AVIATION WEEK

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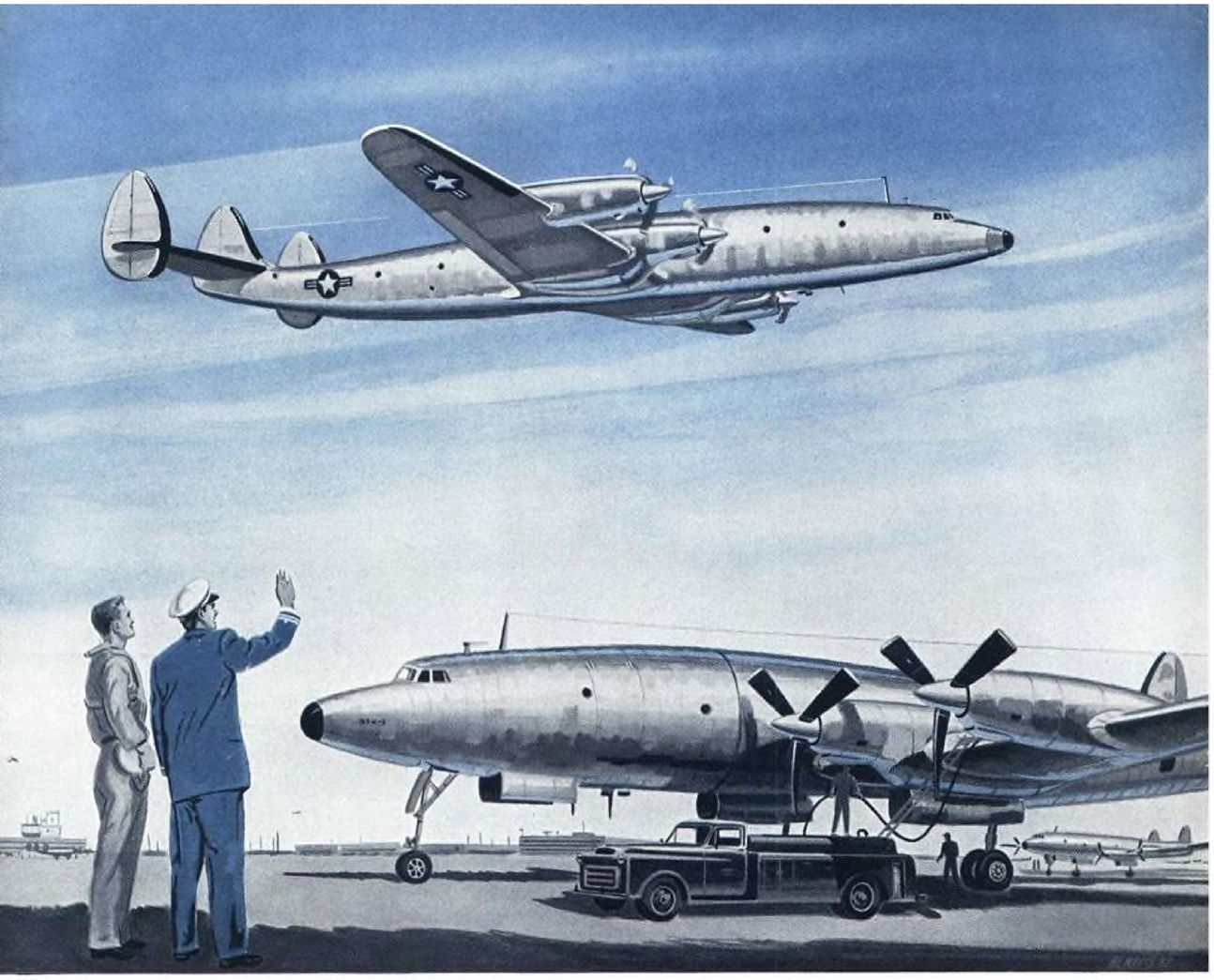
OCT. 24, 1955

50 CENTS



New Holley turboprop power control installed in Lockheed R7V-2

One hundred and six passengers or 36,000 pounds of cargo cruise at speeds up to 440-miles-per-hour in the Navy's new Lockheed R7V-2 turboprop Super Constellation. Four Pratt & Whitney Aircraft axial flow T-34 propeller turbine engines develop a total of 22,000 horsepower for take-off. Each of the four is automatically controlled by a new Holley gas turbine power control.

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The Holley gas turbine control is the result of intensive research and development to provide a light weight, compact means of accurately metering fuel consistent with engine requirements.

This and other Holley developed fuel metering devices have played an important role in our country's undisputed leadership in the design, development and manufacture of superior aircraft.

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VAN DYKE, MICHIGAN

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FOR PNEUMATICS

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OCTOBER 24, 1955

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NEWS DIGEST

Bombs, Bombs, Bombs

North American's F-100C Super Sabre sweeps into the air with a total of 7,000 lbs. in bombs beneath its wings. In actual combat, bomb load could be either atomic or conventional. To increase its range, the Super Sabre is equipped with air-to-air refueling probe.

Domestic

The White House will announce the appointment of Dr. Clifford C. Furnas, Chancellor of the University of Buffalo, as Assistant Secretary of Defense for Research and Development. Dr. Furnas, former director of the Cornell Aeronautical Laboratory and director of research for Curtiss-Wright at Buffalo, will replace Donald A. Quarles who stepped up to the position of Secretary of the Air Force.

North American Aviation, Inc., is establishing a separate division to handle the company's nuclear engineering and manufacturing operations. In its announcement, North American let it be known that it plans to carve a larger niche for itself in the industrial atomic energy market. Board Chairman J. H. Kindelberger: "We now are ready to make available to friendly countries research, medical, industrial and electrical power reactors in keeping with the . . . regulations of the Atomic Energy Commission." To be known as Atomics International, the new division will be located in a $1.5-million facility in the San Fernando Valley and it will be headed by Dr. Chauncey Starr, North American vice president and general manager.

The strike-ridden American Bosch Arma Corp., manufacturers of B-52 fire-control systems, faced new problems last week. The Engineers Association of Arma, an affiliate of the Engineers and Scientists of America and one of three striking unions, placed this ad in a New York newspaper "AVAILABLE, approximately 650 engineers and technicians with broad background in the development of complex fire-control and guidance systems . . . either part-time or full-time employment will be considered." The Arma strike—its third in five years—began Sept. 30 upon the expiration of union contracts. An Engineers Association spokesman said the union will accept a 5% wage increase (it originally asked for 12%) plus an additional 2½% "inequity fund;" an Arma spokesman said it has offered to meet the 5% wage increase but that the company wants to negate certain fringe benefits now in force because they are unduly restrictive.

The tiny A4D Douglas Skyhawk holds the new world's speed record. Navy Lt. Gordon Gray flew the carrier-based attack plane at 695.162 mph. over a 500-kilometer closed-circuit course at Edwards AFB. The Skyhawk became the first attack-type plane to establish a world's speed record over the 500-kilometer course, all previous ones having been set by fighter aircraft. The best previous speed for the measured course (649.46 mph.) was set by Maj. John L. Armstrong, USAF, in an F-86H at Dayton, Ohio, on Sept. 3, 1954.

Boeing's Wichita Division last week delivered the last of an undisclosed but "sizeable" number of RB-47E jet photo planes to the Strategic Air Command. The reconnaissance version of the B-47 Stratojet is capable of high or low-altitude, 600 mph. day and night missions. First reconnaissance model of the plane was produced in 1953 under a unique program whereby B-47 bombers and photo planes emerged from the Wichita assembly line on alternate cycles. The dollar-saving move eliminated the need for training separate manufacturing crews and did away with the necessity of keeping duplicate sets of perishable and non-perishable tools. The RB-47E in its present configuration carries seven aerial cameras within its fuselage and long, equipment-packed nose.

International

Britain's Somers Kendall Aircraft Ltd. announced last week that it has flown its lightweight (810 lb.) jet SK-1 prototype. The aircraft, which presumably will be marketed as a sports plane, has been given a price tag of $28,000, or about $35 a lb. Powered by a Turbomeca Palas 350-lb.-thrust engine, the SK-1 has an assigned maximum speed of 332 mph. and an optimum cruise speed of 300 mph. Features include wing span of slightly over 20 ft., an all-moving butterfly tail, oleo-pneumatic retractable bicycle landing gear, full span flaps and tail parachute for landing.

AVIATION CALENDAR

Oct. 25-27—Technical Conference on Aircraft Electrical Applications, American Institute of Electrical Engineering, Hollywood-Roosevelt Hotel, Los Angeles.

Oct. 26—Airwork-AC Aviation Spark Plug Clinic, at International Aviation Industries, Inc., Westchester County Airport, White Plains, N. Y.

Oct. 26-28—Southwestern Airport Managers' Assn., annual meeting, Greenville, S. C.

Oct. 27-28—Aircraft Electrical Society, 12th annual display, Pan Pacific Auditorium, Los Angeles.

Oct. 31-Nov. 1—Institute of Radio Engineers, 1955 East Coast Conference on Aeronautical and Navigational Electronics, Lord Baltimore Hotel, Baltimore.

Oct. 31-Nov. 2—Society of Automotive Engineers, Golden Anniversary Transportation Meeting, Chase Hotel, St. Louis.

Nov. 2-4—Society of Automotive Engineers, Golden Diesel Engine Meeting, Chase Hotel, St. Louis, Mo.

Nov. 3-4—Institute of the Aeronautical Sciences and Canadian Aeronautical Institute, second annual joint meeting, Chateau Laurier, Ottawa, Ont., Canada.

Nov. 6-9—24th Annual National Conference of the Controllers Institute of America, Hotel Statler, Los Angeles. Robert E. Gross, president of Lockheed Aircraft Corp., will speak on "The Future of Aircraft."

Nov. 8-10—National Aviation Trades Assn., annual convention, Hotel Westward Ho, Phoenix, Ariz.

Nov. 9-10—Society of Automotive Engineers, Golden Anniversary Fuels & Lubricants Meeting, Bellevue-Stratford Hotel, Philadelphia.

Nov. 9-11—Industrial Management Society, 19th annual time, motion study, management clinics, Hotel Sherman, Chicago.

Nov. 13-18—American Society of Mechanical Engineers & American Rocket Society, annual convention, Congress, Hilton and Blackstone Hotels, Chicago.

Nov. 14-15—Aviation Distributors & Manufacturers Assn., 26th meeting, El Mirador Hotel, Palm Springs, Calif.

Nov. 14-17—Second International Automation Exposition, Navy Pier, Chicago.

Nov. 16-18—Society for Experimental Stress Analysis, annual meeting, Hotel Sheraton, Chicago.

Nov. 21-22—Symposium on Aeronautical Communications—Civil and Military, sponsored by Institute of Radio Engineers, Hotel Utica, Utica, N. Y.

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. 12-17—Nuclear Congress and Atomic Exposition, sponsored by Engineers Joint Council, Cleveland Municipal Auditorium.

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

PICTURE CREDITS

25, 74—Levy-Ship; 109—Aviation News Pictures.

WHO'S WHERE

In the Front Office

C. M. Cambern elected chairman of the board of Fasteners Inc., subsidiary of Phillips Screw Co. **Judson B. Shafer** elected president and general manager.

B. Bynum Turner, executive vice president of Ethyl Corp.

Kenneth M. Bartlett, executive vice president of Horizons Inc. Bartlett was manager of research for Thompson Products, Inc.

Fred M. Glass, former aviation director of The Port of New York Authority, chief executive officer of Empire State Building Corp.

Honors and Elections

Oliver A. Rosto, 73, liaison representative for Transocean Air Lines, received a Civil Aeronautics Administration medal for distinguished service to world aviation. Rosto was a CAA inspector prior to his retirement in 1953.

John H. Gibbs, Lockheed Aircraft Corp., named chairman of Aircraft Industries Assn. committee on packaging and preservation; **R. W. Shirk,** Allison Div. of General Motors, appointed vice chairman.

Andrew F. Hillhouse, Solar Aircraft Co., appointed vice chairman of Gas Turbine Power Div., Washington section of American Society of Mechanical Engineers.

Changes

Dr. Charles G. McIllwraith, research director of Bill Jack Scientific Instrument Co., Solana Beach, Calif.; **Clarence E. Forbes,** manager of Technical Employment and Training.

Dr. Alberto F. Thompson, chief of Office of Scientific Information of the National Science Foundation; **Clyde C. Hall,** public information officer.

Robert D. Elbourn, chief of Components and Techniques Section of National Bureau of Standards.

Vernon G. Crudge, special aviation consultant to Boeing Airplane Co.

George G. Hyde, patent attorney for the Pioneer-Central Div. of Bendix Aviation Corp. **Forrest L. Dunbar,** industrial relations director of Bendix Products Div.

James E. Boyce, commercial sales manager of California Div. of Lockheed Aircraft Corp.; **Thomas F. Bergmann,** formerly sales manager of Wright Aeronautical Div., Curtiss-Wright Corp., joined commercial sales staff.

William W. Vogel, chief of sales engineering and flight test dept. of LearCal Div. of Lear, Inc.; **Earle Gardiner** replaces Vogel as national service manager.

Paul Bailey, sales manager of Camair, Div. of Cameron Iron Works, **Roy Thorson,** sales representative; **Hugh I. Gillham,** assistant chief engineer; **Harry H. Walsh, Jr.,** production superintendent.

Kenneth O. Smith, former news bureau manager, public relations director of Western Air Lines; **Bert D. Lynn,** advertising and sales promotion director.

(*Continued on p. 92*)

INDUSTRY OBSERVER

► F5D fighter which Douglas' El Segundo Division is building for Navy is a refinement of the F4D with thinner wing and tail, longer fuselage and higher fineness ratio. First F5D probably will come off the line early in 1956.

► **General Electric has a ducted fan engine in advance development. In the 10,000 lb. thrust category, it will be small enough for retrofit into current operational aircraft.**

► Hughes Aircraft Co. and Sperry Gyroscope Co. reportedly have won the hotly contested competition for development of fire control systems suitable for long range interceptors.

► **Successor to the Glenn Martin P6M SeaMaster on the company's drawing boards is known as the SeaMistress. U. S. flying boat proponents, stimulated by Air Force interest in the new jet-propelled aircraft, are pushing for faster development. A major matter of concern is the possibility that Great Britain will outpace U. S. progress in the field.**

► Atomic Energy Commission and USAF are consulting CAA Medical Division on the possibility of using commercial airliners to take samples of the atmosphere for study of radioactive particle count.

► **Several military avionics equipment manufacturers are eyeing the growing business aircraft market for communications, navigation and flight control equipment. Interested companies include A. C. Spark Plug Division of General Motors, and the Crosley Division of Avco Manufacturing Co.**

► An instantaneous vertical-speed indicator employing inertial devices to eliminate lags encountered in the long-used conventional rate-of-climb indicator, is under development at Summers Gyroscope Co.

► **The airlines are soon to get a look at a radically improved altimeter that gives instantaneous readings to a guaranteed overall accuracy of 1 part in 3,000—equivalent to between five and 10 ft. at sea level and 40 to 50 ft. at 45,000 ft. altitude. This could make more room in crowded air space. High accuracy and sensitivity of the system are due to specially designed aneroid capsules operating in a system that eliminates friction-producing bearings and gear trains between sensing element and indicator.**

► Hughes Aircraft Co. has moved to diversify by forming a new commercial products division. It will exploit military avionics developments which have commercial and industrial automation possibilities. Hughes also hopes to sell its new storage-type cathode ray tube to airlines for use in weather radar and air traffic control signalling systems. Semiconductor diodes are the only present Hughes commercial product.

