reorganization of the company, creating three new operating divisions, marks the maturity of a broad diversification program started ten years ago. These new divisions include:

- **Atomics International**—Nuclear engineering and manufacturing in the field of electrical power, industrial, medical and research reactors.
- **Autonetics**—Development and production in the field of automatic navigation and electromechanical control systems for airplanes and missiles and electronics.
- **Rocketdyne**—Development and manufacture of high-thrust rocket engines for guided missiles and armament rockets.

Kindelberger said the separate operating divisions were created to provide a strong basis for further expansion in those fields. All of them grew initially from the company's interest in guided missiles.

After determining that atomic energy was not immediately feasible for missile propulsion, North American turned to peaceful uses for the atom. Atomics International Division was the result.

Rocketdyne

Rocketdyne Division grew from that same decision. The company entered the rocket engine field when it determined that liquid-propellant rockets would be most suitable for missile production. The Autonetics Division initially was formed to develop accurate guidance and control of NAA's long-distance missile, the Navaho.

All three divisions are indicative of North American's desire to expand into fields apart from strict airframe manufacture. The rapid growth of this industrial giant is one of the most significant aspects of the financial report.

The North American statement confirms AVIATION WEEK reports that the major flight test program of the SM-64 Navaho missile has been moved to the Air Force Missile Test Center, Patrick AFB, Fla.

"Excellent progress has been made in solving the unique structural and manufacturing problems involved in an advanced program of this kind," Kindelberger reported. "New types of materials and new manufacturing techniques have been found necessary in

Collier Trophy Award

The Collier Trophy Award for the "greatest achievement in aviation in 1954" will go to Richard T. Whitcomb, a research scientist for the National Advisory Committee for Aeronautics, for his discovery and experimental verification of the "area rule," a revolutionary concept in supersonic aircraft design that is increasing speeds of military aircraft by as much as 25% (AW Sept. 12, p. 12).

"Whitcomb's area rule is a powerful, simple and useful method of reducing greatly the sharp increase in wing drag heretofore associated with transonic flight," the citation said.

Whitcomb is assistant head of the 8-ft. transonic tunnels section of NACA's Langley (Va.) Aeronautical Laboratory.

order to achieve the rugged construction that will withstand the extreme conditions of missile flight."

Kindelberger said that, in addition to supplying rocket engines for the SM-64, the Rocketdyne Division also is developing and manufacturing propulsion systems for other U. S. missile manufacturers.

Among these are the rocket engines for the Army's Redstone missile and the propulsion system for the Cook test sled. The division also is active in the field of aircraft armament rockets. Kindelberger said several types of small liquid-propellant, as well as solid-propellant, rockets have been designed, developed and manufactured under experimental and service test programs.

Gross business of the Rocketdyne Division has approximately doubled each year for the last three years. Total employment in this division went up during Fiscal 1955 from 1,900 to 4,012.

Manufacturing Divisions

The company gives the following report on its aircraft manufacturing divisions for 1955:

• **Los Angeles**—Completed F-86F Sabre interceptor and F-100A Super Sabre programs and began production of F-86K and F-100C. Resumed production of F-86F for MDAP nations. Started engineering on USAF Phase I contracts for a new fighter-bomber and a long range interceptor.

• **Columbus**—Continued manufacture and delivery of FJ-3 Fury fighter throughout the year, with FJ-4 now in production build-up stage. Began production of T-28B and T-28C Navy trainers following transfer of this program from the Downey, Calif., plant. Became second production source for F-100, with first flight of Columbus-built F-100C in September. Completed production of F-86H.

Completed Navy modification program AJ-1 attack bombers. Expanded engineering work on new types, including a number of design proposals for advanced Navy aircraft.

• **Fresno**—Continued modernization, modification, inspection and repair of F-86 day fighters and F-86D interceptors.

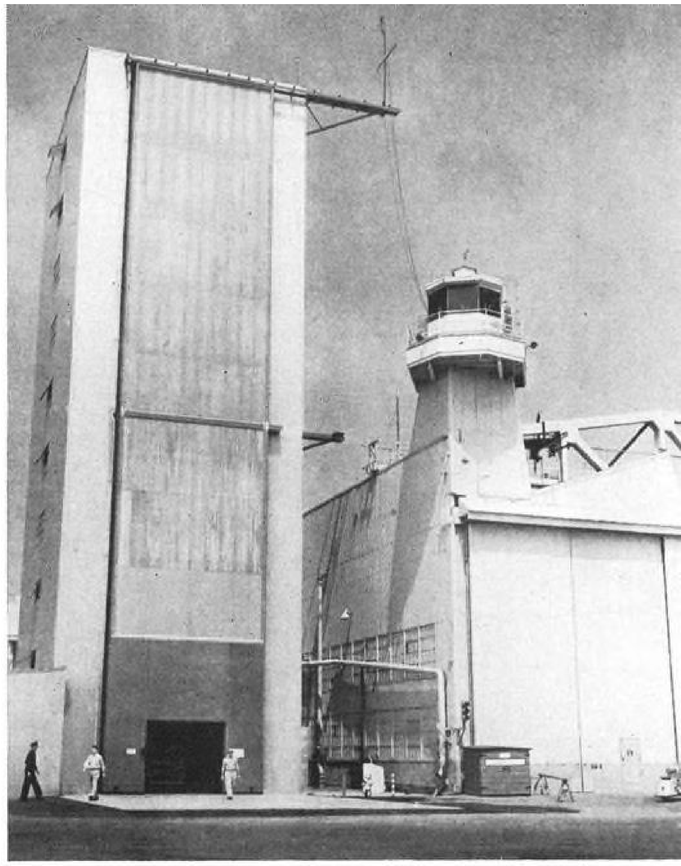
Foreign Operations

North American reports that during the year it delivered airplanes of ten different types for use by the Air Force, Navy and North Atlantic Treaty Organization countries. Eight of these programs involved jet fighters or interceptors.

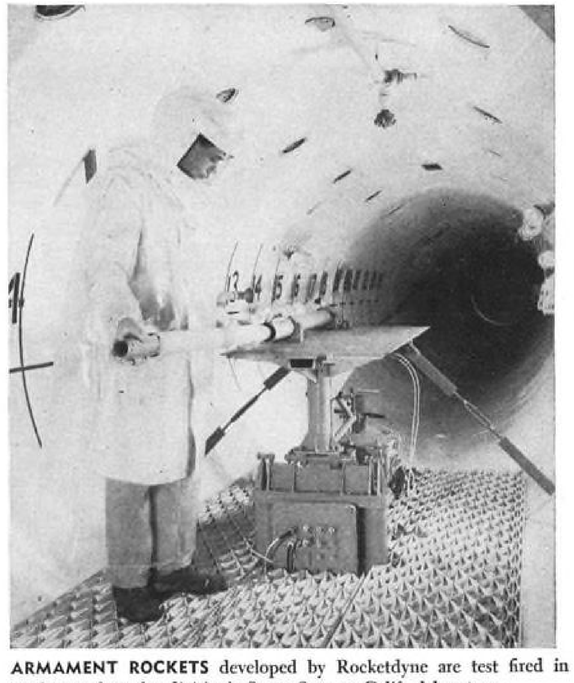
Production of F-86 Sabre fighter and interceptor aircraft is now licensed in four foreign countries—Canada, Australia, Italy and Japan. Overhaul and repair of F-86 Sabres is authorized in a fifth country, Spain.

Missiles of Future Tested at North American

HIGH-THRUST rocket engines pour out enveloping smoke clouds during tests at Rocketdyne, one of North American's three new divisions.



NORTH AMERICAN tower at Downey, Calif., where the Missile Development Division is testing the SM-64 intercontinental missile.



ARMAMENT ROCKETS developed by Rocketdyne are test fired in steel tunnel at the division's Santa Susana, Calif., laboratory.

F-105 Exceeds Mach 1 in First Flight

Republic Aviation's F-105A supersonic fighter-bomber exceeded the speed of sound in its first flight late last month at Edwards AFB, Calif., and approximately 12 other flights have been made.

The event marked a strong bid by Republic to dominate the Air Force fighter-bomber field.

The F-105 is powered by a Pratt & Whitney Aircraft J57 turbojet which develops 10,000 lb. dry thrust. USAF said the new aircraft has short, very thin sweptback wings, a long cylindrical fuselage, wing root air intake ducts permitting radar equipment to be installed in the needle nose, and a one piece flying tail set low on the aft section of the fuselage. A ventral fin on the bottom of the fuselage aft section provides increased lateral stability.

The new fighter-bomber can carry over long ranges at high Mach speeds nuclear weapons as well as heavier loads of non-atomic bombs and rockets.

Russell M. Roth, Republic's chief experimental pilot, piloted the plane on its first flight and reported "a very fine ride." The flight was made a month ahead of schedule and lasted 45 minutes.

USAF-Army Missile Feud Flares

Washington—New tests of the Army's Nike anti-aircraft missile, in which it made only partially successful attempts to stop the Air Force's TM-61 Matador missile at White Sands Proving Ground, N. M., have started another round of Pentagon controversy over the Nike's effectiveness.

Army Secretary Wilber Brucker has made the flat statement that Nike "can seek out and destroy any aircraft, no matter how high or fast the aircraft can fly."

Other Army spokesmen, in support of this thesis, have said there had been test firings against the Matador where kills were scored on both of two shots fired.

Air Force sources told AVIATION WEEK there have been two experiments. In the first, a Matador that had been used for various development purposes was turned over for the Nike experiment.

It was flown over the White Sands range at 35,000 ft. altitude, escorted by two fighter planes.

Approaching the firing zone, the two fighters peeled off and for a short time befuddled the radar and interfered with control of the Matador.

The TM-61 recovered and four Nike missile were fired.

The first missed the target. The second missed, and it is believed it honed on the explosion of the first Nike, which was detonated to keep it from causing damage.

The third Nike had a power failure, and the fourth missed the target and was destroyed.

Later, a second test was held with two Matadors as targets. Four Nikes were fired at the first TM-61 and all missed. Two Nikes were fired at the second TM-61 and both hit the target.

It was pointed out that the Matadors were not flying at maximum altitude or speed and that no electronic countermeasures were used to jam the Nike control system.

Air Force continues to maintain that the Nike is overrated as an anti-aircraft weapon but insists the stand is taken for practical reasons.

"We are not opposed to Nike as such," one officer said, "and we wish it would work as well as it should. But the tests don't prove it is a fully effective defense measure despite the constant improvements."

New Dispersal Policy

Defense Department has issued new policies governing dispersal of industry to avoid concentration of facilities within target areas.

The Defense instruction (No. 5220.5) states:

- When multiple sources for an item of material or development are practical, dispersal will be the key factor in selection of the additional sources. This also applies to subcontracting work.
- Dispersal will be one of the prime considerations in the location of new facility construction, particularly when furnished at government expense or with U. S. aid to construction. This does not necessarily apply to new facilities which are minor adjuncts to existing plants.
- All facilities in being will be maintained in use as required to avoid excessive cost and social dislocation caused by abandoning existing production facilities. Every effort will be made to use existing facilities before new plants are constructed.
- Urgency of dispersal must be weighed against the urgency of early delivery of the vital product involved.

The instruction was signed by Reuben B. Robertson, Jr., Deputy Secretary of Defense.

Jackson Urges Navy To Speed Atom Power

Washington—A crash-type program to convert the Navy to atomic propulsion and atomic armaments was urged by Sen. Henry Jackson (D.-Wash.), Chairman of the Military Applications Subcommittee of the Joint Congressional Atomic Energy Committee.

In a letter to the Secretary of Defense, the Secretary of the Navy, the Chief of Naval Operations and the Director of the Bureau of the Budget, Jackson specifically urged that funds be included in the Fiscal 1957 budget for the construction of an atomic-powered aircraft carrier.

"Aircraft carriers are particular 'naturals' for the early application of nuclear power, and extensive testimony . . . has convinced me that every new carrier for which authorization is sought should be atomic-propelled," he said.

"The combination of nuclear propulsion and nuclear armaments—as in atomic-propelled submarines firing atomic missiles, or in atomic-driven aircraft carriers launching planes with atomic payloads—can give our Navy an offensive punch and defensive strength without parallel in history."

Jackson pointed to the recent rapid increase of Soviet naval power: "Twenty years ago, Soviet naval strength was almost insignificant when compared with that of the great naval powers. Today, the Soviet navy is the second largest in the world."

Guaranteed Wage May Be Industry Issue

Los Angeles—The aircraft industry may be next in line to face union demands for a guaranteed annual wage.

Leonard Woodcock, vice president of the United Auto Workers-CIO, said last week that in next year's negotiations the aircraft locals will seek, not only a closed shop, but also job security of the type provided by the guaranteed annual wage.

"While we do not propose a mechanical application of the formula in the aircraft industry," Woodcock said, "we will nevertheless insist in our negotiations on security guarantees.

"Because of the sudden cancellation of contracts by the Government and because of 'phasing out,' aircraft workers are probably more in need of guaranteed employment than any other workers within the UAW-CIO."

Woodcock said the union hopes to work out cooperatively with the aircraft companies a system of employment security "adapted to the special circumstances of the industry."

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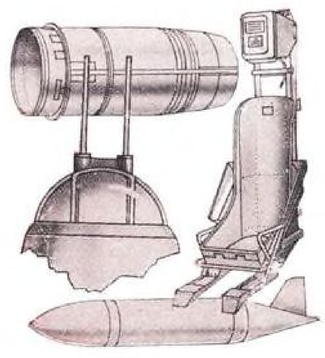

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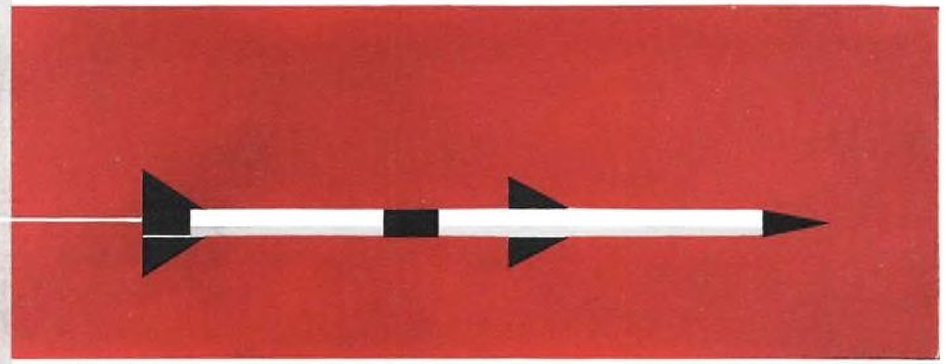

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McDonnell Aircraft Expands Facilities

St. Louis—McDonnell Aircraft Corp., has reorganized and expanded its research and development activity and soon will open a new flight test base in an area remote from the congestion of St. Louis.

The company says these changes will be effective Dec. 1 to handle the greater R & D effort demanded by present and future contracts:

- **Four research departments** and all laboratories in the Airplane Engineering Division will report to the division's chief technical engineer, Vernon Outman.

Departments are aerodynamics, wind tunnel, thermodynamics and control dynamics. Laboratories are applied mathematics and all activities of the electrical laboratory except flight test instrumentation.

- **A new flight department** will be formed and the activity expanded to cover flight testing for the airplane, helicopter and missile divisions. All pilots will be in the new department, which will report directly to Kendall Perkins, vice president engineering.

Reorganization of Aircraft Engineering Division laboratories under one head is expected to economize on equipment, personnel and tests. Service to various company departments will be made quicker and more efficient.

Expansion of the flight test department is preliminary to selection of a site for the new test center in a sparsely settled area. McDonnell has faced a community problem with its flight test work based at Lambert Field in St. Louis.

The new flight test department will be headed by Frank E. Christofferson.

It is expected that he will join the company Dec. 1.

Defense Department Liberalizes 'Set Aside'

A new Department of Defense instruction (4100.9) aims to broaden small business participation in military procurement by liberalizing "set-aside" provisions.

Under it all military procurement agencies are required to make "set asides" for small businesses; partial "set asides" are directed when a procurement can be split economically; classified, as well as unclassified, procurements are to be screened for "set asides."

F-W Begins Production

The Focke-Wulf aircraft factory in Bremen has begun production of its first post-war aircraft, the 135-mph. BL 502 (AW Sept. 12, p. 83). The company hopes to find an international, as well as a domestic, market for the light plane designed by Professor E. Bwume.

Military Aviation Funds:
(July-August)

Defense Department had more than $13.5 billion on hand for aircraft, engine, and parts procurement contracts on Aug. 31. During July and August, the first two months of Fiscal 1956, Air Force reported cancellations of $1 billion more than the amount of new contracts let for aircraft, engines and parts. Army cancellations exceeded new obligations by $63 million.
Here are the details:

	(OBLIGATIONS) (000 Omitted)		(EXPENDITURES) (000 Omitted)	
	July & August	Unobligated Aug. 31	July & August	Unexpended Aug. 31
Aircraft, Engines, Parts				
Army	−63,007	308,691	17,457	468,776
Navy	138,592	3,156,563	289,595	5,818,272
Air Force	−1,023,329	10,050,051	888,788	14,675,042
MDAP	−7,761	.....	−5,217	486,639
Total	**−955,505**	**13,515,305**	**1,190,623**	**21,448,719**
Guided Missiles				
Army	102,016	275,884	33,240	910,135
Navy	28,186	294,476	19,878	550,271
Air Force	20,301	890,076	69,016	1,364,715
Total	**150,503**	**1,460,436**	**122,134**	**2,825,121**
Electronics and Communications Equipment				
Army	−1,764	207,400	5,993	573,817
Navy	8,994	203,165	10,391	350,860
Air Force	−44,565	451,905	86,794	1,101,204
MDAP	9,762	.....	20,552	−28,279
Total	**−27,573**	**862,470**	**123,730**	**1,997,602**

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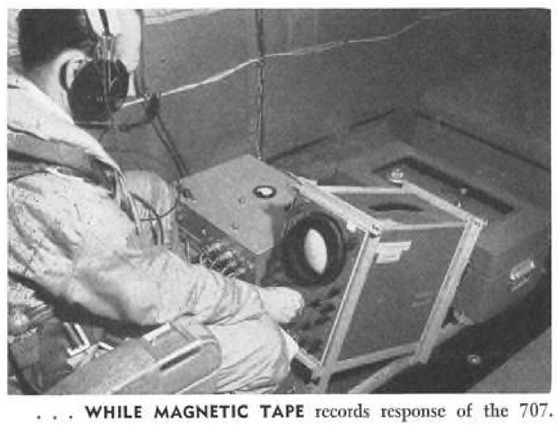
FLIGHT-TEST center is lined with B-52s.

XB-52, shown during test with F-86 chase plane, is father of USAF's Stratofortresses . . .

. . . **THESE ARE THE MEN** (led by production pilot Clayton Scott at right) who tested it.

BOEING 707 goes aloft to test high-speed flying boom . . .

FLIGHT-TEST SECTION led by A. M. Johnston discusses 707.



. . . **WHILE MAGNETIC TAPE** records response of the 707.

707 PRE-FLIGHT crewmember checks one of the jet engines.

New Boeing Equipment Will Speed Flight

By Irving Stone

Seattle—Testing of Boeing Airplane Co.'s 707 jet transport series, the KC-135 jet tanker and advanced versions of the B-52 will be facilitated with new equipment scheduled for full operation at the company's huge flight-test center by the middle of 1956.

One of the major innovations Boeing will introduce will be a high-speed set-up for ground reduction and processing of airborne-recorded magnetic tape data similar to that at Convair-San Diego (AW Nov. 14, p. 95). This installation will:

- **Speed up transcription** and reduction of flight test measurements.
- **Reduce transcription manpower** requirements through the elimination of manual methods.

This approach will make design changes easier and permit faster-translation of these improvements into production articles.

Representing an investment of about $250,000, the new system will automatically translate into engineering form in about 12 to 24 hr. the average 1½ million data points from a single B-52 representative test flight. Further engineering computations may be obtained directly from computer facilities in another 12 to 24-hr. period.

By comparison, the present semi-automatic system used at Boeing's flight test section (AW June 4, 1954, p. 49) would take from 7 to 10 days to get the data processed.

432 Variables

The magnetic tape system will utilize a pulse-width modulation (PWM) technique which will record 432 separate test variables two-and-a-half times per second.

A lesser number of test variables could be recorded at a higher rate.

In effect, this relatively slow-speed pulse-width modulation technique is an adaption, for bomber and large transport type aircraft use, of the higher speed PWM method now applied to missiles and some fighter planes.

In the ground handling system, the magnetic tape will be used exclusively for translation of the data and further input to computer, so that essentially no manual operation will be required.

In addition to manpower savings, which may run as high as $200,000 a year, feeding flight test data to the computer by magnetic tape will reduce computer work load by about 50%, thus making the device available for more jobs.

Already, Boeing is testing prototype airborne PWM equipment in its 707 aircraft. Corresponding ground handling equipment is now being readied for operation.

In 707 flights, Boeing instrumentation engineers merely are using the prototype equipment to check operation and reliability by presentation on an oscilloscope. This will insure that no real problems will exist when the KC-135 test program starts about the middle of 1956.

Heavy Load

Flight test load and preparational phases for incoming aircraft are the heaviest in Boeing's history. Included in the flight test program:

- **707 prototype,** being flown as a test vehicle for the KC-135 jet tanker-transport program and as a test plane for the production versions of the 707 Jet Stratoliner.

Flight test planning is underway for certification tests of the Jet Stratoliner, likely to commence late in 1957 or early in 1958 with the first production planes.

- **Ten B-52s,** assigned to various development programs in support of B-52 production. These programs are concerned with aerodynamics, powerplants, airplane systems, armament, bombing and navigation, structural integrity and avionics. As many as eight B-52s have been in the air at one time when engaged in specific test programs.
- **Two B-47Es and one B-29,** used for development and proving of armament systems for the B-52.
- **Two XB-47Ds,** serving as test beds for the Wright T49 turboprop. First flight of the XB-47D recently took place at Boeing Field (AW Sept. 5, p. 17).
- **Two B-47Es,** for development of bombing and navigation systems for versions of the B-52 and other aircraft.
- **Two YC-97Js,** turboprop test bed versions of the KC-97, are fitted with Pratt & Whitney T34s. The first was delivered to Edwards AFB in August.
- **Two F-94Bs,** for testing electronic gear.
- **Four F-86s,** chase and observer planes in support of the B-52 and 707 programs. They have been used for simulated fighter attacks, for B-52 armament tests, photographic coverage and observation of such things as boom extension and retraction on the 707.
- **B-45A,** used for high-speed, high-altitude towing of targets for B-52 aerial gunnery tests.
- **C-46,** for hauling parts, equipment and personnel between Boeing Field and Moses Lake Flight Center and other points.

All these aircraft, including those not specifically used as test vehicles, are serviced and maintained by Boeing crews.

Since Boeing's $6-million flight test center started operations in 1954, actual hours in the air per test airplane have been stepped up 100%. The schedule now is running about 80 hr. per week on B-52s alone.

The cost of testing each B-52 assigned to the test program has been cut by 50% since 1953, when development testing (Phase 3) of the plane began.

The flight test section now has more than 700 engineering employes. This

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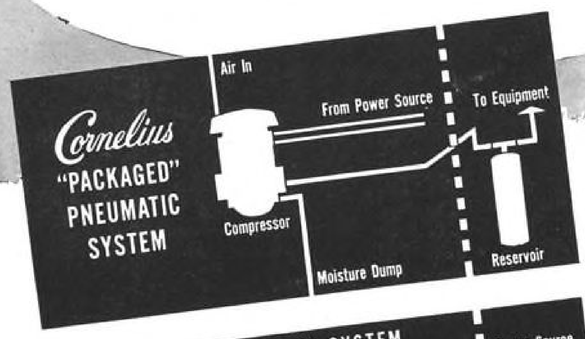

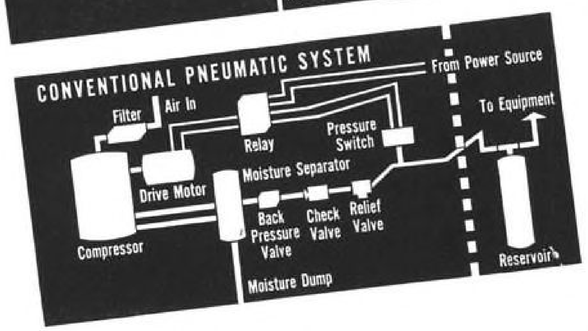

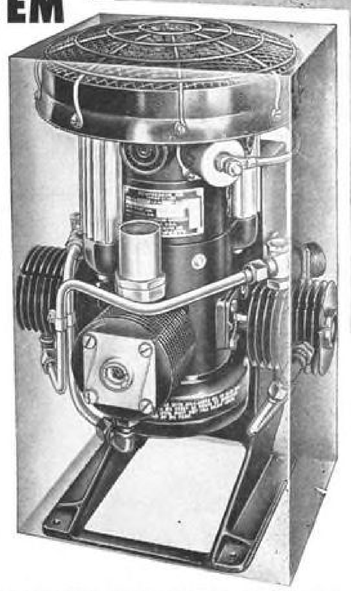

COMPLETE PNEUMATIC PACKAGE

*The Cornelius Compressor, Model 130, 2CFM, 3000 PSI, is used in the McDonnell F2H-3 and F3H, North American FJ-2 and FJ-3, Chance Vought F7U-3, and Grumman F11F-1. Also on order for the Lockheed P2V, Grumman S2F, Martin P5M, Boeing KC135, Boeing B52, Convair Turboprop Airliner and Canadair Britannia. Thousands of service hours under all operational conditions are proof of outstanding performance.

The Cornelius Model 130 compressor* is the heart of the complete Cornelius "packaged" pneumatic system which includes inlet air filter, starting relay, radio noise filter, moisture separator with automatic condensate dump and heating element, back pressure valve, check valve, relief valve and pressure switch.

Compact Design Saves Space—Entire air supply system occupies only slightly more space than compressor alone in conventional system.

Weight Savings of 5 pounds or more are possible by eliminating separate system components, associated tubing, fittings and flare connections.

System Leakage Is Reduced to a minimum because integration of components removes possible leakage sources such as flare connections and o-ring sealed fittings.

System Reliability Is Assured because each integral component is designed specifically to give optimum performance in combination with the other components.

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figure is 100 more than was projected a year and a half ago.

More than 1,000 manufacturing shop personnel work only in support of the flight test section.

These people maintain the test vehicles and install test equipment. All this work is done on a three-shift basis. Normally conducted five days a week the work frequently runs to six and seven days depending upon the urgency of the program.

The Engineering Flight Test section is headed by A. M. (Tex.) Johnston.

Johnston's administrative assistant is H. A. Ricke.

The section operates through five units—experimental test pilots, flight test operations, flight test instrumentation, production flight test and supporting services.

Experimental Test Pilots

This unit conducts flight or ground tests of the test aircraft and evaluates their operational characteristics.

Pilot recommendations in the past have resulted in the adoption of the B-52 crosswind landing gear, in an improved lateral control system (a modulated finger type spoiler) and improved longitudinal control in the critical speed ranges.

Senior experimental test pilot is R. L. Loesch, Jr.

Flight Test Operations

This activity establishes test schedules, formulates data requirements, prepares test specifications and procedures, determines and releases to the shop the configuration the plane should have for the test, plans the test and participates in it with the pilots.

The operations unit also transcribes and reduces flight test data and prepares and releases technical reports to research and development staffs and design projects (B-52 or 707, as the case may be).

A special group has been selected from the operations unit to handle the 707 test project, since it has both military and commercial aspects.

Other special groups include engineers concerned solely with work such as bombing and navigation system development, electronic counter-measure equipment, etc.

Head of Flight Test Operations is G. M. Blount.

Flight Test Instrumentation

This unit is concerned with design, development, procurement, installation and operation of instrumentation used in the various test programs.

Involved in its work is approximately $7 million in equipment, varying from a simple transducer to the extensive and complicated magnetic tape recording

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This jet's engine wears a wrinkled jacket

HERE'S Convair's F-102A, new entry in the supersonic field. Original models used a titanium shroud—or jacket—for the jet engine to save 40% in weight over a comparable steel part. In the latest models, Convair has introduced a new wrinkle to save even more weight.

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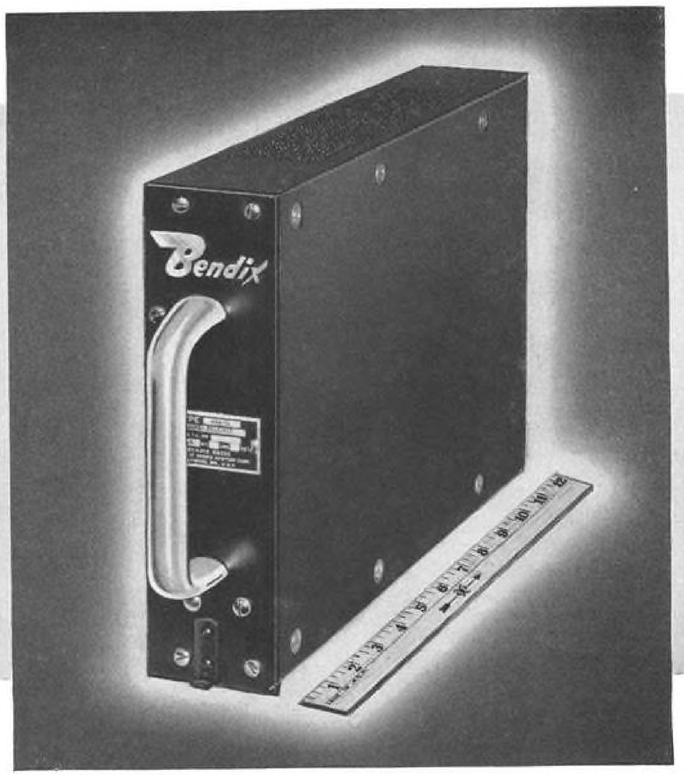

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(1) Greatly reduces the chance of television or FM interference.

(2) Stabilizes gain under wide ranges of environmental conditions and line voltage fluctuations.

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Antenna transmission line input impedance	52 ohms. Voltage standing wave ratio less than 1.2 to 1.
AVC characteristics	Audio output is within a 6-db range at r-f input levels from 400 to 200,000 microvolts.
Selectivity	Attenuation: 6 db, 60 db — Total Bandwidth: more than 40 kc, less than 250 kc
Frequency stability	± 10 kc under all service conditions.
Undesired response rejection	Interference from adjacent channel television signals will not produce lamp threshold at input levels up to 3.5 volts.
Audio output impedance	500 ohms, nominal.
Power requirements	*AC Power Supply* 115 volts ac, 300-1000 cps, 35 VA with 27.5 volts dc for ON-OFF relay control, or *DC Power Supply* 27.5 volts dc, 36 watts.
Altitude performance	Operates at barometric pressures equivalent to 30,000 feet altitude.
Ambient temperature rating	−40°C to +70°C (−40°F to +158°F).

Specifications subject to change without notice.

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system Boeing now is preparing to install.

Head of Instrumentation is F. E. Woods.

Production Flight Test

This activity determines the procedures to be used for functional flight test of the production planes and conducts these tests.

Its responsibility is to deliver a fully operational article to the customer, but it aims to do this with a minimum number of flights, because of the high cost involved.

One big job of the unit is to keep track of repeated malfunctions and refer these back to Manufacturing and Engineering for proper attention.

Head of Production Flight Test is C. L. Scott, who was the personal pilot for company founder W. E. Boeing.

Supporting Services

This unit coordinates, plans and procures flight test facilities. Thus, it may have to make arrangements for remote base operation, for example, in connection with special B-52 or 707 tests. Its responsibility also includes design and operation of all ground-to-air radio facilities at Boeing.

Supporting Service, now has in operation a multi-channel receiving and transmitting station which handles all Boeing test traffic in the western Washington area.

This unit indoctrinates all flight crew members in the use of flight equipment and supplies Link trainer instruction to pilots stationed at Boeing Field. It maintains all the various flight crew equipment.

Head of the Supporting Services activity is R. V. Brown.

French Govt. Will Buy 20 Breguet Dux Ponts

The French Air Force announced plans to purchase 20 Breguet Dux Ponts double-deck transports plus three existing protypes. Delivery of the transports is presently scheduled to be completed by 1958.

The move apparently was an effort by the French government to bolster the shaky financial position of the transport's manufacturer, Ateliers D'Aviation Louis Breguet, and, at the same time, to recoup some of its own losses. Breguet went, and still is, heavily in debt to government financial agencies several years ago through heavy investments for the development of the Deux Pont which failed to find buyers. Breguet also has been awarded a contract for the development of the Taon light fighter for the North Atlantic Treaty Organization.

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Boeing, Douglas Swap Techniques In Designing Competitive Jetliners

By George L. Christian

In designing their respective, and competitive, jet airliners, Douglas and Boeing tacitly acknowledged one another's skill. Boeing's 707 jet prototype has the stamp of Douglas on it, and Douglas plans for the DC-8 have a Boeing look about them. These design reversals are especially noticeable in the cockpit layout, flight-control boost and cabin cooling systems in proposals made by the two competing companies to Pan American World Airways and United Air Lines.

They include:

• **Cockpit.** Boeing's 707 has a typical DC-6-type cockpit. It is built to about the same dimensions—a little snug—and has the flight engineer's position behind the pedestal. His control panel is to the right.

The cockpit of the Douglas DC-8 is about as roomy as the Stratocruiser's and has almost the same amount of visibility.

• **Control boost.** Boeing, which used hydraulic boost on the Stratocruiser's rudder control system, has gone to complete aerodynamic boost on the 707's flight controls—elevator, rudder and ailerons. Spoilers, which can operate differentially as ailerons or symmetrically as air brakes, are hydraulically operated.

Douglas, whose entire series of DC-6s and -7s uses aerodynamic boost on all three control axes, has gone over to hydraulic boost on the DC-8's aileron and rudder control systems. Elevators are still aerodynamically boosted.

• **Cabin cooling.** Boeing uses a Freon cabin cooling system on the Stratocruiser but has switched to an air-cycle cooling system on the 707.

Douglas uses an air-cycle system on its DC-6s and -7s but will go to a Freon system on the DC-8s. (Some DC-7s, such as American Airlines', have a Freon refrigeration system, but it is primarily to cool the cabin on the ground. It can be used, however, to supplement the air-cycle equipment while airborne.)

DC-8 Questions

Some airline officials are inclined to put an "if" in front of DC-8 delivery dates.

They say the plane incorporates a number of unconventional design features. If these fail to prove out as expected, it might mean an extensive redesign effort. Coupled with the change in the customary prototype testing procedure by the manufacturer, this might wash out promised delivery dates, these officials say. Among the unconventional features:

• **Unusual wing airfoil section,** which resembles a conventional wing section inverted, with the greatest camber on the bottom instead of the top of the wing.

• **Douglas is now building hydraulic boost** into a large aircraft for the first time.

The DC-8 does not have the usual high-speed ailerons or spoilers.

• **Main landing gear** is novel for a transport plane in that it rotates 90 deg. to retract into the fuselage.

Engine Availability

Also of concern to some airlines is the question of availability of turbojet engines to power the overseas version of the Douglas DC-8—an appreciably heavier plane than the 707. One airline official says: "With the presently proposed Pratt & Whitney Aircraft J57, the international DC-8 could barely stagger from Gander to Shannon non-stop."

P&WA's J75 would give vastly improved performance, but the earliest date a commercial version of the engine will be available to them probably will be around 1960-65, they say.

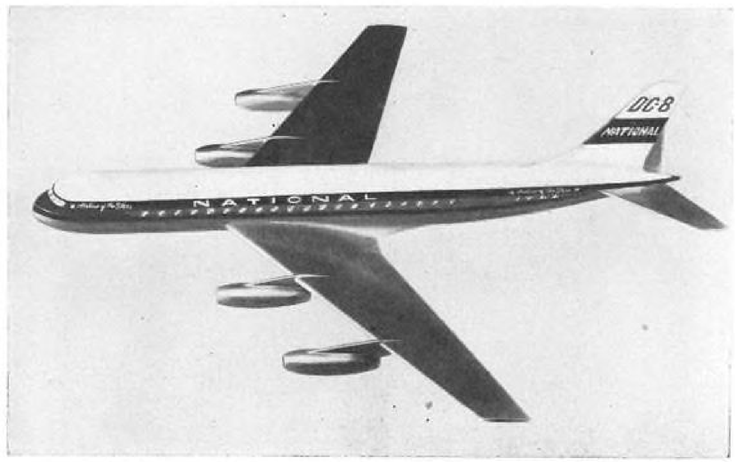
The situation is aggravated, they claim, because airline technicians cannot obtain any performance data on the J75 due to security restrictions. Even on the much-publicized, much-used J57, only airline personnel with a secret clearance may have access to complete engine specifications and performance data.

Water Injection

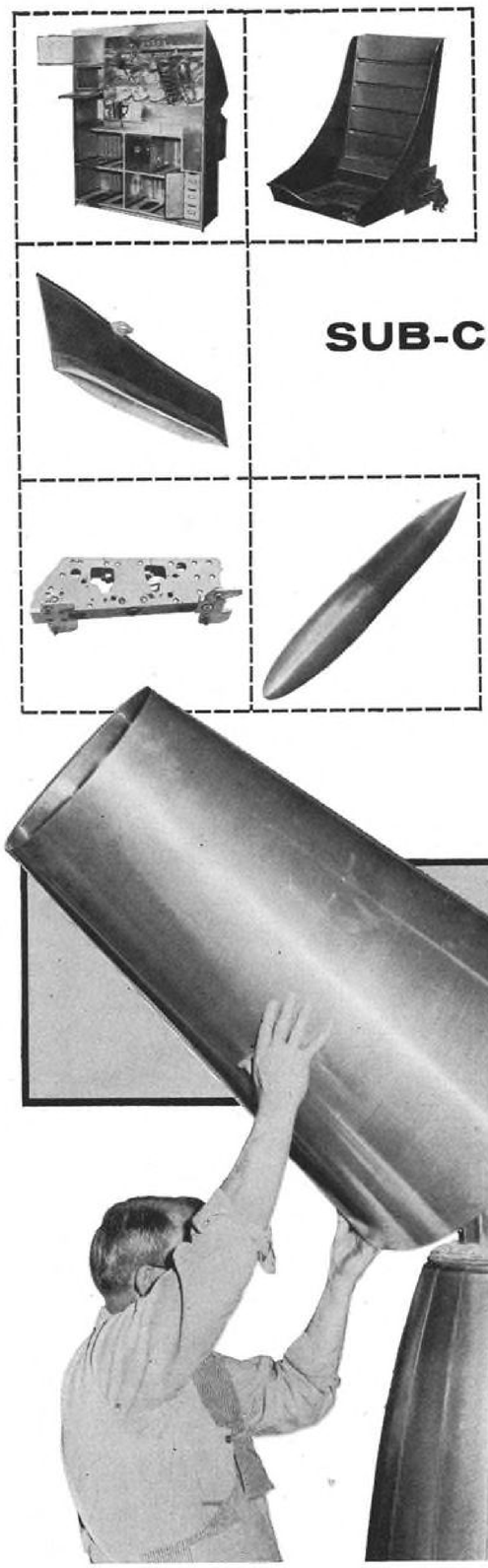
J57s on both the DC-8 and the 707 will require water injection under all takeoff conditions except those made with ambient temperatures under about 40-50F. Some 400 gal. of water (no methanol added) will be used in the initial two minutes of the plane's takeoff. On the 707, water injection pumps will draw a 40 kva from the plane's electrical system.

The water system will present no freezing problems. If ambient temperatures are down to freezing, the air will be dense enough to eliminate the

BOEING borrowed from Douglas in designing the 707 above, while . . .



. . . **DOUGLAS,** in turn, relied upon a number of Boeing features in designing the DC-8.



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need of water for takeoff. If water is needed, the entire quota of 400 gal. is used during takeoff and initial climb, so none is left to freeze in the tanks when the aircraft climbs to altitudes at which sub-zero temperatures exist.

Nor will water be required for a go-around because of the excellent acceleration characteristics of the twin-spool turbojet, airline sources say.

Reverse Thrust

Boeing is investigating several reverse thrust proposals but believes one of its own designs is as effective as any (AW Apr. 19, 1954, p. 28).

The Boeing device consists of two air deflectors which fit flush to the contour of the nacelle afterbody in flight. Upon landing, deflectors fold out from nacelle sides and aft so that rear sections of both deflectors meet over the jet's exhaust, forcing most of the blast forward along the deflectors at approximately a 45-deg. angle to engine thrust line.

Douglas also has its own design in the works. The Douglas proposal consists of two louvered sliding panels which are normally retracted into the nacelle afterbody sides. When extended aft to provide reverse thrust, the rear sections come together in the center of the jet exhaust blast, deflecting most of it forward through the louvers.

Observers estimate that reverse action of either proposal would be about equivalent to that provided piston engine planes with engines idling and propellers in low blade angle, forward pitch.

Structure Comparison

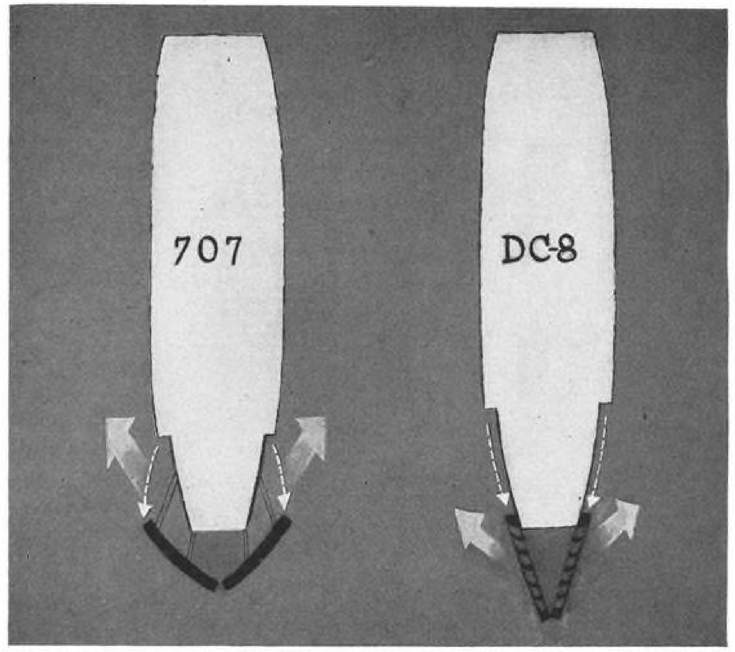
The 707's structure is of multipath design. In every load-bearing structure in the airframe there are at least three load-paths. Any one of the three can break without resulting in a catastrophic failure.

In the DC-8, use of redundant structure in the fuselage has allowed Douglas to build a "tear stop" into the body at 20-in. intervals. The result is that a fuselage skin tear, resulting from excessive differential pressure, can rip open to a maximum length of only 20 in. This will prevent catastrophic explosive decompression.

The DC-8's wing structure represents a radical departure from conventional design. Wing skin is roll-tapered from root to wing tip, with large sheets of wing skin to keep number of panels to a minimum.

The 707's wing skin is applied in the more conventional manner—constant thickness panels are used with gage becoming progressively thinner towards the wing tip.

Douglas uses span-wise, wing stringers with shapes developed by NACA for efficient load-bearing characteristics—a "Y" shape for compression loads on the upper surface and a modified "I" shape for tension loads on the bottom skin. Result is that the wing's skin/stringer combination carries 70-80% of wing loads, the three spars only 20-30%.

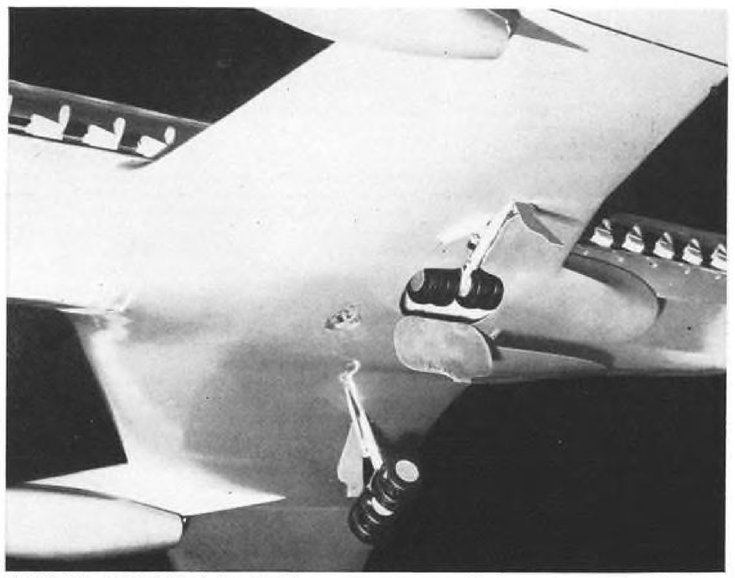


707-DC-8 REVERSE THRUST proposals. 707's deflector panels fold to meet in exhaust path, forcing blast forward; Douglas does this by sliding louvered panel into path.

Stringers are spaced along wing skin every few inches. Front and rear spars Vee together from root to tip (but do not join). Center spar runs from root to outboard engine pylons.

Hydraulic Systems

Both aircraft will use engine-driven, variable-displacement hydraulic pumps (one per engine) to supply main system hydraulic pressure at 3,000 psi. Both jets will have electrically driven auxiliary pumps to supply pressure in



IN NOVEL DOUGLAS design, landing gear must rotate 90 deg. to retract into fuselage.

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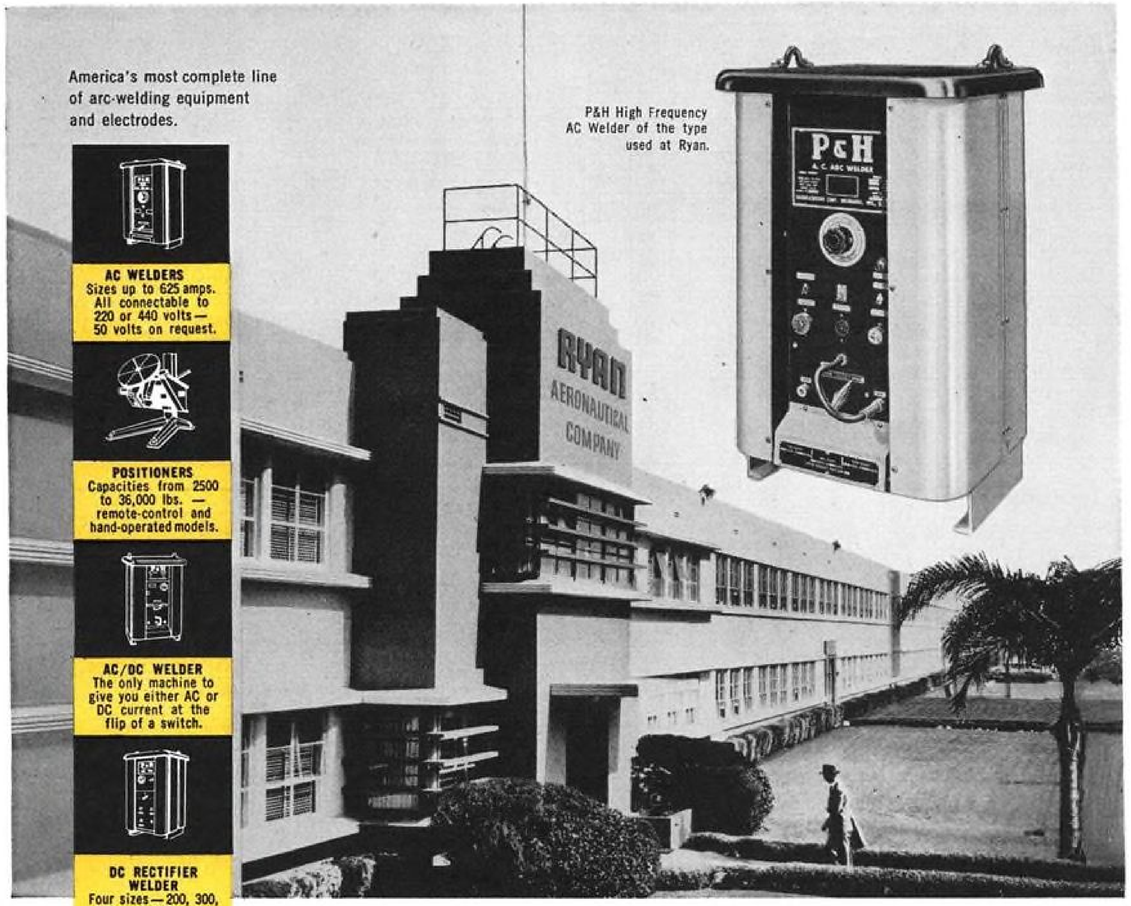

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In addition, P&H welders have an extremely wide range. On one of our models for example, you can go all the way from 475 amps down to 2 amps.

But we were talking about titanium — a tough material to weld in anyone's language. Here's what they say at Ryan where they use P&H high frequency machines, "There is less of a problem welding titanium than many users have been led to believe. With titanium we can go to any degree of thinness on material so far available. We have been down to .016" on this vital material." May we add again that it's P&H positive heat control and wider range that makes such a performance possible.

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case of main system failure.

Systems which will be hydraulically operated on the 707 are landing gear retraction and extension (in case of hydraulic system failure, all gear can be mechanically unlocked, will free-fall and lock in down position), wing flaps, low speed ailerons, speed brakes, wheel brakes, nose wheel steering and windshield wipers.

Hydraulically operated systems on the DC-8 are the landing gear (with emergency mechanical extension), wing flaps, speed brakes, wheel brakes, nose wheel steering, aileron and rudder boost. The DC-8 has no windshield wipers, uses compressed air jet streams instead.

Skydrol 500, low-temperature development of standard Skydrol, will be used in the hydraulic systems of both jets. The fluid's pour point is —100F. Monsanto Chemical Co. and Douglas cooperated in its development.

Electrical Systems

Both planes incorporate highly developed, completely automatic, modularized, alternating current electrical systems.

For the first time in commercial aviation, batteries are eliminated.

The a.c. systems are 208 v., 3-phase, 400 cycle. The small amount of d.c. current needed for some instruments and the radio is obtained from transformer-rectifiers.

Systems of both planes automatically isolate any defect in the a.c. layout and turn on lights to pinpoint the trouble for the pilot or flight engineer.

Pressurization & Cabin Cooling

On the 707, all air bled from the engines, whether for pressurizing or de-icing, is taken from the J57s' first spool (at about 425F) and is manifolded together. Pressurization and cooling air is pushed through twin air-cycle cooling turbines before it reaches the cabin.

On the DC-8, air is bled from the engines' second spool (at about 750F but cooled to 450F by an aftercooler/pressure regulator) to drive four air compressors which furnish cabin pressurization. A pair of compressors is located on each side of the nose wheel well.

Cooling is supplied by two additional air turbine-driven Freon refrigation compressors. Normal cabin operating differential pressure is 8.67 psi.

De-Icing

Boeing uses engine bleed air to de-ice wing panels outboard of the outboard engines only. Stabilizers are electrically de-iced. No anti-ice protection is provided for the wing from root to outboard panels, the four engine struts or the vertical pin.

707's sharply swept-forward engine pods are easily accessible from the ground.

Douglas cycles engine bleed air to all wing, engine strut and empennage leading edges.

The double-walled titanium nacelles of the DC-8 incorporate two-shot Freon extinguishing systems for the engines' accessory sections.

Provisions for fire extinguishing on the 707 have not yet been worked out in detail.

The Boeing's cabin windows will measure 9x17 in. (long axis vertical), will be made of laminated glass and will be located 20 in. on centers.

This unusually close spacing assures that passengers sitting on the aisle (three-abreast seating) will have a good view.

The Douglas jet will have elliptical windows (also with the long axis vertical) like those of the Viscount. Glazing material will be either stretched Plexiglas 55 or Gafite, a plastic produced by General Aniline. Spacing will be every 40 in.

The 707 cabin incorporates a new module system for passenger services. Four 10-in. square modules contain all essential services—one each for light and call, gasper (air outlet), loud speaker and oxygen. One complement of four modules takes up the 40 in. between seats. Moreover, the modules are track-mounted, like the seats, and if seat spacing is changed, the module spacing may be altered in a corresponding manner.

Landing Gear

The 707 uses a four-wheel main gear with wheels in a tandem bogey arrangement.

The minimum turning radius is restricted to inner gear describing a 21-ft.-diameter circle.

The DC-8's main gear lines up the four tires span-wise, with a pair on each side of the main strut. This allows plane to pivot on either gear. Industry sources say that Douglas hopes to put each pair of tires on one wheel, thus cutting total number of main wheels from four to two. Gear has to rotate 90 deg. during retraction to stow in fuselage.

On both aircraft, main landing gear is attached to special box structures in the wing instead of to the main wing

Erasing the Noise

Boeing is investigating a novel way of canceling out noise in the 707 transport.

A microphone and amplifier would pick up the frequency of noise entering the cabin. Loudspeakers located in the bottom of the baggage rack at each row of seats would produce the same noise but with exactly the opposite phase.

If the system works, the two sounds will cancel each other out.

In the fields of tracking systems and optical missile guidance systems, the H. A. Wagner Company has a record of outstanding contribution. Under the direction of Dr. Herbert A. Wagner, developer of the first tactically-used guided missile weapon system, this company is now engaged in a long-term missile guidance system development program.

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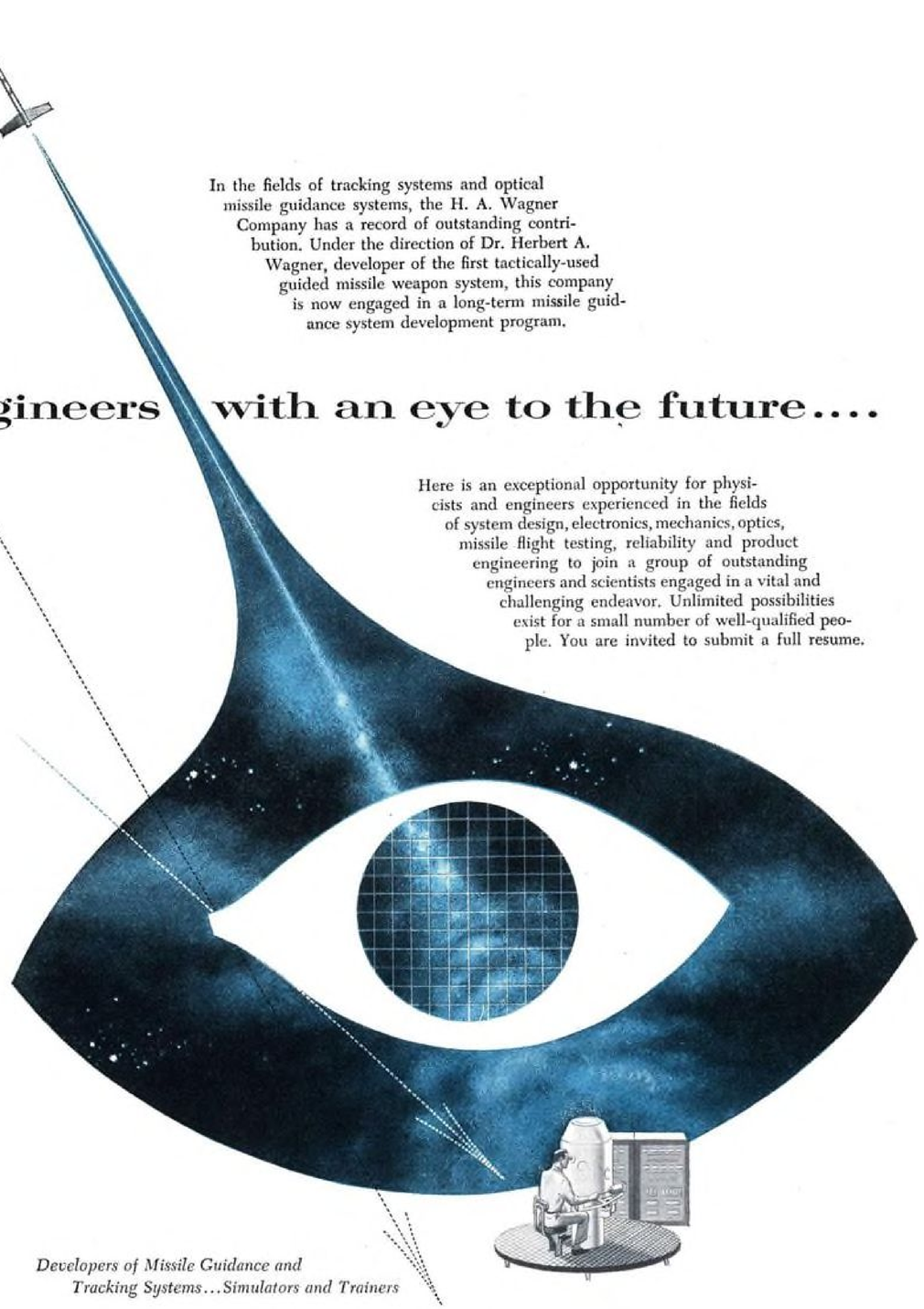

Developers of Missile Guidance and Tracking Systems...Simulators and Trainers

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spars. This will allow a main gear to be washed out without necessarily rupturing the plane's integral wing fuel tanks or damaging the wing itself beyond repair as is usually the case with today's aircraft.

Other Details

Douglas hopes to get a 4-mph. boost for its DC-8 by dumping the exhaust from its air turbine drives and cabin into a special aft-facing nozzle mounted on centerline bottom of the fuselage.

The plane has a 100% safety factor built into the fuselage at the main wheel well area. If the 5-ft.-deep keel which normally carries loads through this area fails, the stresses are taken over by two heavy 20-ft.-long forgings built into the fuselage just below cabin floor level.

The 707 has electrically-driven fuel pumps to dump fuel from wing center section tanks (located in the fuselage) which help bring the plane down to landing weight in case an emergency landing has to be made shortly after takeoff.

Aircraft Praised

Airline engineers quote their company test pilots as having high praise for the 707's flying characteristics. Approach and landing speeds are almost identical to the DC-7 and control response is more than adequate, especially on the roll axis, they say. Engine acceleration is equal to or better than current piston power plants.

Engine controlling, especially on go-around, is greatly simplified since a single throttle per engine takes the place of throttle, propeller control and mixture control of the piston transport.

Cornell Building Gun-Rocket Range

Cornell Aeronautical Laboratory Inc. plans to build an underground firing range for research and development on aircraft small arms and ammunition under a contract with U. S. Army Ordnance.

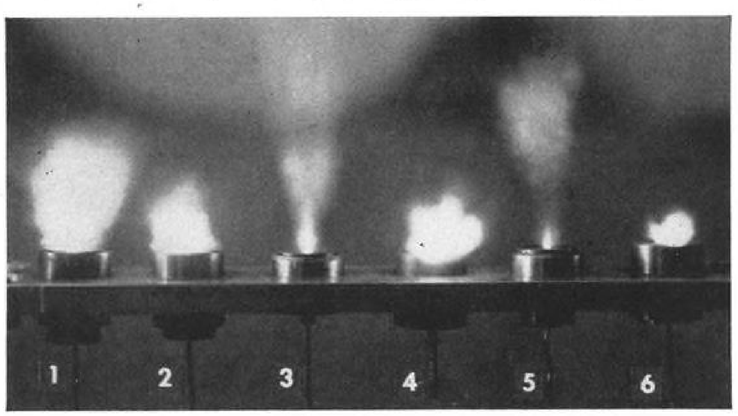
The range will be used to study internal, external and terminal ballistics of guns and small rockets. It also may be used to investigate aerodynamic and stability characteristics of projectile bodies at supersonic speeds.

The new facility will include an 84-ft.-long underground tunnel five feet wide and six feet high. At the end of the range will be a two-level range house. The lower floor will contain an enclosed test cell and exterior remote controls, instrumentation and equipment for test preparation. The upper level will house the main preparation area, with space for a range for low-velocity firing, instrumentation, storage of equipment and ammunition and a photographic dark room.

The new range, which is expected to be ready in six months, will cost about $31,000. It will be located adjacent to Cornell's present buildings in Buffalo, and will take the place of a previously-used outdoor range.

New Weber Division

Weber Aircraft Corp., Burbank, Calif., has established a new Passenger Seat Division, to specialize in the design, engineering and manufacturing of custom, functional, standard and high-density aircraft passenger seats.



New Igniter Projects Longer Spark

Comparison test of new axial, or constrained gap, jet engine igniters (AW Oct. 31, p. 47) and standard, radial-type units shows new plugs projecting spark farther into jet's combustor than standard igniters. In the photo above, axial plugs are in positions 1, 3, 5; standard plugs are in positions 2, 4, 6. Plugs here are being fired wet with JP-4 fuel by a 4-joule ignition system. Scintilla Div. of Bendix Aviation Corp., which made the igniters, is conducting the tests for Wright Air Development Center.

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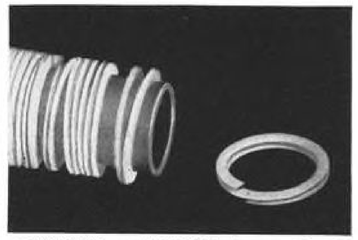

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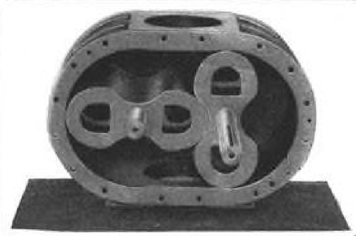

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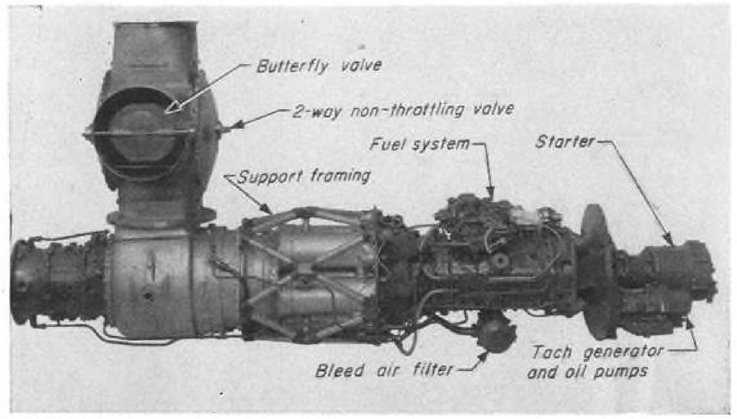


ORYX gas generator. Vertical duct at left supplies power to helicopter blades.

Napier Oryx

- Length ..... 83.5 in.
- Diameter ..... 19.25 in.
- Weight-engine ..... 495 lb.
  -valve ..... 60.5 lb.
- Rpm., max 21,900
- Gas mass flow at takeoff ..... 14.4 lb./sec.

Napier Schedules Oryx Type Test

England's Oryx gas generator, designed primarily as a helicopter powerplant, completed 1,350 hours of test bed running. Its type test is expected by the end of the year.

High efficiency, good controllability and small diameter are the three principle design features of the Oryx. The makers, D. Napier & Son Ltd., say the first two features stem from "typical" Napier compressor characteristics:

- **Best efficiency point well removed from surge.**
- **Stability in throttle bursts.**

The small diameter is the result of carefully shrinking the compressor geometry. The present compressor with its 9-in.-diameter stator is the smallest axial type in Britain.

Helicopter Application

In a typical helicopter application—on the Hunting Percival P. 74—the output from two Oryx engines is ducted through hollow rotor blades to the tip jets. Each powerplant supplies a maximum of 750 ghp. (gas horsepower) at sea level at a low pressure of 23.5 psia. and a moderate temperature of 678K (405C). Gas horsepower refers to the shaft horsepower that would be developed if all the exhaust gas output drove a turbine with 100% efficiency.

Mechanically, the turbine at the center of the single shaft drives the two compressors at each end.

Thermodynamically, the flow from the rear compressor goes directly into the vertical output duct. At the same time, the flow from the forward compressor reaches this duct by way of the burners, where energy is added, and the turbine, where some of the energy is subtracted to drive the system.

The maximum flow of gas generated —14.4 lb./sec.—is composed of about two parts hot turbine exhaust to one part cooler compressed air. The large valve in the output duct dumps the flow overboard during start and the butterfly valve gives a variable area nozzle effect.

The compressor's natural surge margin is further increased at low rpms. by a speed-sensitive servo control operating the variable angle inlet guide vanes.

Upstream burners in the combustion chambers keep the overall length down and will handle very high air/fuel ratios.

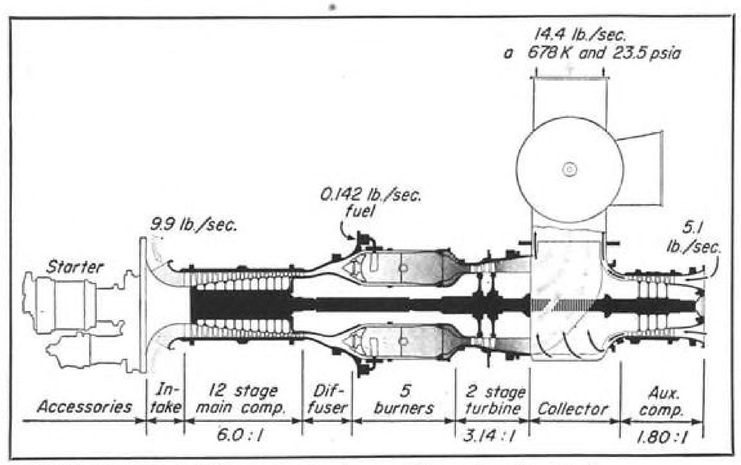
The two-stage reaction turbine is designed to operate against high back pressure in the output duct due in part to the flow from the oppositely directed auxiliary compressor.

Cooling Envelope

The collector is double-cased so that the auxiliary compressor air forms a cooling envelope around the hotter turbine exhaust. This cooling effect continues along the length of the vertical ducting up to the rotor head. Helicopter rotor head cooling also comes from the sixth-stage bleed air.

Before choosing the present design, Napier investigated a ducted fan configuration. The engineers found that the aerodynamic losses of the necessary duct length added to the increased diameter of such an engine offset any advantages.

Napier development of the Oryx will be directed towards getting up to 900 ghp. from the same basic engine for the Hunting Percival P.105 helicopter, a future development of the P.74.



SCHEMATIC of Napier's Oryx generator shows gas flow and engine layout.

Titanium Extrusion

Research on aircraft titanium fabrication by Battelle Memorial Institute indicates that use of conical rather than flat dies in the extrusion of round titanium bars results in improved metal flow and surface finish.

Optimum die angle was found to be about 130 F. Optimum mechanical properties were attained at extrusion temperatures in the alpha-phase region for unalloyed titanium and in the alpha-beta region for Ti-3Mn. Lubricants containing graphite, molybdenum disulfide and mica produced acceptable sur-

face finishes. Titanium carbide, chromium carbide and cobalt-base alloys showed promise as die materials.

Research was conducted for the Air Force. Details can be obtained from the Office of Technical Services, Department of Commerce, Washington 25, D. C. Ask for report PB 111696, The Extrusion of Titanium, dated March 1955, price $2.

USAF Contracts

Following is a list of unclassified contracts for $25,000 and over, as released by Air Force Contracting Offices:

PATRICK AFB (ARDC), Florida.

Ampex Corp., 710 Peachtree St. N.E., Suite 233, Atlanta 8, Ga., magnetic tape recorder, 1790NL-728519-25, 48 ea., amplifier, 1790-NL038632-155, 48 ea., (PR FP-1(56)-208 and FP-1(56)-209), $212,160.

Spar Engineering & Development Inc., Paxson & South Aves., Wyncote, Pa., calibration test system, 1760-NL, 120251-45, 3 ea., distribution rack, 1760-NL, 172815-75, 5 ea., (PR AF 16M-III-B-LP-55-6055-B, AF 16M-III-B-LP-55-6126-B, AF 16-M-III-B-LP-55-6058-B, AF 16-M-III-B-LP-55-6129-B), $75,830.

Convair Division, San Diego, Calif., design, development and fabrication of Azusa system (X-2), (PR FP-1(56)-243), $240,000.

GENTILE AF STATION, Dayton, Ohio.

Bomac Laboratories Inc., Salem Road, Beverly, Mass., tubes, magnetron, JAN Type 6551 a/w spec MIL-E-1B, RFP 33-604-56-1194, 800 ea., $280,000.

Cosmos Industries Inc., 31-28 Queens Boulevard, Queens 1, N. Y., signal generators, SIG-13/ARN in accordance with military specification MIL-S-4298 (USAF), maintenance spare parts, engineering data, maintenance data RFP 33-604-55-3738, 247 ea., $188,708.

Gamewell Co., 1238 Chestnut St., Newton Upper Falls, Mass., resistors, variable, linear, precision, 300 ea., resistors, variable, sinusoidal, 200 ea., RFP 33-604-55-3530, $30,225.

Herbach and Rademan Inc., 1204 Arch St., Philadelphia 7, Pa., switches and relays, RFP 33-604-56-1320 & RFP 33-604-56-1134, various items, $49,619.

Magnaflux Corp., 7300 West Lawrence Ave., Chicago, Ill., inspection equipment, horizontal, magnetic particle, stationary, Type MB-3, maintenance spare parts and data, 35 ea., inspection equipment, magnetic particle, portable, and data, 86 ea., inspection, unit, penetrant, fluorescent, stationary, Type MA-2 and data, 24 ea., inspection unit, penetrant, fluorescent, stationary, Type MA-3, 1 ea., inspection unit, fluorescent, penetrant, stationary, Type MA-1 and data, 2 ea., RFP 33-604-55-3789, $385,107.

Philco Corp., 4700 Wissahickon Ave., Philadelphia, Pa., switches, miscellaneous, RFP 33-604-55-3763, various items, $49,675.

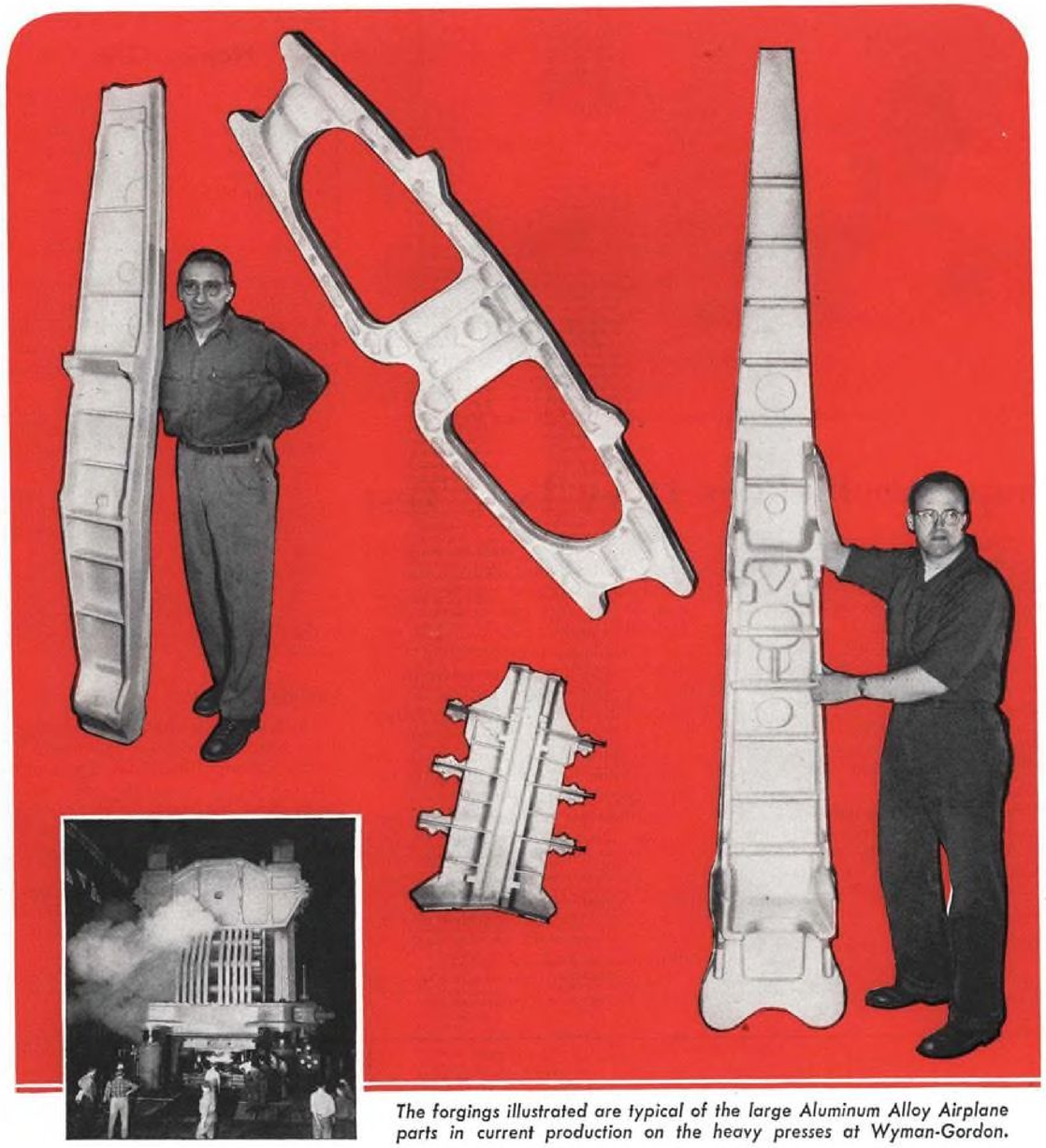
Scintilla Div., Bendix Aviation Corp., Sherman Ave., Sidney, N. Y., relays, solenoid, non-pile up Type Scintilla P/N 10-34637-1, RFP 33-604-56-1204, 1,000 ea., $30,780.