► **Vickers-Armstrongs expect to boost the speed of its Viscount series from the current 328 mph. to 365 mph. by the use of the ultimate development stretch version of the Dart turboprop. This Rda. 8 development is expected to boost Dart power to over 2,100 eshp. through component efficiency improvement.**

► Aircraft certificated for dusting and spraying now total more than 4,200. Flying for this purpose should hit new record in 1955 with 3,180,000 acres of forest already covered in fight against gypsy moth and 1,600,000 acres sprayed to control grasshoppers.

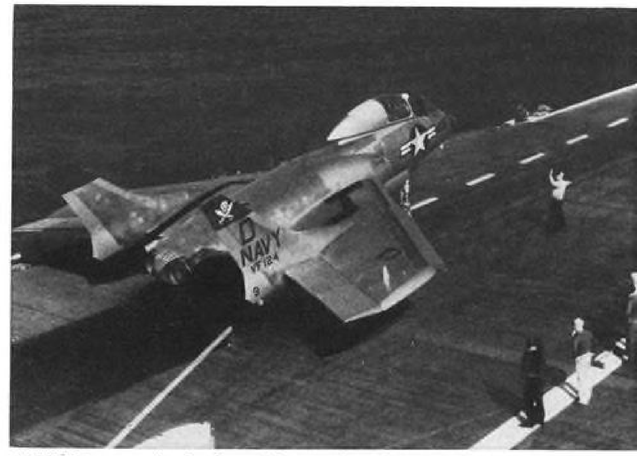
► **Rolls-Royce Conway turbofan engine is now running its official type test aimed at producing a rating of 13,000 lb. for commercial applications. Military thrust ratings of the Conway are considerably higher.**

► Pilots of the South African air force will be trained in Canada to fly the Canadair-built Sabre F-86 Mark 6 fighter. When delivery of 37 planes on order is started next April, first trainees will start ferrying aircraft to South Africa until two squadrons are equipped. Order is worth $10 million.

New Look for Carriers:

Steam Catapults, Mirror Landing Device

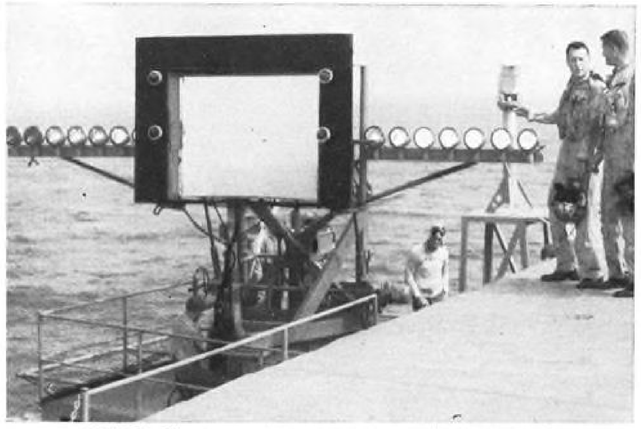
ABOARD Hancock, F7U-3 is rolled to new-type steam catapult . . .



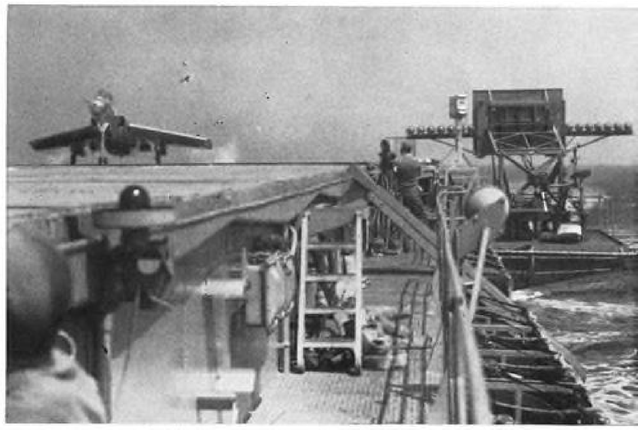
GROUND crew makes hookup with catapult and gives ready signal. . . .

STEAM rolls up as catapult prepares to shoot F7U-3 off deck . . .

GOING full force, catapult sends Cutlass down deck for takeoff.



NEW landing system (concave mirror and lights) on Bennington . . .



Gets first test as F7U-3 lands. Unit indicates glide path, altitude.

AVIATION WEEK VOL. 63, NO. 17
OCTOBER 24, 1955

PAA Order Touches Off Equipment Race

BEA buys Vanguard; New York Airways, S-58s; Lockheed revises Electra; tourist DC-8 announced.

The international air transport industry buzzed with new equipment deals last week in the wake of the record $269-million jet airliner orders placed by Pan American World Airways (AW Oct. 17, p. 7).

As U. S. and British airframe and engine manufacturers swarmed around the fringes of the 11th annual general meeting of the International Air Transport Association in New York, the following developments occurred:

• **Vickers-Armstrongs** sold more than 20 new 93-passenger Vanguard transports to British European Airways. The Vanguard (V.900) will be powered by four Rolls-Royce RB 109 turbo propellers. Final negotiations on quantity and price of the BEA order are now under way.

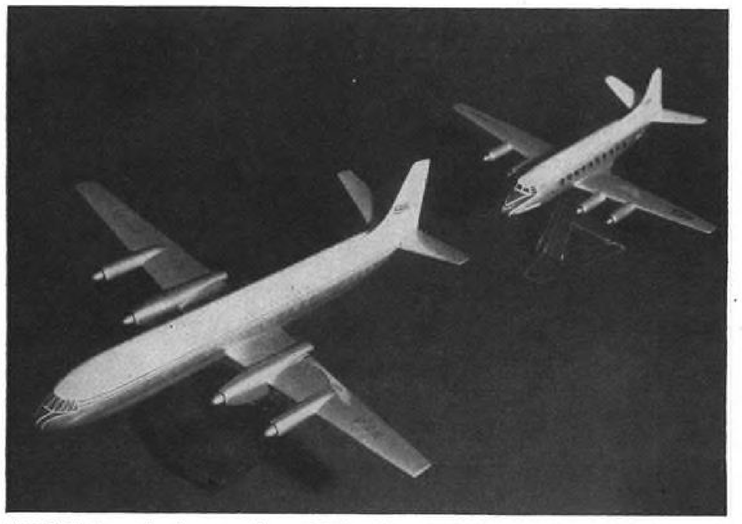
• **Sikorsky Aircraft** sold seven S-58 helicopters to New York Airways for $2 million. Another sale of an unspecified number of the 12-passenger helicopters to Sabena, Belgian National Airline and international transport helicopter pioneer, will be officially confirmed in the near future.

• **Lockheed Aircraft Corp.** has released the latest revised design of its Electra turboprop transport (AW June 13, p. 12) to the production department at its Burbank plant. New Electra design features a triangular vertical fin, larger wing span, higher gross weight, larger payload and longer range.

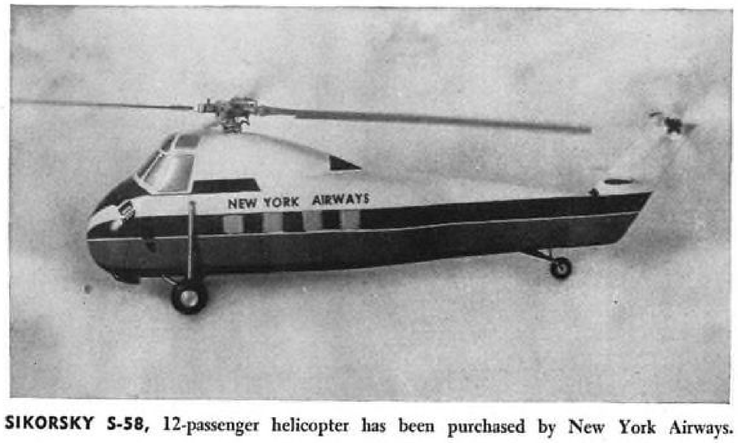
• **United Aircraft Corp.** revealed that the Pratt & Whitney J75 split compressor turbojet aimed at 15,000-18,000 lb. thrust will be available in commercial versions of the Douglas DC-8 and Boeing 707 jet transports. F. B. Rentschler, UAC chairman, said the military version of the J75 will be in production next year and reach military service by 1957 to provide two full years of operational experience before initial commercial deliveries are made in 1959.

• **Boeing Airplane Co.** flew its model 707 transport prototype on a spectacular transcontinental roundtrip in 8 hr. and 16 min. The 707 piloted by A. M. (Tex) Johnson flew the 2,040 nautical-mile stretch from Seattle to Washington, D. C., in 3 hr. 58 min., averaging 592 mph. and returned to Seattle in 4 hr. 8 min. Top speed recorded was 615 mph. The 707 cruised between 33,000 and 35,000 ft. altitude and maintained cabin pressure of 8,000 ft. It carried 74,000 lb. of fuel and had 10,000 lb. remaining on landing at Washington.

• **Douglas Aircraft Co.** revealed a high-density version of its DC-8 jet transport that can carry 131 tourist-fare passengers on the nonstop trans-Atlantic hop. The high density DC-8 features three abreast seating on both sides of the center aisle. Douglas said the DC-8 will carry a 31,110 lb. payload over the 3,320 statute-mile route from New York to Paris in 6 hr. 25 min., cruising at altitudes between 30,000 and 40,000 ft. at an average speed of 556 mph.



MODELS show size increase of new Vickers Vanguard (foreground) over Viscount 700.



SIKORSKY S-58, 12-passenger helicopter has been purchased by New York Airways.

BEA Buys Vanguard

British European Airways firmly linked its future to Vickers-Armstrong turboprop aircraft with the announcement that it will buy a fleet of Vickers Vanguards, newest and biggest of the turboprop series which started with the Viscount.

The carrier is now in final negotiation for an order of 20 to 25 Vanguards powered by 4 Rolls-Royce RB 109 split-compressor turboprop engines.

Delivery of the Vanguards is scheduled for 1959-60. The order for the new airplane, plus new and current orders for 800 series Viscount Majors, represent BEA's equipment plans well into the 1960's.

BEA believes that possibly within three years it will have an all-turboprop fleet, with the exception of aircraft needed for small operations in Scotland. If a small turboprop, such as the Fokker F-27, could be found that satisfies BEA, the carrier could have an all-turbine operation within three years.

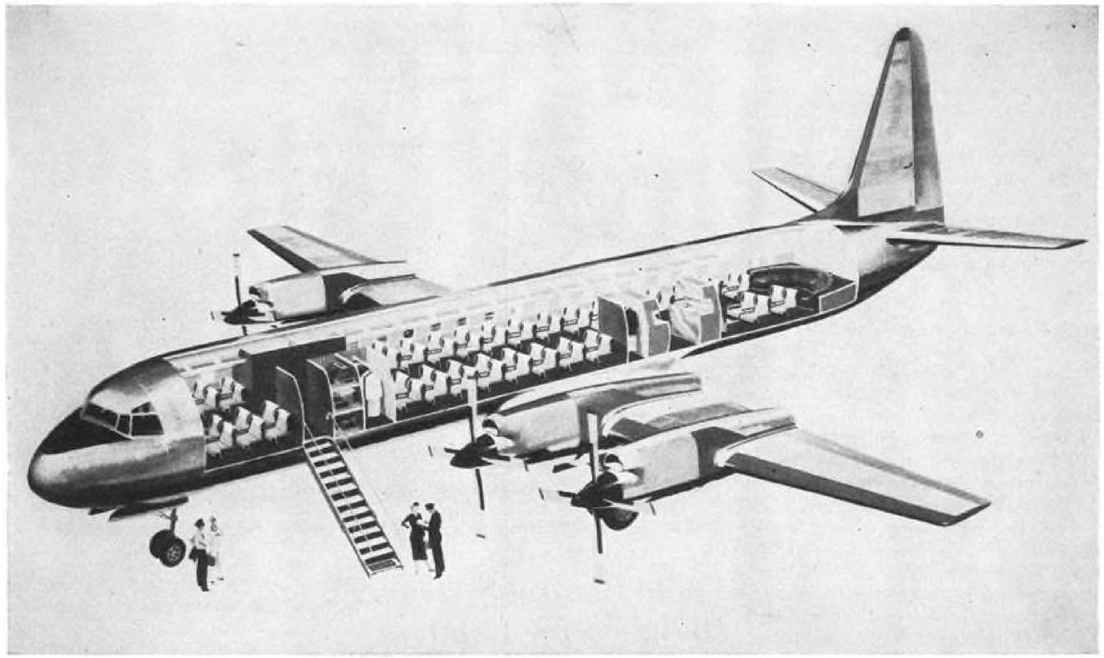
Vanguard Statistics

The new Vanguard was designed by Vickers to meet detailed BEA specifications for a short and medium-haul transport. It is a mid-wing, four-engine design and will carry 93 passengers in the BEA configuration (five abreast seating).

A "double-bubble" fuselage will be used with the upper part divided into three passenger compartments. Two luggage and freight holds are in the lower part. Vickers has 105-passenger version it is offering to other airlines.

Performance of the Vanguard is tied to development of the Rolls-Royce RB 109 engine that will power it. Initially, it will be a 4,470 eshp. engine, and the airplane will cruise at 400 mph. As RB 109 power is increased to 5,000 eshp, cruise speed will go to 425 mph.

Vickers and BEA believe the Vanguard has an ultimate potential of carry-



REVISED Lockheed Electra interior (four-abreast seating) is shown in artist's drawing. New Electra has greater range, payload.

DC-8 CUTAWAY model on display during IATA meeting shows five-abreast seating in forward compartment; six-abreast in rear. Model also gives good planform view.

ing 90 passengers over 2,500 miles stage length of at least 400 mph., and that it could be operated over 86% of the world's routes.

Rolls-Royce has been bench testing the RB 109 and plans its first flight test early next year in a Lincoln flying test bed. The engine has been designed around an axial-flow split compressor that has a 12 to 1 pressure ratio for low fuel consumption.

The Vanguard, which will be similar to the Lockheed Electra, is designed for short and medium hauls and is not capable of flying such long-haul services as the North Atlantic route. BEA's sector average is about 500 miles, and the carriers longest route—London to Rome—is less than 1,000 miles. BEA thinks the Viscount Vanguard series will satisfy its needs well into the next decade.

To supplement the high density Vanguard, BEA is ordering additional Viscount Majors. The new order will be for the 806 powered with Rolls-Royce Dart R. Da.7 engines. With the new engines, it will cruise at 360 mph. It is expected by September, 1957.

BEA already has an order with Vickers for 88 802 Viscount Majors. This aircraft, expected to fly next year, is powered with the Dart R. Da.6 engine and will cruise at 320 mph. with 65 passengers.

Vickers plans to develop the 800 series into 1959 and will have a speed of 400 mph. The 700 and 800 series will be manufactured together, starting next year. Production of the Vanguard will begin now and the first aircraft off the line will be used as a prototype by Vickers.

S-58 Order

New York Airways' seven Sikorsky S-58s (costing $2,000,000) are scheduled for delivery starting early next spring.

Delivery of the aircraft will give New York Airways the largest helicopters operated in scheduled service anywhere. The aircraft will be added to the carrier's current fleet of five Sikorsky S-55's.

The S-58 will be powered by a Wright R-1820 engine, providing 1525 hp. It will cruise at 105 mph. and carry twelve passengers. Lifting power will be 4,000 lb.