O. E. Szekely & Associates Inc., 5312 Westminister Ave., Philadelphia 31, Pa., signal generators-SG-1, ()/ARN in accordance with military specification MIL-S-4296A (USAF), maintenance spare parts and data, RFP 33-604-55-3392, 144 ea., $109,289.

Triumph Manufacturing Co., 1829 S. 55th Ave., Chicago 50, Ill., analyzer circuit, applicable to E-4 gyro pilot, Sperry Model T100834 is acceptable, maintenance spare parts and data, RFP 33-604-55-3794, 45 ea.

GENTILE AF STATION, Dayton, Ohio.

General Electric Co., Lamp Div., 225 N. Wilkinson St., Dayton, Ohio, lamp, P/N 1385, 22,000 ea., lamp P/N AN 3120-1047, 42,000 ea., lamp P/N 327R, 26,000 ea., GE-



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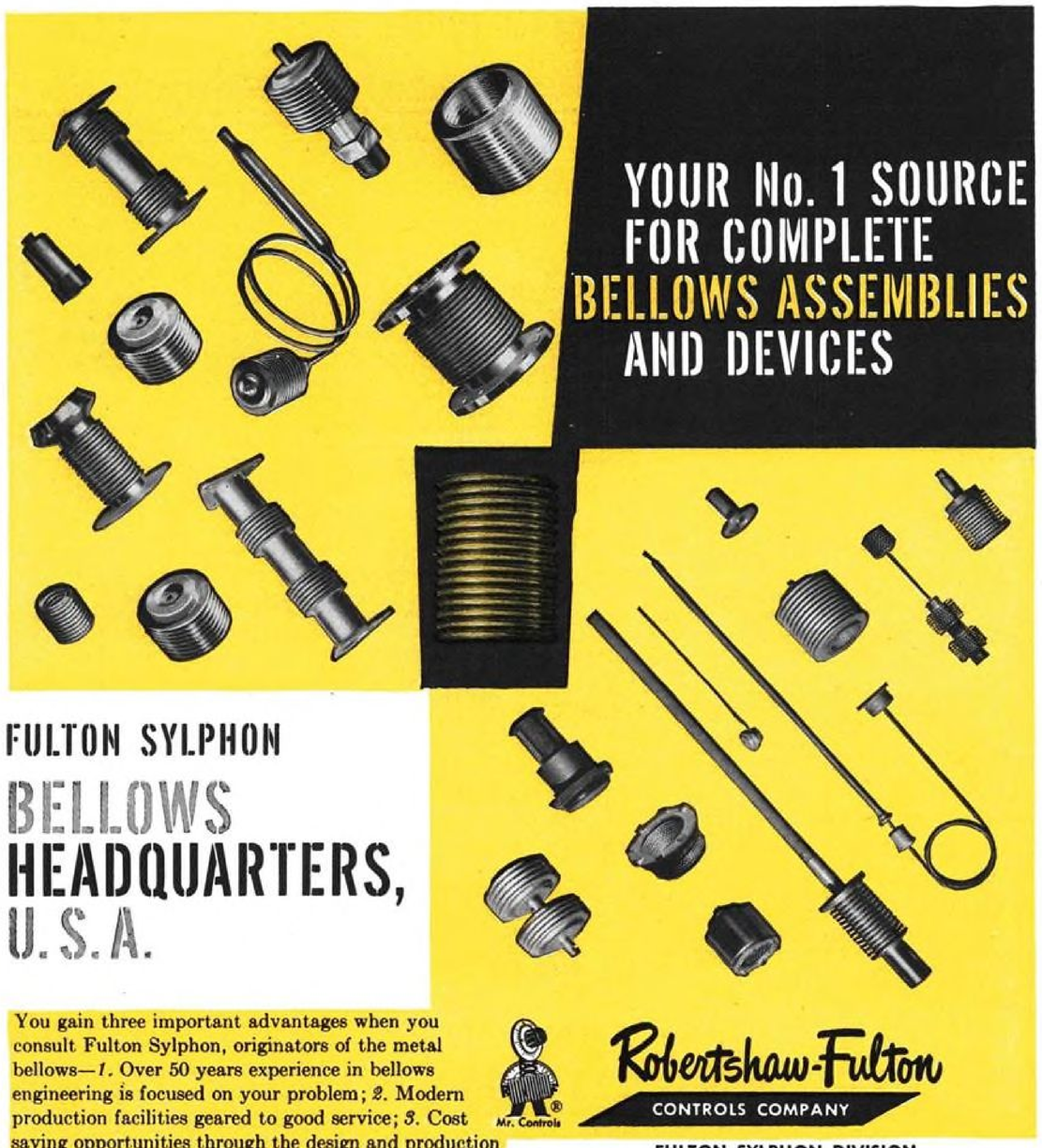

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Tung-Sol Electric Inc., 95 Eighth Avenue, Newark, New Jersey, tubes, electron, Type 6AU6WA, in a/w specification MIL-E-1B dtd. 2 May 52, amt. No. 2 dtd. 12 Nov. 1953 and technical specification sheet MIL-E-1/1 dtd. 13 Jan. 1953, 43,000 ea., RFP 33-604-55-2897, $39,560.

Fenwal Inc., Pleasant St., Ashland, Mass., switches, thermostatic, 11 items, RFP 33-604-55-3906, $121,516.

Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Calif., relays, Leach P/N 9254-1, 6,000 ea., PR:MO 599738, $58,020.

General Electric Supply Co., 601 E. 3rd St., Dayton, Ohio, circuit breaker, magnetic, GE #32020 New TE32020, 200 ea., circuit breaker, magnetic, GE #ATB36070 New TF136070, 200 ea., circuit breaker AB, magnetic thermal type GE CO TF13610, 500 ea., RFP 33-604-55-3756, $26,299.

DeJur-Amsco Corp., 4501 Northern Blvd., Queens 1, N. Y., resistors, variable, linear, precision, 15 items, RFP 33-604-55-1249, $61,220.

Astron Corp., 255 Grant Ave., E. Newark, N. J., suppressor, elec. noise, capacitor, Astron P/N AF-1031, 450 ea., suppressor, elec. noise, capacitor, Astron P/N AF-1032, 1,300 ea., suppressor, elec. noise, capacitor, Astron P/N AF-1033, 1,200 ea., RFP 33-604-55-2378, $42,868.

Raytheon Mfg. Co., Microwave & Power Tube Operations, Waltham 54, Mass., tube, electron, JAN Type 2J56A in a/w spec MIL-E-1B dtd. 2 May 1952 amend, #3 dtd. 12 Nov. 1953 and ML spec. MIL-E-937B dtd. 16 Aug. 1955, 4,322 ea., RFP 33-604-56-1190, $327,564.

SHELBY AF DEPOT, Shelby, Ohio.

Skyline Clothing Corp., 173 Room Bout Ave., Beacon, N. Y., coveralls, Class 8415, 95,278 ea., $788,138.

Screw Machine Products Co., 7727 N. E. Killingsworth, P. O. Box 7497, Portland 20, Ore., maintenance platform type B-3, Class 19A, 5 ea. and 1 lot spare parts, $33,275.

Aeroquip Corp., 300 South East Ave., Jackson, Mich., hose assemblies, Class 04B, 900 ea., $28,827.

ROBINS AFB, Georgia.

United Truck & Equipment Co., 1228 S. Paca St., Baltimore 30, Md., vehicle weighing kit, trailer mounted, type MA-1 in a/w spec. MIL-W-4711, (RFP-1311), 29 ea., $215,108.

General Electric Co., Dallas Aircraft Apparatus Service Shop, 1135 South Lamar St., Dallas, Tex., repair, overhaul and/or modification of fire control systems, (PR-584353), $1,154,743.

Dashew Business Machines Inc., 5886 Smiley Drive, Culver City, Calif., embossing machines, electric, for identification plates, (local purchase), 3 ea., $72,646.

AIR RESEARCH & DEVELOPMENT COMMAND, Baltimore 3, Md.

Trustees of Columbia University, New York 27, N. Y., continuation of research on sub-grain boundaries and their effect on mechanical properties, (AF 18(600)-899), $34,112.

Pioneer Industries Inc., 328 Welis Ave., Reno, Nev., research on Coanda effect in three dimensions, (AF 18(600)-1568), $28,-236.

Technical Operations Inc., 6 Schouler Court, Arlington 74, Mass., research on synthesis of heterocyclic and non-benzenoid compounds, (AF 18(600)-1569), job, $49,772.

AIR RESEARCH & DEVELOPMENT COMMAND, Baltimore 3, Md.

Trustees of the University of Pennsylvania, Philadelphia 4, Pa., continuation of studies in photonuclear reactions (AF 18-(600)-472), $22,000.

Washington University, St. Louis, Mo., nuclear reaction studies (AF 18(600)-777), $34,957.

Johns Hopkins University, Whitehead Hall, Homewood Campus, 34th & Charles St., Baltimore, Md., continuation of research on unsteady viscous supersonic flows, (AF 18(600)-1121), $82,742.

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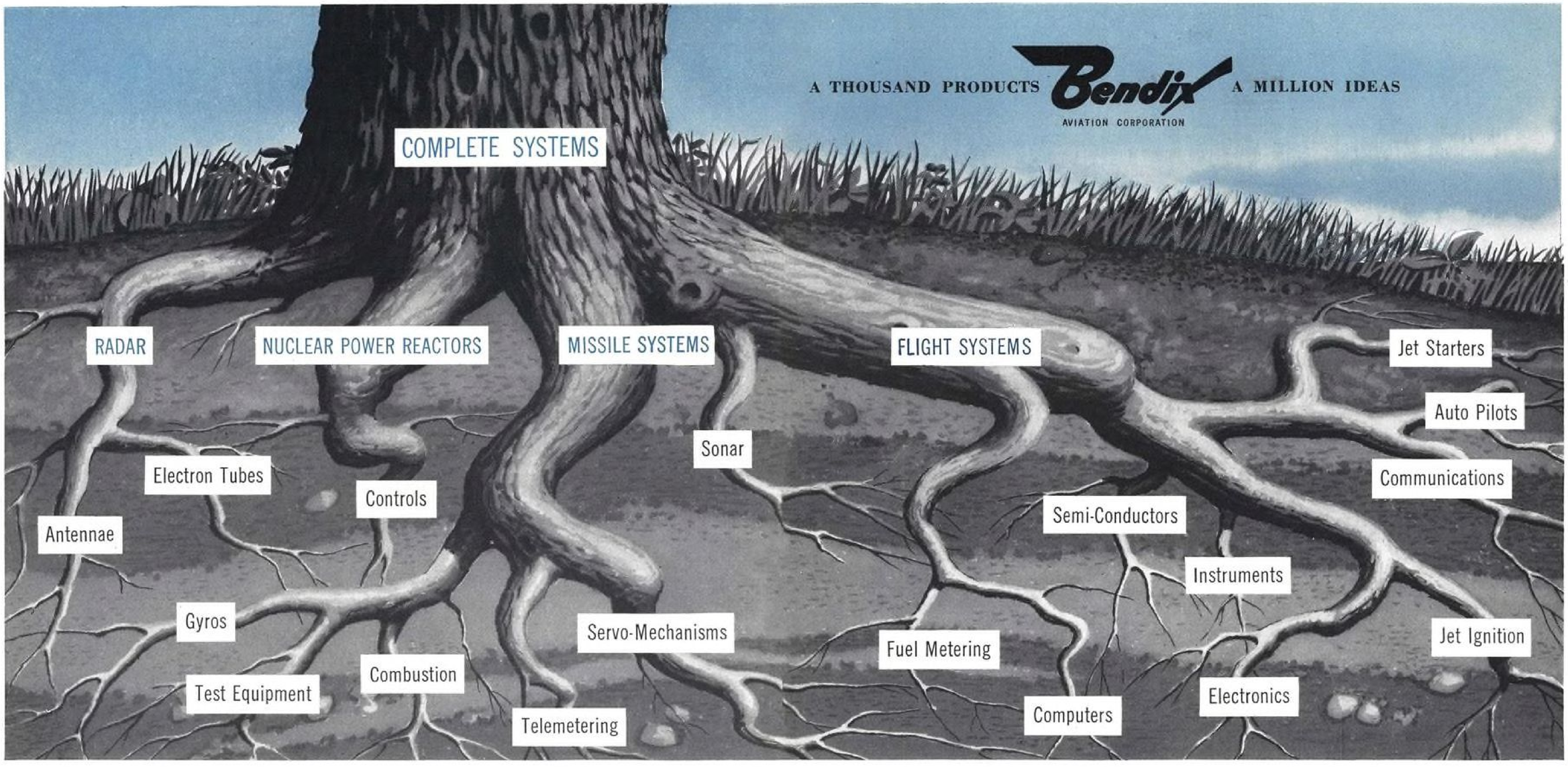

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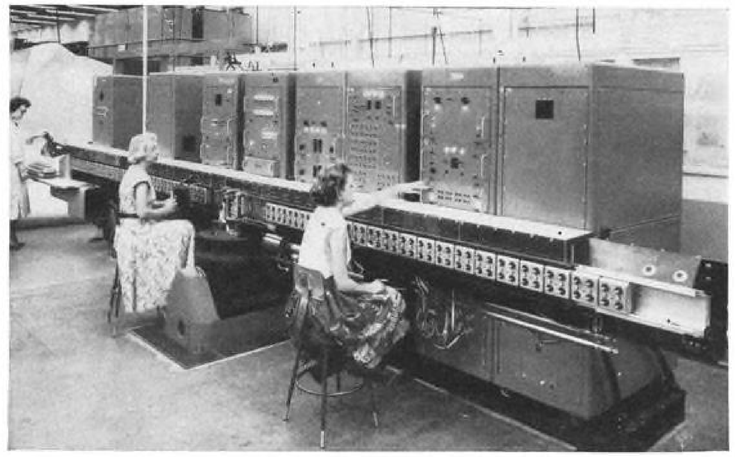

AUTOMATIC TUBE TESTING machines, such as this one at Hughes' missile plant in Tucson, are used extensively throughout the industry. Arinc fears they may create serious problems for the military and the avionics and missile industry.

Arinc Warns That Special Tests Of Vacuum Tubes Can Backfire

By Philip J. Klass

Washington—Special tube testing and processing procedures now being set up by more and more missile and avionic equipment manufacturers to improve reliability may actually be unnecessary and injurious to tube life. Even more serious, they are creating a potential production bottleneck that could plague both industry and military in the event of a shooting war.

This warning, in the form of a special report prepared at Defense Department request, comes from the Military Electronic Reliability Project at Aeronautical Radio Inc. This Arinc group contains some of the nation's top experts on the subject of tube reliability. It was set up originally to study the problem and has conducted extensive field surveillance programs on tube reliability in military equipment.

Arinc's warning stems from a recently completed survey of practices and the results of special tube processing procedures employed by six guided missile manufacturers.

Too Much 'Witchcraft'

Arinc is not ready to recommend the discarding of certain practices, such as the widely used tube aging (burn-in), despite what it believes is strong evidence that this procedure is no longer justified. Many of the special processing and test procedures now in use "were adopted under panic conditions" to meet production commitments, without time to evaluate the validity of the test criteria, Arinc feels.

This explains the lack of consistency of test procedures employed by different companies, and even within a single company. For example, a manufacturer with missile programs for both Air Force and Navy may employ different incoming tube inspection procedures for each program, Arinc finds, and suspects that there is too much "witchcraft" and too little science in present tube processing programs.

Arinc's Recommendations

Arinc has no quarrel with the use of acceptance sampling procedures during incoming inspection to provide the basis for accepting or rejecting an entire batch of tubes.

What it does object to is 100% testing of tubes as a screening procedure to criteria which are not included in the basic MIL-E-1B procurement spec, especially when there is no attempt to evaluate the merits of such special criteria.

The organization therefore has recommended to the Defense Department that it support a comprehensive, scientifically based program to evaluate some of the special test procedures now employed in the missile and avionic equipment industry. Following such an evaluation, Arinc proposes:

- **Incorporation of test procedures** and criteria which assure tube reliability and make it possible to predict reliability, in the MIL-E-1B tube spec. These procedures then would be conducted by tube markers.
- **Banning of test procedures** and criteria which show no merit and prohibition of the introduction of new process procedures, unless special sanction is granted.
- **Where present MIL-spec performance** criteria for tubes do not meet industry's requirements, tube development programs should be established to meet industry's needs.
- **A system should be set up** to provide for timely modification of MIL tube spec performance criteria, as one or more tube makers show their capability to produce higher quality tubes.
- **Equipment makers should submit** monthly reports on the results of their lot sampling evaluation of the quality of incoming tubes.

Arinc also recommends that the Defense Department set up prescribed tests for avionic equipment. These would be conducted on development and pre-production models as well as on production units to be sure that:

- **Tubes are being used** within their prescribed (MIL) ratings.
- **System performance does not** depend upon tube properties not specified in MIL-E-1B.
- **Where MIL-spec tube performance** criteria are not generally adequate, descriptive information is made available on specific tube requirements needed by industry.

Grounds for Suspicion

The results of Arinc's survey of six missile manufacturers provide good grounds for suspicion that many of the elaborate 100% inspection procedures now in use do not pay off in increased tube or equipment reliability. For example:

- **Preliminary data** from one missile plant showed that a batch of tubes rejected during incoming inspection, but then assigned (randomly) to sockets in the missile, showed no more failures during production-line testing than another batch of tubes which had passed incoming inspection.
- **The missile manufacturer** which rejects the greatest number of tubes during incoming inspection has the highest overall production failure rate of the group. Despite the high initial tube rejection rate, this manufacturer suffers more additional tube failures during subsequent production line testing than

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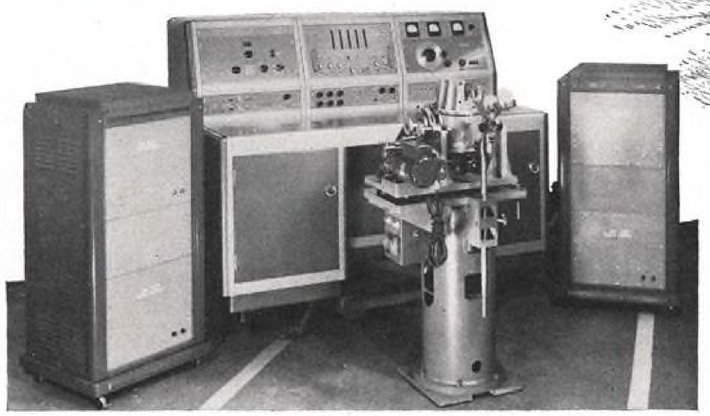

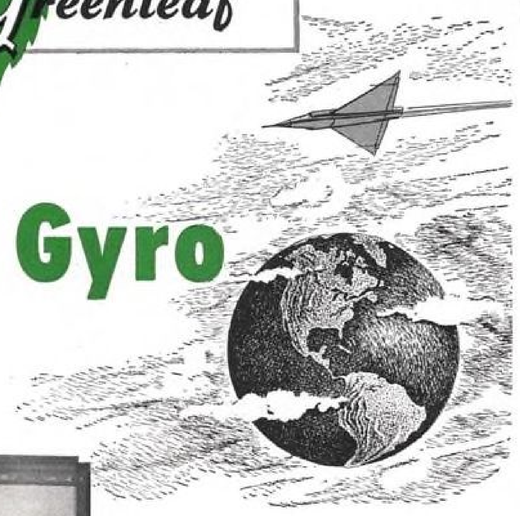

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3. The characteristic time.
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5. Minimum rate detectable.
6. High limit angular velocity deviation of performance.
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8. Signal generator linearity.
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Since a time interval meter is incorporated in the system, the following data can also be obtained:

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three of the other five missile makers.

• **45% of all tubes rejected** by the six missile makers during production line testing later were found to be within prescribed MIL-E-1B limits. This indicates that the true cause of rejection was basic equipment (circuit) design incompatibility—calling for tube requirements which are not fully reflected in the MIL-E-1B specs.

Penalties of Special Selection

When avionic equipment or missile manufacturers set up test requirements which are different or more rigorous than those contained in the MIL spec, they are resorting to special selection.

While this may be acceptable as an interim measure, if allowed to continue it raises serious problems both for the tube industry and the military services, Arinc points out. For example:

• **Degraded missile performance,** or complete failure, will result when the military uses standard MIL tubes for field maintenance to replace original tubes with selected characteristics, assuming that the equipment does indeed require specially selected tubes. (Tubes rejected by missile manufacturers, which otherwise meet MIL-spec performance limits, may later find their way into military field replacement stocks.)

The only alternative, which poses a serious logistics problem, is for the military to stock separate groups of specially selected tubes for each type of missile and avionic equipment.

• **Serious production bottleneck** in the event of a shooting war is created by the large number of good tubes, meeting MIL specs, which are rejected for failure to comply with an individual equipment maker's special requirements.

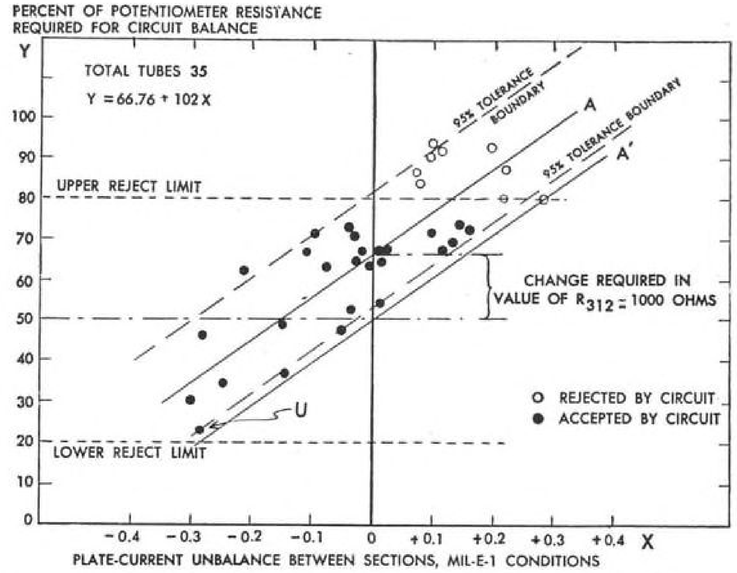
One guided missile manufacturer, now employing special selection, rejects about 50% of the tubes it receives. For individual tube types, rejection rates may run as high as 80%. Such rejection rates, which Arinc believes are needlessly high, would pyramid the military requirements for tubes under mobilization conditions.

• **Adjustment of MIL-spec performance** requirements to reflect a universal need in the equipment industry for a certain tube type may be delayed. This is because the need for such change, and its realistic description, are obscured by special selection procedures in use.

All too frequently, Arinc believes, the elaborate processing programs are substituted for an adequate engineering evaluation of the real cause of tube failures, and the necessary circuit redesign and/or tube improvements are thereby delayed.

Application Incompatibility

Procedures for obtaining tubes with special characteristics often obscure the basic cause of the trouble—marginal or wholly incompatible tube application—Arinc says. For example, in one missile guidance equipment, approximately two out of every three tubes of one type (twin-triode) rejected during production line testing were "good" tubes by MIL-spec criteria.



ANALYSIS of high-tube rejections for failure to balance showed change of 1,000 ohms in value of series resistor would eliminate all but one reject.

Two of the sockets in this equipment, which accounted for 90% of the rejections, required that plate currents in the two halves of the tubes be balanced within much closer tolerances than provided by MIL-E-1B. To compensate for this, a balancing potentiometer was designed into the circuit.

In order to provide for possible future changes in tube balance, it was required that the tube be balanced without using up the last 20% of the pot's travel at either end.

Nine out of 35 tubes from a randomly drawn sample failed to balance within this prescribed pot setting limit. However, investigation of the circuit design showed that by changing the value of a resistor in series with the pot from 15,000 ohms to 16,000 ohms, all nine of the rejected tubes would meet circuit requirements, with the loss of only one tube which previously had been satisfactory but would now fall outside limits (see sketch, above).

Does Burn-In Pay Off?

Arinc believes it has some rather convincing evidence that tube aging (burn-in), either with or without vibration, does not contribute to reliability of present MIL types, despite widely held views to the contrary. "Infant mortality," the term applied to mass failures in the first few hours of tube use, does not appear to be a characteristic of present MIL receiving tube types, Arinc says, based on its considerable data.

Here is some of the evidence Arinc offers to support its doubts on the value of tube burn-in:

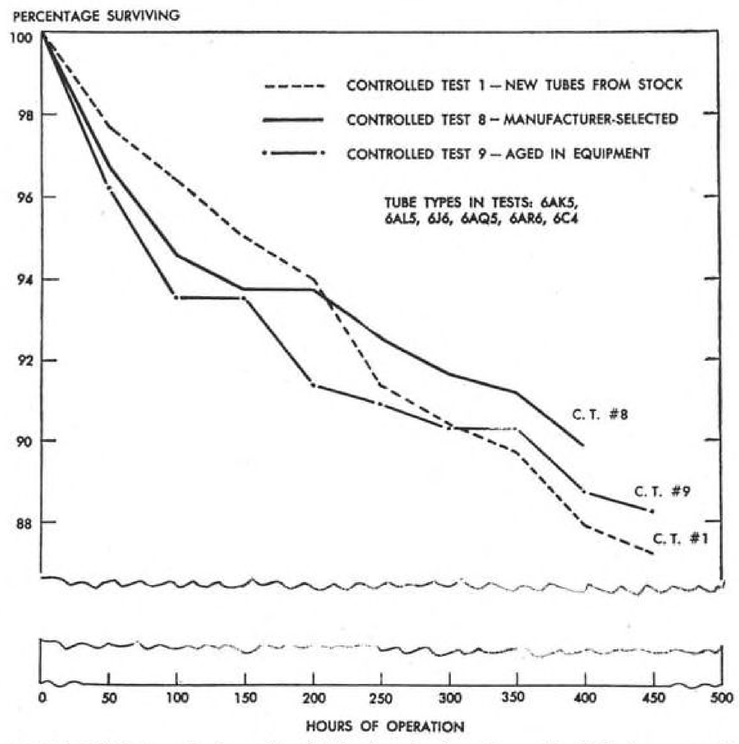
• **Controlled Arinc tests** in 1952-53 on six different tube types used in an airborne bombing system showed no significant difference in failure rate in the first 400 hours between a batch of tubes drawn from stock without any pre-aging, another batch which had been pre-aged in the equipment and a third group which had been pre-selected and burned-in by the equipment manufacturer (see chart, p. 48).

• **Wright Air Development Center** in 1953 conducted tests on 35,000 MIL-type tubes to determine the relative merits of burn-in and burn-in-with-vibration versus mere on-the-shelf aging. Two groups of tubes were operated under vibration for 48 hours; one group was operated for 48 hours without vibration; the last group was not subjected either to burn-in or vibration.

The results of the tests showed no significant difference among the four groups insofar as detecting shorts, opens or leakage. Burn-in, either with or without vibration, did result in a slight improvement in the stability of such characteristics as plate current, transconductance and screen current, however.

• **CBS-Hytron** recently ran tests on two tube types, using a group of 1,000 6099/CTs and 1,200 6AK5s. Each tube type group was divided in half. The tubes in the first half were tested,

COMPARATIVE SURVIVAL DATA ON STANDARD TUBE TYPES IN CONTROLLED TESTS: NEW TUBES FROM STOCK, TUBES AGED IN EQUIPMENT, AND MANUFACTURER-SELECTED TUBES



ARINC TESTS to evaluate merits of tube burn-in show it provides little improvement.

then burned-in for 15 minutes, then retested, while those in the second half were tested, placed on a shelf for 15 minutes, then retested. This cycle was repeated at the following intervals: 45 minutes, 2, 12, 24, 48, and 100 hours.

The company concludes "that there is no practical difference in the percentage of 'inoperable' tubes for the types 6AK5 and 6099/CT" resulting from burn-in as compared to merely sitting on the shelf.

The Human Angle

In interpreting the results of its tests, CBS-Hytron concludes that the human element present in tube inspection and test, plus variables in the test equipment itself, play an important part in determining the number rejected.

Arinc agrees there are many intangibles in the variety of tube testing procedures and equipments now in use. This results in a lack of uniformity in test results from different guided missile manufacturers which leaves the tube makers in a quandary, Arinc believes.

The very nature of microscopic and X-ray tube inspection techniques, which appear to be gaining wide acceptance, are subjective and dependent upon the individual inspector, Arinc says. As a result, one inspector may pass a tube which another would reject.

Arinc is not at all sure that X-ray inpection, pioneered by North American Aviation, pays off to any large degree in improved tube and equipment reliability. However, an NAA spokesman tells AVIATION WEEK that tube reliability has ceased to be a problem since the company put its microscopic and X-ray inspections into effect.

Arinc proposes to conduct a carefully controlled test run on two batches of tubes to evaluate microscopic and X-ray (M&X) inspection. One group would consist of tubes which had passed M&X inspection as well as MIL-E-1B tests. The second group would consist of tubes which had not been subjected to M&X inspection, but which had passed MIL tests.

A further subdivision of the first group may include tubes which fail to pass the M&X inspections, but do pass MIL tests, in an attempt to see if there is any correlation between the visual acceptance criteria and performance.

NAA has volunteered to cooperate in such an evaluation program. By spring, Arinc hopes to have sufficient tubes to outfit K-type bombing systems in a number of B-47s. A similar evaluation test is planned for AN/ARC-27 UHF communications sets in Navy aircraft.

If these tests show a positive correlation between tube life and the results of M&X inspection, these visual inspection techniques should then be considered for inclusion in the basic MIL-E-1B spec, Arinc says, until equally effective tests can be developed for use by the tube manufacturers.

Some observers question whether tube performance tests can detect certain flaws which now show up only in microscopic and X-ray inspection. Raytheon, which recently started using a 300,000-volt X-ray to inspect its tubes, says that it has "detected tiny flaws in the welding of certain minute parts which, even under a powerful microscope, appeared to have been perfect."

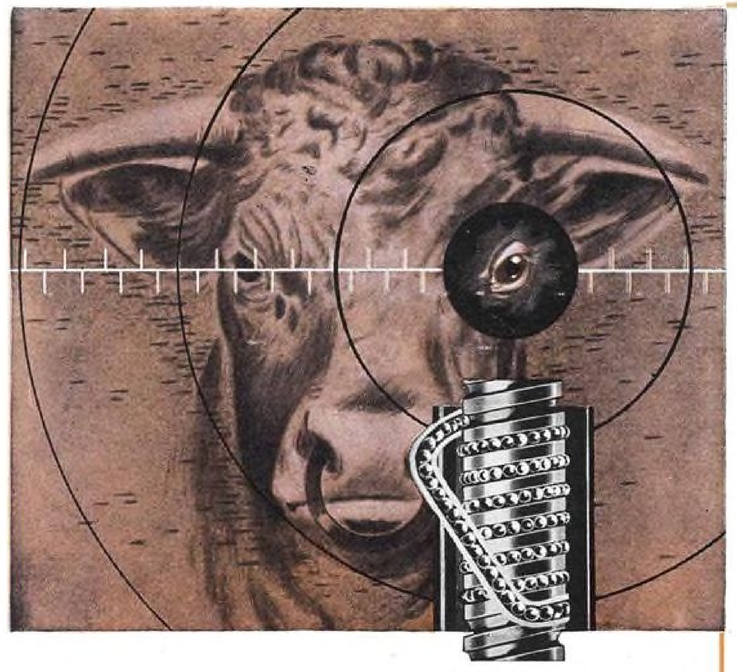
Difference of Opinion

Some avionic equipment and guided missile manufacturers may take issue with a few of Arinc's views. For example, in a recent symposium on reliability sponsored by the USAF and Radio Corporation of America, RCA presented the results of its program to improve the dependability of the ARC-21 HF transceiver. These results suggest that tube burn-in does pay off.

Prior to introducing special tube processing, ARC-21s suffered tube failures at the rate of 14% per 1,000 hours during a 48-hour equipment run-in test. After special processing was introduced, the failure rate dropped to 1.5% per 1,000 hours. (The RCA processing consists of a 40-hour burn-in, 100-cycle heater test at elevated temperatures, microscopic inspection and 100% test of electrical characteristics.)

Following this 48-hour run-in, the equipment is subjected to operational and quality control tests, then operated for another 125 hours. During this 125-hour run, tube failures have dropped from 9% to about 0.5% since tube processing was introduced, RCA's R. H. Baker reports. However, a variety of other improvements, incorporated to improve ARC-21 reliability, may also have contributed to improved tube performance, making it difficult to pinpoint the contribution of each.

It is because of such conflicting evidence, on the merit of various types of tube test procedures, that Arinc has proposed that the Defense Department authorize a comprehensive and scientific evaluation under carefully controlled conditions. From such a program it will be possible to definitely establish which procedures contribute to tube reliability and incorporate these into the MIL specs. Those that contribute nothing, or actually cut tube life because of frequent handling, can be dropped, saving industry's time and the taxpayer's money.



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Would you like to work where the future is as long and bright as the future of the aircraft industry? Where vacation and retirement benefits are among the most liberal in the industry? Where the employees share in the profits of the Company?

If you are qualified for one of the jobs listed below, you owe it to yourself to talk with the people at Cleveland Pneumatic . . . a 60-year-old company managed by men with vision and enthusiasm.

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Avionics Companies Open New Facilities

National Aeronautical Corp. (Narco) will build a new $250,000 plant in Ambler, Pa., to house its engineering, office and manufacturing operations. The new plant will have an annual production capacity of $15 million, approximately five times the amount of the firm's 1955 sales.

Other recently announced expansions in the avionics industry include:

• **Norden-Ketay Corp.**, New York, has established a Western Division in Gardena, Calif. The division includes a second plant in nearby Hawthorne, providing 30,000 sq. ft. of facility for engineering, development and manufacture of precision synchros and other avionic devices. New division is headed by Mr. Arnold Raines.

• **Bourns Laboratories**, Riverside, Calif., maker of precision pots, has opened a Midwest subsidiary plant in Ames, Iowa. The operation will occupy 12,000 sq. ft. of space in the Whattoff Bldg. and employ 25. Arthur J. Miller has been named manager.

• **Computer-Measurement Corp.**, North Hollywood, Calif., is the new name of the former Computer-Measurements Division of Detectron Corp., recently acquired by RC Controls Corp., North Hollywood. The new company is located at 5457 Cleon Ave.

• **Timely Instruments & Controls Corp.**, has established its new facility at 1645 West 135th St., Gardena, Calif. Company, headed by Milton Schulman, makes electronic instruments and magnetic amplifiers.

• **Electronic Engineering Co. of California**, Los Angeles, has added 6,300 sq. ft. of engineering office space to raise its total area to 26,000 sq. ft. New facility is located at 183 So. Alvarado, directly across from the plant.

• **Texas Instruments Inc.**, Dallas, has opened a new Eastern region marketing office at 500 Fifth Ave., New York, New York.

Avionic Bulletins

• **Servomation building blocks**, consisting of a number of versatile electro-mechanical general purpose analog computer components, are described in 12-page bulletin TDS-2300. Servo Corp. of America, 20-20 Jericho Turnpike, New Hyde Park, L. I., N. Y.

• **Coaxial directional couplers**, for power measurement over frequency range of 225 mc to 4,000 mc., are described in Catalog Sheet 282. New line of fixed and sliding coaxial terminations, covering 2.4 to 12.4 kmc., are described in Catalog Sheet 302. Narda Corp., 160 Herricks Road, Mineola, L. I., N. Y.

• **"There Is No Substitute For Experience"** is the title of 28-page brochure outlining manpower and facilities for electronic design and development available in the Research Division of National Union Electric Corp. Address: 350 Scotland Rd., Orange, N. J.

FILTER CENTER

► **New Type ADF Circuits**—New noise-blanking circuits which reportedly will boost automatic direction finder performance in the presence of atmospheric noise may soon be declassified to permit their use in civil ADFs now under development. Reason is that military is interested in civil ADFs as replacements for old World War II models now in use.

► **Narco Expands de Luxe Line**—Narco is expanding its Sapphire line of airline-executive aircraft type avionics equipment which it launched with the Model UDI distance measuring equipment. The firm soon will market its Model 1016 VHF communications set, consisting of a 360-channel crystal-controlled receiver, covering the 108 to 136 mc. band, and a 90 or 360-channel transmitter, both with 50 kc. channel spacing. Narco also is developing a VOR-localizer navigation adapter for use with the receiver.

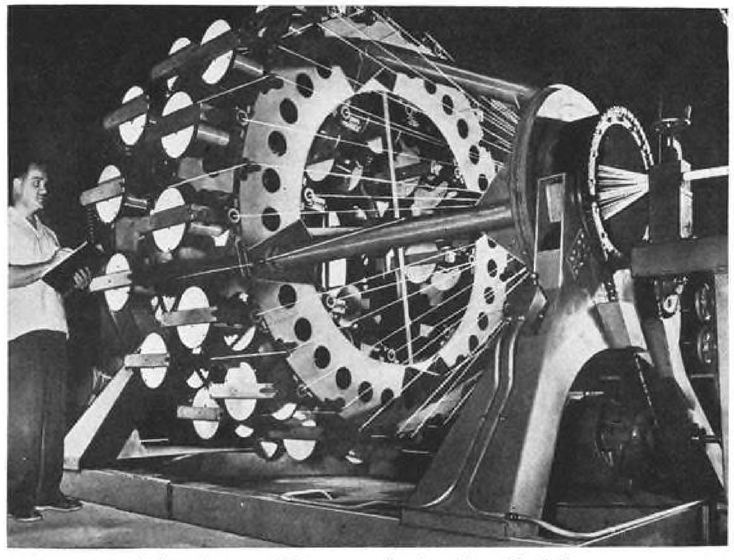
► **New Cold Cathode Emitter**—A new type of high-power (megawatt) cathode, which releases electrons in the presence of a high-potential field, eliminating the need for a filament heater, has been developed by the Physics Dept. of Linfield College, McMinnville, Ore., under contract to the Office of Naval Research. New cold cathode has delivered up to 20 amp. at a peak power of more than one megawatt under pulsed operation. Development of a similar cold cathode for CW use is under way. Navy says the new type cathode may be as important to high-power tubes as the transistor to lower-power devices. Dr. W. P. Dyke, of Linfield, directed the project.

► **SPARs Go South**—Laboratory for Electronics has delivered two of its SPAR precision approach radars to the Navy for use in Operation Deepfreeze, the new Antarctic expedition under command of Rear Adm. Richard E. Byrd. The SPARs will be used to provide GCA approaches on Polar landing strips.

► **KLM Buys British Autopilot**—The Smiths S.E.P.2 automatic pilot has been selected by KLM for use in its fleet of Viscount 803s, beating out U. S. competition. The autopilot will include automatic approach coupler, automatic elevator trim and barometric altitude control.

► **First Collins Radar Order?**—Delta Air Lines may become the first carrier to buy the new Collins C-band weather radar. The carrier's officials say they plan a fleetwide radar installation.

► **Flush ADF Sense Antenna**—Douglas Aircraft Co. is working out a dual flush-mounted installation of Bendix LPA-70 flush ADF loop antennas in which the sense antennas will be incorporated in



Machine Forms Avionic Cables

New planetary cabler forms variety of individual wires, coaxial cables, and power leads into a single stranded cable for use in aircraft and missiles. Developed by Douglas Roesch, Inc., the device can handle large-scale or short-run production. Company's address: 2200 So. Figueroa St., Los Angeles 7, Calif.

Now! . . . the NEW

DIAGONAL GRIP-HEAD

ROBINSON WIRE TWISTER

Faster, more efficient than ever! The new, slendernose DIAGONAL GRIP-HEAD is designed especially for those narrow, hard-to-reach places. Split-second whirling action safety-wires 3 engines in time required for one by any other method . . . saves as much as $140 per engine assembled.

3-TOOLS-IN-1 . . . pliers-cutters-twisters. Side-cutting, oil-tempered head. Permanent bronze bearing. No adjustments. Jaws lock on wire, can't slip off. Perfect, uniform twist every time.

12" —for assembly line safety-wiring, 15 oz. **$21.50**

9" —for bench work, sub-assemblies, 12 oz. **$20.50**

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Opportunity for the holder of a production-item patent!

A large manufacturing plant equipped with precision machinery will finance and manufacture, on royalty basis, patented production items.
If you have such a patent, and are interested, write:

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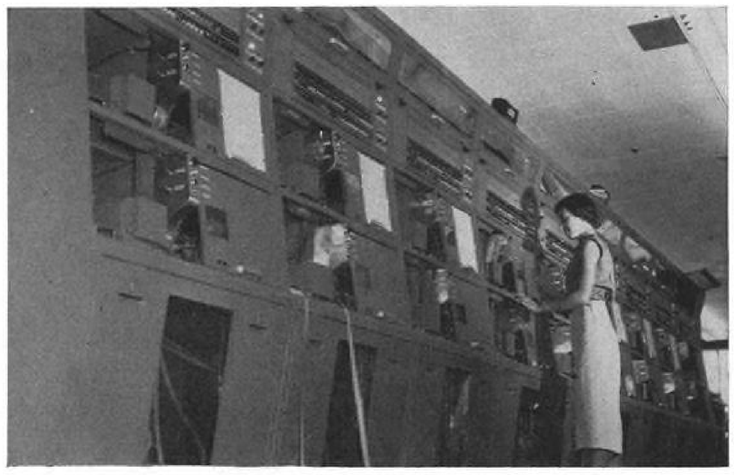
the same housing which encloses the loop antennas. The new design is expected to eliminate much of the drag that is prevalent in older ADF antenna installations.

► **Y-Shaped Stick for Fighters?**—With the increasing number of switches, pushbuttons, and controls being mounted on the control stick in a modern interceptor, there is little room left for the pilot's hand. Some observers say the solution is to provide a Y-shaped or U-shaped control stick. Switches and controls used during take-off, cruise, and landing, might be installed on the left side of the "Y," while those needed during intercept-combat could be mounted on the right side. Even the throttle control itself might be placed on one or the other. Pilot would then fly with both hands, one on each of the branches.

► **New Target Seeker**—Bell Aircraft has developed a new very small, lightweight passive-type target seeker which senses electromagnetic radiation of any frequency. New device could also be used in helicopters or lightplanes to permit homing on ground beacon or a ground radar.

► **Private Commentary**—During recent press tour of Hughes Aircraft Co. labs and factory, each member of the tour received a tiny Regency transistorized

portable radio (with private earphone) which was tuned to a flea-power radio transmitter connected to the guide's chest mike. The transmitter and its battery supply were mounted on a golf cart and wheeled around by an assistant. This enabled visitors to hear the guide's commentary despite factory noises, and to pause at points of interest without losing voice contact with the guide. Lest a failure cast a blot on their electronic capability, Hughes built a standby transmitter into each cart, placed spare batteries along the tour route, and carried spare receivers. To prevent interference between touring parties, each transmitter operated at a different frequency.



Center Speeds UAL Message

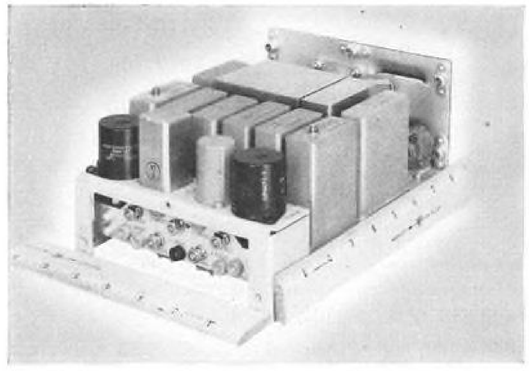
New telegraph message switching center put into operation by United Air Lines at New York International Airport has six times the capacity of UAL's previous switching center at LaGuardia Airport. Messages from 47 of United's stations are channeled into the new center, from which they are relayed immediately to their destinations without retyping, simply by pressing a button. Messages are typed at point of origin only and are produced in printed form at destination. The New York switching center, one of six in UAL's 30,000-mi. private telegraph network linking 250 stations, also incorporates a master-message transmission device which allows an operator to send a message simultaneously to any combination of stations by merely pushing station buttons. UAL's network carries 3 million messages a month.

Meet Your Air Arm Man With The Facts, A. D. Foster

Al Foster serves the New York and New England areas. Through him, or one of his counterparts in your area, you can get all the facts on how Westinghouse Air Arm has bridged the critical gap between radar fire control and automatic flight control.

Contact Al at 40 Wall St., New York, N. Y. Telephone: WHitehall 3-4321. In other areas, for the name of your Man With The Facts, contact Westinghouse Electric Corporation, Air Arm Division, Friendship International Airport, Baltimore 27, Md. Telephone: LInthicum 1000. Learn how the . . .

New radar coupler links flight control to fire control

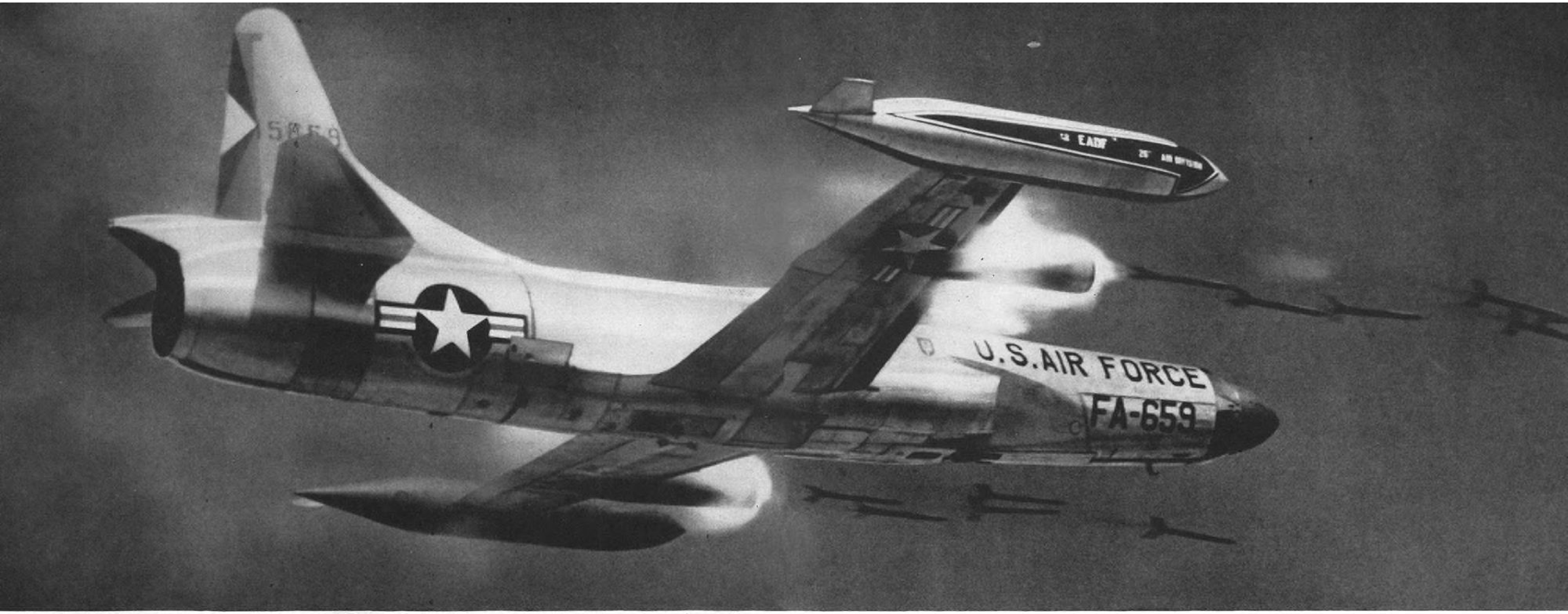


This new coupler makes it possible for the automatic flight control system to take commands directly from the fire control system and fly the interceptor to the target for an automatic kill.

The gun camera used to check accuracy of the combination of radar gun sight, coupler and flight controller. Camera is bore-sighted to rocket trajectory to give visual record of over-all system performance.
J-91047-A

NOW . . . Read more facts about this important new development ⟶

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



A Lockheed F94C Starfire interceptor using the new radar coupler fires a double salvo of rockets from wing pods.

New radar coupler links flight control to fire control

During the all-important few seconds that constitute the mission—from lock-on to knock-down—the new Westinghouse W-3A radar coupler takes over!

The coupler frees the pilot for other flying duties at this critical time, eliminates human response time in air-to-air interception and gives far greater likelihood of success for the mission. After the radar operator locks on the target, the pilot switches to automatic intercept. Then—the flight control system takes command signals from the W-3A Radar Coupler to automatically fire the rockets and destroy the enemy.

If the target should be lost after lock-on due to evasive maneuvering, the system automatically reverts to straight and level flight, allowing the radar search to be resumed.

The coupler may be adapted to any fire control system and Westinghouse rate-type flight control.

Eighty-six Westinghouse test flights were made during the development. During the 90-day operational suitability tests at Eglin Air Force Base, the coupler and flight control system experienced 100% availability. It has passed all environmental tests.

This coupler and parallel developments in airborne electronics at Air Arm are constantly advancing the state of the art . . . helping you bring tomorrow's aircraft . . . One Step Closer. For aid with any of your developments related to the Air Arm Systems Family, contact Westinghouse Electric Corporation, Air Arm Division, Friendship International Airport, Baltimore 27, Md. J-91047-B

THE AIR ARM SYSTEMS FAMILY

Fighter Armament	•	**Special Purpose**
Missile Guidance	•	**Flight Control**
Bomber Defense	•	**Systems Components**

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

Westinghouse

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IS THE WORLD'S LARGEST PRODUCER OF READY-TO-INSTALL POWER PACKAGES FOR AIRPLANES

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ROHR has won fame for becoming the world's largest producer of ready-to-install power packages for airplanes like the all-jet Boeing B-52, the Douglas DC-7 and other great military and commercial planes.

But the whole ROHR story is in millions of parts, for in addition to power packages ROHR builds over 30,000 other different parts for aircraft of all kinds.

When you want aircraft parts better, faster, cheaper . . . call on ROHR and the ROHR engineering skill and production know-how gained from building thousands of power packages—and millions of other aircraft parts.

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AIRCRAFT CORPORATION

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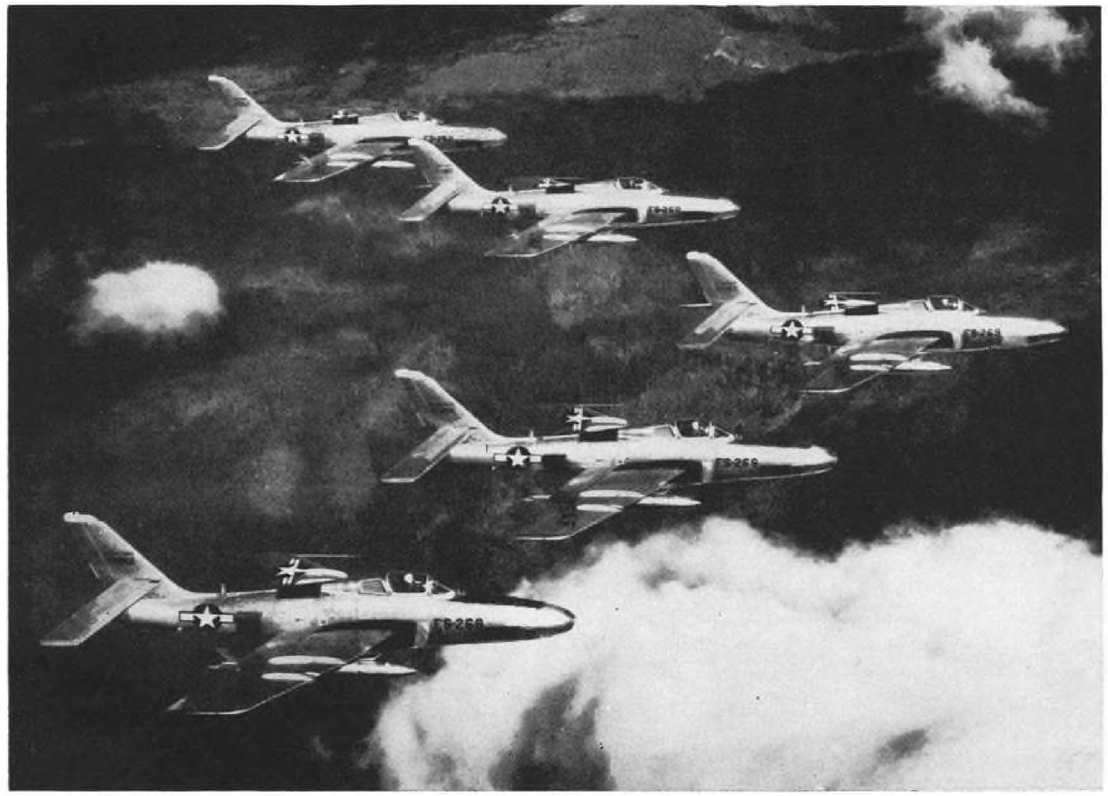


Thunderflash Patrol

Five RF-84F supersonic reconnaissance planes are shown here in first flight formation photo of the Thunderflash to be released. "Droop" horizontal tail allows plane to fit inside bomb bay of GRB-36 aerial carrier for long-range missions.

WHAT'S NEW

Telling the Market

1956 Condensed Reference File of Bakelite Plastics and Resins; booklet; Bakelite Co. Div., Union Carbide and Carbon Corp., 300 Madison Ave., New York 17, N. Y. . . . **Trip Controls**—electric two-hand clutch controls for industrial machines; Catalog 65; Micro Switch Div., Minneapolis Honeywell Regulator Co., Freeport, Ill. . . . **High Vacuum Furnaces** for melting, heat treating, sintering, annealing, brazing, degassing and purification of metals and alloys; Catalog 552; High Vacuum Equipment Corp., 349 Lincoln St., Hingham, Mass.

Apparatus Digest No. 3 illustrates laboratory apparatus and equipment, including mobile air conditioners, liquid coolers, portable refrigeration systems, flexible heating tapes, vacuum control instruments; bulletin; A. Daigger & Co., 159 W. Kinzie Ave., Chicago 10, Ill. . . . **A Guide for Selecting an Engineering Firm;** brochure; Teller Co., Butler, Pa.

Combination 6 and 12 volt testing and servicing equipment; folder; Allen Electric & Equipment Co., 2101 N. Pitcher St., Kalamazoo, Mich. . . . **Conax explosive valves;** catalog; Conax Corp., 7811 Sheridan Drive., Buffalo 21, N. Y. . . . **Ball bearing screws** and ball bearing splines; catalog; Saginaw Steering Gear Div., General Motors Corp., Saginaw, Mich.

Applications of Marbond bonded sandwich structures to Martin's XP6M-1 multi-jet seaplane; 16-mm. color-sound film; available on loan from Glenn L. Martin Co., Presentations Section, Mail 376, Baltimore 3, Md. . . . **Use of Light Waves for Controlling the Accuracy of Block Gages;** book; Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.

Double-Action Straight Side Presses, design features and improvements; Series D Catalog; Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. . . . **Lower Manufacturing Costs** shows how a nondestructive testing program can be instituted in production departments as a money-saving tool; booklet; Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill.

Fabricating silicone rubber parts for industrial needs, Booklet CDP-672; **The Plastics Story** describes new automatic compression and injection molding facilities, Booklet CDP-673; Plastics Dept., General Electric Co., 1 Plastics Ave., Pittsfield, Mass. . . . Operation and application of **Norelco Elt Ratemeter,** Type 12112 frequency meter; folder; Electronics Div., North American Philips Co., Inc., 750 S. Fulton Ave., Mount Vernon, N. Y.

Free Machining Tool and High Speed Mailer, first edition, detailed information on analyses, red hardness, abrasion resistance, toughness, size stability and machinability of tool and high speed steels, Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22, Pa. . . . Mechanical, pressure, **airframe and aircraft-mechanical carbon and alloy steel tubings,** catalog,

CHOU FOO LING

was born too soon...

Back in 1237 AD the inventive Chinese saw the potential of Rockets as a source of power.. attempted to gain extra acceleration by attaching rockets to their sleds.

he was seeking "Superperformance"

Alas, Chou Foo Ling's experiment was a dud, even though he had the right type of power-source for superperformance.

Today, Mr. Jet Pilot can have extra power—reliable rocket power—at his fingertips, thanks to recent important technical achievements at Reaction Motors. He can turn his RMI rocket auxiliaries off or on at will for steeper and faster climbs, higher operational altitudes, or greater maneuverability and speed.

At RMI's new modern plant, an integrated team of rocket specialists are putting the "super" in today's aircraft performance... constantly conquering the frontier of speed and space.

Spearheading Progress through Research

RMI

Career opportunities available for experienced mechanical, aeronautical, electrical and chemical engineers, physicists, chemists. Send complete resume to employment manager.

REACTION MOTORS, INC.
Denville, New Jersey
Affiliated with OLIN MATHIESON CHEMICAL CORP.

Ohio Seamless Tube Div., Copperweld Steel Co., Shelby, Ohio.

Aircraft Catalog No. 100 includes information on **fluid system planning,** selection and installation of flexible hose lines, fittings and self-sealing couplings, Aeroquip Corp., 300 S. East Ave., Jackson, Mich. . . . **Automatic Screw Machine Products,** bulletin, ASM Div., Harvey Aluminum, 19200 S. Western Ave., Torrance, Calif.

"Fansteel Metallurgy", bi-monthly publication of Fansteel Metallurgical Corp., North Chicago, Ill. . . . **Tool holders for throw-away carbide inserts,** Catalog GT-293, Carboloy Dept., General Electric Co., Detroit 32, Mich. . . . **FS line of battery-powered trucks,** Bulletin 1327D, Baker-Raulang Co., Cleveland 2, Ohio.

Publications Received

• **Across the High Frontier**—by William R. Lundgren—Pub. by William Morrow & Co., Inc., 425 Fourth Ave., New York 16, N. Y. $3.75; 288 pp. Story of test pilot Charles E. Yeager.

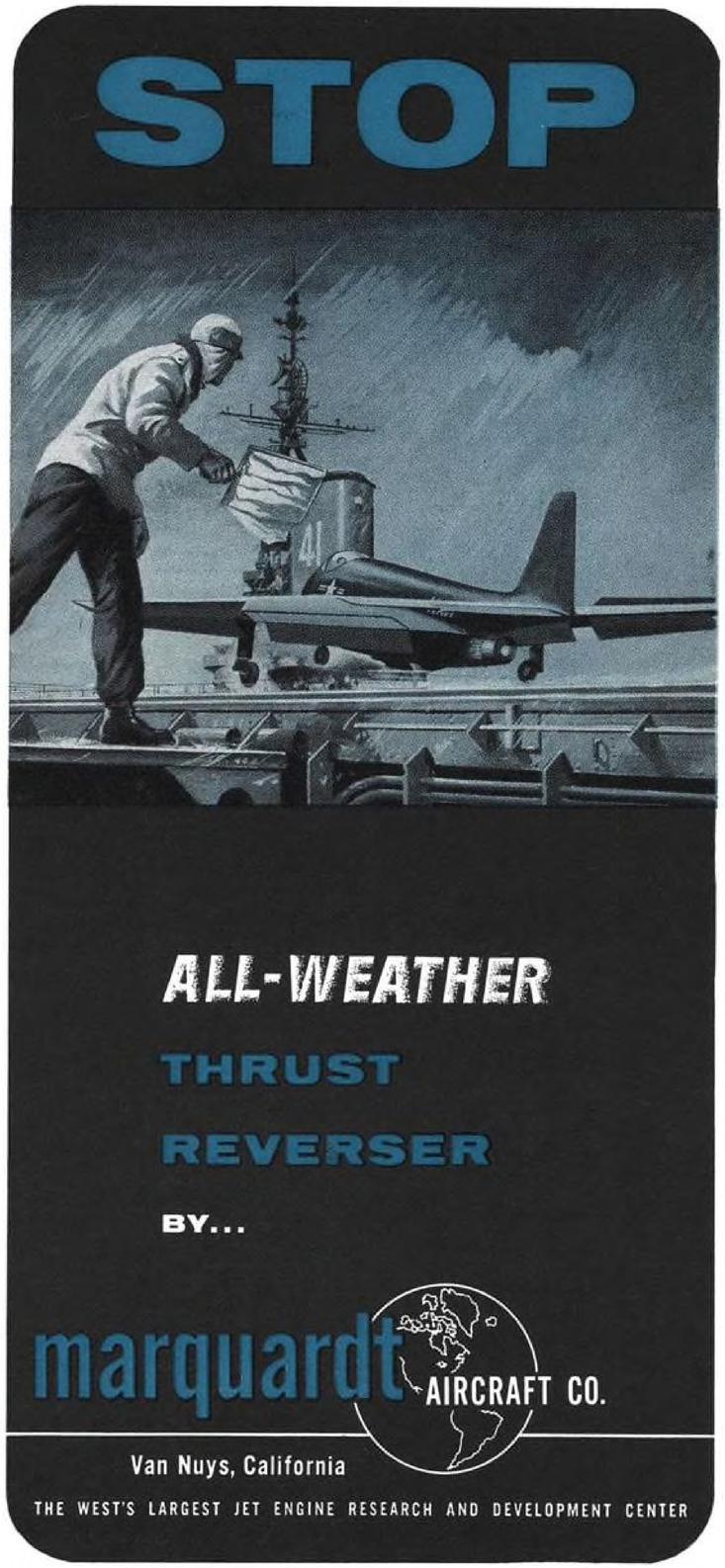
• **200 Miles Up—The Conquest of Upper Air**—Second Edition—by J. Gordon Vaeth—Pub. by Ronald Press Co., 15 East 26th St., New York 10, N. Y. $5.00; 261 pp. Information about the progress of the upper air research program in the United States.

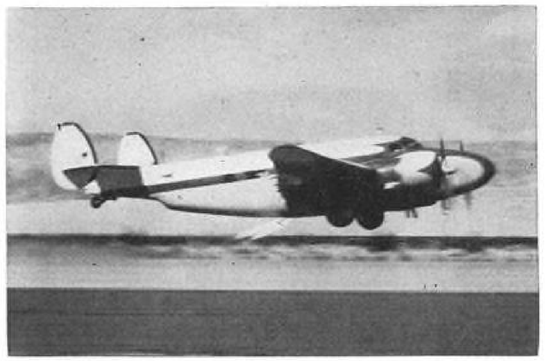
• **British Civil Aviation**—by D. G. T. Harvey—Pub. by John de Graff, Inc., 64 West 23rd St., New York 10, N. Y. $3.00; 168 pp. Photos and sketches of British civil aircraft and brief biographies of operating companies.

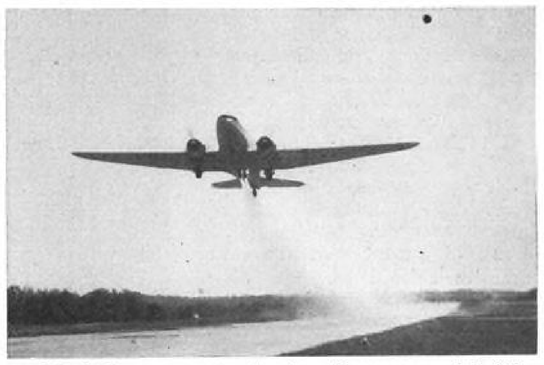
• **World Airline Record,** 5th Edition, 1955—Pub. by Boadcap & Associates, 327 So. LaSalle St., Chicago 4, Ill. $17.50; Traffic & financial reference of 269 scheduled airlines.

• **Fifty Years at Farnborough**—Prepared for the Ministry of Supply by the Central Office of Information—American Agents: British Information Services, 30 Rockefeller Plaza, New York 20, N. Y. 36¢ (plus 5¢ postage and handling); 36 pp. Brief history of the Royal Aircraft Establishment and its predecessors.

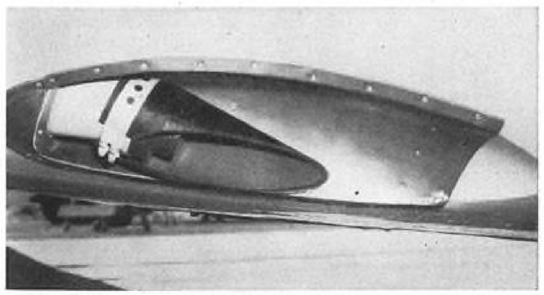
• **Rotorcraft**—By Capt. R. N. Liptrot and J. D. Woods—Pub. by Butterworths Scientific Publications, 88 Kingsway, London, W. C. 2, England. $4.48; 161 pp. Introduction to the theory and practice of rotary-wing aircraft.

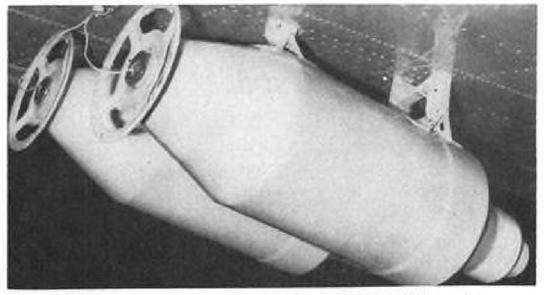






RATO INSTALLATION is internal on Rockwell PV-1. At right, Aerojet DC-3 climbs on two external units, with one prop windmilling.





RATO UNITS—Exhaust deflector of PV-1's rocket (left) is glass-plastic tube. Twin Ratos on Aerojet's DC-3 are 15-KS-1000 units.

New Unit Starts Trend Towards Rato For Business Aircraft

By Erwin J. Bulban

A trend towards installation of rocket-assist-takeoff powerplants on business aircraft has resulted from pilot interest in the safety aspects of Aerojet-General Corp.'s 1,000-lb.-thrust smokeless Rato recently released for civilian use by the U.S. Navy. Initial indications of the trend:

- Several hundred installations of the auxiliary powerplant will be carried by U. S. and Canadian corporate aircraft within the next two years, the Rato manufacturer told AVIATION WEEK. G. E. Rice, commercial sales manager, said approximately 40 corporation and airline orders were on the books prior to the first public demonstration of the Model 15KS-1000-Al Rato during the National Business Aircraft Assn. forum in Detroit (AW Oct. 17, p. 18).
- A junior version of the 15KS-1000-Al, developing 250 lb. thrust and weighing 42 lb., is expected to be certificated by the Civil Aeronautics Administration within nine to twelve months for installation on aircraft ranging from the Beech Bonanza to the Aero Commander.

Standby Power

Business pilots are interested in the Rato units because of the standby power instantly available should an engine cut on takeoff and because of the power boost it provides for taking off fully loaded from marginal airports of high elevation or on high-temperature days. Aerojet reports that the 15KS-1000-Al will reduce takeoff distance up to 50%.

In a demonstration of its own DC-3 fitted with two Ratos under the belly, the Aerojet pilot chopped the right engine at V_2 on a cross-wind takeoff and permitted the propeller to windmill. He attained approximately 200-ft. altitude at 4,000 ft. from start of takeoff and was going 15 mph. faster than he would have been with the engine dead and no Rato. The airplane's gross weight was 25,000 lb. Aerojet noted that without Rato it would have taken approximately 8,000 ft. to achieve this altitude.

Noise level inside the cabin when the Rato fired off was about half that of a T-33 jet trainer. The pilot said no unusual flight characteristics were noted in the use of Rato.

The current Aerojet-General 15KS-1000-Al solid-fuel Rato, bearing CAA Type Certificate 249, produces 1,000 lb. thrust for 15 seconds. It is approved for operation and storage within a temperature range of −65 to 140F and to 35,000-ft. altitude. Standby installed life is 500 hr. or one year, whichever

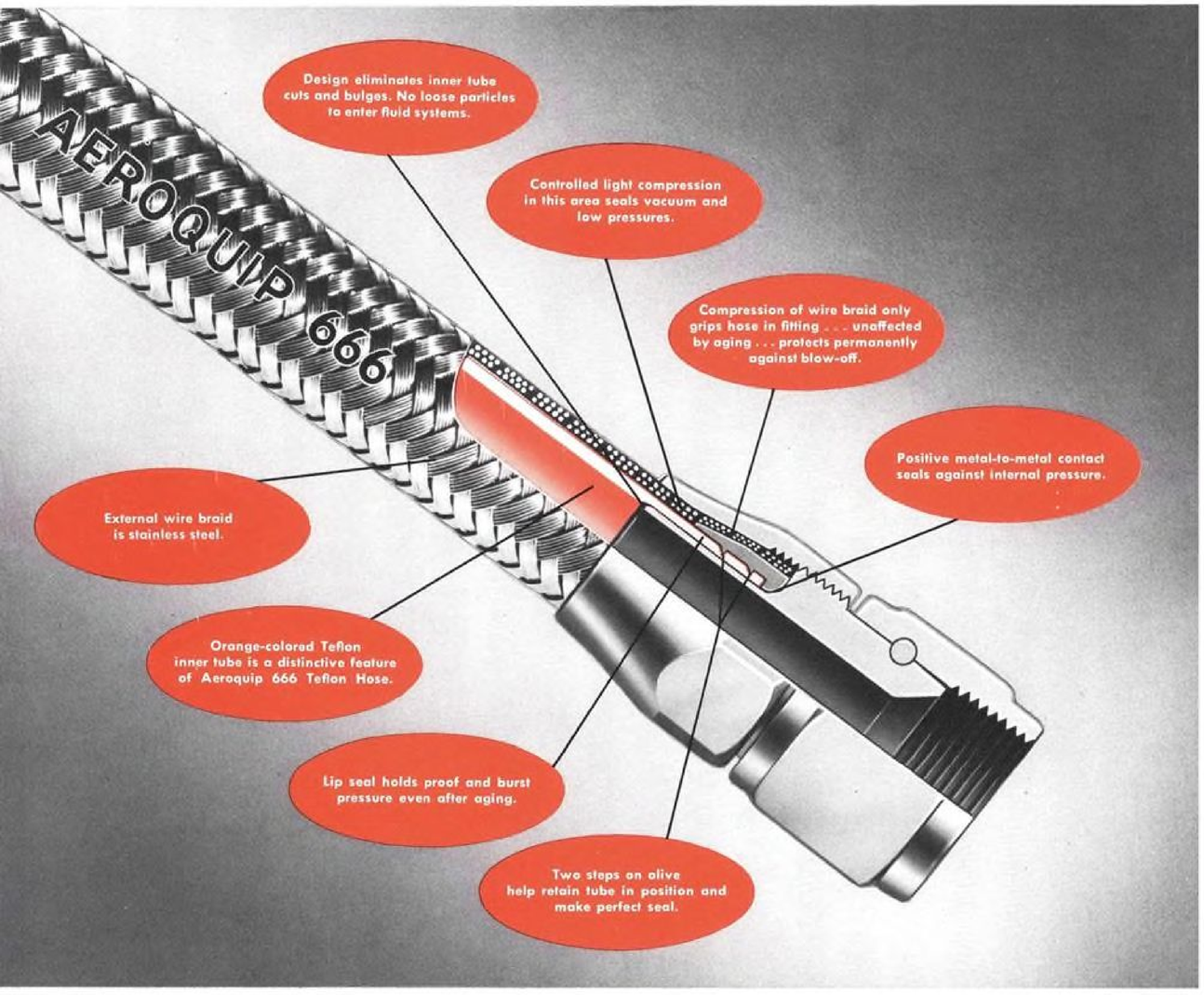
MASTER AND FIRING Rato switches are centered on Aerojet DC-3 panel.