Performance of the S-58 is a substantial increase over that of the S-55 which has a 600 hp. engine, cruises at 85 mph. and carries five passengers.

"All of these benefits will be passed on to passengers in speedier service, greater capacity and even more convenient schedules than now prevailing," NYA president Robert L. Cummings said after announcing the order.

"This will mean that present airport hourly schedules will be shaved to half-hourly operations."

SPERRY flight-control unit hovers helicopter off ground. No hands are on controls.

Flight Control Systems Designed for Copters

The development of a 60 lb. automatic flight-control system, believed to be the first capable of stabilizing flight path and heading as well as maintaining constant altitude and airspeed, was announced last week by the Sperry Gyroscope Co., Division of Sperry-Rand.

The new system which will increase the helicopter's all-weather capability, is scheduled for production in December (AW Oct. 17, p. 7). Sperry officials say the unit is a forerunner of a new set of simplified helicopter flight instruments it plans to produce.

The lightweight system provides five channels of automatic control.

They are:

- **Heading,** by controlling "rudder" pedals.
- **Airspeed** and pitch stabilization, by controlling the cyclic pitch stick.
- **Bank and turn,** by controlling cyclic pitch stick.
- **Barometric altitude** by controlling collective pitch.
- **Rotor rpm,** by controlling engine throttle position. (This feature was developed under sponsorship of the Wright Air Development Center.)

Like the newer autopilots for fixed-wing military aircraft, the Sperry helicopter autopilot enables the human pilot to over-ride the automatic system and introduce maneuvers through the regular control stick and pedals.

Automatic hovering over a fixed spot, at constant altitude, is possible by feeding Sperry system with signals from inertial devices in the helicopter or from submerged sonar units, cables and ground radio signals. It also opens up the possibility of pilotless helicopter operation for such things as airlifting cargo to a tactical position or hoisting a radar antenna.

Sperry reports that the system remains operative (through battery power) despite engine failure, to maintain constant rotor rpm and provide stabilization until the point of flare-out.

Sperry used "redundant design" in the system's circuits, and provided duplicate amplifiers (wherever tubes or transistors are used) so that failure of one unit does not incapacitate the system.

Adm. Pearson Asks Support-Policy Review

Los Angeles—Rear Adm. John B. Pearson, Jr., USN, last week proposed a strong review of the Navy's aircraft support equipment program.

"Development of support equipment, its readiness and placement into service is of major interest," Pearson said, following formal acceptance last week of command of the Bureau of Aeronautic's Western District.

Under his broad management and technical control, will be six major Bureau of Aeronautics representatives and three resident representatives who have naval inspection cognizance over such companies as Douglas Aircraft Co., Lockheed Aircraft Corp., Convair, Goodyear Aircraft Corp., Hiller Helicopters and Aerojet-General Corp.

Pearson said the importance of a support equipment program often is overlooked and a fleet of aircraft is no better than the ability to get it in the air.

He noted that over half of the Navy's aircraft contracts are in the Southern California area.

Wilson Seeks Tighter Spending, Orders Review of Procurement

Washington—Defense Secretary Charles E. Wilson, adamant in his stand that the national defense program will not be curtailed, nevertheless last week took two steps to enforce maximum economy and efficiency in procurement.

After ordering the elimination of 68,000 civilians on the department payroll, he directed the military secretaries to tighten up on procurement and production. There was no indication that goals will be altered.

Wilson also named Deputy Defense Secretary Rueben B. Robertson, Jr., as chairman of an ad hoc committee to study ways to shorten the development time of aircraft and helicopters. The group, which will look into all phases of research, development and procurement, also includes Frank D. Newbury, Assistant Secretary for Applications Engineering; Robert D. King Deputy Assistant Army Secretary for Financial Management and James N. Davis, consultant to John Hopkins University Research Office. King will serve as management director and Davis as technical director to the committee.

Air Force spokesmen did not feel that Wilson's request for new procurement economies would have serious effect on aircraft industry contractors. Some tightening up is to be expected, but most of Wilson's suggestions, it was pointed out, duplicate USAF policies already in effect.

The Secretary laid out his program in a memorandum which he refused to call a directive. He is offering "guide lines," he said, and reluctantly set a figure of about $500 million as the amount he wants to save, bringing the department's Fiscal 1956 spending within a limit of $34 billion.

There were some rumblings among industry representatives who suspect that the Wilson "guide lines" can result in an aircraft procurement stretch-out. This thought was denied by Pentagon observers, who believe that the Secretary will stick to his goals, particularly the 137-wing Air Force.

It was pointed out that there is a difference of opinion between the Army and Air Force, for example, on how long a new war would last. Army would prepare to fight two years. USAF believes the atomic age will curtail it to 30 or 60 days.

In his memorandum, Wilson said "critical examination is to be made of current plans for support forces and the accumulation of mobilization reserves to assure that they are established at minimum feasible levels, within the requirements of the Logistic Annex to the Joint Mid-Range War Plan.

"Where mobilization reserve levels presently represent substantial inventories, delivery of material on order will be delayed to the extent possible without incurring substantially increased unit costs, and the placing of unnecessary follow-on orders will be avoided."

Objectives listed by Wilson include:

- **Tighten up of flight time,** particularly in the field of proficiency and non-essential flying.
- **Restrict overhaul and modification** programs to equipment for current requirements.
- **Reduce stock levels** of spare parts.
- **Increase self-maintenance** of aircraft.
- **Salvage overage, obsolete aircraft.**
- **Hold to a** minimum the utilization of contractor-furnished maintenance personnel and field representatives.
- **Review requirements** in the light of availability of modern weapons.
- **Evaluate existing contracts,** modify reserve requirements.
- **Cancel contracts** for unnecessary material except when termination charges would be excessive.
- **Eliminate unnecessary multiple sources of supply.**
- **Reduce procurement** of development-type items.
- **Adjust buying to reduce** stocks on hand where possible.

Wilson made it clear that high-priority items in the R & D field will continue to get emphasis.

Wilson said curtailment of non-productive programs is necessary so that others "can be adequately supported within the approved level of expenditures."

TAC Gets Probe & Drogue Tankers

The U. S. Air Force is converting 100 B-50 bombers to three-point refueling tankers for the Tactical Air Command. The multi-million dollar conversion contract awarded to Hayes Aircraft Corp., is the first large USAF commitment for the probe and drogue refueling equipment manufactured by Flight Refueling Inc.

TAC has long stated a requirement for multiple point refueling for its fighter and fighter-bomber aircraft. It has been using KB-29 tankers "handed down" from the Strategic Air Command and equipped with the Boeing-developed single point flying boom system.

The KB-50s will be cleaned up aerodynamically, adding a few knots to its normal 30-40 knot speed advantage over the KB-29s. With this added speed and the equipment to fuel three F-84Fs or F-100Cs simultaneously, TAC believes the KB-50s will meet its requirements for the next three to five years.

Model A-12-B1 Flight Refueling hose reel units will be mounted at each wing tip and in the belly of the B-50s.

TAC's F-84Fs, now equipped for flying boom refueling, have a probe conversion kit with which to change the boom receptacle in the wing, just outboard from the cockpit.

Piasecki Helicopter Stockholders to Meet

Stockholders of Piasecki Helicopter Corp., will meet this week to consider a new stock option plan for company executives and the possibility of changing the corporation's name. Both questions involve mild controversy. A proposal of the directors that the company name be changed to Vertiplane Corp., to distinguish it from Piasecki Aircraft Corp., may run into legal tangles because the Ryan Aeronautical Co., of San Diego, Calif., has an application pending to register the trademark "Ryan Vertiplane." Piasecki Aircraft is a new company founded by Frank N. Piasecki after he was ousted as board chairman of the original company.

If the Vertiplane name is not available, proxies will be sought by the Piasecki Helicopter management to defeat the proposal and another title will be sought.

Another management plan, to make 67,184 shares of stock available to company executives and key employes at a bargain price, is the subject of a dispute between Frank Piasecki and Don R. Berlin, president and new board chairman of the company.

Piasecki has asked stockholders to vote against the proposal, warning that it places control of the company in jeopardy. Berlin has denied this, claiming advantages over the sale of stock on the public exchanges and holding that the total percentage is too small to assure control by the internal management.

Also at this week's meeting, action will be taken on the nomination of Thomas K. Finletter, former Air Force Secretary, and John F. Floberg, former Assistant Secretary of the Navy for Air, to the board of directors.

Eyewitness Report:

'Misadventure' Caused Midge Loss

The Folland Midge, prototype of the Gnat (AW Oct. 17, p. 34), crashed in England Sept. 26 after a "protracted" takeoff run (AW Oct. 3, p. 13). Max Mathez, member of a Swiss Army Air and Supply Department delegation which was planning to purchase six Midges, was flying the aircraft. AVIATION WEEK has received the following report from an eyewitness:

"Mathez was the twenty-first pilot to fly the Midge. He was fully briefed by Ted Tennant (Folland's chief test pilot) and after the briefing was invited to leave the cockpit and have a cup of coffee before making the flight. He refused the invitation, asked for and received permission to taxi out and later for permission to take off.

"At first the take-off was normal, and it was not until the Midge was still on the runway at a point well past that at which it should have taken off that alarm was felt by the knowledgeable among the spectators. Some eye witnesses said the Midge left the runway for a short distance, but photographs taken soon after the crash show that one wheel, at least, was on the ground when the Midge ran off the runway into the grass over-shoot area, and that all three were bearing hard within a matter of 20 yards or so.

"The distance from the end of the runway to the line of trees flanking the airfield at this point is about 250 yards. After about 200 yards it begins to slope away quite steeply. The Midge, still on the ground, hit a ridge about a hundred yards from the trees and shot into the air in a steep nose-up attitude. A moment later it hit two fir trees and started to break up as it cartwheeled into some water meadows alongside the River Test. The tops of the two trees were knocked off about 20 ft. from their bases, but the wings of the Midge remained in position though cut through from the leading edge to the main spar on each side by the tree trunks—cuts indicating that the pilot must have tried to fly between the trees.

"The point of impact with the trees was found to be 14 ft. below the level of the end of the runway. No change in the engine note occurred until the Midge hit the trees, and the aeroplane must have been going very fast indeed when it ran into the over-shoot area. No one was really in a position to see whether the Midge was actually gaining height when it hit the trees, but if it had been only 20 ft. higher it would have missed them.

"At the inquest, held two days later, the coroner said that there was strong evidence that the Midge was entirely serviceable when Mathez climbed into it and in returning a verdict of 'death by misadventure' implied that the accident was most probably attributable to the 'human factor.'

"Giving evidence, Ted Tennant said that he had briefed the pilot as fully as possible and had been most careful to stress the importance of having a correct tailplane setting for take-off. He had, in fact, set the tailplane correctly before Mathez taxied out for the take-off. A member of the Swiss mission, of which Mathez formed part, gave evidence that he was present when Tennant briefed the pilot and had, in fact, translated some of Tennant's remarks to make sure that the pilot understood them. This witness was satisfied that 'Mathez had been adequately instructed in the Midge's flying technique.'"

Douglas Indorses USAF Policy To Penalize Performance Failure

Santa Monica, Calif.—Douglas Aircraft Co. has announced its approval of the new Air Force get-tough policy calling for financial penalties against firms failing to meet performance guarantees.

The airframe company believes, however, that the policy should be applied on a long-term basis rather than on specific contracts.

This statement by Donald Douglas Jr., vice president, was made at the first national meeting of the Military Products Division of the Radio-Electronics-Television Manufacturers Assn. (RETMA).

Douglas pointed out that too-severe application of the get-tough policy might discourage companies from taking large steps forward in attempts to advance the state of the art. He added:

"So that manufacturers will be willing to take a reasonable chance and keep moving forward, I believe that a company's performance should be measured on a long-term basis rather than on a specific contract."

Douglas said his company favors the principle because it will result in more realistic design competitions.

"I am assuming that it will be limited to production items," he said. "The same policy applied to research and development would kill interest in this type of work."

Citing possible pitfalls, he said:

"Suppose, for instance, that one of you guaranteed a 90% kill probability on a fire-control system and had your profits cut in half because you could only deliver an 80% probability. Next time you probably would take no chances and would only guarantee 80%."

How Big a Step?

He said this is the biggest problem in national defense today. "How big a step forward should we take in the state of the art at a given time? We can get into trouble either way, by going too far or by not going far enough."

The Douglas statement came shortly after Maj. Gen. T. P. Gerrity, USAF Director of Procurement and Production Engineering, said the Air Force will eliminate development programs which fail to offer large gains in performance (AW Oct. 17, p. 12).

Douglas said the new Air Force get-tough policy is one of the reasons why some avionic companies, along with other component suppliers, are going to have to change their attitudes considerably. They can no longer expect merely to skim off the cream.

Douglas emphasized the importance of reliability, weight-saving and adequate cooling of avionic equipment, pointing out that these factors help in making a sale as well as price and meeting of specifications.

Equipment Evaluation

Stressing the importance of "plus values" in equipment, the air-frame official cited this memorandum from the Douglas equipment group to the chief engineer. It concerns the electric generating system for the DC-8:

"In evaluating the proposals, equipment group engineers took into account the electrical and mechanical features of the generator, regulator, protective panel, control apparatus and connecting circuits. These were evaluated not only for compliance with the specification but for any additional features or 'plus values.' Simplicity and serviceability were taken into account. The installed weight of the equipment, including wiring, was determined and included in the evaluation Other factors evaluated to the best of our ability were the engineering groups involved, the service facilities and personnel which would be available, the experience of the companies with comparable equipment and installations and the development status of the equipment being proposed."

Douglas warned that the "plus values" mentioned are going to be increasingly important in both the military and commercial field because they help to guarantee performance.

ARDC Reorganizes, Tells More Secrets

By Claude Witze

Baltimore—Air Research and Development Command has streamlined its headquarters organization and is prepared to ease the secret classification on System Requirements in another double-barreled Air Force effort to spur aircraft industry development of improved weapon systems.

Like the program to lift restrictions on Technical Program Planning Documents (AW Oct. 17, p. 12), details on System Requirements will be handed out on a restricted basis. They will be given to a few contractors in across-the-table agreements designed to take full advantage of the aircraft industry's top engineering talent and development facilities.

Indications are that the companies entrusted with ARDC's System Requirements, which involve highly secret details of USAF's war planning, inventory and technical data, will be major weapon system contractors. The list will be as selective and not much larger than the Air Materiel Command's list of potential contractors for a given weapon system and as a general rule will include the same names. AMC, on abolition of paper design studies this summer (AW Aug. 8, p. 12), said it would further conserve on industry's engineering effort by restricting Phase I competitions to contractors with proven ability.

Boyd in Key Post

Most significant of ARDC's organizational changes is the establishment of a Deputy Commander for Weapon Systems, a post initially filled by Maj. Gen. Albert Boyd, former commander of Wright Air Development Center. Other deputy commanders under the new setup are:

- **Brig. Gen. Kurt M. Landon,** Deputy Commander for Resources.
- **Maj. Gen. Floyd B. Wood,** Deputy Commander for Research & Development.

Creation of General Boyd's new job follows realization by Lt. Gen. Thomas S. Power, ARDC Commander, that proper management control over weapon systems can be realized only by the consolidation of planning and policy-making functions at headquarters of the command.

The entire program is part of Gen. Powers' plans to meet the challenge of fast-moving Russian development with "big jumps." USAF itself lacks the facilities and talent to do the job and is determined to force industry to create more of both and use them at peak efficiency. Performance in this area now clearly is the basis for competition.

Seek New Concepts

Great stress is placed within ARDC on the reorganization in the office of the Deputy Commander for Research & Development, designed to put emphasis "on the development of new concepts and equipment which can be introduced into new air weapons."

Separation from this office of weapon systems, placing them under a separate command headed by Gen. Boyd, is an important step in this direction. It places ARDC control of systems at a command level near the top, apart from all the other R & D problems encountered in the day-to-day operation of Baltimore headquarters.

"One of the big problems," a top programming officer told AVIATION WEEK, "is the fact that deadlines have to be met during the growth of a weapon system, and the essential decisions were only part of the work that had to be done under the old Technical Operations Office. Now we have a setup that can give its entire attention to problems coming out of the Weapon System Project Office (WSPO)."

WSPO Action Speeded

Under Gen. Boyd, there now is a Directorate of Systems Management, headed by Brig. Gen. Howell M. Estes Jr., who also serves as Assistant Deputy Commander for Weapon Systems. Under him are the ARDC components of the WSPO. These include offices for equipment and handbooks and program control as well as divisions covering bombardment aircraft, fighter aircraft, bombardment missiles, supporting systems, cargo and trainer aircraft, fighter missiles and drones and rotary wing and liaison aircraft.

For the contractor, separation of these offices from the other vast interests of ARDC's Research and Development should result in faster action on the tremendous amount of paper work that accompanies early development of a new system.

A counterpart of the Systems Management Office under General Boyd is the Directorate of Systems Plans, headed by Col. Ernest N. Ljunggren. It is from this office that ARDC's secret System Requirements will be distributed to a few highly qualified contractors.

Must Show Capability

Qualification to know the System Requirements, Col. Ljunggren said, will depend on these factors:

- **The preliminary design capability** of the contractor. This will get major emphasis because the long range aim is to keep preliminary design groups in the industry busy and coming up with new ideas. Stimulated activity, it is hoped, will result in major breakthroughs that will contribute to "big jumps."
- **The interest shown** by the contractor in a particular field of development.
- **The new ideas** already produced or suggested by the contractor.
- **The contractor's existing facilities.** This does not mean that an aircraft company will be cut in on the requirements simply because he has a facility. He must meet other qualifications as well.

As in the case of firms allowed to share the secrets of ARDC's Technical Program Planning Documents, contractors who obtain release of the System Requirements will not get a contract to pursue any particular project. They must use their own money in exploration of the field in which ARDC considers them qualified.

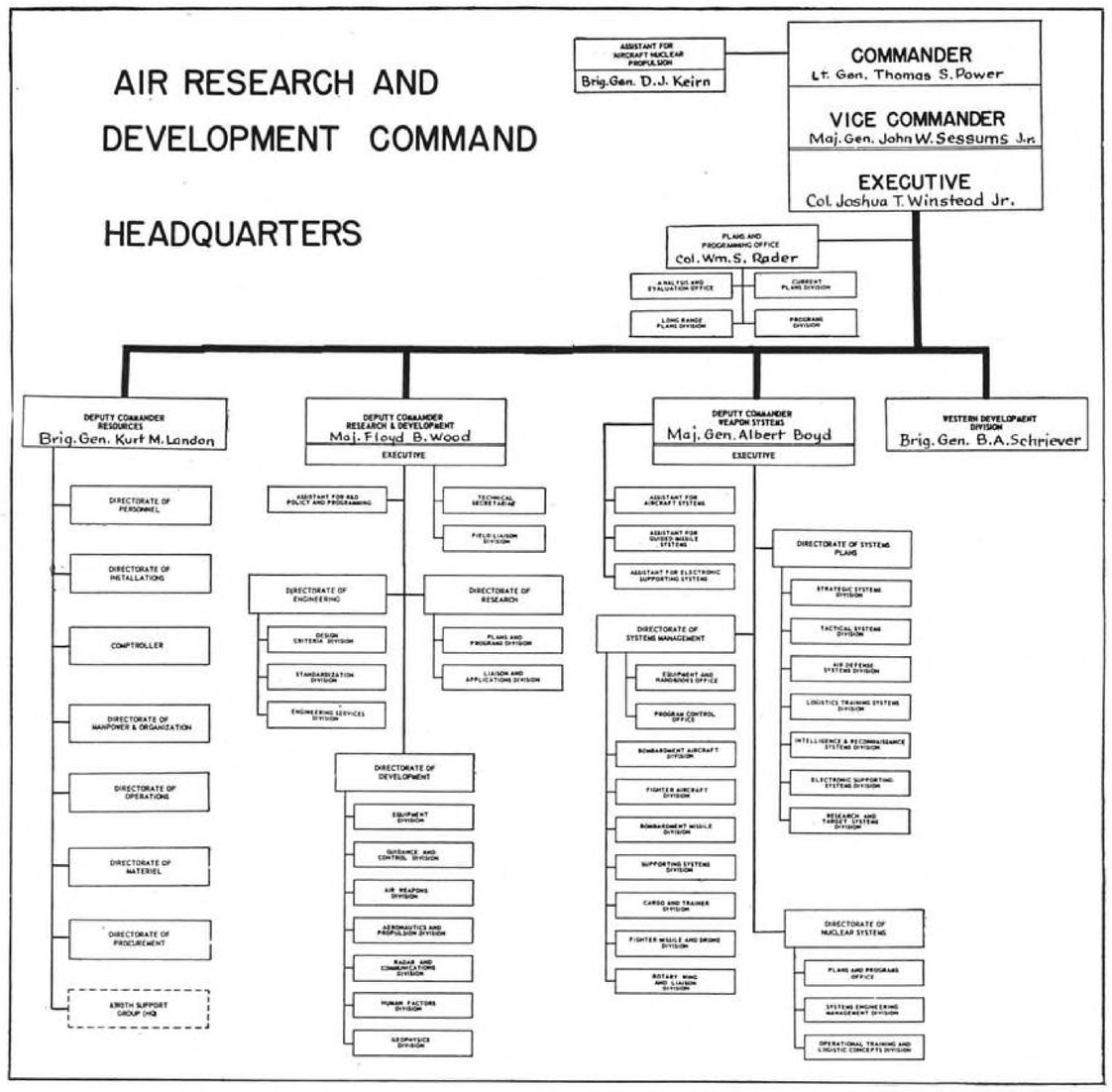
On the other hand, ARDC does expect that contractors will come up with proposals and they are encouraged to do so. From time to time the situation may arise where a void exists between the contractor's proposal and the ultimate weapon system as visualized by ARDC.

BOYD
Weapon Systems

WOOD
Research

ESTES
Systems Management

OSTRANDER
Guided Missiles



In this case, it is possible that design study funds can be spent to complete the development.

Contracts Possible

The general philosophy is that contracts may be used to fill gaps but are not expected to be necessary once industry development competition is in full swing. Sharing the secrets of the System Requirements is intended to assure that industry development work heads in the right direction, overcoming the complaint that USAF expects industry to spend money on these projects but makes programs nearly impossible by enforcing security in scientific areas.

Other facets of the program, as explained in Baltimore, are that it will provide a contractor with much of the technical information he formerly received from work on a design study and that development will be speeded because USAF will make more decisions before the industry effort is expanded.

Other New Offices

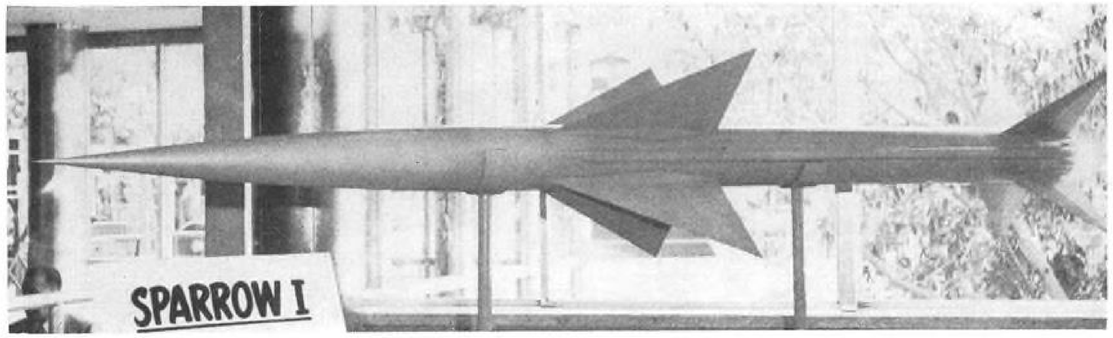
Also, in the offices under Gen. Boyd, separation of systems plans from systems management is expected to expedite work in both fields. One of the old chronic complaints was that WSPO personnel were hampered in the production of a new system by the almost continual introduction of new ideas, improvements and at times extraneous suggestions. It is intended that these matters will be handled by the Directorate of Systems Plans and not passed to the Directorate of Systems Management until they have met all tests for practicability and necessity.

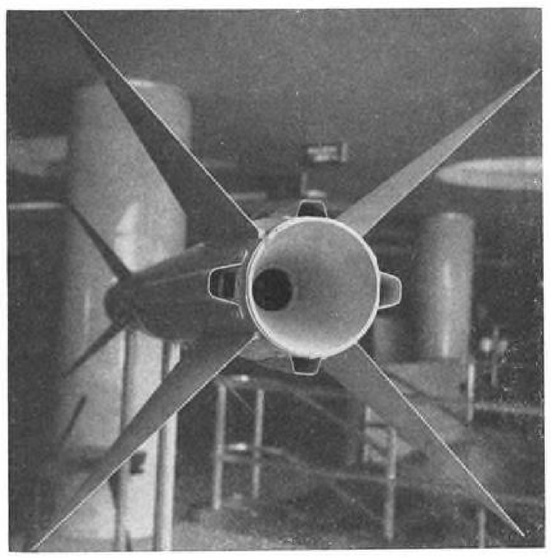
Third major office under Gen. Boyd is a new Directorate of Nuclear Systems, headed by Brig. Gen. Ralph Wassel, who is posted at WADC.

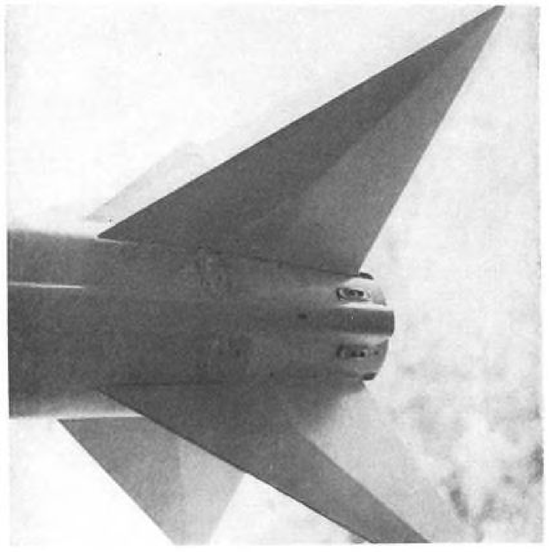
In addition, there are three other top management functions. They are an Assistant for Aircraft Systems, an Assistant for Guided Missile Systems and an Assistant for Electronic Control Systems. Col. Ljunggren temporarily is filling the first post and Brig. Gen. Don R. Ostrander has been named to the missile office. The electronic assistant has not been named.

These positions were created to plan and manage the entire USAF weapon systems program in a specific area. They are intended to provide necessary emphasis in the three areas to "attain a proper balance of superior weapons for all combat missions."

Navy Sparrow in First Detailed Pictures







Aerodynamic and structural layout of the Sperry Sparrow I is shown in these first detailed pictures of the Navy's latest air-to-air missile.

Wings and tail are delta planform, double-wedge airfoil sections. Sweep is greater for wings than for tail.

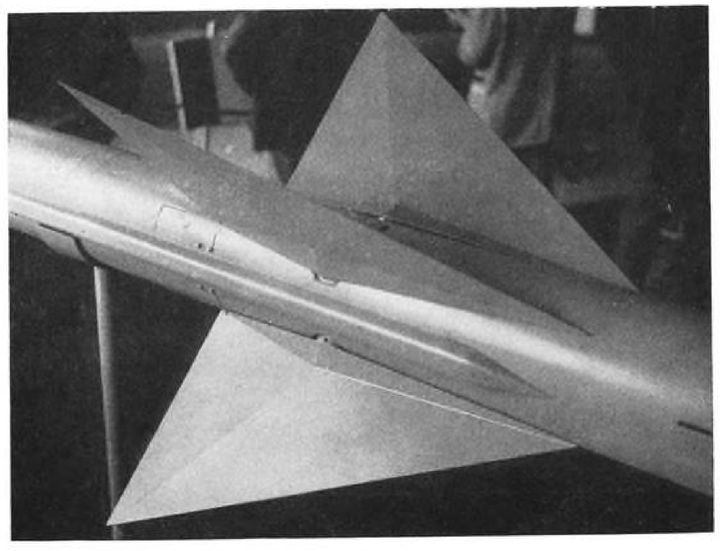
Wings are movable, tail fins fixed for high degree of maneuverability. Wings are pivoted at the root.

Tail fins fit in slots cut into the trailing edge of the cast exhaust cone.

Sparrow I has a solid-propellant rocket to drive it at speeds approaching Mach 3 at burnout. Range is about five miles.

Launched from underwing racks, Sparrow requires no booster. Guidance is beam-rider system, directed from the launching aircraft.

Current Sparrow I, designated AAM-N-2, is being built by Douglas Aircraft under Sperry subcontract. Advanced versions of Sparrow—models 2 and 3—are in development and test stages.



Josh Lee Protests Short-Haul Mail Rates

Final mail rates set for local service airlines by the Civil Aeronuatics Board have drawn a minority protest from CAB member Josh Lee.

The new rates establish the multi-element formula principle for the local airlines with standard pay for line hauls and terminal handling.

Lee says the new formula doesn't offer a reasonable price for air mail service. He favors establishment of a minimum station charge for low traffic points.

Under the new rate, which became effective Oct. 1, the local airlines will get a line-haul rate of 30.17 cents a ton-mile and a terminal rate ranging from 3.32 cents to 33.21 cents per pound according to the traffic generated at the station (AW Sept. 26, p. 107).

The new scale, similar to one now applied to the trunk carriers, will pay the local carriers about $883,000 a year. Separate rates are set for individual lines for the period July 1 to Sept. 30, 1955.

Lee filed a separate statement with the rate order in which he maintained that the multi-element rate formula doesn't pay carriers enough when applied to small volumes of mail at stations which don't produce an appreciable amount of traffic.

Lee favors a minimum terminal charge of $15 a day. In support of his argument, he quotes a study of terminal costs made by the CAB Office of Carrier Accounts and Statistics which found that the minimum station cost per day which can be assigned to mail service is $10. Lee would set the charge at $15 to cover such factors as general administrative costs and return on investment not covered by the study.

If the minimum station charge were applied, Lee would reduce the line haul rate to 29 cents a ton-mile. These alterations of the rate structure would pay the local carriers about $2,210,000 a year.

Airborne Surface Mail

Approximately 6% of the total first class surface mail volume is now moving by air, just two years after the Post Office Department inaugurated its experiment of airlifting surface mail on a space available basis, according to an official report.

Applauding the success of the experiment, Postmaster General Arthur Summerfield said that "nearly a billion letters a year are being delivered sooner, as much as 48 hours in many instances." The airlift operation has been expanded to provide direct service to 200 cities in 33 states.