Aeroquip
ANNOUNCES THE
BIG
NEWS
IN TEFLON HOSE!
See Next 3 Pages

Years Ahead! Detachable, Leakproof "super gem" Fittings

(PATENT APPLIED FOR)

and 666 Teflon* Hose



"super gem" is an Aeroquip trademark

Aeroquip

REG. TRADEMARK

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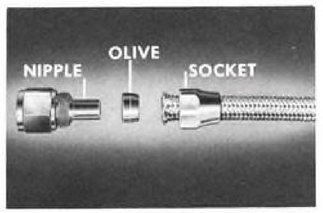
AERO-COUPLING CORPORATION, BURBANK, CALIFORNIA
AEROQUIP (CANADA) LTD., TORONTO, ONTARIO, CANADA

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

ASSEMBLE QUICKLY, EASILY WITH ORDINARY BENCH TOOLS!



Aeroquip's new "super gem" Fitting consists of nipple, olive, and socket. First step in assembly is to slide socket over the hose.

Next, the olive is pushed by hand into position between the Teflon inner tube and the wire braid.

Assembly is completed by screwing the nipple into the socket using an ordinary AN adapter.

"super gem" FITTINGS WILL NOT LEAK EVEN AFTER HIGH TEMPERATURE AGING. Unlike conventional swaged or crimped fittings, the "super gem" Fitting does not hold the hose by compression of the Teflon inner tube. There can be no loss of compression due to the cold flow characteristics of Teflon with resultant leakage at proof pressures.

"super gem" FITTINGS SAVE WEIGHT. Available in steel, stainless steel, or aluminum, "super gem" Fittings offer significant weight savings . . . particularly in the larger sizes.

ELIMINATE EXPENSIVE, HEAVY ASSEMBLY OR SWAGING MACHINES. A vise and a wrench are the only tools needed to assemble 666 hose and "super gem" Fittings.

SIMPLIFY ENGINEERING MOCK-UPS AND PRODUCTION CHANGES. Development and production engineers have complete freedom in making changes, even on the production line. New hose lines can be made in minutes. Scrap costs are kept to a minimum because end fittings on assemblies can be reused and hose salvaged.

REPLACE HOSE LINES QUICKLY IN THE FIELD. Simple assembly of 666 hose and "super gem" Fittings makes field replacement easy. Minimum inventories of bulk hose and fittings are required for field storage.

666 TEFLON HOSE IS DESIGNED TO AEROQUIP'S EXACTING SPECIFICATIONS. Distinctive orange-colored inner tube provides positive identification. Operating temperatures are —100° F. to +500° F. Sizes and pressure ranges are suited to all engine and airframe fluid systems.

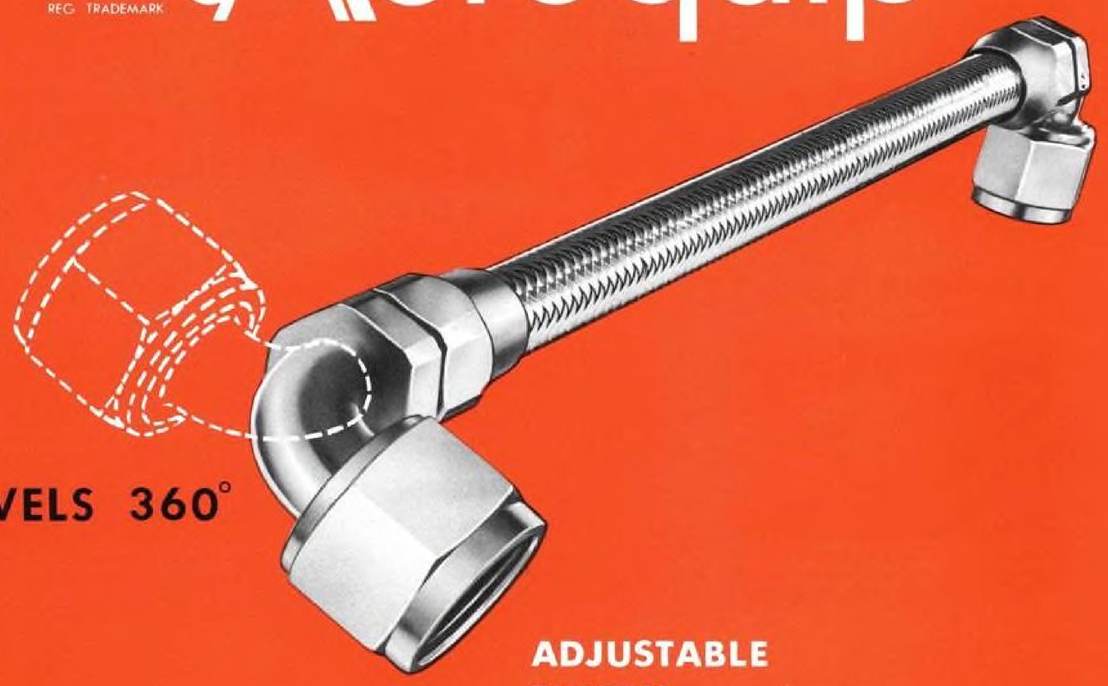
*Du Pont Trademark for its tetrafluoroethelene resin

Aeroquip Bulletin AEB-9 Gives Complete Technical Information and Test Data

Fill in and mail the handy coupon on the next page

Aeroquip

REG. TRADEMARK



SWIVELS 360°

ADJUSTABLE
ELBOW
FITTINGS
Simplify Hose Line
Installation

Aeroquip *"super gem"* Adjustable Elbow Fittings can be loosened and rotated to the exact position required as the hose assembly is installed. They are then tightened in position. This adjustment has absolutely no effect on the grip of the fitting on the hose. There is no danger of hose twist. Ordering is simplified.

Aeroquip Corporation,
Jackson, Michigan

Gentlemen:
Please send me your Bulletin AEB-9 on reusable *"super gem"* Fittings and 666 Teflon Hose.

Name_____
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FILL IN AND MAIL
THIS COUPON TODAY
FOR AEROQUIP
BULLETIN AEB-9
Get complete technical
information and test data
on Aeroquip 666 Hose
and *"super gem"* Fittings!

comes first. Maximum storage period is two years.

Cost of each bottle including igniter is $500. Because of the detailed and time-consuming inspection that would be required to check the integrity of the casing after the firing, the company does not refill the containers.

Installation Costs

Initial installation costs for a twin unit on a DC-3 will be between $2,500 and $3,000, including pilot checkout bottles. Aerojet says that it will furnish external installation blueprints at cost and supply names of bases where the customer can have his airplane fitted. The structure to which the bottles are attached is designed to take 4,850 lb. thrust. Fully loaded, the installation weighs 340 lb. A single bottle hookup for a Twin-Beech would cost about $1,500.

Installation also can be internal. First business plane to take the new smokeless units was Rockwell Manufacturing Corp.'s Lockheed PV-1, which has three 15KS-1000-A1's faired into the belly.

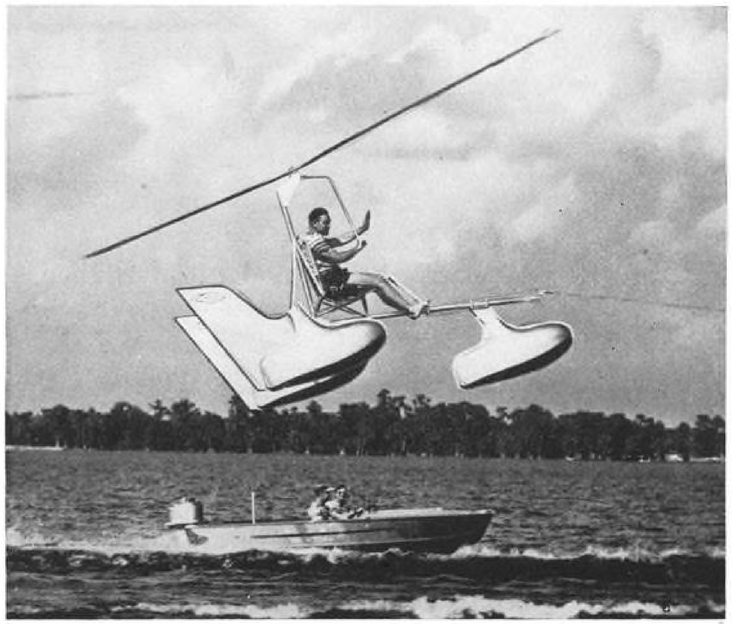
This design was worked out by Aircraft Engineering Service, Burbank, Calif., and installed by Pacific Airmotive Corp., Burbank. The Rato maker recommends submerged Ratos for the Ventura, B-25 and B-26.

Aerojet-General Corp., Azusa, Calif., reports that about 18,000 Rato units have been fired in military service and in other applications without a single malfunction. The CAA has certificated the standby powerplant on the same basis as any other engine, duration being the only limiting factor, Rice told AVIATION WEEK.

PRIVATE LINES

Shell Oil Co., Tulsa, Okla., plans to purchase a sixth de Havilland Dove executive transport. It recently purchased its fifth Dove through Butler Aircraft Sales, Dallas, Tex. Approximately 80 Doves are now in service in the U. S., primarily as business planes.

Four hangars under one roof and an administration building to handle business aircraft will be built by AiResearch Aviation Service Division, Garrett Corp., on a 25-acre site at Los Angeles International Airport, Calif. The project, designed to handle business aircraft, will cost $600,000. It is scheduled for completion in January.



Build-it-Yourself Helicopter-Glider

Designed especially for water sport enthusiasts, the new Bensen Hydro-Glider helicopter is also said to have commercial applications. One suggestion: Tow it behind a fishing vessel to spot possible catches. The motorless Hydro-Glider is shown during a flight by its designer Igor Bensen at Cypress Gardens, Fla. Bensen Aircraft Corp., Box 2725, Raleigh, N. C., says it will sell the all-aluminum craft in ready-to-fly form as well as in build-it-yourself kits. Construction plans also will be made available to amateur builders.

Grumman Goose amphibian conversion, aimed at boosting the plane's performance by 10% is being completed by Dean H. Franklin Aviation Enterprises, Inc., Miami, Fla. The Super Goose's wings will be clipped by 18 in. and squared off. Other features: Wrap-around Plexiglas windshield, dump valves on fuel tanks to increase gross weight by 600 lb., flush-type pressure cowls and electrically operated landing gear. Flight tests of the prototype conversion are expected this month.

All-weather spark plug for business aircraft is being marketed by AC Spark Plug Division, General Motors Corp., Flint, Mich. Designated HSR-86, unit has a seal directly with the ceramic jacket on the plug's inside, to prevent leaks of moisture and foreign matter.

Two-position propeller for personal and business planes, built by McCauley Industrial Corp., Dayton, Ohio, has been approved for Cessna 170A and 170B. Prime feature of the new prop is said to be increase in cruise speed from eight to 10 mph. at 6,000-ft. altitude, compared with fixed pitch unit. In climb it is stated to increase performance 12% at seal level to 69% at 10,000 ft. New two-position Met-L-Matic's price is $895.

Learstar Mark 2 conversion is offered Lockheed Lodestar owners who seek the Learstar's 260-290-mph. cruise speed and over 2,500-mi. range without disturbing existing interiors and other general characteristics. Lear Aircraft Engineering Division, Santa Monica, Calif., which developed the Learstar Mark 1, notes that its new Mark 2 will meet air transport category license requirements.

A new Lycoming GSO480 geared-and-supercharged engine has been approved by the Civil Aeronautics Administration under Type Certificate No. 284. The six-cylinder 495-lb. engine develops 340 hp. on takeoff and 320 hp. normal. It is installed in the new Super Aero Commander 680 light transport (AW Sept. 19, p. 105). Several other manufacturers of small executive transports are also expected to use the new powerplant.

Shipment of 311 utility-business planes in the one to 10-place category during September was made by six U. S. companies. The total net billing value was $5,394,000. January-September total: 3,328 planes worth $50,867,000. September shipments by company: Aero Design, nine; Beech, 44; Cessna, 99; Mooney, 6; Piper, 152, and Taylorcraft, 1.

HUGHES TOOL COMPANY AIRCRAFT DIVISION

in Southern California,

is expanding its research and development activity in a variety of commercial and military fields including helicopters, rockets, missiles, armament, electronics, etc. These long-range projects have created exceptional opportunities for Engineers and Scientists in the following fields:

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AIRCRAFT STRUCTURES DESIGN:
At least five years responsible aircraft design experience required. Experience in design and development of helicopter rotor blades, hubs and transmissions helpful.

HIGH-SPEED MECHANISM DESIGN:
Experienced in design and development of mechanical, electrical, hydraulic, or pneumatic devices. Analytical ability essential.

HYDRAULIC-PNEUMATIC DESIGN:
Analytical ability and experience with hydraulic and pneumatic valves and regulators required.

AIRCRAFT WEIGHT CONTROL:
B.S. degree and at least three years experience required.

RECENT GRADUATES IN ENGINEERING
Challenging assignments are available in a variety of experimental activities.

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For analytical investigations of hot gas flow systems involving turbines, compressors, etc. Requires theoretical background and supervisory ability.

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To head new section conducting research and development in liquid propellant rocketry and propellant synthesis. Advanced degree and considerable liquid propellant experience required.

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Experienced in designing and testing latest hydrodynamic developments.

We invite your immediate inquiry—by telephone, telegraph or air mail special delivery.

CONTACT
Mr. Floyd S. DeForest

HUGHES TOOL COMPANY AIRCRAFT DIVISION

Culver City, Los Angeles County, California

LETTERS

First-Class vs. Tourist

I flew from New York to San Francisco on the one-stop Super Constellation G flight that has the new first-class-tourist configuration for domestic service. I wrote Trans World Airlines that it was difficult for me to understand how it was possible for 25 people to pay $176 for a ride that was costing 36 other people $320.09 for the same equipment, the same schedule and the same service. I said that this was especially so since it took three stewardesses almost two hours to serve lunch to the 36 of us. My lack of understanding of airline economics was further confused by the fact that the stewardesses were hawking drinks at a dollar a piece where just two weeks before they actually had surfeited me with free booze.

The perfunctory letter received from TWA's Customer Relations Department gives me very little satisfaction. This is especially so since I travel somewhere between 40 and 50 thousand miles a year by air, including five or six round trip flights to New York.

GEORGE C. TENNEY, President
McGraw-Hill Company of California
68 Post Street
San Francisco 4, California

Merit of CAB Reports

Your publishing of the CAB report on the Italian Airlines DC-6B crash at Idlewild in your October 31st issue, as with your previous CAB reports on accidents, are deserving of a pat on the back from your readers. I realize that these exceptionally thorough and well written reports represent a tremendous amount of investigation and research on the part of the members of the CAB investigation board involved but your thoughtfulness in publishing these reports in their entirety rather than the "review" or "condensed" form of reporting so prevalent in today's periodicals is further reason for the high esteem your magazine holds in the aviation industry.

As one reader I wish to say many thanks.

LT. PETER MONGIALRDI, JR., USN
Composite Squadron Sixty-Two
U. S. Naval Air Station, Box 43
Jacksonville, Florida

Negative Camber

I have read with interest the article entitled, "Douglas Challenges Industry to Best DC-8" by William J. Coughlin, published on page 107 of the 7 November 1955 issue of AVIATION WEEK. Of particular interest was the description of the use of a negative camber airfoil to increase the drag divergence critical Mach number of the center wing panel. It may be of interest to your readers to know that the merits of this concept were explained and advocated in a paper submitted by the present writer to the Journal of the Aeronautical Sciences in March 1950. This paper was published in the J.A.S. in June 1951 under the title of, "Negative Camber Airfoils for Transonic Flight." The concept of the negative camber airfoil was suggested to the writer by the results of an airplane dive transonic research program executed by the Glenn L. Martin Co. under Navy Contract NOa(S)-3604 entitled, "Flight Investigation of Airfoil Characteristics at High Speeds," during the period 1944 to May 1947.

The concept of the negative camber airfoil for transonic flight has also been advocated by W. F. Hilton in his text book, "High Speed Aerodynamics," pp. 107-109, Longmans, Green & Co., Ltd., copyright 1951, and in his British R & M 2460 entitled, "Use of Negative Camber in the Transonic Speed Range" published in 1952, in which he references the June 1951 J.A.S. paper by this writer.

It should be noted that it is to be expected that the effects of negative camber in increasing the drag divergence Mach number will also be obtained at high supersonic speeds on wing plan forms permitting transonic leading edges. Thus, if a critical Mach number increment of .04 is obtainable on a straight wing subsonically, the increment obtainable on a wing of the same thickness swept back so that the leading edge is parallel to the Mach angle will be approximately .20 at M = 5.

THOMAS B. WOERSCHING
Design Specialist
Operations Analysis Group
Convair
A Division of General Dynamics Corporation
San Diego 12, California

On the United Strike

The United Air Lines Flight Engineers wish to sincerely thank your publication for the article that appeared in the Oct. 31st issue of AVIATION WEEK concerning the strike action that is presently in progress against United Air Lines.

The true issue, however, was not presented, which from a reporting standpoint is understandable. The Flight Engineers are on strike because we feel the present hiring policy of United Air Lines is designed to deteriorate and eventually eliminate the job of the career Flight Engineer. Flight Engineers on all major airlines in this country are men who have mechanical background. The primary design, by the Civil Aeronautics Authority, of the Engineer's job is one of safety. It requires a man whose sole attention and efforts are readily adaptable to understanding the complexity of the modern transport aircraft so that his advice to the pilot in command and to the ground servicing personnel on any malfunctioning, or suspected malfunctioning, is expeditious, both to the safety in the air as well as to intelligent remedial action on the ground.

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

Now...a new DC power supply that's 35% lighter... designed by Federal to help today's planes fly higher, faster, and farther!

FTR-3431-L
Transformer-Rectifier
AC Input: 195 to 210 volts, 3-phase, 4-wire, 380 to 420 cycles.
DC Output: 100 amps., 24 to 31volts, resistive-inductive load.

NEW vs. OLD
View of FTR-3431-L (15" x 7¼" x 7½") compared with a previous 100-amp. type.

Ceilings, speeds, and distances are going *up* . . . boosted by weights that are coming *down!*

A major step in weight reduction is Federal's remarkably rugged and compact FTR-3431-L 100-amp. DC power supply . . . built under a new concept of construction and featuring a smaller, lighter Federal-designed rectifier plate . . . to provide a weight-saving of over *35% per unit!*

Federal's newest contribution to aviation progress is the product of nearly two decades of rectifier pioneering . . . *plus* the vast know-how of IT&T associates around the world.

This unique background—long in the service of America's leading aircraft manufacturers—is ready to supply your ground or airborne DC needs . . . or design to meet them!

For complete data on the FTR-3431-L, write today to Federal, Dept. E-3110.

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Export Distributors: International Standard Electric Corp., 67 Broad St., New York

United Air Lines is presently hiring men with a commercial pilots license and no mechanical background. We of the Flight Engineering profession feel that this is in direct violation with the principles of safe airline operation, and if allowed to continue would completely defeat the purpose for which the job was created. Our interpretation of United Air Lines action in this matter is simply to make the safety station of the Engineer a training station for future pilots. I have taken this up with Mr. Carl Hinshaw, Rep. of the 20th district, State of California, who is a member of the Aviation Sub-committee, as the Flight Engineers feel this is an extremely serious situation.

In looking over the various actions by United Air Lines during the past year or so that led up to this very unfortunate strike action, one begins to wonder to what lengths some large corporations will go to in order to win a point. In the case of United, it appears that some degree of safety is being tampered with in order to remove the Flight Engineers International Assn. from their cockpits. According to a report we have here in Los Angeles, United Air Lines has gone so far as to advise our membership that Mr. William Kent, Pres. of the Flight Engineers' International Assn. will no longer be allowed on United Air Lines property. Sometime before this difficulty broke out, when everything was peaceful, and flights were operating normally day and night, the Engineers initiated a training program for themselves with the following objective; "to provide United Air Lines with the most efficient Flight Engineers possible. To provide United Air Lines with the safest and most economical operation of their aircraft engines and component systems. In order to accomplish the above and meet the demands for the high degree of technical knowledge and skill required of today's Flight Engineer to keep pace with the rapid changes of the present and future aircraft, we must pool the greatest source of technical knowledge known to any profession and share with our fellow Flight Engineer. We must have such a program to gain self improvement, build leadership, make better professionals, advance aviation progress, and gain the maximum use of our equipment."

It seems to me that men so inclined are worth their weight in gold to any organization. Here are a group of men who devote all of their energies on and off the job to the safe and efficient operation of those complicated aircarrier aircraft that you and your reading public ride in. Here now is a large aircarrier corporation allowing this to deteriorate by employing men, who have openly admitted time and time again that they have no interest in the Engineers job, since their ultimate goal is to fly as a pilot. Will the flying public and the Civil Aeronautics Authority condone this? I think not, if the true facts are forcibly brought to their attention.

As I have said this is an extremely serious matter. One that your influential publication should, if I may respectfully state, review and study thoroughly.

W. J. Burkhouse
Public Relations
United, Flight Engineers
656 W. Arbor Vitae
Los Angeles, California

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The Laboratory has the responsibility for the design and development of complete guided-missile systems such as the Corporal. Much of its success is credited to its small but outstanding telemetering and instrumentation group, which was one of the first in the nation to design and employ transistor telemetering systems.

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1) Experience or training in transistor circuit design.
2) Experience in the development of missile telemetering systems.
3) Experience in instrumentation system design and data processing.

Airmail your summary of qualifications and references to:

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4800 Oak Grove Drive, Pasadena, California

U.K. Exports

We have noticed in the September 19th issue of Aviation Week that U. K. aero exports for the first half of 1955 are incorrectly reported—on page 42—as "approximately $6.3m."

The correct figure is £30,693,039 or about $87m.

P. J. R. Moyes
Information Department
The Society of British Aircraft Constructors, Ltd.
32, Saville Row
London, W 1

(Aviation Week multiplication unintentionally devalued the British pound.—Ed.)

Hi-Per DC-3 Speed

In your Sept. 26 issue, you have an article about the Hi-Per DC-3 by George L. Christian (p. 75). You state: "Sheriff estimated that the wheel well doors add about five mph. to the plane's speed." Actually, the correct figure is an increase of 10 mph.

A great deal of effort by Pan American Airways went into the development of this door. As a satisfied customer, we want all interested parties to know that these doors will increase the performance of any DC-3.

To date, we've had 200 hours of maintenance-free operation from the highly successful wheel well doors.

Robert E. Sheriff, Chief Pilot
Thompson Products, Inc.
Flight Department
Sky Tech Hangar, Hopkins Airport
Cleveland 11, Ohio

(Aviation Week erred. Actually each door increases the plane's speed by five mph. for a total of 10.)

'Favorable Comment'

Those of us who work for the irregular carriers appreciate your editorial policy in reference to our status.

I have heard many favorable comments on your objective presentation of the current struggle by North American in its continuing battle with the CAB, even from those who think this particular carrier should be allowed to continue its present operation.

Lesley N. Forden
1816½ Pearl Street
Alameda, California

'Inefficient' Control

It is felt that Aviation Week can offer a very valuable service to the aviation industry by continuously outlining the inefficient traffic control system that CAA is offering today. Let's hope that by consistent hammering, the powers-to-be will soon realize that it is necessary to bring about considerable improvement rather than wasting time advising why the present systems are better implemented.

J. D. Smith
Regional Safety Chairman
Air Line Pilots Association
60 East 42nd Street
New York, New York

SERVING AIRCRAFT OF THE WORLD

To serve the accessory system requirements of the aircraft industry on both sides of the Atlantic, Stratos and Sir George Godfrey and Partners Ltd., have effected an important engineering and product design interchange agreement. This agreement provides for the exchange of ideas and techniques, as well as making available products of both organizations to British and American aviation.

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Through this exchange of ideas and of engineering information, Stratos and Godfrey provide some of the world's outstanding aircraft with such vital systems and accessory equipment as: air-conditioning and pressurization systems, turbo drives, valves and controls, and high pressure pneumatics.

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SILASTIC seals B-47

access openings . . . keeps them operational at temperature extremes

*Silastic**, Dow Corning's silicone rubber, stays resilient and keeps its shape at temperatures ranging from —100 to 500 F. That's why Boeing uses *Silastic* for positive, trouble-free sealing around access doors in the B-47 Stratojet. *Silastic* withstands ozone and weathering . . . has far greater resistance to compression set than organic rubbers at both high and low temperatures . . . may be extruded in practically any cross-sectional size or shape.

Access doors open readily because *Silastic* does not stick to door frame surfaces. And because of its stability at both high and low temperatures, *Silastic* is also being used successfully to prevent air turbulence around wing flaps and engine nacelles on other aircraft.

A product of the jet age, *Silastic* has helped make many other jet age achievements *possible!* When you need a *rubbery* material that will *stay rubbery* and keep its shape at temperatures which would melt organic rubbers or freeze them brittle, *you need SILASTIC!*

Mail coupon for complete information on SILASTIC

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NEW AVIATION PRODUCTS

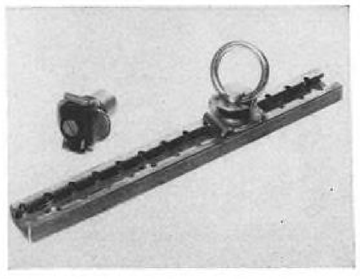
Locking Cargo Tie-Downs

Cargo tie-downs, used in the Douglas C-124 and the Fairchild C-119 can provide weight reductions of approximately 60 and 70 lb. respectively.

In the Model MB-1 for 10,000-lb. service, the chain is automatically locked into position as it is inserted into the slot. The release mechanism permits the chain to be unloaded easily even under tensions of 5,000 lb. Tie-downs can be hand-tensioned to loads of 600 lb.

The hook and chain picket of the MB-1 are constructed of forged, heat treated alloy steel and are zinc-plated with post-plate treatment to afford maximum corrosion protection.

Eastern Rotocraft Corp., Doylestown, Pa.



Aluminum Alloy Plane Track

New lightweight high-strength 75ST aluminum alloy track and component fittings handle 12G loads and were designed specifically for high-density seating modifications, galley installations, bunks, litter conversions, cargo tie-down and partitioning. The new track also affords a 20% weight reduction over previous installation, the maker claims.

Track component fittings such as cargo tie-down rings, seat fittings, strap fittings and galley fittings, are available in either a locked position or free-floating type.

Brown-Line Corp., 341 N. Foothill Road, Beverly Hills, Calif.

Electric Work Tower

Hydro-electric elevating work tower for one-man use is powered by a ¾-hp. single phase electric motor. The ML-4-AC Moto-Lift can be plugged into any 110-V.A.C. outlet. The motor operates a hydraulic pump to raise the work platform from 7 to 17 ft. above the floor in 25 sec. Working capacity is 400 lb.

The plug-in tower is provided with 50 ft. of heavy-duty extension cable, permitting work along a 100-ft. strip before moving to another outlet. Battery and hand-operated models are self-contained and can be used anywhere.

Safway Steel Product, Inc., 6234 W. State St., Milwaukee 13, Wis.

Radiation Exposure Dosimeter

Exposure dosimeter for instant detection and visible warning of dangerous exposure to radiation is the size of a ball point pen and consists of a hollow, hermetically sealed ionization chamber enclosing Polystyrene beads which serve as indicators of the amount of exposure to X-rays or gamma rays.

Model 520 Radad is calibrated to detect 50-roentgen exposure, which is ⅛ of the amount of radiation which the average human being can withstand, the maker says. This 50-roentgen dosage may occur over a number of hours or in a single exposure charge. Special models can be calibrated at prescribed roentgen ratings to meet specific requirements.

Electromation Co., 116 S. Hollywood Way, Burbank, Calif.

Indicating Flowmeters

New flowmeters feature a direct flow design which utilizes a flexible vane traveling under flow to indicate flow on a calibrated scale, eliminating component parts such as pivots, bearings, bellows, diaphragms.

Model L uses a direct reading scale. Pressure drop across the meter can be as low as 4 in. of water, permitting its use on very low flow rates of gas.

Model LP is fitted with a transparent cover to permit visual inspection of the liquid or gas flow. It can be built for any pressures that are considered safe for the transparent cover. Transparencies can be designed and made to withstand pressures of several thousand pounds under moderate pressures.

Instrument Div., Scully-Jones & Co., 1901 S. Rockwell St., Chicago 8, Ill.

Tool Bends Stainless Tubing

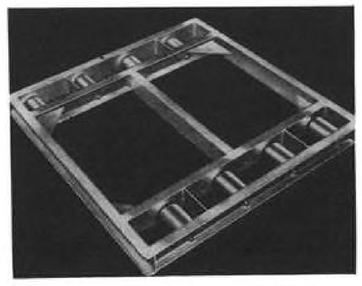
Exactol tube bender is a compact, crank-operated, worm-gear device for easy manual bending to exact tolerances. It will handle annealed or ⅛ H cold drawn stainless steel tubing. The unit is designed to produce bends up to 180 deg. in one continuous operation without strain or fatigue.

Operating mechanism consists of one-piece frame provided with bronze worm wheel and hardened steel worm with ratio of 60 to 1, supported with prelubricated ball bearings and a ball-type thrust bearing.

Slide block has grooves for six tube sizes: ¼, 5/16, ⅜, ½ and ¾ in O.D. The crank handle which operates the bender is also used to adjust the slide block screw.

The bender can be clamped in a bench vise or mounted in an adaptor fastened to a work bench or to a mandrel support base.

Tube & Hose Fittings Div., Parker Appliance Co., 17325 Euclid Ave., Cleveland 12, Ohio.

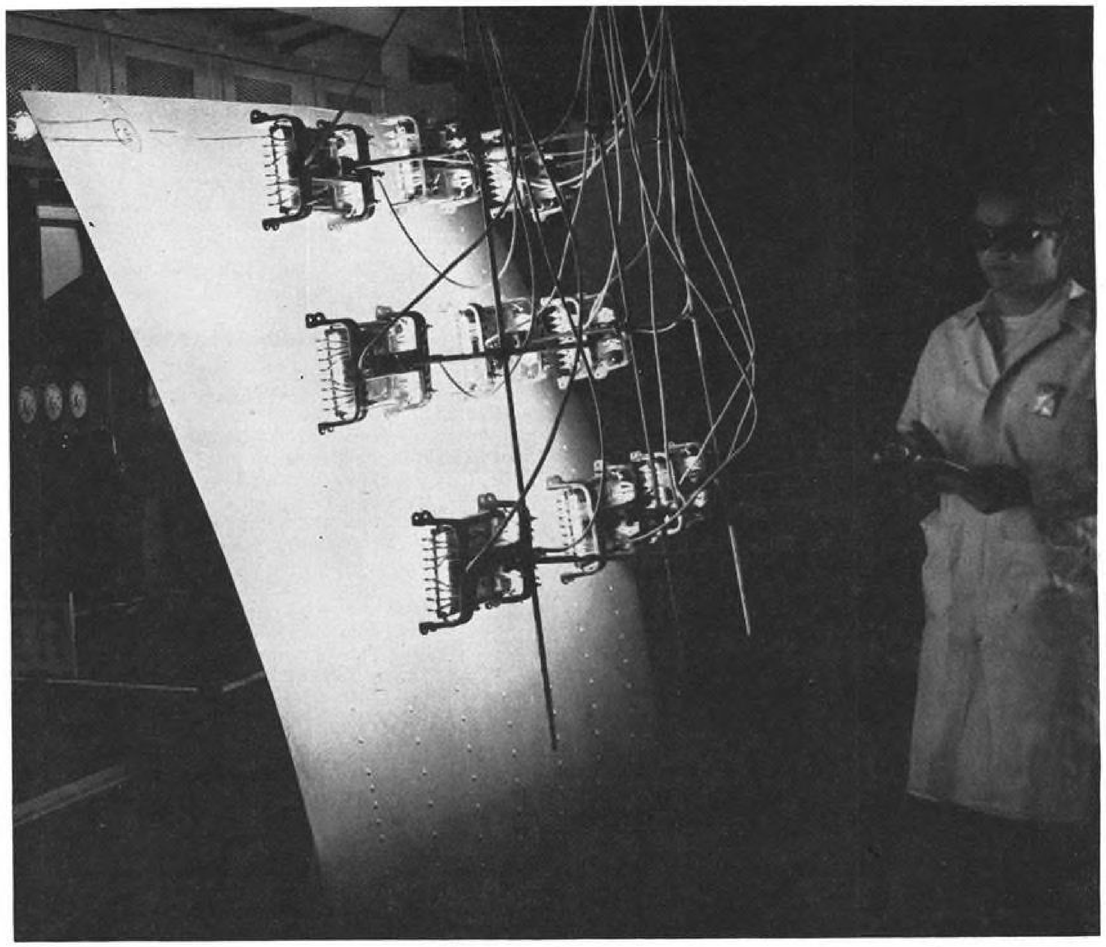


One-Man Pallet Dolly

Pallet dollies of all-magnesium construction provide maximum strength at minimum weight for easy one-man handling.

The units are available in six standard sizes and in capacities of 2,000 or 4,000 lb. Weighing from 31 to 42 lb., they facilitate quick, efficient manual positioning and result in fast material flow in freight car loading or trucking operations.

Magline, Inc., 1900 Mercer St., Pinconning, Mich.



Penetrating the "thermal thicket"

Flying at two to three times the speed of sound, airplanes and missiles enter the "thermal thicket," where heat is so intense that rubber and plastics as we know them melt, lubricants boil away, and aluminum grows weak as butter.

New materials and designs, and new testing techniques, are being developed to cope with these and other problems of supersonic flight. If test equipment does not exist, Boeing engineers create their own—as they have in the test device shown above. It raises the temperature of the metal "skin" section 700 degrees or more in a few seconds, to simulate the sudden temperature rise that a fast-climbing missile encounters.

Such tests carry Boeing engineers another step forward through the "thermal thicket." But with each step, new and greater obstacles appear.

Many of Boeing's 6,000 engineers are busy meeting these challenges. They are developing an air conditioning system, adequate for a small hotel, to keep men and equipment cool in the searing temperatures of supersonic flight. They are working with researchers in other industries to produce new heat-resistant materials . . . better insulation . . . electrical systems that won't break down under heat . . . new tires and ways of cooling them where conventional ones would blow out, then melt, then burn.

As a contribution toward aviation progress, Boeing provides laboratory facilities for research and development probably not equalled by those of any private concern in the world. But even more important are the men themselves. Their skill, imagination and devoted research will bring you even more powerful weapons of defense, and faster, safer, more comfortable transportation in the epoch of supersonic flight just ahead.

BOEING

New Missile Products

Auxiliary Power Unit

Auxiliary power unit provides electrical and mechanical or hydraulic power to operate guidance and control systems in guided missiles. The unit weighs 29 lb. and has dimensions of 13x10x7 in.

It develops power of 650 w. and can be up-rated to 1,600 w., which, according to the manufacturer, is enough to supply the power needs of three modern homes.

The power unit performs with either a liquid or solid propellant, either of which burns to generate gas directed against a turbine wheel, mounted on the same shaft as an induction generator rotating at about 24,000 rpm. An output shaft turned by a pinion gear system can operate missile controls mechanically or turn a pump for hydraulic power up to 2.5 hp.