UAC-Rensselaer Combine Talent; Evolve New Concept in Education

By Jerome E. Kelley

South Windsor, Conn.—An unusual experiment in engineering education is being conducted in this quiet Connecticut community at Rensselaer Polytechnic Institute's Hartford Graduate Center.

The center is a cooperative venture between United Aircraft Corp. in East Hartford, Conn., and Rensselaer Polytechnic Institute in Troy, N. Y. (AW June 13, p. 40).

Filled to capacity by 220 students, most of them engineers employed by UAC, the new center has broken several precedents in education.

It is a joint venture of educators and industrialists pioneering in the educational field in an effort to do something about the nation's shortage of scientific and engineering talent.

Behind the thriving new center was the fact that UAC had become increasingly disturbed at seeing its scientists and engineers leave its laboratories and assembly lines to seek graduate degrees in their chosen field at distant universities. With the problem a growing one, UAC moved to solve it.

Within six weeks, UAC and RPI, the nation's oldest engineering college, had set up a plan for graduate education in the greater Hartford area. This fall, five months from the time of the plan's inception, the center went into operation with a 23-member faculty.

UAC has furnished a 22,000-sq. ft. building in South Windsor as an outright gift to RPI. It is the former site of UAC's nuclear powerplant laboratory. The building, entirely renovated, contains 10 classrooms, two seminar rooms, a lecture hall, library, study room, cafeteria and 14 offices.

United's Program

All qualified employes of UAC will be admitted to the new center, and the company will underwrite the full cost of tuition. At the present time, all but two of the students are employes

Hinged Cowl Simplifies XHR2S-1 Engine Inspection

Easy accessibility to P&W R2800-50 engines on Sikorsky XHR2S-1 Marine helicopter is shown by this photo of engine cowl hinging downward, exposing most of the powerplant.

of UAC, but several other companies in the area have shown great interest in the program and may soon join the venture.

The cost of a full course towards a master's degree—two to two and a half years—will be approximately $2,000. Classes are scheduled for Monday, Tuesday, Wednesday and Thursday nights, but students are encouraged not to attend classes more than two nights a week or carry a workload of more than six credit hours per semester.

In the UAC program, whenever classes conflict with working hours the company gives time off with full pay to attend classes. At present, Master of Science degrees are given with majors in the following:

- **Aeronautical engineering.**
- **Mechanical engineering.**
- **Mathematics.**
- **Applied mechanics.**

Minors are offered in several subjects, including nuclear chemistry, physics, engineering law and management engineering. It is expected that the list will be expanded into major fields of study in the near future and that, as part of the expanding program, doctoral degrees will be instituted.

Solves Many Problems

The center is helping to cope with many joint problems that have beset—and are besetting— industry and educational institutions. Among them:

- **Improvement of the ratio** between graduate degrees and bachelor degrees—a problem that has been concerning educational institutions. Most educators feel that, once a man has an engineering degree, he is anxious to enter a profession immediately but, with today's rapidly advancing technology, an increased ratio of advanced degrees is desirable.
- **Engineers can continue work** on critical defense programs while advancing their education.
- **Local industries** will be able to avail themselves of more research talent, since faculty members will be able to do independent research and serve as industrial consultants.
- **The center will provide** a healthy intellectual atmosphere in areas where it has been lacking.

Entrance Requirements

Entrance requirements for the Hartford Graduate Center are exactly the same as at the Rensselaer Polytechnic Institute campus in Troy. A recent graduate with a bachelor's degree is admitted on the strength of a transcript of his marks and recommendation of at least three of his former professors. Prospective students who have been out of college longer are given the Graduate Record Examination.

According to Dr. Clayton O. Dohren-

wend, director of RPI's graduate division and one of the Hartford Graduate Center's originators, results of the tests on NAC personnel were amazing. He said:

"People taking the tests had been out of school for as long as 30 years and yet the results of the tests amazed us. They were far better than the national average."

H. M. Horner, president of UAC, had this to say about the new center:

"This program should not be confused with the usual company on-the-job training program. Modern technology is moving so rapidly, particularly in the multitude of sciences supporting aviation, that we must offer our working engineers an opportunity to broaden their background in the basic sciences. The new Hartford school will provide successful candidates with an advanced Master's or Ph.D. degree equivalent to any that can be earned at the very finest university graduate schools. If the working engineer at Hartford goes away to graduate school, we lose him for at least one to three years. We decided that it was best to bring a graduate center here to meet this continuing problem."

Dr. Warren C. Stoker, former head of the computer laboratory at RPI, is the director of the new graduate center. He told AVIATION WEEK:

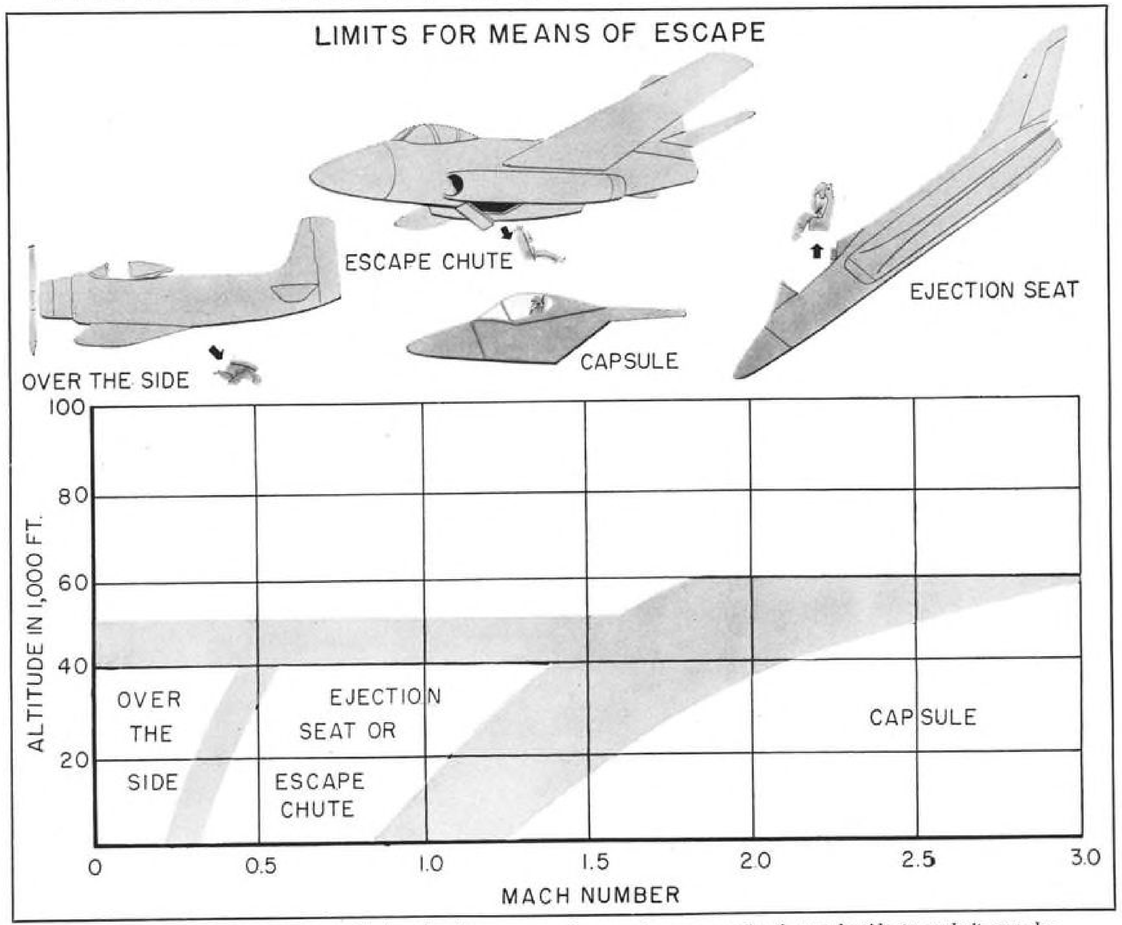
"The reception of this new venture has been amazing. We have met with much enthusiasm in Hartford, and the cooperation and interest shown us by United Aircraft has been magnificent. We of the faculty fully realize that this is a new venture in technological education, but we sincerely believe that as time goes on many more forward-looking American corporations and universities will institute similar cooperative educational programs."

KLM-Air Ceylon Agree

KLM Royal Dutch Airlines will own 49% of Air Ceylon and the latter's present agreement with Australian National Airways will end under a new arrangement expected to be concluded early next month in Amsterdam. Air Ceylon expects to charter a Constellation from KLM to establish Colombo-Amsterdam service and after its establishment, plans to buy new equipment.

Viscount Prices Rise

Central African Airways announced that Vickers Viscount price increases have raised the cost of its five transports on order by approximately $160,000. Spares, the company said, would cost $45,000 above original estimates. The carrier also said it has experienced a six-month delay in delivery.



DOUGLAS AIRCRAFT CO. chart showing limits of various means of escape from conventional over-the-side to cockpit capsules.

Pilots Demand Better Chance of Escape

By Irving Stone

Los Angeles—Test pilots, their pleas backed by experience, have bluntly warned industry engineers to provide them with escape equipment able to keep pace with the requirements of today's (and tomorrow's) supersonic aircraft.

"We know," one pilot warned during an escape symposium here, "that attempted escape above 35,000-40,000 ft. would probably prove fatal. We know that escapes at speeds that are in excess of 500 knots would probably prove fatal."

The pilot, A. Scott Crossfield, test pilot at the National Advisory Committee for Aeronautics test facility at Edwards AFB, told the 500 scientists, aeromedical researchers, industry engineers and military personnel at the symposium that the period between the development and production of new types of escape equipment must be drastically shortened.

"Expert talk," he said, "pride of authorship and standardization are the bottlenecks in the flow of this equipment to pilots."

Pilots are concerned with wind blast, free-fall spinning, premature chute opening and escape during violent maneuvers, Crossfield said.

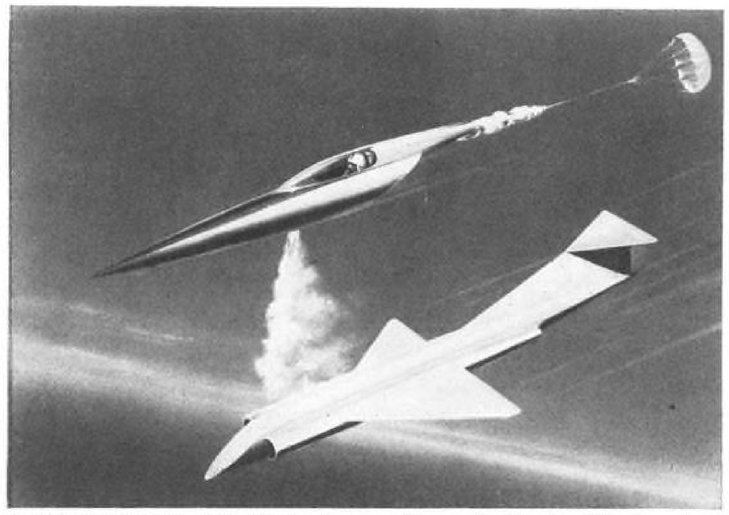
"We know that there are the means and in fact the hardware in existence to protect against loss of equipment and wind blast, but it is not available for us.

"We know that there are means with existing equipment to stabilize the free-fall spinning tendency but it is not being provided us."

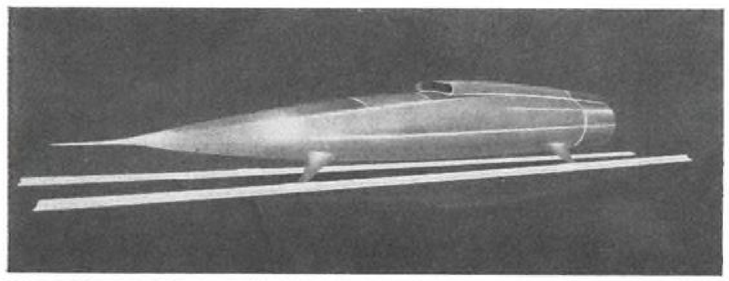
The meeting was sponsored by the Institute of Transportation and Traffic Engineering and Engineering Extension, University of California at Los Angeles, in cooperation with the Aeromedical-Engineering Assn. and the In-

Human Tolerance

"The century series of aircraft now in operational use can in level flight easily put our ejected pilot into the danger zone for human tolerance. If we plot the speed capabilities of this series . . . we can predict that an appreciable number of our estimated ejection attempts will be unsuccessful in terms of recovering a usable crew member"—Brig. Gen. Don D. Flickinger, of the Air Research and Development Command.



ESCAPE CAPSULE for high-altitude planes as foreseen by Douglas Aircraft engineers.



SEAT-EJECTION sled presumably designed to check ejection scheme for Republic F-103.

stitute of the Aeronautical Sciences.

There, a research spokesman told AVIATION WEEK:

"There is a need for getting experimental escape hardware out of the laboratory stage quickly and into the applied stage in aircraft. Closer liaison between aero-medical researchers and designers will result in quicker transition of test results into actual hardware."

Herman Salmon, Lockheed's chief test pilot, added: "We now use subsonic equipment for supersonic flight. Subsonic equipment is not adequate."

Progress Report

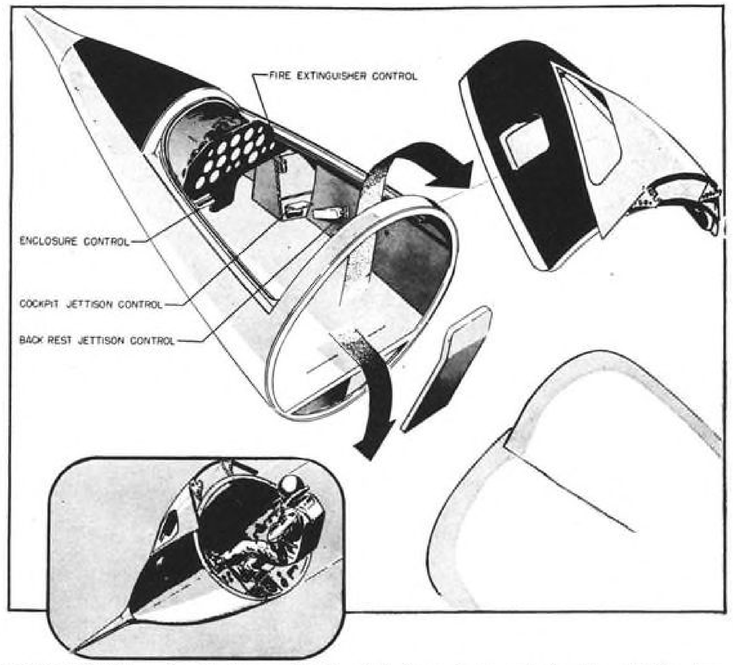
In the face of this criticism, Air Force and Navy spokesmen reported on the progress of development of escape capsules.

A. B. Nutt, chief of escape development section, Wright Air Development Center, said most of the WADC effort has been applied to two programs. One involved development by the prime aircraft contractor of a capsule for a current weapon system. This capsule ejects downward with the crewman in the seated position. Capsule is pressurized during the descent after escape and is stabilized by fins which deploy on two booms immediately after initiation of the one-motion escape sequence. A delayed-deployment drag chute draws out the main recovery chute when speed has been sufficiently slowed.

Early full-scale subsonic drop tests indicate satisfactory performance of the stabilizing fins, and so do supersonic model tests. Supersonic track tests are scheduled for early 1956. Weight penalty for the capsule will be about 1,000 lbs.

Another capsule program, conducted by WADC's Aircraft Laboratory under contract, features a unit which will introduce a weight penalty of only 150 lbs. This is achieved by using the aircraft canopy and windshield as the upper part of the capsule. The seat, designed to transfer the pilot from the seated to the prone feet-forward position becomes the bottom of the capsule. Thrust is achieved through use of a rocket unit below the capsule. Stabilization is by an aft boom with trimmers.

Wind tunnel tests have indicated that satisfactory performance of the stabilizing device may be expected. Subsonic half-scale flight tests are scheduled this fall. Full-scale supersonic track tests are programmed for the summer of 1956. A full-scale mockup has



D-558 ESCAPE unit. At lower altitude pilot drops back rest (inset) and falls free.

proved the feasibility of the collapsible seat.

Paul D. Dugan, head of the Navy's Bureau of Aeronautics cockpit systems unit, reported that the Navy is continuing investigation and development of capsule type escape. No immediate plans have been made for incorporation of seat capsules. However, based on a recent directive, he said, all designs of future Navy aircraft which are capable of Mach 1 sealevel performance (which would be accompanied by dynamic pressures of 1,500 lb per sq. ft or more) are to have a design study made to determine whether cockpit capsule type escape can be incorporated without undue penalty to the airplane.

Ejection Seat Limits

Recapping the escape picture as he sees it, Dugan said that ejection seat use is limited to conditions approximating those at Mach 1 at sea level and corresponding speeds at higher altitudes.

"We may be able to extend those limits somewhat by development of means of slowing down the aircraft prior to ejection by incorporation of stabilizing means and by addition of weight to the seat . . ."

Various capsule escape systems were briefly mentioned by Douglas El Segundo Division's A. M. Mayo, chief of the equipment and interiors engineering section. These included a jettisonable nose unit and ejection seat capsule, an ejectable cockpit capsule and a unit comprising the forward fuselage section of a high speed altitude aircraft design.

Mayo said that operational conditions are being approached that are clearly beyond the capabilities of the ejection seat. The cockpit capsule, he pointed out, offers greater flexibility with respect to streamlining and the amount of useful equipment capable of being included in the escape section. He added that the overall weight penalty of the cockpit capsule system may be less than that of an ejection seat system, with satisfactory drag-weight characteristics, for sealevel speeds that in some cases may approach values as low as Mach 1. The additional environmental and water survival capabilities inherent in the cockpit capsule could well swing the pendulum in its favor in some borderline cases.

USAF's Lt. Col. John P. Stapp, pioneer in aviation biophysics, told the meeting: "Between 500-600 knots the ability of the present ejection seat to save the pilot begins to fall away."

He reported that a number of production fighter and bomber aircraft have already been equipped with subsonic type ejection seats which are inadequate above Mach 1, even though these planes are capable of considerably higher performance.

It is essential, he said, to extend the useful range of the existing seat by retrofit or replacement so that escape under maximum performance conditions can be made from these fighters and bombers.

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

Now that the Air Force is eliminating design studies in favor of Phase I contracts so far as aircraft are concerned, why can't the major companies apply a similar program to the supplier field?

It's worth serious consideration, for doing away with design studies in the procurement of aircraft valves, for instance, would accomplish the same goals attributed to the plan in the field of airframe procurement: save money, conserve engineering manpower, compress development time and improve the chances of obtaining a good product.

Aviation Week described the new approach as "seeing the colt, not placing the bet from the racing form." I'll carry it a step farther and say it would be seeing the colt rather than placing the bet from a single racing form selected from a group of varied forms, with those that remain rendered useless and representing pure waste in time and money.

As it is now, perhaps fifteen suppliers are asked to design for a given job. They compete helter-skelter in the hope of winning a contract. Yet they know – and the majors know, too – that only one company, possibly two, will get a production order. The rest will have devoted fruitless skill and energy to the project.

If the Air Force can pick a major company to do a job on the basis of past performance, know-how, availability of engineering effort and current work load, then there's no reason why that company itself can't select its suppliers on that same basis.

Why shouldn't the suppliers as well as the prime plants be relieved of the constant but frequently futile pressure of designing on speculation, so to speak? Why not select suppliers, too, on the basis of their past successes in the type of work required?

It would prevent spreading design talent to perilous thinness at a time when engineer availability is a critical problem. And without a doubt it would result in better products and speedier delivery – basic reasons for hand-picked Phase I contract awards.

It would also seem to go without saying that in selecting a company with a reputation for performance, an airframe manufacturer would thereby eliminate all possibility of picking itself a major headache in the form of a firm that can't produce when the chips are down or a concern that can't service its product in the field – despite the finest promises.

Certainly development contracts, rather than general design competitions, would shorten the procurement cycle in equipment and accessories just as they do in aircraft. As in the building of fighters, bombers and transports, supplier specialization invariably limits the field so far as success is concerned. It is absurd to waste precious time – as well as money and manpower – when Russia's red star is rapidly drawing abreast of us.

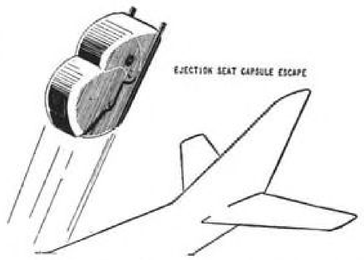
This is not to say there should be no competition. No one doubts the value of pressure in the struggle to out-do a worthy rival. As a matter of fact, the competition, although narrowed in field, would be considerably rougher.

Surely it makes sense to assign the development of special products to firms with specialist skills. Not only would it prevent the immeasurable waste of engineering manhours on projects that aren't particularly desired – but which must be sought to maintain economic levels – it would channel such projects to other concerns and spread the business equitably on a direct premise of efficiency.

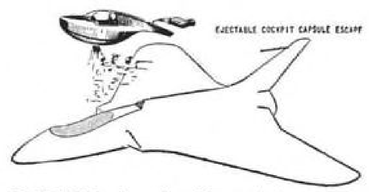
Past performance in place of paper proposals can as well be the measuring stick in development awards to the supply industry as it will be the gauge in airframe production. "Multiple sourcing" is as inefficient in one field as it is in the other, but you'll find the veteran supply houses themselves have long been placing important contracts only with vendors of proved capability.

If the prime plants don't extend the Air Force plan to the suppliers, it could be the whole program will lose a good part of the efficiency it's now expected to achieve.

It's something to think about.



GOODYEAR unit. Chute drops capsule.



PROPOSAL for ejectable cockpit capsule.

"Equipment we have should be evaluated on a very long range basis—we can't reproduce another species of man," he said. First objective in supersonic escape research should be to determine limits of human tolerance and the margin of survivability beyond this point through animal experimentation, Stapp claimed.

Human Level

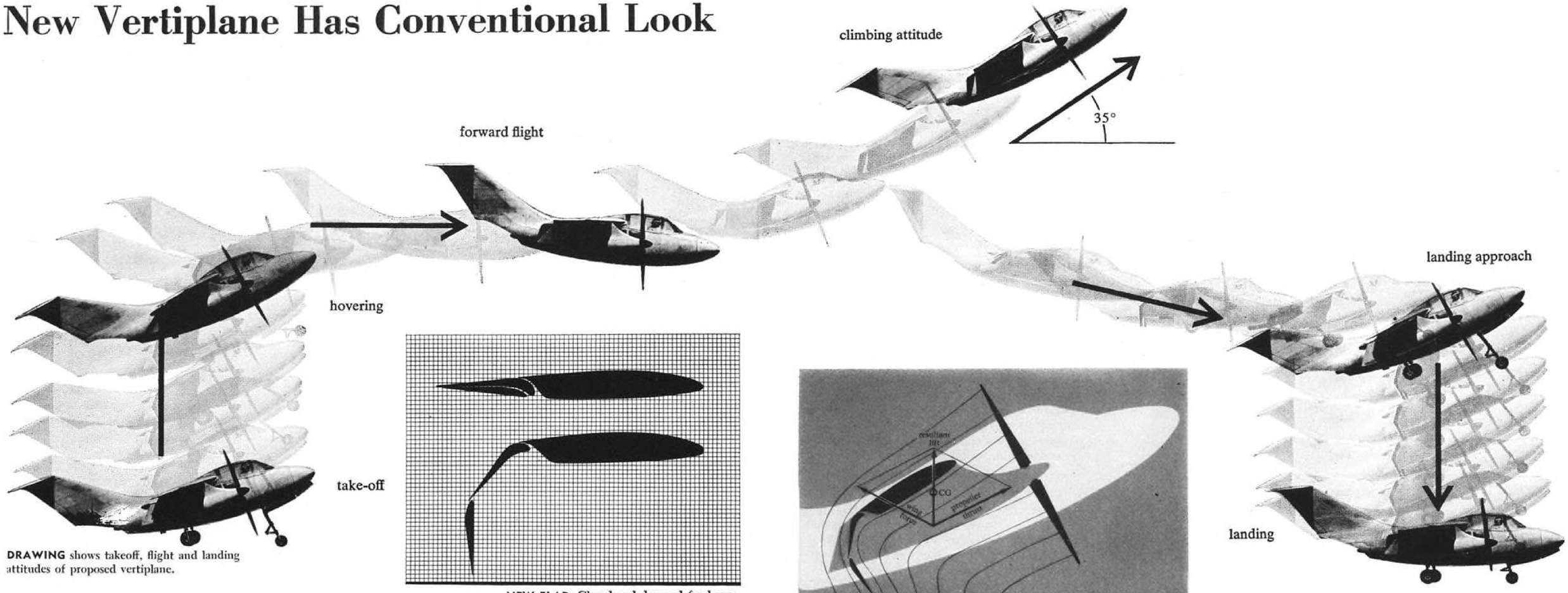
Second line of attack, he said, consists of devising equipment with controlled performance under all expected conditions of escape to modify and confine the force to tolerable human levels. An essential specific problem, he added, is the full scale determination of lift and drag of the man-seat combination at all angles of presentation by means of wind tunnel experiments up to Mach 2 at sea level.

A man should be used in the tunnel tests up to Mach 1.1, after which a plaster duplicate could be used up to Mach 2, he said.

A re-examination of human tolerance in both upward and downward ejections, using additional pilot support (restraint) is long overdue, Stapp said. He reported that there have been two upward ejections at about 500 fps. at 33G without injuries. One approach for solving the problem of wind drag deceleration is to oppose wind ram force during ejection by a counter force using a propulsion means, he said.

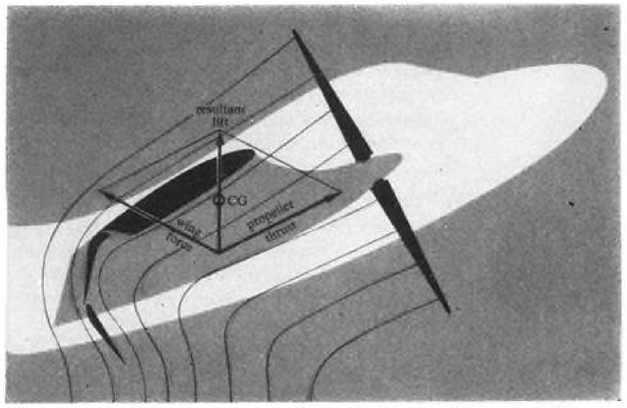
Northrop Aircraft's George Nichols told the meeting that the escape problem must be solved soon or further loss faced in the efficiency of the weapon system. An interesting experiment in design of a new aircraft would be to bring in optimum escape factors and then compromise other conditions around these, he said.

New Vertiplane Has Conventional Look



DRAWING shows takeoff, flight and landing attitudes of proposed vertiplane.

NEW FLAP: Closed and drooped for hover.



SCHEMATIC of slipstream over wing and flap creating vertical lift.

Double Flaps Give Weber Model Vertical Takeoff Ability

By William J. Coughlin

Burbank, Calif.—Weber Aircraft Corp. is flight-testing a powered model of a new vertical rising aircraft, conventional in appearance but capable of taking off and landing with zero forward speed.

The firm hopes to interest the military services in design and construction of a low-cost research airplane for full-scale flight testing. Preliminary evaluation by Wright Air Development Center has indicated that both the concept and proposal are "feasible."

Designer of the new aircraft is Joseph L. Velazquez, former project engineer on Piasecki H-16 helicopters and now chief engineer of airplane projects at Weber.

Weber's design was evolved from basic research done by the National Advisory Committee of Aeronautics, Charles H. Zimmerman, Louis Breguet and others.

The Weber aircraft is a conventional fixed-wing aircraft with turboprop engines. To achieve its vertically rising and hovering capabilities, the design employs extended double flaps to deflect the propeller airstream from horizontal to vertical.

Aerodynamic Theory

"The aerodynamic theory is not new but recent developments make this type of aircraft possible," Velazquez points out. These developments include aircraft turbine engines and controls. But the key to the Weber design is found in NACA Technical Note 3198 which indicates that all that is required to produce vertical lift without a horizontal component is to impart a sufficient downward acceleration to a sufficient mass of air.

Helicopters achieve this by imparting a relatively low velocity to a large mass of air. Designs such as the Convair and Lockheed vertical rising fighters accomplish it by imparting a relatively high velocity to a smaller mass of air.

Velazquez points out that it is not necessary for the thrust line of the propeller rotor to be in a vertical direction to produce the downward acceleration of air. He contends that the same result can be obtained by redirecting the slipstream by means of a wing and flaps.

Although the wing, engines and propellers remain in a conventional attitude, the flap arrangement will produce a purely vertical force on the aircraft, according to the Weber designer.

He cites recent NACA wind tunnel tests which show that it is possible to obtain a change in direction of the propeler thrust by as much as 72-deg. with only 10% loss of magnitude.

One difficulty in the past has been that the large degree of flap required for such an effect produces an uncontrollable nose-down pitching moment. Horizontal tail surfaces, ineffective at zero speed, cannot trim this out.

The answer to the pitching moment problem is the heart of the Weber design. The solution offered is placement of the propeller thrust line below the aerodynamic center of the wing. This downward displacement of the thrust line combines with wing lift, drag and pitching moment to act through the aircraft's center of gravity.

"Pitching equilibrium then results about the airplane's center of gravity," Velazquez says. "Under such conditions, the nose-down pitching moment resulting from extension of the flaps is balanced by the nose-up pitching moment introduced by the propeller thrust."

To reduce cost of the initial airplane, the company proposes that an Ercoupe two-place airframe be converted into a one-place research aircraft to test the theory involved. After early flight testing in a stripped-down configuration, which would not have canopy, fairings or retractable gear, the aircraft would be completed prior to its final flight testing.

The WV-1 would have a 30-ft. wingspan, 20-ft. 6-in. length and a design hovering weight of 2,200 lb. with a useful load of 600 lb. It would be powered by a Continental T51 turboprop engine, the U. S. version of the Turbomeca Artouste II, rated at 425-hp.