AiResearch Manufacturing Div., Garrett Corp., Los Angeles 45, Calif.

Guided Missile Accelerometer

New accelerometer for airborne flight control and fire control is suited for operation in modern high-speed aircraft where acceleration measurement is required for precise guidance and control. It is adapted from the GLH guided missile accelerometer, Model GLO.

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Genisco, Inc., 2233 Federal Ave., Los Angeles 64, Calif.

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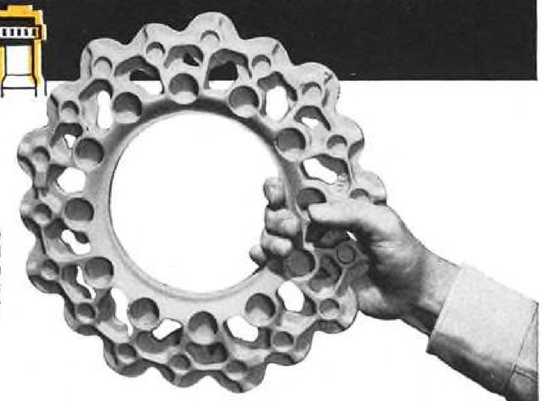

Typical of the intricate design and thin metal sections possible with the CERAMICAST process is this backing plate for a jet aircraft brake.

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Linear actuator for a.c. or d.c., weighs 2 lb. and conforms to MIL-A-8064 specs. Actuator is rated at 650 lb. maximum operating load and 2,000 lb. ultimate static load.—Airborne Accessories Corp., 1414 Chestnut Ave., Hillside 5, N. J.

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FORMABLE CORE MATERIAL nests easily into compound curve mold, reducing lay-up time by an estimated 65% on bonded aluminum fibrous glass pod built for Convair-San Diego. Measuring 20 ft. long and up to 5 ft. in diameter, the pod is fabricated in sections using "multiwave" aluminum foil core, which permits the formation of extreme compound curvatures without saddling, crippling or the need for precurving or slicing. Sandwich construction is employed to obtain lightweight, contoured sections with a minimum of production and tooling expense.

Manufacturer is Narmco Industries, 1882 Moore St., San Diego 1, Calif.

Tough plastic colors for decalcomania transfers have been developed to increase the life and durability of decals. The pigments make possible a permanent transfer in quantities.—Allied Decals, Inc., 8360 Hough Ave., Cleveland 3, Ohio.

New hydraulic Keylift can handle a maximum payload of 3,500 lb., lifting it from a minimum height of 32½ in. to a maximum of 124 in. One-man operation is made possible by means of a remote control lifting and lowering mechanism.—Keystone Engineering Co., 1444 S. San Pedro St., Los Angeles, Calif.

Portable precision instrument for measuring oxygen and combustibles in exhaust gases is built into an aluminum carrying case, 18x12x18 in., and weighs 35 lb. Oxygen and combustibles are measured in separate cells and results shown on separate meters.—Instrument Div., Davis Emergency Equipment Co., 55 Halleck St., Newark, N. J.

Corrugated box for shipping airplane propellers affords protection to precision-made blades, reduces package cost and provides convenience in packing and unpacking. The containers consist of five principal parts, three boxes (one for each blade) and two triangular caps to house the hub and hold the individual boxes in position.—Gaylord Container Corp., 111 N. Fourth St., St. Louis 2, Mo.

Gask O Seal for AN electric plugs provides zero-leakage sealing. It is available with a variety of glands and retainers to seal temperatures from —65 to 350F (500F intermittent) and both low and high pressures.—Franklin C. Wolfe Co., Inc., 3644 Eastham Drive., Culver City, Calif.

Duroid 5600 sheet material is made of Teflon into which inert fibers have been incorporated by a process that maintains the fiber structure. These reinforced fibers give the material greater resistance to cold flow heat distortion and extrusion than is possessed by unreinforced Teflon. Continuous service up to 500F is permissible, with intermittent service up to 600F.—Rogers Corp., Rogers, Conn.

Double acting tube piercing units for press brakes and punch presses are used in fabricating aircraft components where clean, accurately located single or multiple holes are required in tubular parts. The units have a capacity of ½ to 1 in. O.D. tube, maximum punch diameter of .312 in., maximum wall thickness of tubing .093 in. Tube piercing units can be set up on flat

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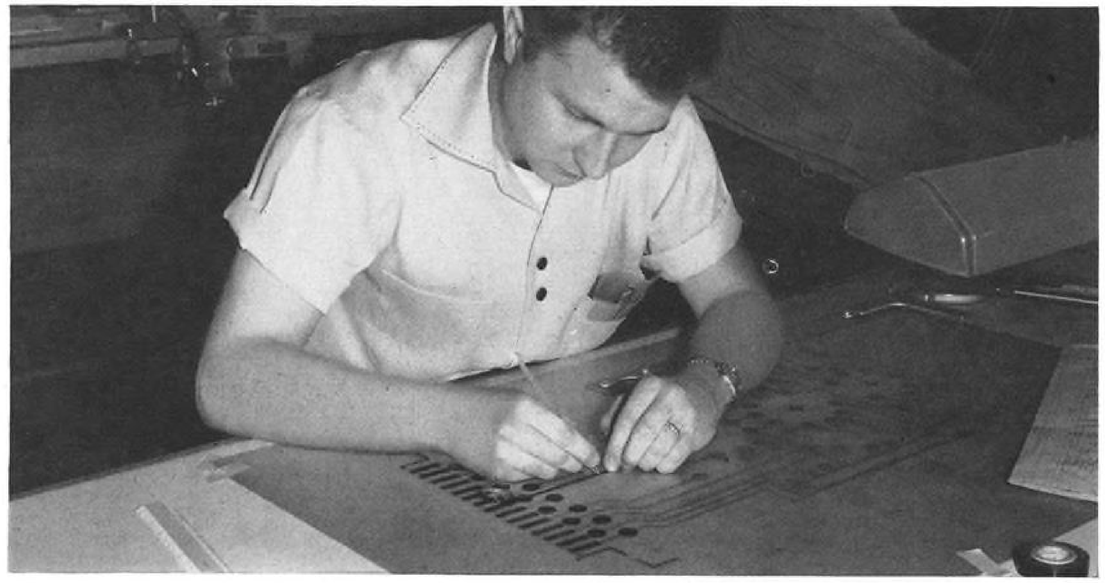

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plates for mounting to bolster and ram plates of punch presses.—Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y.

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Micro Delta P Controller is a back pressure control system complete in one unit. It serves as pressure sensing element, control pilot and control valve, providing square-wave pressure re-

sponse, microsecond control without hunting, constant pressure throughout full flow range.—Industrial Engineering Corp., 525 E. Woodbine, Louisville 8, Ky.

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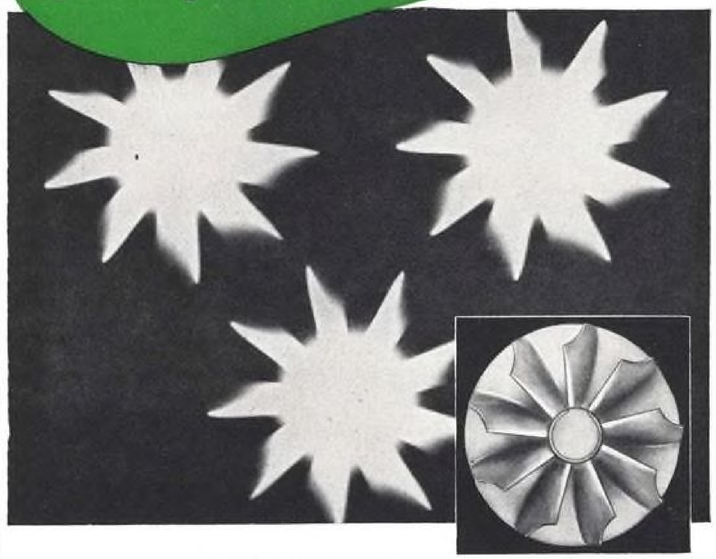
Automatic pressure wet blast unit, for finishing interiors of large metal cylinders, was designed to remove selenium deposits from inside half-hemispheres approximately 30 in. in diameter.—Cro-Plate Co., Inc., 747 Windsor St., Hartford, Con.

INSIDE STORY

Austenal Quality Control



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Official CAB Report on Trans World 4-0-4 Crash

Pilot Off Course, Hits Mountain

Trans World Airlines Flight 260, a Martin 4-0-4, N 40416, struck Sandia Mountain, near Albuquerque, New Mexico, February 19, 1955, about 0713.[1] All 16 occupants were killed and the aircraft was destroyed.

HISTORY OF THE FLIGHT

Flight 260 originated at Albuquerque, New Mexico, and its destination was to be Baltimore, Maryland.

A number of stops were scheduled, of which the first was to be Santa Fe, New Mexico, 53.5 nautical miles distant by airways, 43 miles direct.[2]

The crew completed their weather briefing and the captain filed an Instrument Flight Rules plan to cruise at 9,000 feet via Victor 19 to Santa Fe, estimating Santa Fe 20 minutes after departure. The aircraft had been fueled to a total of 1,020 gallons; its gross weight was 40,027 pounds, well under the maximum allowable, and its center of gravity was located within prescribed limits. On board were 13 passengers and a crew of three—Captain Ivan R. Spong, First Officer Jesse J. Creason, and Hostess S. D. Schoening.

Takeoff Clearance

The tower advised that either Runway 11 or 17 could be used as the wind was southeast, between these runways, at eight knots.

The flight received the following instrument flight rules clearance by radio from the tower at 0703: "ATC clears TWA 260 for an approach at the Santa Fe Airport via Victor 19; cruise 9,000, report leaving 9,000, climb northbound on the back course of the ILS localizer." This was acknowledged and repeated by the flight. The tower then requested the flight to report over the Weiler Intersection and the flight requested information regarding the location of the Weiler Intersection.

The tower operator verified that the Weiler Intersection was formerly the Alameda Intersection and had only been renamed; also, that it was the intersection of the 026 radial from the Albuquerque Omni Range and the back course of the Albuquerque ILS localizer. The flight acknowledged this information. (The Weiler Intersection is 13 miles north of the center of the Albuquerque Airport.)

Flight 260 took off from runway 11 at 0705 on schedule. The time off was not reported, contrary to company practice.

Permission was asked for a right turn which the tower immediately granted. There were no further radio contacts with the flight.

The tower operators last saw the aircraft south of the airport at an altitude of 500-600 feet. Takeoff appeared normal.

Unusual Course

One highly qualified observer, at his residence about three miles north (magnetic) of the airport, saw the aircraft proceeding directly toward the middle of Sandia Ridge. This man, an Air Force officer-pilot, thought the course was so unusual that he watched the flight with binoculars.

It passed over the eastern part of Albuquerque, near him, at an estimated altitude of 3,000 feet (8,300 feet msl.) in a high-speed shallow climb. He noticed that the upper portion of Sandia Ridge was obscured by clouds. The aircraft continued its heading, toward the ridge, and was lost to his view as it entered the cloud, less than two miles from the ridge crest, still in a shallow climb. The engines sounded normal.

One other witness, who observed the aircraft at about the same time and place, watched until it disappeared in the cloud, headed toward Sandia Ridge. There were no known witnesses to the crash.

When the flight did not report over the Weiler Intersection, shortly after 0712, the tower asked the flight if it was northbound on the back course (of the ILS localizer). There was no answer. Repeated subsequent calls were unanswered.

A search had been started by 0830. Clouds hampered search for the remainder of that day. About 0942 the following morning the wreckage was sighted from the air just below the crest of Sandia Mountain.

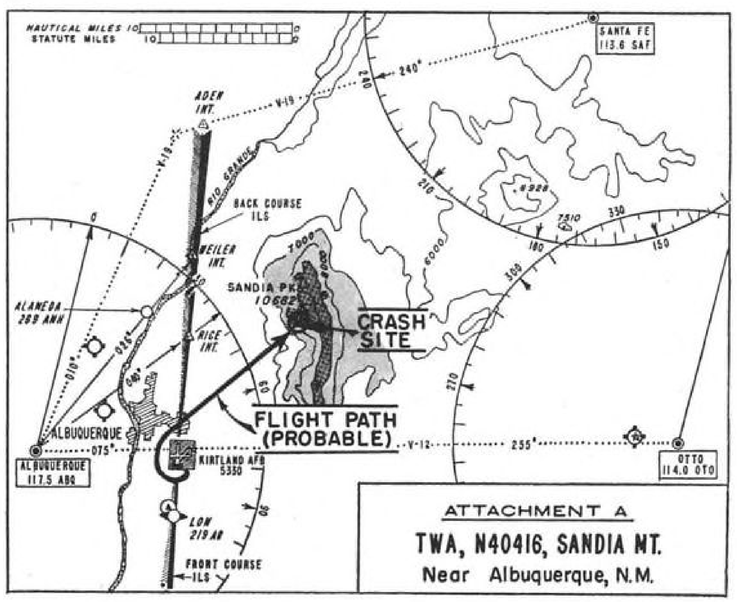
INVESTIGATION

Shortly after the flight was assumed to be down all CAA radio facilities that could have been involved were flight checked. All were found to be functioning normally, including Albuquerque Omni Range and the Albuquerque Localizer.

The crash site was about 13 miles northeast of the Albuquerque Airport and almost directly on a straight line course of 30 degrees magnetic from that airport (elevation 5,340 feet msl.) to the Santa Fe Airport (elevation 6,344 feet msl.). Elevation of the site was 9,243 msl., some 1,439 feet lower than the crest of the ridge a mile or so directly ahead. (See Attachment A.)

At 0708, about five minutes before the crash, the Albuquerque weather was officially recorded as: 4,000 feet scattered, 7,000 feet thin broken clouds; visibility 40 miles; wind SSE 6; altimeter 29.82; mountains obscured northeast. The Santa Fe 0628 regular sequence weather report gave: Estimated 3,000 feet broken; 20 miles visibility; wind southwest 9. Before departure the pilots had been briefed on the weather, which was generally clear and would have permitted visual flight over nearly the entire route, with only short instrument flight probable. This condition was actually encountered by another flight over the same route that departed Albuquerque 11 minutes after Flight 260 (Pioneer Flight 62).

The TV towers on the highest point of Sandia Ridge had been visible from the Albuquerque Airport at 0625, approximately 43 minutes before the crash, by official Weather Bureau observation. How-



[1]All times herein are Mountain Standard and are based on the 24-hour clock.
[2]All distances herein are in nautical miles.

Design, Development, Production
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subject: **T-37 EJECTION SEATS**

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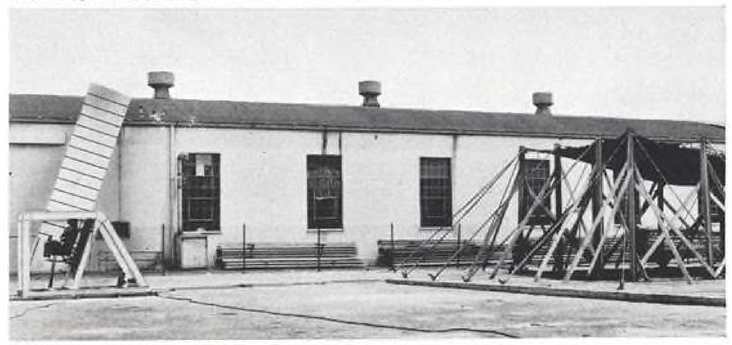
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ever, at the time of the crash the upper portion of the ridge was obscured by cloud.

Fire followed impact, which is believed to have been while the aircraft was in a left climbing turn. Wreckage was widely spread over the extremely rugged mountain in the general direction of about 320 degrees magnetic. One wrist watch was recovered; it was impact-stopped at 0713. One altimeter was recovered; its setting was correct for the time and place of takeoff.

Hazardous Investigation

Initial investigation at the scene was greatly handicapped and curtailed by deep snow and inclement weather and dangerously unsure footing on the steep, rocky, snow-covered slopes. Careful planning went into the organization of another expedition, which was scheduled at a later date when the deep snow and ice had gone. This included the use of pack horses and mountaineering equipment.

This expedition of Investigators reached the site on May 3 and made an exhaustive study of the wreckage after considerable difficulty and hazard, including a rock slide that injured several members, one seriously. The results of their findings, and later study of some of the recovered components of the aircraft, showed no evidence of fire or structural failure prior to impact, nor of malfunctioning of either engine or either propeller.

A study of recovered radio components disclosed that No. 1 VOR Navigation Receiver was tuned to the frequency of the Albuquerque Omni Range Station; No. 2 VOR Navigation Receiver was tuned to the frequency of the Albuquerque ILS Localizer. Both pilots were using safety belts at the time of the crash and had been in their proper respective seats at takeoff.

Terrain Warning Indicator

This airplane was equipped with a Hughes Terrain Warning Indicator, which simultaneously flashes a light and sounds an alarm when the aircraft is 500 feet, 1,000 feet, or 2,000 feet from any obstruction, as set. The obstruction may be anywhere downward from within about 5 degrees of the horizontal in all directions—ahead, astern, or to either side. In other words, it covers a space of almost a complete hemisphere below the airplane. On the last previous flight of this aircraft the Terrain Warning Indicator had been functioning and it was one of the items checked, and found to be working properly, during the preflight inspection just before the final takeoff.

The subject aircraft arrived in Albuquerque at approximately 1219 on February 19, the morning of the final flight. The captain of that flight, which was TWA No. 300, reported the following items which were entered in the aircraft log:

a. Propellers overrevving on takeoff.

b. Right fuel pressure high in cruise—indicated 25 psi.

c. Used alcohol. Requested replenishment of deicer fluid.

Prior to dispatching N 40416 on Flight

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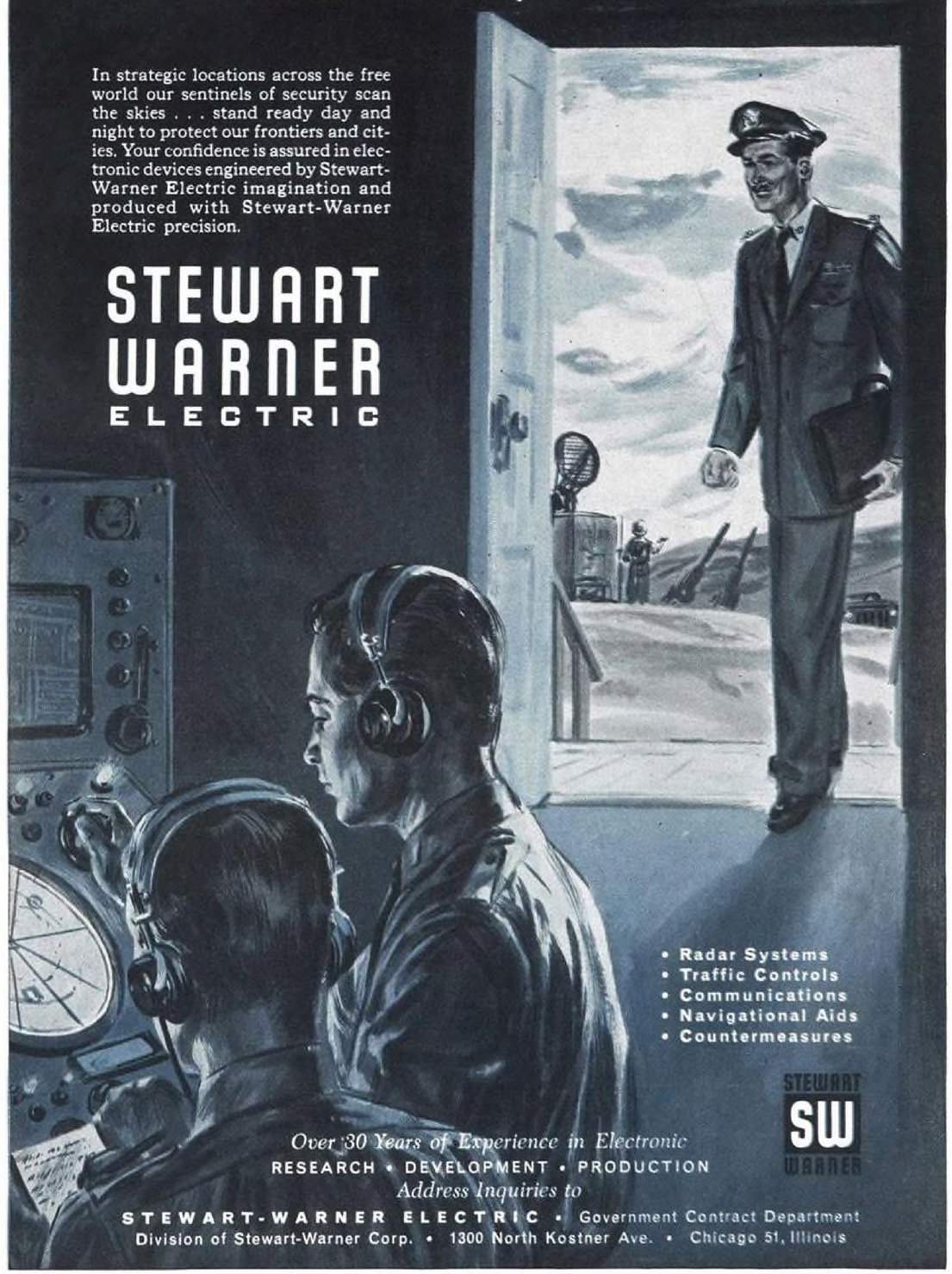

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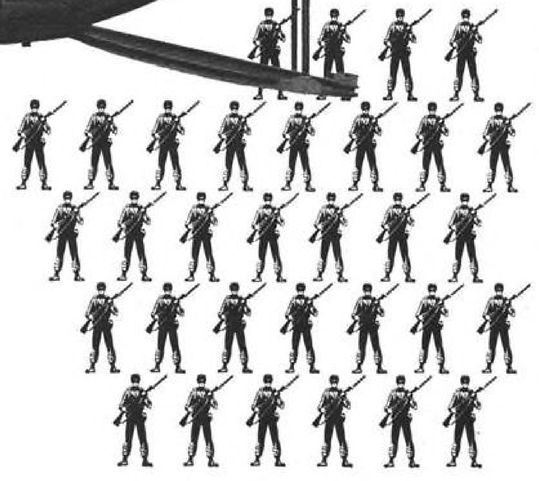

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260, these items were taken care of and signed off by the TWA maintenance personnel at Albuquerque, a Station Service Inspection was conducted which indicated the aircraft was airworthy.

At 0716, eleven minutes after the departure of TWA Flight 260, Pioneer Airlines Flight 62, a Martin 2-0-2, took off from Albuquerque for Santa Fe, New Mexico, using the same runway (No. 11). This flight had the same route clearance at 10,000 feet which it followed. Tower personnel watched this flight proceed out the back course of the ILS and still had it in sight when it reported over the Weiler Intersection at 9,500 feet msl. Its crew testified that they encountered only approximately one minute of instrument flight near the intersection of the back course of the ILS localizer and the 240 degree radial of the Santa Fe Omni Range. (The Aden Intersection, formerly called Jemez.)

In reference to the renaming of the Alameda Intersection to the Weiler Intersection, the change was made and published as official in the November 30, 1954, issue of the Airman's Guide. This change in name was made to avoid any possible confusion with the Alameda Low Frequency Homer, only three miles away.

Captain Spong had been originally qualified to fly the Albuquerque-Santa Fe route in 1947 and had been route checked over it on February 13, 1955. He had flown this route eleven times previously during February 1955. First Officer Creason was flying it for the first time that month although he had been over it twice during the previous month.

ANALYSIS

The flight took off at 0705 and the only indication of the actual crash time is the watch found impact-stopped at 0713. If we assume that this tells the duration of the flight as eight minutes, it is evident that the aircraft was flown straight from the airport to very near the crash site for there was not time to do much more than traverse the intervening 13 miles. The testimony of ground witnesses confirms this straight course.

The magnetic course from Albuquerque to the crash site (and to Santa Fe) is about 30 degrees and the wreckage was strewn in a manner indicating a direction of flight at the moment of impact of about 320 degrees magnetic while in a left climbing turn. This means that the aircraft was turned to its left about 70 degrees from its original heading and climbed just before the crash, as if to evade an obstruction.

Evasive Maneuver Started

The pilot must have suddenly realized that he was practically at the precipitous wall of the mountain and acted quickly. We can only conjecture as to whether this realization was spontaneous with the captain, or the first officer, or induced by a warning from the Hughes Terrain Warning Indicator of an obstruction ahead, below, or both. The realization of the mountain ahead may, of course, have been brought about by something other than the Terrain Warning Indicator, possibly a glimpse of

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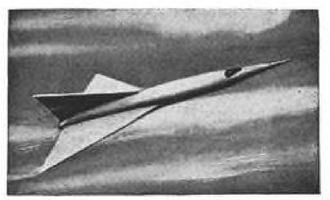

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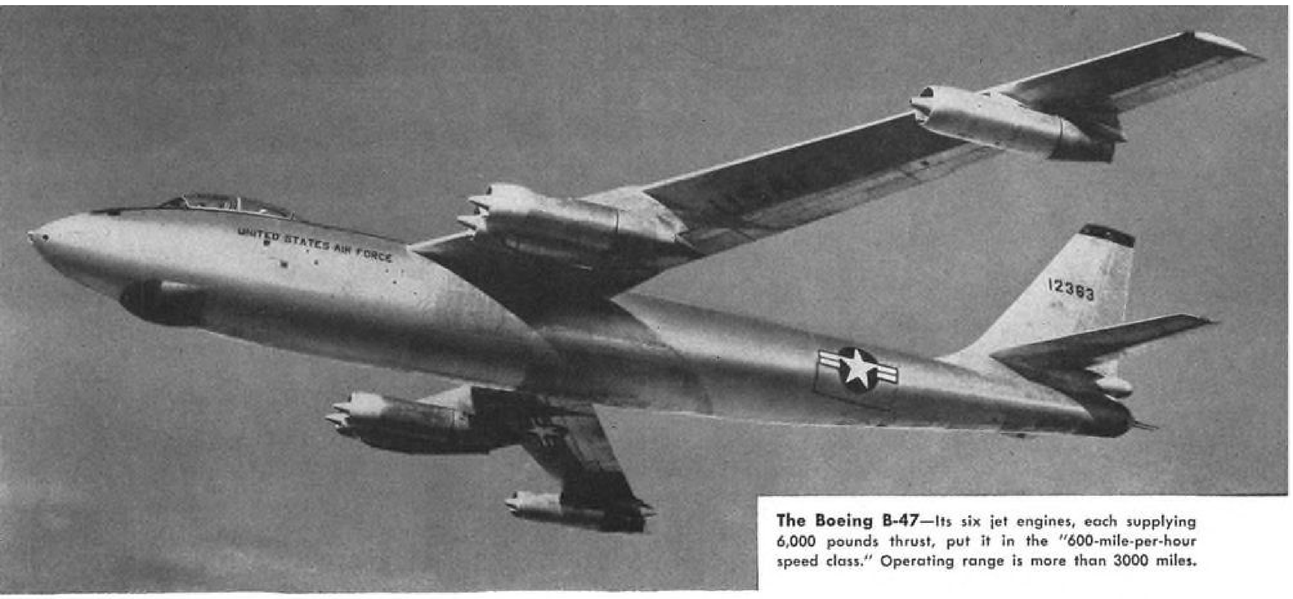

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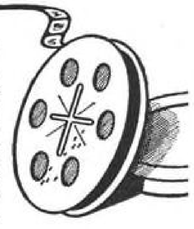

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terrain close below, or ahead, or both. Obviously an evasive maneuver was started.

The Board, in an attempt to determine a reason for the pilot's actions in pursuing the course flown, explored all possible evidence and circumstances. Consideration was given to a possible misunderstanding in the ATC clearance.

It is interesting to note that the 026-degree radial of the Santa Fe Omni Range, which is 206 degrees from that range, is very nearly in line with the Albuquerque Airport and the crash site. This is considered to be a highly remote source of navigational error particularly considering the excellent weather existing along the authorized route.

As previously stated, the first officer was relatively unfamiliar with the Albuquerque area. In identifying the location of the Weiler Intersection the 026-degree radial of the Albuquerque Omni was mentioned. Had this course been flown with the receiver tuned to the Santa Fe Omni instead of the Albuquerque Omni, the aircraft could conceivably have arrived close to the point of impact.

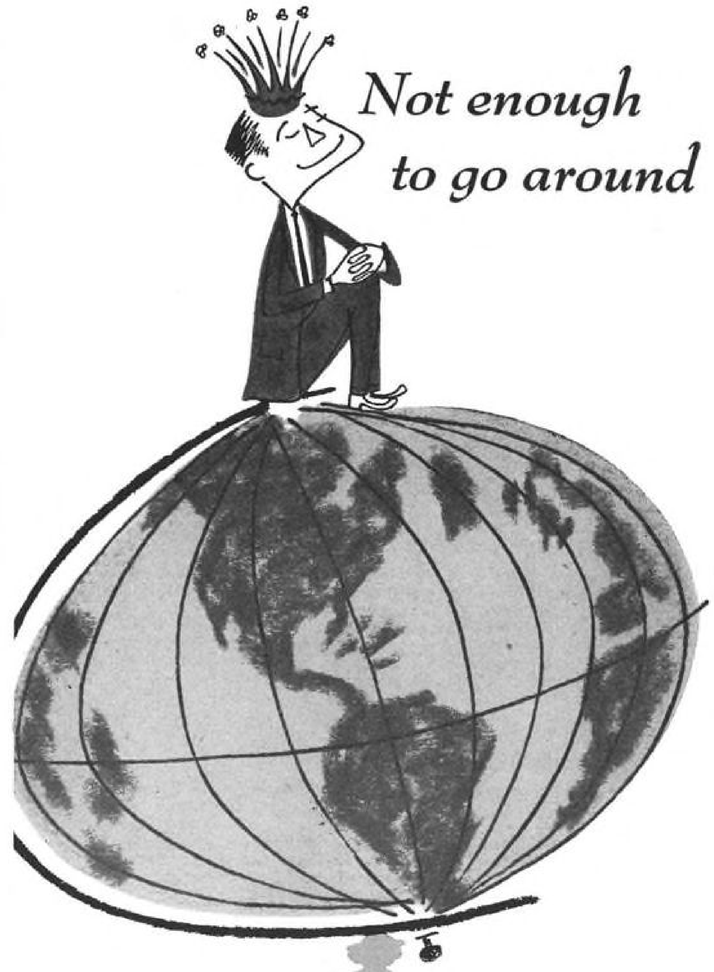
It is impossible to know what changes may have been made in the radio frequencies just prior to the accident. This thought is offered with the full realization that it is entirely unprovable and completely conjectural. The aircraft's receivers were found set to the proper frequencies for using the Albuquerque Localizer and Omni Range in accordance with the flight clearance. However, the flight did not follow this plan.

Could Have Topped Ridge

It is difficult to conceive of the crew attempting to cross a 10,682-foot ridge at 9,000 feet, especially when the aircraft was capable of climbing to an altitude which would more than clear the ridge. The Martin 4-0-4, grossing 40,027 pounds should, at maximum continuous power, climb at 1,500 feet per minute up to 9,000 feet and slightly less than that thereafter. This rate of climb would have brought the aircraft several thousand feet above the ridge starting from Albuquerque, only 13 miles away. Even with much less power the ridge could have been easily topped. There appears to be no plausible explanation of why the airplane was not climbed, presuming the pilots flew the direct route knowingly.

The course flown was off airways and was neither authorized by the Civil Aeronautics Administration nor sanctioned by TWA. The correct and only permissible course is via Victor 19 airway, which skirts Sandia Mountain to the west by several miles. The airways distance between Albuquerque and Santa Fe is 53.5 miles; the direct course is 43 miles. This difference of 10.5 miles would amount to only about ¾-minute's difference in flying time. However, the flight departed Albuquerque on schedule and if it had been flown according to the flight plan would have arrived at Santa Fe on time.

Wind velocity over the Sandia Mountain was indicated to be too light to produce an important "mountain effect" such as severe turbulence, downdrafts, and erroneous altitude indications. Furthermore, such effects when present are manifest over the crest and lee slopes, whereas this accident oc-



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curred on the windward slope.

The captain in command of the flight was well experienced over the route Albuquerque to Santa Fe. In addition the weather was such that visibility along the airway was good for many miles ahead to the north. The mountains, although partly obscured by clouds, were clearly visible from V-19 airway.

The flight took off from runway 11, circled the airport to the right, and picked up a northeast heading directly toward Sandia Mountain instead of pursuing a course along the airway to the west and north of the mountain. It was contact during the turn around the airport and for approximately five minutes thereafter before entering the clouds obscuring the top of the mountain.

Even if all navigational aids and instruments had failed, all the captain had to do was look outside to determine that he was not following the airway. Therefore, from all available evidence, and the lack of any evidence to the contrary, the Board can conclude only that the direct course taken by the flight was intentional.

FINDINGS

On the basis of all available evidence the Board finds that:

1. The air carrier, the aircraft, and the crew were properly certificated.
2. The aircraft's weight and center of gravity location were within prescribed limits.
3. The aircraft was airworthy and had been adequately pre-flight checked upon departure.
4. The fuel supply aboard Flight 260 was more than adequate for the proposed flight.
5. The flight was operating under an approved IFR flight plan to proceed to and follow Victor Airway 19.
6. All ground radio navigational facilities involved in following this flight plan were functioning normally.
7. The Sandia Mountain area was covered with cloud before and during the flight.
8. The flight was dispatched properly and the crew had the latest weather data prior to departure.
9. The flight did not follow the instructions contained in its ATC clearance.
10. The flight collided with a cloud-shrouded mountain while flying an off-airways course which coincided with the direct route between Albuquerque and Santa Fe.
11. All portions of the aircraft were accounted for at the scene of the accident, and no evidence of any malfunction or failure of any component was found.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was a lack of conformity with prescribed en route procedures and the deviation from airways at an altitude too low to clear obstructions ahead.

By the Civil Aeronautics Board:

Ross Rizley
Joseph P. Adams
Josh Lee
Chan Gurney
Harmar D. Denny

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***because the awful alternative is the end of all life"* ✳**

✳ **Seawolf Launching Invocation,** July 21, 1955, by Lt. Comdr. Paul F. Bradley, (ChC), USN. "Therefore, reverently we ask Thee, O God, of both the atom's law and man's reason, to bless and guide them to life more abundant . . . to peace . . . because the awful alternative is the end of all life."