Velazquez says the WV-1 flight test program would seek solutions to these problems:

- **Amount of buffeting during transition** due to stalled portions of the wing not immersed in the propeller slipstream.
- **Trim changes due to ground effect.**
- **Possible dynamic instability** in hovering or transition.
- **Possible propeller vibration** during transition due to high angle of attack.
- **Effect of ground cushioning.**
- **Deviations from NACA test data.**

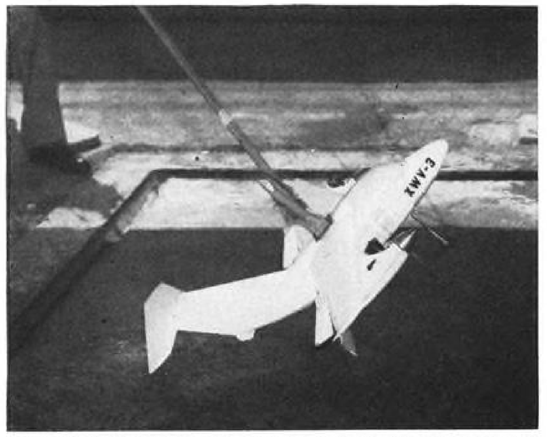
NACA Wind Tunnel Tests

Studies leading to this design were largely theoretical until last year when NACA conducted wind tunnel tests on the principles involved. These tests support Velazquez in his design theories.

"It is only since these test results were made available that it has become possible to design a hovering airplane with accurately predictable hovering performance, including power required and hovering attitude," says the Weber designer. It was after this information was made public that the WV-1 evolved from a variable-incidence wing design

DESIGNER VELAZQUEZ at control chair . . .

Puts his vertiplane model through paces. Note extended flaps for hovering.



WEBER VERTIPLANE model hovers just off ground in nose-up attitude with flaps fully extended.

Then, at Velazquez's command, the model climbs for enough altitude to revert to normal flight attitude.

conceived earlier by Velazquez.

WV-1 is designed for takeoff, hovering and landing in a 25-deg. nose-up attitude. "It appears that the best design compromise is . . . where the hovering attitude nose-up angle is in the same order of magnitude as for present day sweptback or delta-wing fighter aircraft," says the designer.

Flight testing of a gasoline-powered one-tenth scale model now is under way at the company's Burbank plant. The test rig employs an operator's seat with a free-swinging helicopter-type arm extending out to the model, which is free to move in a circular path or to rise and descend vertically.

The twin-engine wooden model employs double flaps as its only movable control surfaces. Angle of attack is controlled by movements of the rotor arm and engine power is adjusted by a throttle on the operator's chair.

"The model is proving out our theory," Velazquez reports.

Transition to Horizontal

Horizontal flight characteristics of the WV-1 are expected to be those obtained with the conventional elevator, aileron and rudder control surfaces which it employs. Vertical takeoff and transition to horizontal flight would be accomplished in this manner: Nose gear would be extended to bring the aircraft from its level ground attitude to takeoff angle of about 25-deg. Increase in power and blade angle of the constant-speed propellers would lift the aircraft into hovering flight.

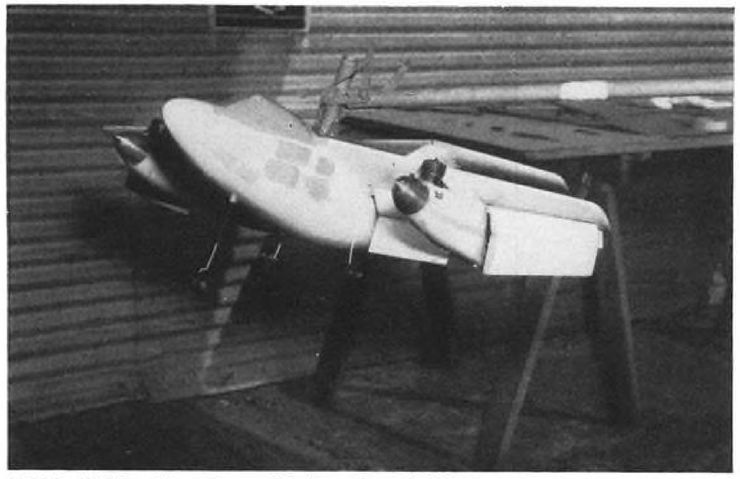
The nose would be lowered to cruising or climb attitude for forward flight as flaps retracted into their position as trailing edges of the straight wing.

Landing procedure would be somewhat similar to a partial-power carrier landing. Flaps would extend gradually as power was added, nose lifted and speed reduced. After a nose-high, zero-speed hovering condition was achieved, descent would be made by a slight decrease in power.

In the zero-speed hovering condition, roll would be controlled by engine differential, either through power changes or change in blade angle; yaw by differential use of flaps, and pitch by simultaneous flap changes. Conventional stick and rudder movements would be employed for all these in an admittedly complex control system.

Air Support Vehicle

Charles L. Buckley, vice president of Weber, believes the Weber VRA (vertical rising aircraft) would be excellent



FRONT VIEW of hovering model shows how double flaps fit around engine nacelle.

for logistic and tactical air support, combining the range, speed and reliability of a conventional aircraft with the vertical characteristics of a helicopter.

Although Weber studies indicate that such an aircraft would have payloads below those of a comparable helicopter, the rate of cargo delivery could be much higher due to cruising speeds greater than those of the helicopter. When operating where runways were available, its payload could be greatly increased by conventional horizontal takeoffs.

The ability to make either horizontal or vertical takeoffs would be a great advantage over a tail-sitting vertical takeoff aircraft, Buckley notes.

On longer missions, the Weber VRA could make a heavily loaded horizontal takeoff and then land vertically in a combat area after using up fuel weight en route.

The WV-4 cargo version would have a top speed of 452 knots, cruise at 301 knots and have an effective range of 1,820 nautical miles at full payload, according to Weber calculations. Conventional takeoff might permit gross weight to climb from 45,000 to 70,000 lb.

Buckley believes the cost of any of the WV series should not be more than that of a helicopter of the same gross weight.

Weber's Work

Weber Aircraft Corp., with a plant area of 211,722 sq. ft., presently designs and manufactures aircraft interior equipment as well as doing subcontract work on major airframe components. Weber ejection seats are used on the Boeing B-47 and B-52, Convair F-102, McDonnell F-101 and Cessna T-37.

During World War II, the firm's facilities were used for fabrication and final assembly of more than 40 P-38 aircraft and over 400 Lockheed Lodestars.

A separate engineering division was set up at Weber two years ago for research and development in rotary-wing aircraft. It was at this time that Velazquez joined the firm.

The helicopter projects since have been shelved to concentrate on his VRA design.

Velazquez, after receiving a Master of Science degree in aeronautical engineering from the California Institute of Technology, was employed as structures engineer at the Douglas Aircraft Co. from 1939-1944, served with the Navy Bureau of Aeronautics between 1944-1946, worked as structures engineer at North American Aviation, 1946-1948, and joined Piasecki in 1948. He came to Weber as chief engineer, airplane projects, in May of last year.

Prefab Heliports

Manufacture of all-steel prefabricated heliports has been announced by Dravo Corp., Pittsburgh.

The heliports consist of structurally supported sections of open steel grating which serve as landing and takeoff pads for the helicopter. The open grating provides proper drainage and carries away excess air churned by the rotor.

For water-based use, the heliport's flight deck is constructed of 10x40-ft. sections with automatic stabilizing provided by pivotally-mounted floats which cushion the impact of landings and takeoffs.

The floating platform may be anchored in as little as 2½ feet of water.

The prefab heliport design was developed by Standard Heliports, Inc., Minneapolis, under whose license Dravo will operate.

USAF Contracts

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

ROBINS AIR FORCE BASE, Macon, Ga.

Glenn L. Martin Co., Baltimore, Md., repair and modification of TM-61 series missiles (PR-584[illegible]), $386,784.

Western Electric Co., 120 Broadway, New York, N. Y., printing and distribution of technical orders, (PR-548492), $60,000.

Ideal Electric & Mfg. Co., Mansfield, Ohio, motor generator sets, type MC-1, 47 ea., (RFP-1246), $842,016.

WRIGHT-PATTERSON AIR FORCE BASE, Ohio.

General Mills, Inc. (Mechanical Division), 1620 Central Ave., Minneapolis, Minn., overhaul, repair and modernization of MA-4 optical group assy., (PR 584464), $531,087.

Sperry Gyroscope Co., Great Neck, Long Island, N. Y., essential repair and/or modification of A-1A bombing navig. computor, systems, assemblies, sub-assemblies, and/or components, (PR 584536), $554,278.

AC Spark Plug Division, 1300 N. Dort Highway, Flint, Mich., modification, repair and overhaul of A-1A bombing navig. computors, (PR 584538), $1,844,136.

National Cash Register Co., South Main and "K" Sts., Dayton, Ohio, modification, repair and overhaul of A-1A bombing navig. computors, (PR 584532), $1,620,000.

Stewart-Warner Electronics Div., 1300 North Kostner Ave., Chicago, Ill., receiver-transmitter BC-788E/SCR-718E, 81 ea., receiver-transmitter BC-788E/SCR-718E, 31 ea., indicator I-152E/SCR-718E, 96 ea., (PR's PE-158413 and GE-557769), $107,918.

David Bogen Co., Inc., 29 Ninth Ave., New York, N. Y., public address set AN/AIC-11(XA-2), 2 ea., engineering data, handbook of operating & maint. instruction, (PR 158667), $157,837.

Navy Contracts

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

AVIATION SUPPLY OFFICE, Philadelphia.

Walter Kidde & Co., Inc., 675 Main St., Belleville 9, N. J., cartridges, (383/2110-1663/51-1441/52-1450/50), 13,208 ea., $40,-813.

North American Aviation, Inc., Columbus Division, 4300 E. Fifth Ave., Columbus, Ohio, ground handling equipment for AJ and FJ aircraft, (383/2110-1402/52), various, $46,751.

Sperry Gyroscope Co., Great Neck, L. I., N. Y., klystron signal source and directional coupler, (PREN 11-3935-55/aero), various, $26,780.

Goodyear Tire & Rubber Co., Inc., 1144 East Market Street, Akron, Ohio, wheel assys., (383/2110-1376/52), 420 ea., $76,810; brake assys., (383/2110-1483/50, 105/54), 195 ea., $48,516.

Pesco Products Div., Borg-Warner Corp., 24700 North Miles Rd., Bedford, Ohio, fuel pumps, (383/2116-24/54), 348 ea., $48,310.

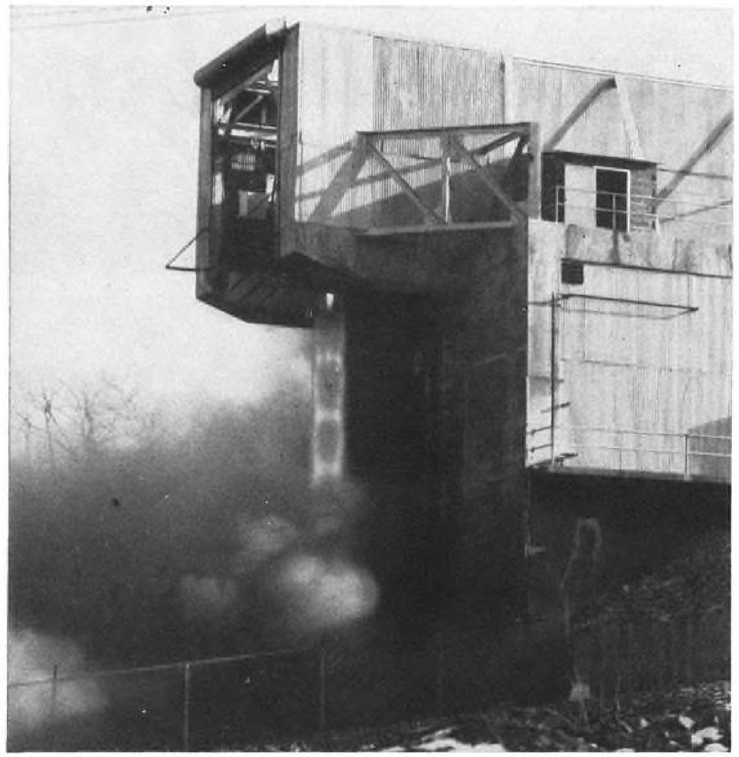
Scintilla Div., Bendix Aviation Corp., Sidney, N. Y., connectors, (383/2140-1866/52), various, $36,455.

General Tire and Rubber Co., 1708 Englewood Avenue, Akron 9, Ohio, wheel assys., (383/2110-1333/52, 72/54), 1,106 ea., $41,364.

Airborne Accessories Corp., 1414 Chestnut Ave., Hillside, N. J., actuators, (383/2110-1479/50, 95/54), 42 ea., $30,906.

Bendix Products Div., Bendix Aviation Corp., 410 Bendix Drive, South Bend, Ind., maintenance parts for overhaul of Bendix pumps, (383/2117-182/50), various, $782,272; brake, wheel assys, and maintenance parts for various aircraft, (383/29043-74X1/56), various, $41,237.

Zak-Lac Paint & Lacquer Corp., 250 Simpson St., N. W., Atlanta, Ga., enamel, (IFB-383-775-55), 22,905 gal., $29,729.



ROCKET MOTORS for Viking are checked in big stand overlooking RMI test area.

Navy & Reaction Motors Open $4-Million Rocket Engine Facility

By Henry Lefer

Denville, N. J.—The U. S. Navy and the nation's oldest rocket engine company formally opened a $4-million rocket engine development and production facility earlier this month here in the rolling hills of northern New Jersey.

Built under the auspices of Reaction Motors, Inc., and the Navy, the plant consolidates within its 200,000 sq. ft. of working area RMI's administrative offices, research, engineering and manufacturing operations, that previously had been divided between Rockaway and Lake Denmark, N. J.

The company is retaining the lease on its Rockaway plant, however, for use in special projects. In addition, new administrative, test and instrumentation facilities have been constructed at a Lake Denmark test site, seven miles from the Denville headquarters and—it is hoped—far enough away from residential areas to reduce complaints about the shattering noise produced by rocket engine firing.

The Denville plant consists of three buildings—administration, engineering and research and experimental—on a 50-acre site. It was laid out with a view of achieving the most efficient communication between related departments and with an eye towards future expansion.

The administration building is located on RMI property and belongs to the company. The remainder of the new facility is on Navy-owned land and is operated by RMI under a Navy facilities contract as part of the Naval Industrial Reserve.

The 66,000-sq.-ft. engineering and research building contains laboratories, design department, project and planning offices, a library and records section. One wing is devoted to chemical and physical research. There are nine chemical laboratories, controlled humidity areas and much special equipment necessary for rocket research. The building also includes a large physics lab, a hydraulic lab and an metallurgy lab.

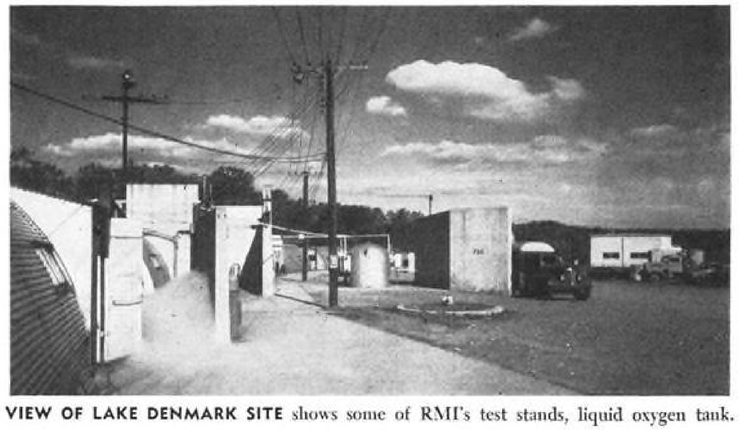
The 67,000-sq.-ft. experimental shop building contains production, fabrication, component test and inspection departments.