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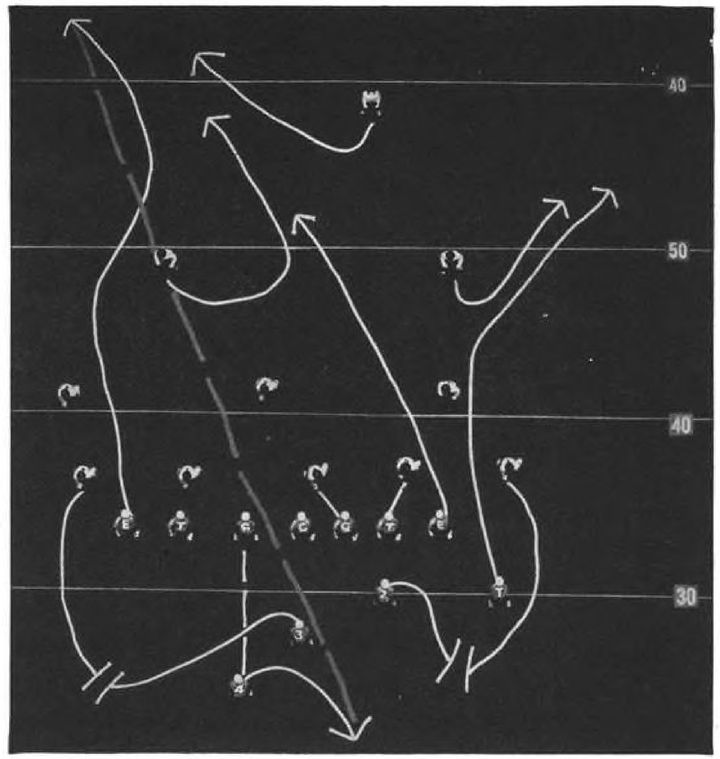

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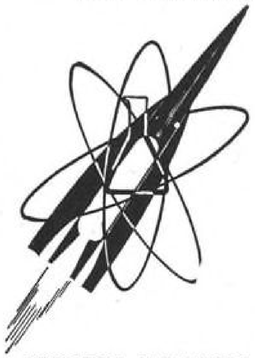

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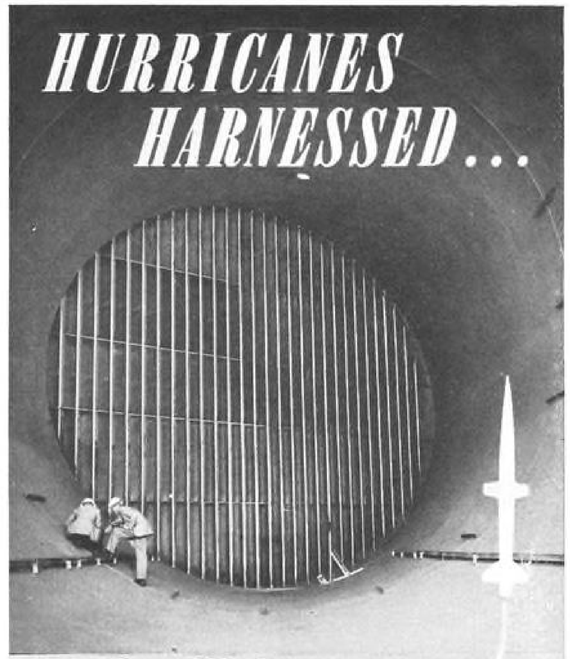

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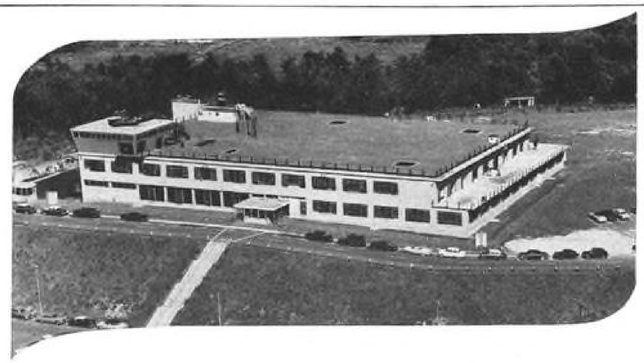

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18	RA-6833	Rearing Assy.	11,421	RA-8271	Gasket
41	RA-7109	Gear	311	RA-8275	Screen Assy.
12	RA-7141	Gear Assy.	120	RA-8275	Strainer
25	RA-7152	Gear Assy.	50	RA-8275	Screen Assy.
10	RA-7425	Gear Assy.	24	RA-8291	Ignition
12	RA-7426	Housing Stud Assy.	20	RA-8307	Wiring Assy.
12	RA-7428	Shaft & Plug Assy.	1,111	RA-8314	Screw
13	RA-7491	Adapter	1,300	RA-8320	Ring
11	RA-7504	Shaft	1,300	RA-8320-05	Ring
30	RA-7505	Nut	1,424	RA-8320-10	Ring
86	RA-7506	Plug	900	RA-8320-15	Ring
508	RA-7536	Valve	2,971	RA-8363	Ring
50	RA-7585	Adapter	1,575	RA-8363-05	Ring
164	RA-7586	Bearing	550	RA-8409	Baffle
119	RA-7604	Valve	975	RA-8412	Clamp Assy.
360	RA-7605	Seat	12	RA-8671	Shaft Plug Assy.
570	RA-7605-05	Seat	94	RA-8856	Flywheel Assy.
151	RA-7605-10	Seat	1,903	RA-8897	Spring
60	RA-7605-15	Seat	1,061	RA-7898	Spring
240	RA-7605-20	Seat	1,768	RA-8899	Washer
86	RA-7607	Nut	5	RA-8915	Baffle Assy.
23	RA-7626	Spacer	9	RA 8919	Gear
37	RA-6731	Gear Assy.	99	RA-8963	Pipe
95	RA-7654	Sleeve	35	RA-8964	Pipe
203	RA-7670	Nut	65	RA-8996	Rod As.y.
1	RA-7758	Gear Assy.	5	RA-9155	Gear Assy'
45	RA-7805	Nozzle	205	RA-9311	Plug
651	RA-7807	Cylinder Stud Assy.	41	RA-9814	Plug
6,108	RA-7841	Bearing	8,082	RA-9816	Gap
6,704	RA-7861	Insert	254	RA-9903	Plug
105	RA-7903	Slinger	38	RA-9991	Crankshaft Assy.
1,451	RA-7904	Ring	984	RA-10118	Bushing
40	RA-7909	Cylinder Assy.	10	RA-10151	Housing
221	RA-7909	Cylinder Assy.	32	RA-10769	Tee Intake
110	RA-7928	Rocker Assy.	88	RA-10974	Cylinder
404	RA-7962	Bearing			

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WHO'S WHERE

(*Continued from page 9*)

Jack W. Seay, director of ground operations for Braniff International Airways.

Gustave Mize, commercial relations manager for KLM Royal Dutch Airlines; **George S. Sztybel,** cargo development manager.

Robert J. Connor, New York sales staff of Canadian Pacific Airlines.

James J. Kerrigan, traffic coordinator for Riddle Airlines.

Ernest G. Stout resigned from Convair to become assistant manager of business development of Ralph M. Parson Co., Los Angeles, Calif.

Arthur Stein, chief research engineer in the Systems Research Department of Cornell Aeronautical Laboratory, Inc.

Dr. W. Crawford Dunlap, Jr., semiconductor consultant at General Electric Company's Electronic Laboratory, Syracuse, N. Y.

Louis E. Dondero, manager of Cleveland Rock Drill plant of Le Roi Div., Westinghouse Air Brake Co.

Dr. Daniel Alpert and **Dr. Aaron Wexler,** associated directors of Westinghouse Research Laboratories.

Edward F. O'Neill, traffic manager of Greer Hydraulics, Inc.

B. M. Barrett, director of Appliances Marketing Department of Radio Corporation of America; **J. A. O'Hara,** sales manager, Military Exchange Services.

Bliss K. Thorne, public relations director of Avco Manufacturing Corp.'s Advanced Development Division.

Jesse A. MacIntire, Jr., manager of Wire Braid Hose Sales for Republic Rubber Div., Lee Rubber & Tire Corp.

John A. Baldinger, general manager of Yale & Towne Manufacturing Company's Materials Handling Div., Philadelphia. **Roy L. Wolter,** general manager of Automatic Transportation Company Div., Chicago.

Ransom B. De Lisle, purchasing agent for Niagara Machine & Tool Works, Buffalo, N. Y.

William M. Hawkins, manager of Los Angeles district sales office of Consolidated Engineering Corp.

Andrew G. Farkas, manager of sales engineering of Eastern Div. of United Manufacturing Company Division.

Edward P. Sadowski, research metallurgist, Development and Research Div. of International Nickel Co., Inc.

William J. McGowan, director of industrial and community relations division of Allis-Chalmers Manufacturing Co.

Donald R. Helson, assistant sales manager of Huck Manufacturing Co., Detroit.

B. L. Lerch, midwest regional manager of General Controls Co.

Don P. Carr, assistant to the manager of Tool Steel Sales Div. of Crucible Steel Company of America.

Gordon R. Howe, San Francisco district manager of Nickel Cadmium Battery Corp., Easthampton, Mass.

Wilfred A. Smith, new products sales manager of Industrial Products Div. of B. F. Goodrich Co.

George F. Hagger, engineering director of Snap-Tite, Inc.

Donald V. Sarbach, research director of Hewitt-Robins, Inc.

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Riddle, Aaxico Win Eastern Cargo Routes

5-year certificates awarded in north-south portion of airfreight case, air express operations approved.

Washington—Riddle Airlines and American Air Export and Import Co. have been awarded five-year certificates for north-south cargo service in the eastern United States by the Civil Aeronautics Board in its decision on the north-south portion of the airfreight renewal case.

The two cargo lines are also authorized to carry air express. Their applications to carry air mail are deferred for consideration in the east-west portion of the airfreight renewal case.

U.S. Airlines' bid to retain its certificate was denied.

The CAB awarded these routes to Riddle and Aaxico:

- **Riddle will operate** between Boston, New York, Detroit and Chicago and Miami.
- **Aaxico will operate** between New York, Chicago and Detroit and New Orleans.

Some intermediate points in both certificates are classified as demand service points not requiring regularly scheduled service.

Obstacles Noted

The north-south airfreight renewal case was originally part of the general airfreight renewal case. When the proceeding became bogged down by the complications of the aborted merger between Slick Airways and Flying Tiger Line, the CAB severed the north-south portion and went ahead with it. The east-west portion is still under consideration.

In the north-south case, Riddle asked for a permanent New York-Florida route and a ten-year Midwest-Florida route. The examiner recommended five-year certificates for the carriers, and the Board has decided to follow this recommendation, although Vice Chairman Joseph P. Adams dissented on this issue. He feels Riddle should have a permanent certificate for its New York-Florida route.

The Board said it is convinced that increasing amounts of freight will be transported by air and that there is a vast reservoir of cargo potential. But it also said that there are many obstacles still to be hurdled before cargo carriers can take their proper role in the airline pattern.

The CAB favors further experimental periods because much of the service authorized is new and many of the points involved have received little or no cargo service. Shippers will have to be educated and routes tested before the certificates can be made permanent, according to the CAB.

Examiners Reversed

Both carriers were certificated for the same length of time so the Board can compare the efficiency and effectiveness of two carriers using different techniques and methods.

The Board reversed its examiner's recommendation that the air express issue be deferred for consideration with the east-west case, although the air mail issue was put off for later consideration. The CAB said that a decision on express doesn't amount to a prejudgment of the issues in the east-west case, and that Riddle and Aaxico deserve to have the case decided on the record in the north-south case.

On the merits of the express issue, the CAB said that "no one has advanced any cogent reason why the authority to carry air express in aircraft operated by all-cargo carriers should be any different than their authority to carry other types of cargo. Railway express shipments, by their very nature, are as readily adaptable to being transported in cargo planes as is ordinary airfreight.

"Air express and airfreight both show similar patterns of concentration of movements during the evening hours as contrasted with the concentration of passenger traffic during the day. Schedules designed to accommodate airfreight will therefore prove adaptable for the carriage of air express," the Board said.

Negligible Diversion

The CAB noted that times have changed since the 1949 prohibition against cargo carriers doing business with the Railway Express Agency and the reasons for the restriction are no longer persuasive.

Observing that participation by Riddle and Aaxico in the air express traffic wouldn't produce any impressive amount of revenue, the Board said that any additional revenue will be helpful and the diversionary effect on the combination carriers will be negligible.

In selecting certain cities as demand points, the CAB felt that such a classification will help develop cargo traffic at such points and still conform with the experimental nature of the cargo system planned by the Board. The decision favors inclusion of certain marginal points as a means of determining if they should be certificated for regular service in the future.

American Airlines and Trans World Airlines objected to authorization of service between points in the same area or points on the same route, but the CAB ruled that the issue was within the scope of the case and decided to allow such services.

National Motion Denied

National Airlines raised a question of fitness with Riddle Airlines in the case, and asked that it be reopened to receive evidence on the holdings of Arthur Vining Davis.

National claimed that Davis had holdings in Mackey Airlines, Skyways International and other transportation companies. The Board pointed out that the connection between Davis' holdings and the Civil Aeronautics Act is currently under investigation in another case, and the issue doesn't warrant delaying the north-south case.

The CAB also dismissed a National motion to reopen the case on the basis of the fitness of Riddle in connection with outside activities of John Paul Riddle and Basil P. Autrey. The Board concludes that there has been no showing of a failure by Riddle to comply with the act or the CAB regulations.

Route Pattern

Riddle's certificate authorizes it to haul freight and express between Boston and Miami via New York, Philadelphia, Baltimore, Washington, Richmond, Jacksonville, Palatka, Lakeland, Orlando, Tampa-St. Petersburg, Fort Myers, Sarasota, Fort Pierce, Stuart and West Palm Beach, Fla. All but New York and Philadelphia are demand points.

Riddle Midwest routes are from the terminal point at Miami to West Palm Beach, Stuart, Fort Pierce, Fort Myers, Sarasota, Tampa-St. Petersburg, Orlando, Lakeland, Palatka, and Jacksonville, Fla., Atlanta, Louisville, Indianapolis, Cincinnati and Columbus and beyond Columbus to the terminal point at Chicago and to the terminal point at Detroit via Cleveland. All but Orlando, Atlanta, Columbus and Cleveland are demand points.

Aaxico's New York-New Orleans

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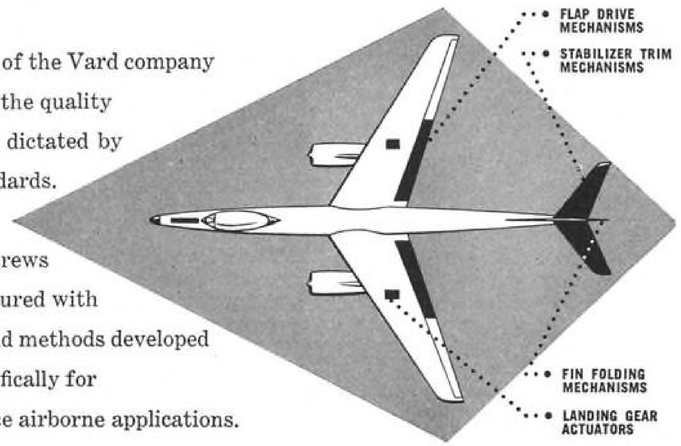

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route is via Philadelphia, Baltimore, Washington, Richmond, Atlanta, and Birmingham, Ala. Philadelphia, Baltimore, Washington and Richmond are demand points.

Aaxico's route to the Midwest runs from New Orleans to Birmingham, Indianapolis, Louisville, Cincinnati, and Columbus, and beyond Columbus to the terminal point at Chicago and the terminal point at Detroit via Cleveland. Indianapolis, Louisville, Cincinnati and Columbus are demand points.

Irregular Ruling Stirs Diverse Opinions Among Air Carriers

Washington—Strong, bitter currents of opinion are running in the wake of the Civil Aeronautics Board's historic decision on the Large Irregular Case and the Air Exchange Case (AW Nov. 21, p. 12).

The irregular carriers are, of course, pleased with their new status as Supplemental Air Carriers, and they say the decision will give them stability and furnish the public a much-needed sphere of air service.

Opinion among the certificated carriers is just as strong in the other direction. Generally, they regard the decision as an unjust reward for past violations of the law and a dangerous source of new, unrestricted competition.

Air Exchange Meetings

The Aircoach Transport Assn. and the Independent Military Air Transport Assn. both are preparing final air exchange agreements for CAB approval. ACTA plans to have its plan approved by its members and filed with the Board by mid-December.

IMATA has scheduled meetings of its board of directors and member airlines for Dec. 6 and 7 to complete and approve its air exchange plan. A change in the organization's name may also be discussed at the meeting to bring it more into line with IMATA's current functions.

Both organizations now operate military traffic exchanges. ACTA has 28 field offices and IMATA has nine. Commercial charter operations will be integrated with military operation wherever practical, but both associations plan to expand facilities to handle commercial traffic.

ACTA members currently have 59 aircraft available for military charter—26 DC-4s, three DC-6s, 18 C-46s and 12 DC-3s. The IMATA members qualified to operate under the air exchange have one DC-6, 20 DC-4s, 27 C-46s and 11 DC-3s.

The new supplemental carriers feel that the CAB decision gives enough stability and market potential for them to conduct a really profitable operation for the first time. They expect that this new stability will make it simpler for them to arrange financing, allowing them to buy new equipment and modernize their fleets.

Ramsay D. Potts, Jr., IMATA president, says the service contemplated by CAB is not cut-rate transportation.

Potts says charter transportation is a tailor-made, special type of travel which is suited to the specific needs of the charterer and is subject to his schedule. While rates will be kept to a minimum, the transportation won't be of the caliber ordinarily implied by such terms as "cheap" or "cut-rate," according to Potts.

The supplemental carriers expect the new service authorizations to bring a better balance between civil and military traffic. Presently, about four-fifths of the total traffic is military. H. B. Johnston, president of ACTA, expects the balance to swing toward civil traffic, with that segment eventually making up about 60% of the total.

The possibilities of a merger between ACTA and IMATA, often discussed in the past by the two associations, may have received a boost from the CAB decision, although currently ACTA seems to feel that the best immediate solution would be for the IMATA supplemental carriers to join ACTA, leaving IMATA an association of scheduled cargo carriers.

'Law of the Jungle'

The certificated airlines are strongly opposed to the 10 flight rules contained in the CAB decision, although they have only minor reservations on the charter authority. Both trunk carriers and local airlines term the decision "ominous" and "nearly a return to the law of the jungle."

Speaking in Richmond, Va., at the time of the irregular decision, Stanley Gewirtz, executive assistant to the president of the Air Transport Assn., said the airline industry has grown under a doctrine of regulated competition by enfranchisement.

"If the time comes when the Civil Aeronautics Board opens the floodgates to unregulated and unregulatable competition, you can tear up the promises of future aviation progress and anticipate rate-cutting reduction in service to marginal cities, and concentration of air transportation where the dollars are more abundant—without regard to the general welfare," Gewirtz said.

The certificated airlines point out that awards made by the CAB in recent route decisions all point to greater competition and added route-type competition from supplemental carriers will make the new operations marginal.

Subsidy Factor

Objections are also raised by the scheduled carriers that the Board ignored past violations of the Civil Aeronautics Act and the Economic Regulations in praising the record of the irregular carrier industry. The national defense aspect of the issue is dismissed with the observation that most of the equipment of the irregulars is obsolete.

Trunk airlines fear that competition from the supplemental carriers will hurt service to smaller cities and will impede attempts of the regional carriers and local airlines to get off subsidy.

Local service airlines expect direct impact from supplemental carrier competition for peak period traffic, mostly on weekends and holidays needed to balance week-day traffic.

Local carriers are also afraid that competition on highly lucrative routes will discourage the trunk airlines from turning smaller traffic points over to the feeder airlines to aid in their route development.

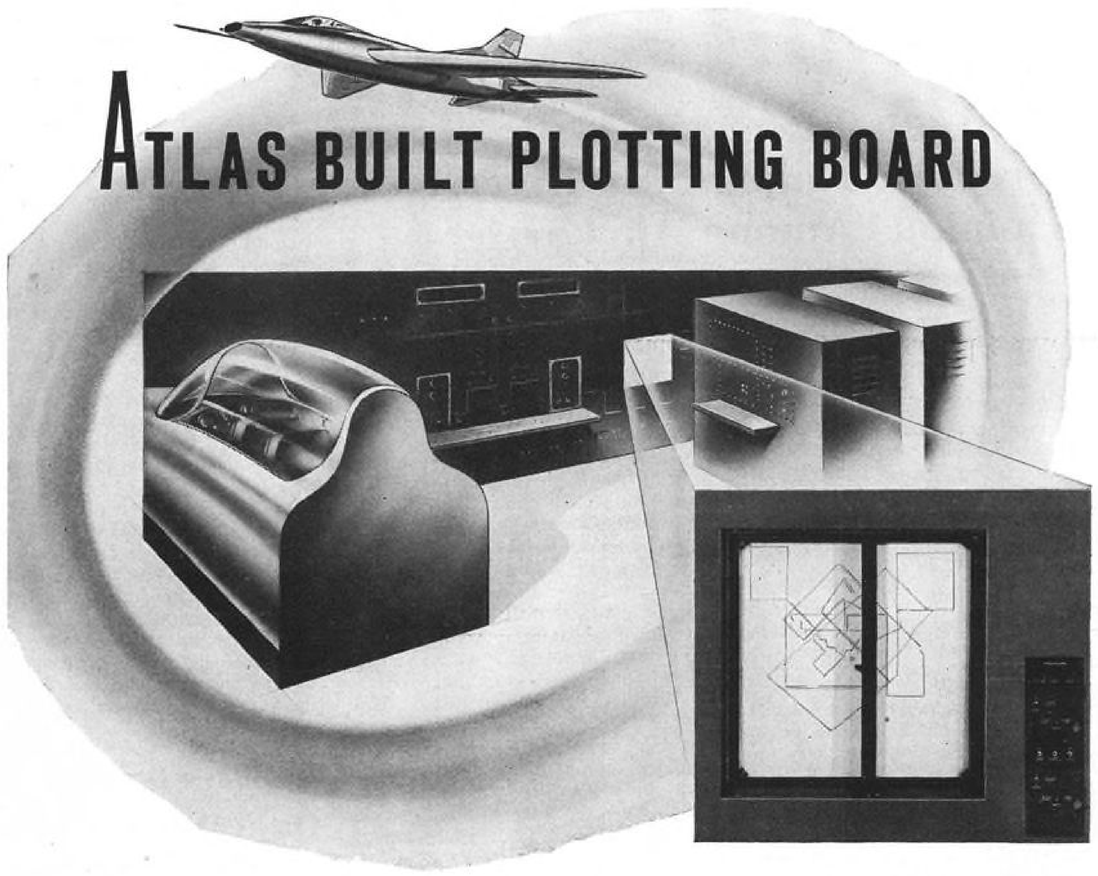
Hearings Continue On Peninsular Charges

Washington—Peninsular Air Transport, Inc., operators of the chartered DC-4 which crashed at Seattle Nov. 18 with 74 passengers, was charged last summer with violations of air safety regulations (AW Aug. 22, p. 100). Civil Aeronautics Board delays and postponements caused a continuance of the hearings, which are still in progress.

The charges were made by Civil Aeronautics Administration against Peninsular and Aero Finance Corp. as jointly-owned irregular airlines. CAA issued an emergency suspension order Aug. 12 against both airlines and asked CAB to consider suspending or revoking the operating rights of each of the Florida-base carriers.

CAA instituted a safety enforcement proceeding with the Board by filing complaints alleging 37 counts of safety infractions. The two carriers were charged with overloading aircraft, failing to overhaul aircraft within required inspection time limits, and operating aircraft in excess of pilot flight-time limitations.

The temporary suspensions of the two air carriers were lifted by CAA in less than two weeks but CAA has continued to press its case before CAB.



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Burwell Urges 'Third Class' Fare

Washington—Maintaining that coach service does not go far enough in tapping the mass market, Lewis Burwell, vice president of Flying Tiger Line, has called for a new "third class" $100 one-way transatlantic air fare.

In a speech to the Ninth Air Transportation Institute of American University, he said:

"We find that a first-class ticket from New York to Paris at $420 appeals to a theoretical market of about two million people. The tourist fare at $310 has a wider reach, to about 18 million people. A third-class fare of $100 would reach 100 million more. This covers just about everybody who has got shoes. . . .

"These 100 million people represent the market we have swept by in our blitz and the market which the industry should investigate and exploit."

Points he made on the "third class" fare moving on "low, slow rides," included:

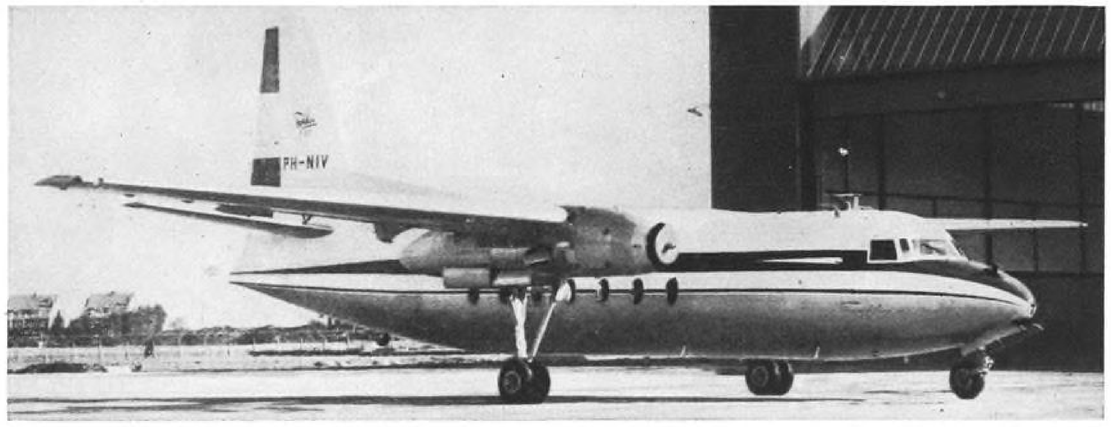
- **Both passenger and freight tickets** should be on a go-show or backlog basis. If the $100 passenger winds up with a seat next to a $300 passenger, he said, it should be dismissed as "a bargain hunter who this time found a bargain." Building up go-show business, he said, "will go far to build load factors on light flights, particularly in off-season or on off-days and at off-hours."
- **"Third class" aircraft** should be able to carry passengers in one direction and cargo in another.
- **Further expansion of air coach** isn't the answer because "this is still a compromise and the airline must still bear the expense of finding and individually handling each passenger and accepting the possibility or probability of flying with empty seats. The few service frills that are omitted in coach service cost-wise do not represent the difference between coach and first-class fares."

To stimulate the purchase of new transport aircraft and increase airlift, Burwell urged Defense Department to guarantee to award the industry a certain amount of business for a period of one to five years.

He said the 100 large prime contractors with the Defense Department have order backlogs of $14.7 million to $1.1 billion. He added:

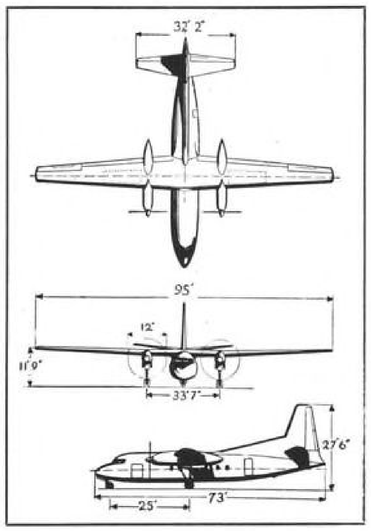
"These orders are scheduled for production and delivery as far ahead as four years. In many cases specifications are not even final. This is a sound principle, however, because it enables the manufacturer to intelligently plan his . . . requirements."

Burwell called for a life insurance actuary "highly placed in Civil Aeronautics Administration." Consideration should be given to "dispensing with a lot of fittings and furnishings that cut down pay load and simply accept the risk and the fact that if you hit anything at 600 mph. you are going through the front bulkhead whether you are sit ing in a 15G seat or a dining room chair. The actuary would prove that it was acceptable statistically for the same reason people are allowed to stand up on the subway," he said.



Fokker Begins Flight Tests Of New Friendship Airliner

First prototype of the Fokker F. 27 Friendship turboprop-powered transport has begun its test program. In photo above, the plane still lacks its 12-ft.-diameter four-blade propellers. The flight program is being conducted from Schiphol Airport, where the Fokker plant is located. The aircraft is the first of four prototypes to be built. Powered by two Rolls-Royce Dart RDa. 6s of 1,600 shp. each plus 375 lb. residual thrust, the Friendship has an economical cruise speed of 275 mph. at 20,000 ft. at 13,600 engine rpm. Rate of climb at sea level is 1,500 fpm. Normal stage length with reserves (using SBAC method) is 300 miles and speed for this distance is said to be 203 mph. Maximum stage length with fuel reserves is 1,000 mi. ICAO field length takeoff and landing distances are both calculated at 3,800 ft. The Friendship's pressurized cabin is designed to maintain an altitude equivalent of 8,000 ft. at 20,000 ft. Maximum seating is 36 passengers, with first-class version planned for 24 seats. The transport's maximum takeoff weight is 34,200 lb.



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Class	Cross Sectional Area in Sq. In.	Tensile Strength, 1000 PSI			Yield Strength, 1000 PSI			% Elongation in 2" or 4D*		
		Longi-tudinal	Long Trans.	Short Trans.	Longi-tudinal	Long Trans.	Short Trans.	Longi-tudinal	Long Trans.	Short Trans.
1.	16 and under Length up to 3 times width	65	63	62	55	55	55	10.0	6.0	4.0
2.	16 and under Length over 3 times width	65	63	62	55	55	55	10.0	5.0	3.0
3.	Over 16 to 36 incl. Length up to 3 times width	65	63	62	53	53	53	9.0	5.0	3.0
4.	Over 16 to 36 incl. Length over 3 times width	65	63	62	53	53	53	9.0	3.0	2.0
5.	Over 36 to 144 incl. Length up to 3 times width	62	59	59	53	52	52	7.0	3.0	2.0
6.	Over 36 to 144 incl. Length over 3 times width	62	59	59	53	52	52	7.0	2.5	2.0
7.	Over 144 to 256 incl. Length up to 3 times width	60	58	55	52	50	50	5.0	2.0	2.0
8.	Over 144 to 256 incl. Length over 3 times width	60	58	55	52	50	50	5.0	2.0	2.0

*The elongation requirement applies only to test specimens having a gage length diameter not less than 0.25".

SPECIAL PRODUCT KAISER ALUMINUM HAND FORGINGS
GUARANTEED MINIMUM MECHANICAL PROPERTIES FOR 2014-T6

Class	Cross Sectional Area in Sq. In.	Tensile Strength, 1000 PSI			Yield Strength, 1000 PSI			% Elongation in 2" or 4D*		
		Longi-tudinal	Long Trans.	Short Trans.	Longi-tudinal	Long Trans.	Short Trans.	Longi-tudinal	Long Trans.	Short Trans.
1.	16 and under Length up to 3 times width	65	65	65	55	55	55	10.0	6.0	6.0
2.	16 and under Length over 3 times width	65	65	65	55	55	55	10.0	6.0	6.0
3.	Over 16 to 36 incl. Length up to 3 times width	65	65	63	55	55	55	9.0	5.0	5.0
4.	Over 16 to 36 incl. Length over 3 times width	65	65	63	55	55	55	9.0	5.0	5.0
5.	Over 36 to 144 incl. Length up to 3 times width	64	64	61	53	53	53	7.0	4.0	4.0
6.	Over 36 to 144 incl. Length over 3 times width	64	64	61	53	53	53	7.0	4.0	3.0
7.	Over 144 to 256 incl. Length up to 3 times width	61	60	59	52	51	51	5.0	4.0	3.0
8.	Over 144 to 256 incl. Length over 3 times width	61	60	59	52	51	51	5.0	4.0	3.0

*The elongation requirement applies only to test specimens having a gage length diameter not less than 0.25".

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Kaiser Aluminum hand forgings are now available in sizes up to 1200 pounds in a wide variety of shapes, with grain flow direction as specified by the customer.

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Send for informative folder listing complete specifications for Kaiser Aluminum standard and "Special Product" hand forgings.

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KAISER ALUMINUM STANDARD HAND FORGINGS
GUARANTEED MINIMUM MECHANICAL PROPERTIES FOR 7075-T6

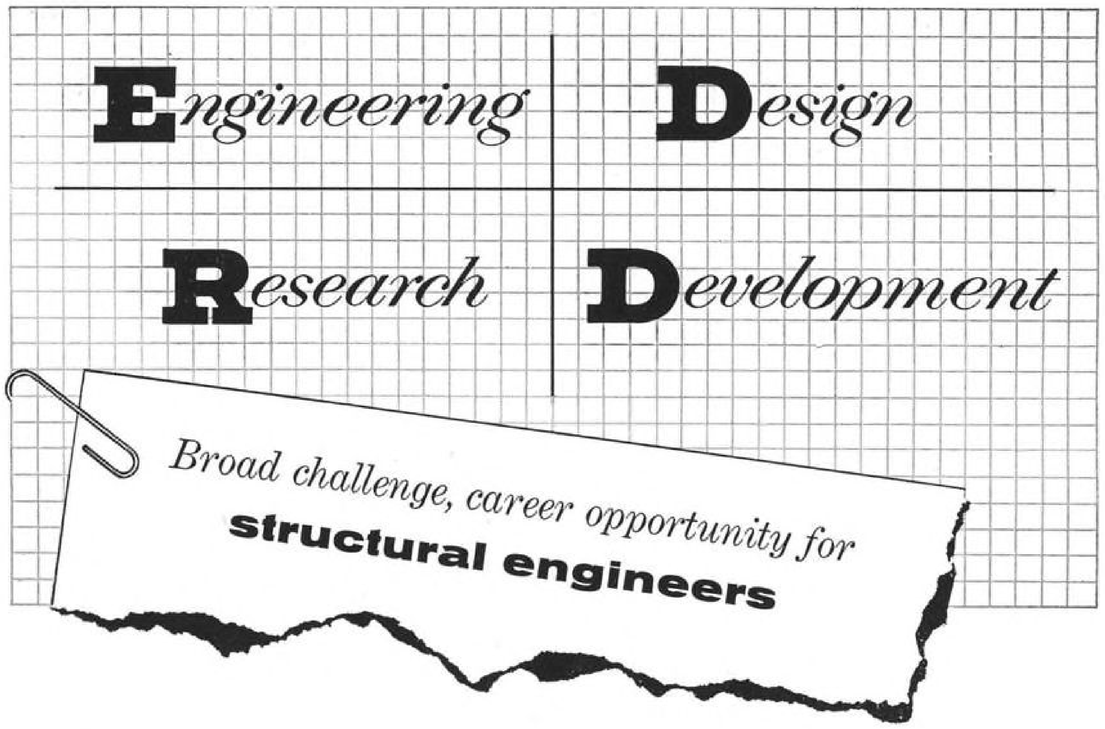
Class	Cross Sectional Area in Sq. In.	Tensile Strength, 1000 PSI			Yield Strength, 1000 PSI			% Elongation in 2" or 4D*		
		Longi-tudinal	Long Trans.	Short Trans.	Longi-tudinal	Long Trans.	Short Trans.	Longi-tudinal	Long Trans.	Short Trans.
1.	16 and under Length up to 3 times width	75	75	72	64	63	63	9.0	4.0	2.0
2.	16 and under Length over 3 times width	75	73	70	63	61	61	9.0	4.0	2.0
3.	Over 16 to 36 incl. Length up to 3 times width	73	71	68	61	60	60	7.0	3.0	2.0
4.	Over 16 to 36 incl. Length over 3 times width	73	71	68	60	59	59	7.0	3.0	2.0
5.	Over 36 to 144 incl. Length up to 3 times width	71	69	66	60	58	58	4.0	2.0	1.0
6.	Over 36 to 144 incl. Length over 3 times width	71	69	66	59	57	57	4.0	2.0	1.0
7.	Over 144 to 256 incl. Length up to 3 times width	70	67	64	58	56	56	4.0	2.0	1.0
8.	Over 144 to 256 incl. Length over 3 times width	70	67	64	58	56	56	4.0	2.0	1.0

*The elongation requirement applies only to test specimens having a gage length diameter not less than 0.25".

SPECIAL PRODUCT KAISER ALUMINUM HAND FORGINGS
GUARANTEED MINIMUM MECHANICAL PROPERTIES FOR 7075-T6

Class	Cross Sectional Area in Sq. In.	Tensile Strength, 1000 PSI			Yield Strength, 1000 PSI			% Elongation in 2" or 4D*		
		Longi-tudinal	Long Trans.	Short Trans.	Longi-tudinal	Long Trans.	Short Trans.	Longi-tudinal	Long Trans.	Short Trans.
1.	16 and under Length up to 3 times width	75	75	72	65	65	63	10.0	7.0	6.0
2.	16 and under Length over 3 times width	75	75	72	65	65	62	10.0	6.0	5.0
3.	Over 16 to 36 incl. Length up to 3 times width	75	74	70	63	62	60	8.0	6.0	5.0
4.	Over 16 to 36 incl. Length over 3 times width	75	74	70	63	62	60	8.0	5.0	4.0
5.	Over 36 to 144 incl. Length up to 3 times width	74	72	68	61	60	59	6.0	4.0	3.0
6.	Over 36 to 144 incl. Length over 3 times width	74	72	68	60	59	58	6.0	4.0	3.0
7.	Over 144 to 256 incl. Length up to 3 times width	71	69	66	59	57	56	5.0	4.0	3.0
8.	Over 144 to 256 incl. Length over 3 times width	71	69	66	58	57	56	5.0	3.0	2.0

*The elongation requirement applies only to test specimens having a gage length diameter not less than 0.25".



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It involves the utilization of a host of materials—new laminated plastics, new alloys, new structural sandwiches.

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THE TEAM TO TEAM WITH in AERONAUTICS

CAB Reports Accident Causes In Braniff, PAA, NWA Crashes

Washington—Civil Aeronautics Board has reported on its investigation of Pan American World Airways and Braniff Airways accidents and issued a revised report on a 1952 Northwest Airlines crash.

The Pan American crash involved the ditching of a Boeing Stratocruiser near Portland, Ore., last March, and the Braniff accident involved the crash of a Convair 340 at Chicago's Midway Airport in July.

The Northwest accident report is a revision of findings in the crash of a Northwest DC-4 near Sandspit, British Columbia in January, 1952.

The CAB found that:

• **The Braniff Convair** probably crashed because of a loss of visual reference during the final phase of the approach.

• **The Pan American accident** was probably caused by the failure of the No. three propeller, causing the loss of the No. three engine.

• **The Northwest DC-4 accident** was probably the result of nose gear retraction difficulty in connection with an icing condition or a power loss, making the aircraft incapable of maintaining flight.

Convair Struck Sign

The Braniff aircraft was completing a Dallas-Chicago flight via Oklahoma City, Wichita and Kansas City. During an instrument approach to Midway, it struck an 18 foot sign across the street from the airport and 1,000 ft. from the runway threshold lights. The Convair crashed through the airport boundary fence, turned over and caught fire. Of forty passengers and a crew of three, the pilot, the hostess and 20 passengers were fatally injured.

The sign struck by the Braniff airplane was about 84 ft. below and 122 ft. to the left of the ILS glide path and localizer course centerlines.

The approach controller said that the approach executed by the Convair was very good up to the point he discontinued advisories a half mile out. Past this point, the airplane descended rapidly, at least 2,000 ft. per minute, and departed from the glide path.

The CAB assumes that the pilots made visual contact, then lost it again in a dense fog that had covered the accident area. It is concluded that the pilot had a momentary disorientation during the transition from visual reference back to instruments. During this period, it is believed the airplane descended rapidly before corrective action could be taken.

The Pan American accident involves an engine separation, a recurring problem with the Boeing Stratocruiser, and an ocean ditching. The aircraft was 42 minutes out of Portland, Ore., on a Seattle-Sydney flight via Honolulu when vibration occurred, and the No. three engine tore free and dropped from the aircraft.

Engine Dropped

The Stratocruiser became temporarily uncontrollable and lost altitude rapidly. The pilots regained control, but attempts to get rated power on the remaining three engines were futile, and the airplane continued to descend until it was ditched in a calm sea nine minutes after the engine was lost.

All 15 passengers and the crew of eight were evacuated, but four of them lost their lives subsequently through exposure or drowning. The aircraft sank in mile-deep water about twenty minutes after it was ditched.

The CAB finds the primary cause of the accident was loss of control and inability to maintain altitude following the failure of the No. three propeller and engine. It is assumed that the propeller threw a blade, unbalancing itself and causing the engine loss. This accident is similar to five previous ones with the Boeing which have been traced to the hollow-blade Hamilton-Standard propeller in use. A program is currently under way to develop a solid aluminum blade for Stratocruiser use.

The CAB pointed out that the aircraft was ditched under nearly ideal circumstances, and that there should have been little difficulty in transferring passengers and crews to life rafts. The life rafts were allowed to drift away from the floating airplane, making it necessary for the occupants to swim to them. This fact led to the deaths of a passenger and two crew members who couldn't reach them. The CAB praised the conduct of individual passengers and crew members.

Since the accident, steps have been taken to improve stowing of life rafts and tighten inspection of the hollow blades for corrosion or fatigue which might lead to propeller failure.

New Evidence

The Northwest DC-4 accident report was issued as a revision made on the basis of new evidence.

The accident occurred on a Tokyo-Tacoma flight when the DC-4 developed engine trouble and tried to make an emergency landing at the Sandspit, British Columbia, airstrip. After touching down, the aircraft attempted a three-engine takeoff and go-around. It cleared a fence at the end of the runway, but couldn't maintain altitude and crashed in the Hecate Strait, less than a mile offshore.

Nose Gear Malfunction

All or nearly all of the 40 passengers and three crew members evacuated the aircraft, but due to the near-freezing temperature of the air and water, only seven passengers survived when help arrived about an hour and a half after the crash.

Subsequent examination of fragments of the DC-4 and of the circumstances surrounding the accident have led CAB to believe that malfunctioning of the nose gear mechanism may have caused failure of the nose wheel well doors and led to buffeting. Such an occurrence could have caused deterioration of climb performance.

The Board concludes that the accident was probably caused by such a nose gear malfunction connected with an icing condition or power loss which made the DC-4 incapable of maintaining flight.

Death Penalty Urged For Plane Sabotage

Death of 44 persons in the crash of a sabotaged United Air Lines' aircraft near Denver, Colo., has spurred a move for quick enactment of legislation making plane sabotage resulting in loss of human life a capital offense.

Sen. Warren Magnuson (D.-Wash.), Chairman of the Senate Commerce Committee, has urged Civil Aeronautics Board to draft a measure for his committee to act on in January. Rep. Kenneth Keating (R.-N. Y.), has called for enactment of a measure he introduced this year. It provides the death penalty or life imprisonment for sabotage resulting in the loss of human life, and sets up a penalty of $10,000 fine or 20 years imprisonment, or both, for other sabotage.

Referring to the Colorado crash, Magnuson declared that "anyone who deliberately planned a wholesale taking of life on that magnitude certainly does not deserve less protection than a man who murders one person in cold blood."

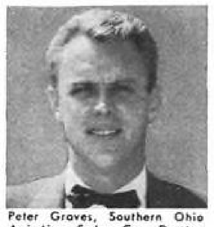
Western Sets Record

Western Air Lines reports record traffic and income for the first nine months of 1955. Travel mileage increased by 16% while passenger traffic rose 35%.

Net income for the period reported at $1,639,756 ($2.21 a share). Income for the nine-month period was $1,037,134 ($1.45 a share).

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

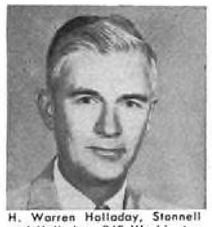
Gene Hudman, Stonnell and Halladay Aircraft Sales, Carolina Division, Municipal Airport, Charlotte, North Carolina



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

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

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



H. Warren Halladay, Stonnell and Halladay, 843 Washington Building, Arlington Towers, Arlington, Virginia.

H. Leibee-Wheeler, Buffalo Aeronautical Corperation, Buffalo Municipal Airport, Buffalo, New York.

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

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

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

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

J. B. Redwine, Fairfax Aviation, Inc., 3301 Fairfax Trafficway, Fairfax Airport, Kansas City, Kansas.

Max R. Brand, Aero Commander Dist. (Downtown Airpark), Hangar 3, Municipal Airport, Tulsa, Oklahoma.

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

Dale Ropp, Jr., Aero Southern Corp., 601 Broadway, Nashville, Tennessee.

W. H. "Bill" Buchanan, Sales Manager, Johnsons Air Interests, Inc., Harlick-Racine Airport, Racine, Wisconsin.

Louis Humphreville, Executive Aircraft Corporation, Municipal Airport, Pontiac, Michigan.

L. S. McIntire, Aero-Tex Corporation, 3300 Love Field Drive, Dallas, Texas.

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

Herrol Bellomy, L. B. Smith Aircraft Corp., Miami International Airport, Miami, Florida.

Lucien M. Taillac, Trans-Aire Corporation, Pan-Air Building, New Orleans Airport, New Orleans, Louisiana.

Joseph H. Frost, Jr.
Commander Sales Company, Terminal Building, International Airport, San Antonio, Texas.

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CAB Orders

(Nov. 10-16)

GRANTED:

Leave to intervene in the Panama City-Atlanta investigation to the Atlanta Chamber of Commerce and the Chamber of Commerce of Columbus, Ga. Petitions of the Lee County Chamber of Commerce, Fla., and the Sarasota Mantee Airport Authority, Fla., are denied.

Seaboard and Western Airlines' application for extension of its exemption authority. The exemption is extended to Feb. 13, 1956 or until Seaboard starts scheduled service, whichever occurs first, to allow added time to secure approval of foreign governments.

APPROVED:

Interlocking relationships between Trans-World Airlines, Ralph S. Damon and Houdaille-Hershey Corp.

Agreements involving Eastern Air Lines, Delta Air Lines and various other carriers relating to intercarrier arrangements.

ORDERED:

Suspension of a Trans World Airlines Las Vegas-San Francisco roundtrip excursion fare extended to Feb. 20, 1956 to allow added time for investigation.

Ozark Air Lines to show cause why the Board should not set a temporary mail rate for the period starting Oct. 21, 1955, designed to cover a breakeven need of $2,146,042 in the first year.

Cordova Airlines to show cause why the Board should not set final mail rates of 99.54 cents a mile for the period July 1, 1955 to Oct. 31, 1955; 202.38 cents for the period Nov. 1, 1955 to Apr. 30, 1956 and the like six month period for each succeeding year; and 99.54 cents for the period May 1, 1956 to Oct. 31, 1956 and the like six month period in each succeeding year.

North Central Airlines' temporary authority to operate two-stop service between Duluth, Minn., and Chicago via Milwaukee and Green Bay, Wisc., terminated.

DISMISSED:

Arthur W. Glose's application for operating authority, since the applicant doesn't wish to proceed further with the application at the present time.

American Airlines' application for a Seattle-Miami route, at the request of the applicant.

DENIED:

Resort Airlines' application for consolidation of certain certificate amendment proposals with the Resort Airlines renewal case.

Flying Tiger Line's motion for temporary authority to carry air express pending decision in the air freight renewal case.

Petition of Trans-Texas Airways for consolidation and petitions of Delta Air Lines and National Airlines for reconsideration and clarification in the Florida-Texas service case. Petitions of Trans World Airlines, the City of New Orleans and the Chamber of Commerce of the New Orleans area for leave to intervene are granted.

Capital Re-Enters Newark

Capital Airlines will resume operations into and from Newark Airport on Thursday after a suspension of almost four years.

Cities as far south as New Orleans and west to Pittsburgh and Youngstown will be served by Capital directly from Newark. The airline first began operations into the airport on Feb. 4, 1946, but halted the service in January, 1952, after turning over several of its planes to the Government for Korean war duty.

White House Approves Less Route Authority

The White House will go along with legislation reducing its authority over foreign air route awards and eliminating its jurisdiction over overseas routes, according to Sen. Warren Magnuson (D.-Wash.), Chairman of the Senate Commerce Committee.

A measure sponsored by Sen. Magnuson would restrict the President's review of foreign route cases to aspects involving international relations or defense considerations. It would clarify that the President has no veto authority over economic aspects. By re-classifying "overseas" transportation as "domestic" transportation it would remove the requirement for any Presidential review. This would give Civil Aeronautics Board final authority over operations to Alaska, Hawaii and other territories.

Magnuson maintains that this is only a "clarification" of the original intent of the 1938 Civil Aeronautics Act.

Announcing that he intends to push the measure in the coming session of Congress, he declared: "I have the informal approval of the people down at the White House. I can see why they want to get this concern off their necks, and it was never intended under the 1938 act."

CAB Chairman Ross Rizley approved the Magnuson measure at hearings earlier this year.

Commerce and State Departments opposed it.

New Viscount Service

Capital Airlines will introduce the Viscount turboprop in the New York-Chicago travel market Dec. 1.

Initial schedule for Capital's new Viscount service calls for two round trips daily between New York and Chicago with an intermediate stop at Pittsburgh. Westbound flights will leave New York at 8 a.m. and 4 p.m., with flights leaving Chicago eastbound at 11:45 a.m. and 8:30 p.m.

Centerline Lighting Installed at Idlewild

Washington—Civil Aeronautics Administration's installation of a centerline approach lighting system at New York's Idlewild International Airport was completed last month, less than a year after the destruction of a slopeline system by the LAI DC-6B crash on Dec. 18, 1954.

Idlewild's lights are Type A system, which means there is no overrun area designated. Eventually there is to be an addition to sequenced flashing lights, which are normally installed at airports where very low visibilities frequently occur.

Since the centerline standard was adopted in 1952, there have been eight CAA-approved installations completed and three more are now under way. The total cost is nearly $1 million.

The first system, which is a Type A, was installed at Newark Airport in November 1952. Other Type A lighting systems have been installed at Fort Worth, Denver and San Francisco.

Type B systems, which have an overrun area designated, are in operation at Pittsburgh, Knoxville and Salt Lake City.

Three additional centerline systems are scheduled for operation at Washington, Los Angeles and Chicago. Two of these installations are in addition to slopeline systems already in operation at Washington and Los Angeles. Only other slopeline system still in operation is at Arcadia, Calif., in addition to the slopeline installation which was destroyed at Idlewild. CAA decommissioned the slopeline lights previously installed at Indianapolis.

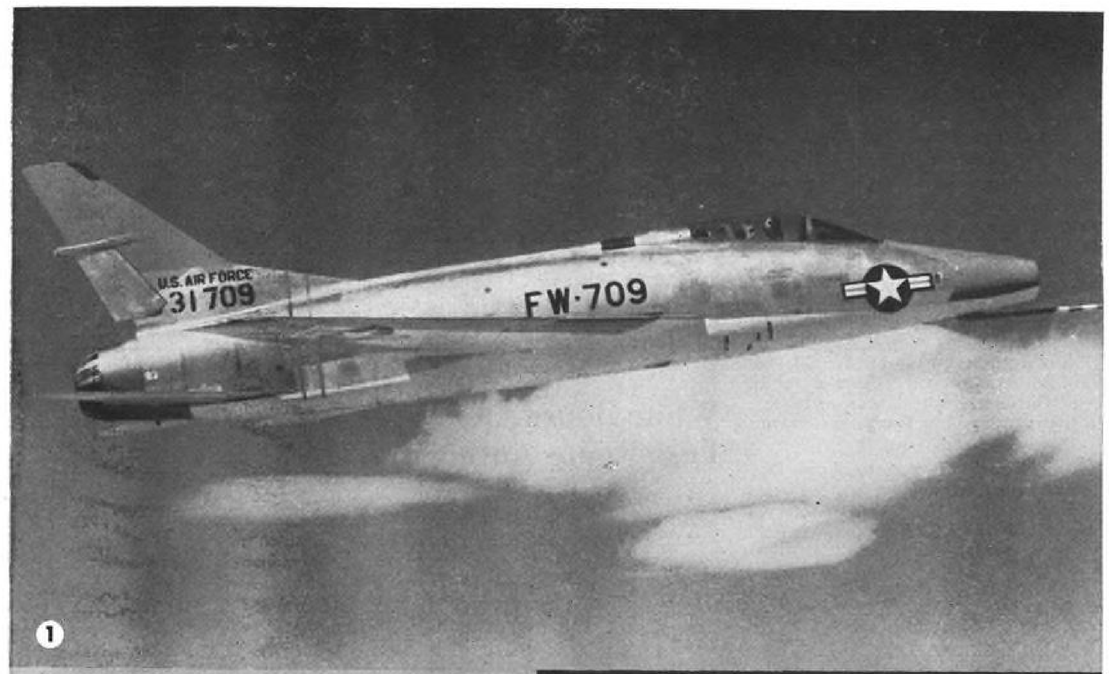
Shortlines

► **Hunting-Clan Air Transport** has increased coach service between London and Gibraltar to two round trips monthly with Viking equipment.

► **Meteor Air Transport** flew 1,043,409 ton-miles of cargo traffic in the third quarter of this year. Meteor has leased two C-46 aircraft from Trans-Caribbean Airlines, bringing its total fleet to seven C-46s.

► **Seaboard and Western Airlines** has signed cargo interline agreements with National Airlines and Varig Airlines.

► **United Air Lines** will resume service to Santa Barbara, Monterey and Eureka, Calif., Dec. 8 with Convair equipment.



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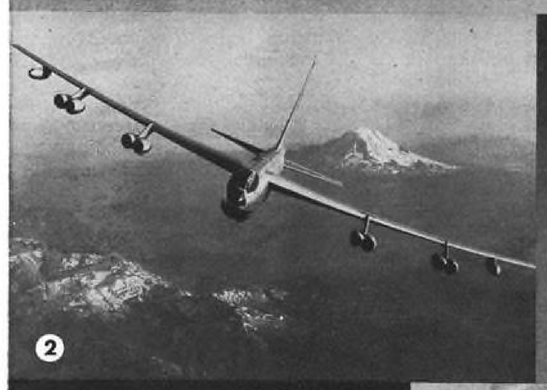

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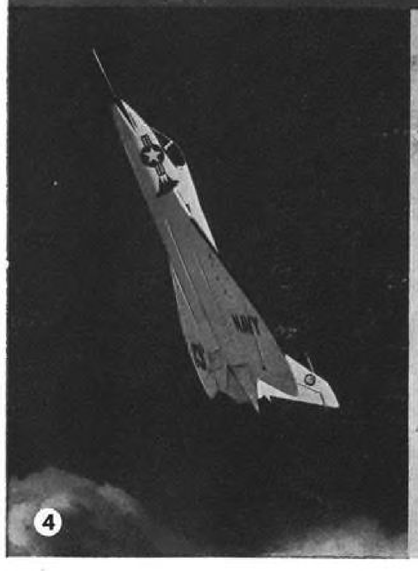

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In the Air Force, J-57 turbojet engines power the fastest fighters—including the holder of the official world speed record. In the Navy, J-57s power the fastest carrier-based aircraft, fighters capable of supersonic speeds in level flight. The mighty B-52, new strength of the Strategic Air Command and the fastest bomber, is powered by J-57 engines, as is the fastest transport now flying, the 707 prototype jet tanker-transport.

In all of these powerful aircraft, and in many others, Pratt & Whitney Aircraft's J-57 advanced turbojet engine has been chosen to meet the exacting requirements of high thrust rating, reliability and efficiency.

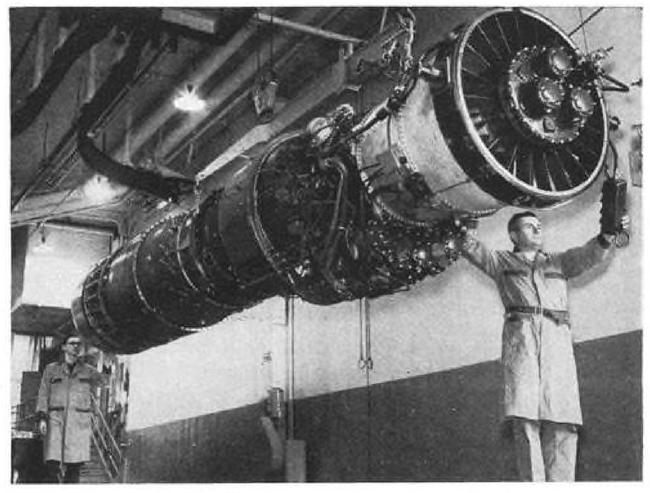
The leading land-based and carrier-based fighters, the new mainstay of the heavy bomber fleet, and the jet transports are all designed to take advantage of the performance of the J-57 engine. Pratt & Whitney Aircraft's J-57 is continuing to make its vital contribution to American air strength.

1. SUPERSONIC RECORD HOLDER—The North American F-100C holds the official world speed record, 822.135 miles per hour. Already in operational use in the USAF Tactical Air Command, the F-100C Super Sabre can deliver an atom bomb at high speed.

2. MIGHTIEST OF THE BOMBERS—The Boeing B-52 Stratofortress uses eight J-57 engines hung in pods under the wings. Now in units of the Strategic Air Command, the B-52 can be refueled in flight to extend its range as needed. Speed is over 600 m.p.h., ceiling over 50,000 feet.

3. JET TANKER-TRANSPORT—Boeing's 707 prototype, with four J-57s, is the fastest transport and the first of a new family of advanced jet aircraft. The Air Force has ordered production of a tanker-transport version, the KC-135. As a commercial transport, the aircraft could carry from 80 to 130 passengers, cruising in the 550 m.p.h. range.

4-5. FASTEST NAVY FIGHTERS—The Douglas F4D Skyray, left, with delta wing, set a 753.4 m.p.h. record on a three kilometer straightaway run. The new Chance Vought XF8U-1 Crusader, right, with swept wing, features a trim, lightweight airframe and uncluttered design. Both are equipped with afterburners, and can exceed the speed of sound in level flight.



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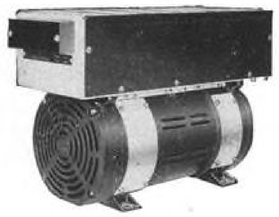

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ADVERTISERS IN THIS ISSUE

AVIATION WEEK—NOVEMBER 28, 1955

AERO DESIGN & ENGINEERING COMPANY....116
Agency—Tom P. Gordon Co., Adv.
AEROQUIP CORPORATION....61, 62, 63, 64
Agency—The Fred M. Randall Company
AIRBORNE ACCESSORIES CORP.... 8
Agency—Gray & Rogers Adv.
AIRCRAFT EQUIPMENT TESTING COMPANY.... 8
Agency—Mahool Advertising, Inc.
AMERICAN AIRLINES, INC....106
Agency—Lennen & Newell, Inc.
ATLAS PRECISION PRODUCTS CO., DIV. PRUDENTIAL INDUSTRIES....110
Agency—A. E. Aldridge Associates
AUSTENAL LABORATORIES, INC. (MICROCAST DIVISION)... 79
Agency—Gaynor, Colman Prentis & Varley, Inc.
BENDIX INSTITUTIONAL DIV., BENDIX AVIATION CORP....42, 43
Agency—MacManus, John & Adams, Inc.
BENDIX RADIO DIV., BENDIX AVIATION CORP. 26
Agency—MacManus, John & Adams, Inc.
BOEING AIRPLANE COMPANY... 72
Agency—N. W. Ayer & Son, Inc.
BURROUGHS CORPORATION... 20
Agency—Campbell-Ewald Company
CALTECH-JET PROPULSION LABORATORY...68, 90
Agency—The Perrett Co.
CHANDLER-EVANS... 50
Agency—Hugh H. Graham & Associates, Inc.
CLEVELAND PNEUMATIC TOOL CO.... 49
Agency—Meldrum & Fewsmith, Inc.
CLINE ELECTRIC MFG. CO.... 75
Agency—The McCarthy Company
CONVAIR, A DIVISION OF GENERAL DYNAMICS CORP.... 82
Agency—Thomas L. Yates Adv.
CORNELIUS COMPANY, THE.... 24
Agency—Sermiger & Osterholt Adv.
DEHAVILLAND ENGINE LIMITED, THE.... 28
Agency—Samson Clark & Co., Ltd.
DOW CHEMICAL COMPANY.... 4
Agency—MacManus, John & Adams, Inc.
DOW CORNING CORPORATION.... 70
Agency—Church and Guisewite Adv., Inc.
EASTMAN KODAK CO. (GRAPHIC REPRODUCTION DIV.)... 77
Agency—J. Walter Thompson Co.
EX-CELL-O CORPORATION... 39
Agency—Holden-Chapin-Laure, Inc.
FEDERAL TELEPHONE & RADIO CO. (COMPONENTS DIV.)... 67
Agency—J. M. Mathes, Inc.
FULTON SYLPHON DIV., ROBERTSHAW-FULTON CONTROLS CO.... 40
Agency—Arndt-Preston-Chapin-Lamb & Keen, Inc.
GOODRICH CO., THE B. F. (TIRE & EQUIPMENT DIV.)... 3
Agency—Batten, Barton, Durstine & Osborn, Inc.
GOODYEAR AIRCRAFT CORP....114
Agency—Kudner Agency, Inc.
GREENLEAF MFG. COMPANY, THE.... 46
Agency—Oakleigh R. French & Associates, Inc.
GRUMMAN AIRCRAFT ENGINEERING CORP.... Front Cover
Agency—Fuller & Smith & Ross, Inc.
HARNISCHFEGER CORPORATION (WELDING DIV.)... 32
Agency—Hoffman & York, Inc., Adv.
HUGHES TOOL COMPANY.... 66
Agency—Foote, Cone & Belding
HYDRO-AIRE, INC.... 27
Agency—Roy S. Durstine, Inc.
KAISER ALUMINUM & CHEMICAL SALES, INC.... 112, 113
Agency—Young & Rubicam, Inc.
LEACH RELAY CO., DIV. OF LEACH CORP.... Third Cover
Agency—Hixson & Jorgbensen, Inc.
LEBANON STEEL FOUNDRY.... 73
Agency—Howard E. Marshall Adv.
LOCKHEED AIRCRAFT CORP.... 85
Agency—Foote, Cone & Belding
MACWHYTE COMPANY... 10
Agency—Needham, Louis & Brorby, Inc.
MALLORY-SHARON TITANIUM CORP.... 25
Agency—The Griswold-Eshleman Co.
MARQUARDT AIRCRAFT COMPANY.... 59
Agency—Heintz & Co., Inc.
MCDONNELL AIRCRAFT CORPORATION.... 84
MELETRON CORPORATION... 87
Agency—Welsh, Holland & Coleman Adv.
NORDEN-KETAY CORPORATION... 91
Agency—Hicks & Griest, Inc.
NORTH AMERICAN AVIATION, INC.... 41
Agency—Batten, Barton, Durstine & Osborn, Inc.
PASTUSHIN AVIATION CORP.... 30
Agency—Lynn-Western, Inc.
PATENT PRODUCTION DEPARTMENT.... 52
Agency—Evers Whyte Agency
PRATT & WHITNEY AIRCRAFT DIV., UNITED AIRCRAFT CORP.... 118, 119
Agency—Lennen & Newell, Inc.
RAYTHEON MANUFACTURING COMPANY.... 78
Agency—Donahue & Coe, Inc.
REACTION MOTORS, INC.... 58
Agency—J. Wheelock Associates
RED BANK DIV., BENDIX AVIATION CORP.... 120
Agency—MacManus, John & Adams, Inc.
RESISTOFLEX CORP.... 35
Agency—Marsteller, Rickard, Gebhardt and Reed, Inc.
RHEEM MFG. COMPANY, GOVT. PRODUCTS DIV.... 19
Agency—Campbell-Ewald Co.
ROBINSON CO., RALPH C.... 52
Agency—Chapin-Damm Adv.
ROHR AIRCRAFT CORPORATION....56, 104
Agency—Barnes Chase Company
SEARCHLIGHT SECTION..92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103
SERVOMECHANISMS, INC.... Fourth Cover
Agency—Sanger-Funnell, Inc.
SIKORSKY AIRCRAFT DIV., UNITED AIRCRAFT CORP.... 89
Agency—G. F. Sweet & Co., Inc.
SIMMONDS AEROCESSORIES, INC.... 44
Agency—Burke Dowling Adams, Inc.
SKYLINE PRODUCTS, INC. (AVIATION DIV.)....121
Agency—Triton Advertising
SOLAR AIRCRAFT COMPANY.... 76
Agency—The Phillips-Ramsey Co. Adv.
SPERRY GYROSCOPE CO., DIV. SPERRY RAND CORP.... 74
Agency—Equity Adv. Agency
STEWART WARNER CORP. (ELECTRONICS DIV.)... 53
Agency—O'Grady-Andersen-Gray, Inc.
STRATOS A DIV. OF FAIRCHILD ENGINE & AIRPLANE CORP.... 69
Agency—Gaynor, Colman Prentis & Varley, Inc.
SUNDSTRAND MACHINE & TOOL CO.. Second Cover
Agency—Howard H. Monk & Associates, Inc.
SUTORBILT CORPORATION... 35
UNITED STATES STEEL CORP.... 88
Agency—Batten, Barton, Durstine & Osborn, Inc.
VARD, INC.... 108
Agency—Graphics, Inc.
VICKERS-ARMSTRONGS LTD.... 6
Agency—McCann-Erickson, Inc.
WAGNER COMPANY, H. A.... 34
Agency—Western Adv. Agency, Inc.
WEBER AIRCRAFT CORPORATION.... 81
Agency—Charles Bowes Adv.
WESTERN GEAR CORPORATION.... 36
Agency—Ruthrauff & Ryan, Inc.
WESTINGHOUSE ELECTRIC CORP.....53, 54, 55
Agency—Fuller & Smith & Ross, Inc.
WESTON HYDRAULICS LIMITED....105
Agency—Anderson-McConnell Adv. Agency
WHITE DENTAL MFG. CO., S.S.... 86
Agency—Peterson & Kempner, Inc.
WOODS AIRCRAFT SUPPLY.... 21
Agency—The Jordan Company
WYMAN GORDON CO.... 38
Agency—John W. Odlin Co., Inc.

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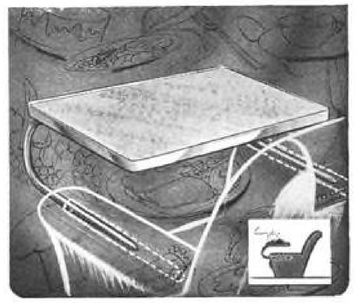
EMPLOYMENT OPPORTUNITIES 92-101
SPECIAL SERVICES TO THE INDUSTRY.....103
BUSINESS OPPORTUNITIES OFFERED 102
PLANES—EQUIPMENT (Used or Surplus New) For Sale 102-103
WANTED Planes—Equipment 102



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EDITORIAL

An Integral Part of the Arsenal

Naval aviation is emerging from the technical and tactical doldrums in which it has languished since the end of World War II. Lack of a substantial research and development program in the pre-Korean war years doomed naval aviators to fight the Korean war with technically obsolete equipment, mostly World War II surplus piston-powered fighters and attack planes.

Even the first crop of subsonic Navy jet fighters were too slow to match the combat pace of the sweptwing USAF Sabre and the Russian MiG-15. Navy had to turn to a carrier-based version of the Sabre to bolster its first line of aerial defense.

During the Korean crisis, however, the spigot of research and development funds was opened wider. Now after almost five years of accelerated technical development effort and some expensive failures, interesting results are appearing that will insure the continuance of naval airpower as an integral part of the American arsenal.

Nuclear Revolution

Nuclear power and nuclear weapons have wrought the biggest change in naval airpower. Nuclear-powered submarines and aircraft carriers will provide unprecedented speed and range for floating guided missile and bomber launching platforms. Nuclear weapons packaged to fit the warhead of a missile and the bomb casing of fighter-type aircraft provide naval airpower with unprecedented destructive powers.

James H. Smith, Assistant Secretary of the Navy for Air, in a recent speech mentioned "the introduction of warheads whose yields are measured in megatons," indicating that fusion-type uranium bombs have been reduced to packages small enough for use soon in carrier-based aircraft. Nuclear power for aircraft is a little farther in the future but there is no doubt that a nuclear-powered seaplane armed with uranium fusion bombs will be a Navy weapon in the foreseeable future.

Secretary Smith also paints a picture of the Navy's mobile nuclear reprisal force with the Forrestal supercarrier as its nucleus augmented by missile-firing cruisers for defense and missile launching submarines for offense.

Higher Speeds

The planes of the Forrestal class carriers will have supersonic speeds both for defensive fighters such as the Grumman Tiger and the Vought Crusader and for attack planes carrying fission or fusion-type bombs such as the Douglas Skyhawk and Skywarrior and the McDonnell F4H. Secretary Smith also forecast speeds of over 1,000 mph. for the next generation of Navy fighters.

The principle advantages of the Navy's mobile nuclear reprisal force, according to Secretary Smith, are:

- **It is a moving target** not vulnerable to attack by ballistic missiles and requires that a large portion of an enemy's airpower resources be diverted to locate and attack the task force.
- **It can use water** for decontamination in event of a nuclear attack and as a shielding device for its nuclear powerplants.
- **It is not dependent** on foreign bases nor will it endanger large populated land areas with radioactive fallout from a nuclear attack on its ships and planes.

The jet-powered seaplane with speeds equal to its land-based contemporaries and capable of utilizing the self-sealing character of water runways has already made its appearance as a naval weapon in the Martin P6M SeaMaster. Combined with submarine tankers, this can be a weapon of almost unlimited range and mobility. Its defensive counterpart, the hydroski fighter, has also appeared in prototype form in the Convair F2Y but will require considerable more development before it becomes a usable weapon.

Bolder Attitude

Even more encouraging is evidence that the Navy is taking a bolder and more aggressive attitude toward extending its technological frontier.

"In our constant battle to compress the time factor between the birth of an idea and the delivery in quantity of a combat weapon, certain calculated risks must be taken," said Secretary Smith. **"Our exploration of an unknown area must not be deterred by the fear of making a mistake.**

"Failure to bring a weapon to a usable stage due to incorrect decisions based on honest errors in judgment are bound at times to appear through hindsight as negligence or as an indication of a total disregard for the taxpayers' dollar. I assure you that in the Navy where research and development funds must provide weapons and firing platforms suitable for use above the surface, on the surface and below the surface, we must carefully monitor all expenditures.

"It must be understood, however, that research and development money is not intended for savings accounts. It is intended for investment in high risk ventures selected by military and civilian experts."

With this type of courageous and forthright approach to the multitudinous and increasingly urgent technical development problem facing naval aviation, there appears to be little doubt that it will retain its place as an integral part of our arsenal.

—Robert Hotz

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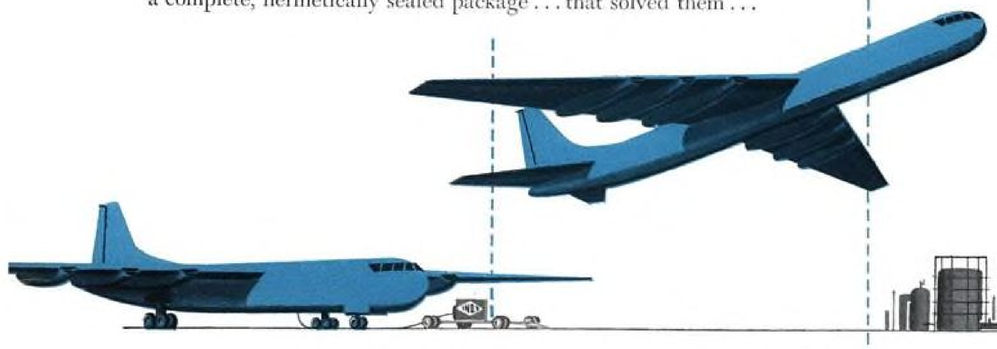

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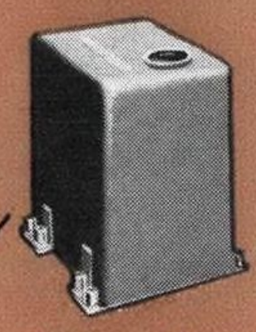
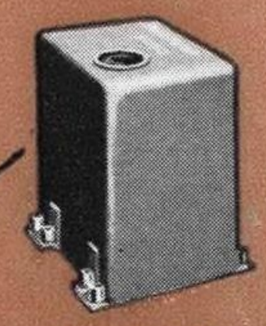


Mach positioner



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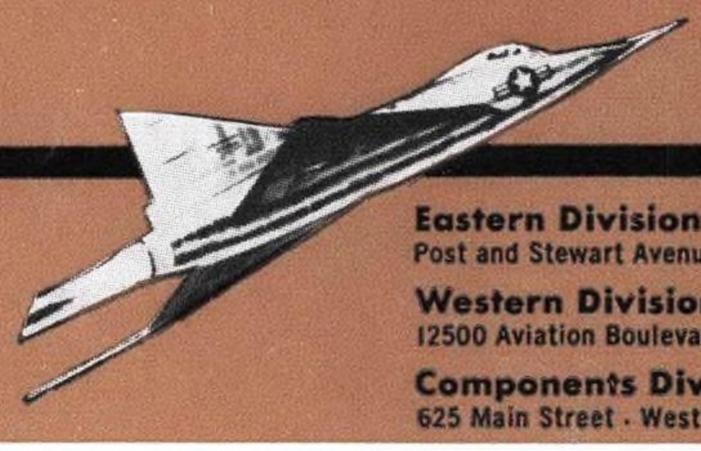

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