In pushing rocket development to new frontiers, Reaction Motors is working with new propellants being developed by its parent company, Olin Mathieson Chemical Corp. RMI, together with Olin Mathieson and Marquardt Aircraft Co. (in which Olin Mathieson has an interest), recently formed the OMAR group for cooperative research in propulsion and associated problems. (AW Aug. 22, p. 50).

The company has not been tapped for the International Geophysical Year space satellite program, according to Raymond W. Young, RMI president, but expects to be asked to bid on the powerplants for the second or later propulsion stages when the prime contractor's designs become further advanced. General Electric has the task of developing the engine for the first stage.

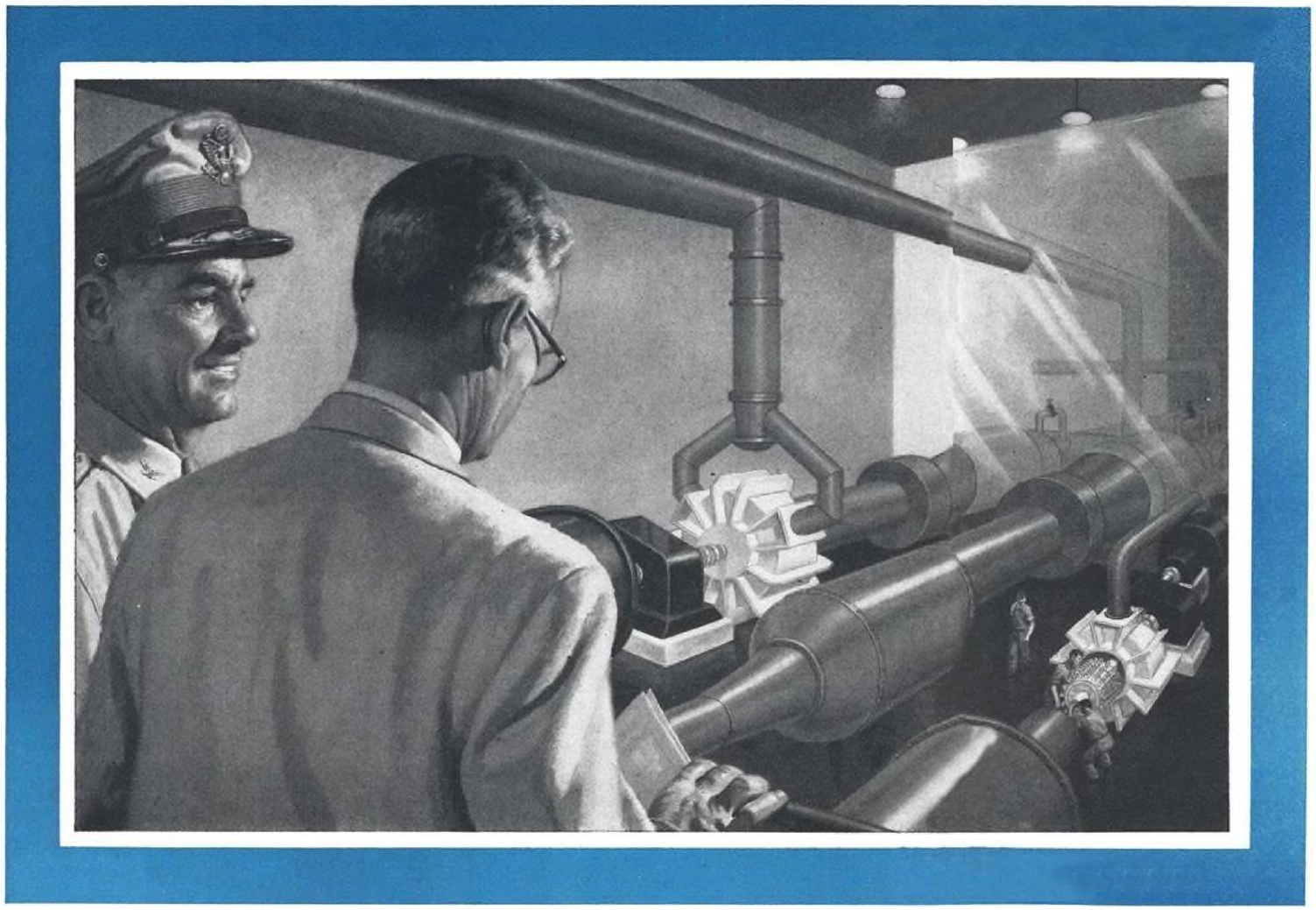
The main emphasis at RMI is on liquid propellant rockets, such as the 6,000-lb.-thrust unit that powered the Bell X-1 and Douglas Skyrocket research aircraft and the 20,000-lb. motor that blasted the Martin Viking to an altitude record of 158 miles in 1954. Other developments include the ROR (rocket-on-rotor) units installed on helicopter rotor tips for auxiliary thrust (AW Sept. 27, 1954, p. 17).

These motors weigh 1 lb. each and produce 32 lb. of thrust. In the Lake



VIEW OF LAKE DENMARK SITE shows some of RMI's test stands, liquid oxygen tank.

Advanced turbine research laboratory



Power is basic to America's future in the air. Whether for small executive aircraft, short or long haul jet transports, fighters, trainers, missiles or other air weapons for free world defense . . . development of new powerplants sets the pace for progress.

Fairchild has taken the lead in the development of the small turbo-jet engine. An entirely new jet engine family has been created in its J44 . . . a package of power delivering higher thrust per pound weight.

Late this year, Fairchild Engine Division's new Turbine Research Lab will be completed and ready for action, armed with the newest engineering and manufacturing facilities and ready to serve America's best interests.

From its small beginning at Farmingdale, L. I. in 1928, Fairchild Engine Division's record has been one of constant growth and progress. This new facility, completely integrated for the latest powerplant manufacture, may be counted on in 1955 and the years to come to continue, as always, with *more power* with *less weight* in *smaller engines* to advance tomorrow's military and commercial aviation progress.

ENGINE AND AIRPLANE CORPORATION

FAIRCHILD

*Engine Division**

DEER PARK, LONG ISLAND, NEW YORK

* *Including AL-FIN, the Fairchild patented process for the molecular bonding of aluminum and magnesium to steel, cast iron, nickel or titanium.*

"where the future is measured in light-years"

Denmark test area, RMI maintains two rotor test rigs—a lowspeed rig and a highspeed rig capable of turning at 1,000 rpm.

RMI Test Stands

In this area there are numerous stands capable of taking large and small rocket motors, as well as necessary storage facilities, including tanks for liquid oxygen, ammonia and alcohol. On a hill overlooking the test area is the 350,000-lb.-thrust stand on which the Viking engines were tested. RMI engineers say the stand could actually take 1-million-lb. units safely, but no motors of nearly that size have been tested here thus far. The largest to date has developed 120,000 lb., and about 75 runs have been made at 50,000 lb.

The company is working on application of rockets to liquid-propellant powered guns, jet drilling devices, catapults and launchers, seat ejectors and boundary layer control. The company is also investigating the possibility of manufacturing industrial chemicals as products of rocket combustion.

RMI's Future

Reaction Motors was founded in 1941 by four members of the American Rocket Society. James H. Wyld, one of the founders, produced the first design in this country for a fully regenerative rocket motor, basis of today's liquid propellant rockets. In this type of design, one propellant flows in a jacket surrounding the combustion chamber, thus cooling the chamber while it itself is warmed. The Germans developed the principle independently at about the same time as Wyld.

RMI'S present activities embrace both military prime contracts and industry subcontracts for specific types of piloted aircraft or guided missiles. The company is working on about 40 government contracts, Young told AVIATION WEEK.

A tour of the new facilities showed many inactive machine tools which indicated little production activity at present. However, company officials say RMI is headed for its biggest year yet. Orders for new business totaled over $9 million in 1954 and will go higher this year, with a backlog indicating continued growth in 1956. Present employment is over 600.

Plant Completed

The final piece of production equipment has been installed in the Timken Roller Bearing Co.'s laboratory-like plant in New Philadelphia, Ohio. Timken claims that the factory is the only one in the world devoted exclusively to the production of tapered roller bearings in substantial quantities which are held to tolerances of 75-millionth of an inch. Components of the bearings have to be accurate to 20-millionth of an inch to make up a bearing whose runout is accurate to 75-millionth.

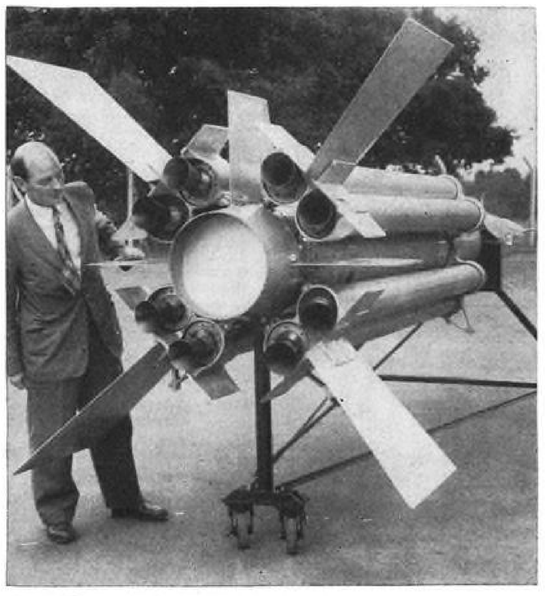
NAA Subcontracts Total $172 Million

North American Aviation, Inc., awarded subcontracts totaling more than $172 million during the first half of 1955 for the manufacture of parts and assemblies for the F-100 Super Sabre, F-86 Sabre, T-28B Navy trainer, FJ-3 and FJ-4 Fury.

The largest single contract, approximately $8 million, was given to Chance Vought Aircraft, Inc., for fabrication of the rear fuselage for the F-100. Other Super Sabre subcontractors include: Rheem Manufacturing Co., $6 million; Northrop Aircraft, Inc., two contracts totaling $3,400,000; Goodyear Aircraft Corp.; Seeger Refrigerator Co.; Servel, Inc.; Cleveland Pneumatic Tool Co.; Temco Aircraft; Liberty Products Corp.

Contracts for components of the T-28B trainer, F-86, FJ-3 and FJ-4, included $3 million to Seeger Refrigerator Co.; $1,900,000 to Ryan Aeronautical.

More than 60 other companies were given contracts ranging from $100,000 to more than $500,000.



Britain's Napier Ramjet

Napier ramjet test vehicle is designed for low supersonic speed range and is boosted by a cluster of eight solid propellant rockets with offset thrust nozzles. Rockets are paired in structural unit, complete with fin; offset nozzles provide guaranteed separation just before burnout. Tiny air intake immediately ahead of boosters is ram air for air-turbine-driven fuel pump. Doppler (for velocity data) and telemetering (for performance data) antenna are visible in at least six locations. Note the unusual shape of vertical surfaces between boosters; the chord of the surfaces increases from root to tip.

PRODUCTION BRIEFING

► **Associated Spring Corporation's** Bristol divisions, which suffered several hundred thousand dollars worth of damage from the floods which devastated large areas in Connecticut, reassured its customers that interruptions in deliveries would be minor. None of the divisions' processing equipment suffered major damage.

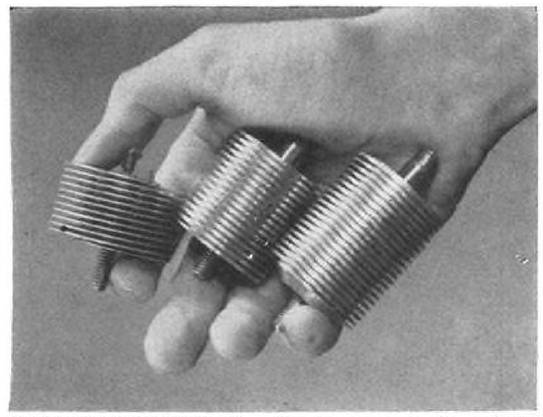
► **Torrington Co.** has moved its New York offices to the Port of New York Authority Bldg., 111 Eighth Avenue.

► **A new welding process** has been developed and patented by Trent Tube Co., E. Troy, Wisc., to manufacture welded stainless steel and high alloy tubing and pipe. The company inverts the rolls of the continuous mill and welded the formed tubing from the underside, permitting gravity to eliminate the weld bead on the inside diameter of the tubing. Even in the as-welded condition, the tube has a smooth and flawless interior surface, the firm reports. Trent Tube is now able to produce full-finished tubing and pipe sizes in the various Hastelloy grades, Zirconium, Zircoloy, titanium, and 19-9-DL.

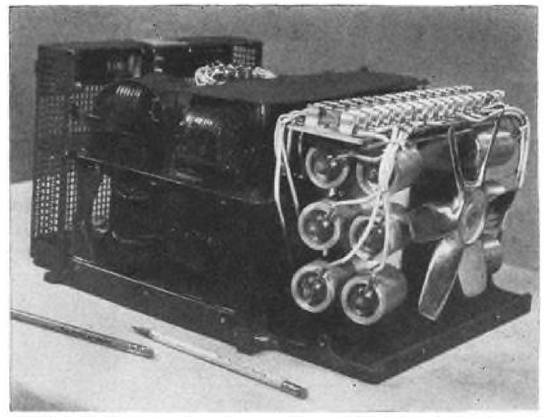
► **Burgoyne X-Ray and Metal Testing Laboratory,** New Cassel, L. I., N. Y., is constructing a test cell capable of simulating altitude changes of a vertical ascent of more than 1,200 mph. with thermal changes of more than 50F. per minute for high-performance tests of rocket-powered missiles and flight components.

► **R. M. Hollingshead Corp.** has opened a new manufacturing and distribution center at Sunnyvale, Calif., as its Western Division headquarters. The plant is equipped to turn out maintenance chemical compounds at an annual rate of 1.5 million gallons.

OCTOPUS GRIP VACUUM CHUCK uses approximately 1,000 suction cups with removable rubber grommets to hold skin and pattern during milling operation. A screw in the center hole serves as a shut-off valve allowing any shape skin to be placed on chuck without complicated sealing-off of vacuum source. Developed by Convair and manufactured by Pioneer Tool Engineering, Inc., El Segundo, Calif.



SILICON RECTIFIERS (above) are key to new a.c. to d.c. converter.



POWER PACK (above) uses magnetic amplifier to regulate output.

Silicon Rectifiers Lighten Power Pack

By Philip J. Klass

A new lightweight airborne a.c. to d.c. converter one-third lighter than—and requiring only one-half the space—of its predecessors, will be introduced this week by Westinghouse Electric Corp.

The new 200-amp. power pack converts engine-generated 200-v., 400-cycle power into 28-v. d.c., regulated to within one volt, and is capable of operating in ambient temperatures up to 120C.

The first public showing will be in Los Angeles at the exhibit of the Aircraft Electrical Society, a group which concerns itself with aircraft power generation and distribution systems. The exhibit is being held in conjunction with a technical conference sponsored by the Air Transportation Committee of the American Institute of Electrical Engineers.

Silicon Rectifiers

The new Westinghouse power pack, ATR-200A, owes its 55-lb. weight, high-temperature and close-regulation capabilities to the use of new high-power silicon rectifiers in combination with a two-stage magnetic amplifier voltage regulator.

This marks one of the first airborne applications of the high-power silicon rectifiers.

In addition to cutting weight and raising temperature limits, silicon rectifiers offer several other important advantages over the previously available selenium units. They include:

- **Long life** without deterioration of its various characteristics with age.
- **Greater efficiency,** cutting power losses and easing cooling needs.
- **Very low (reverse) leakage,** an important factor when used to bias mag amplifiers.
- **Hermetically sealed,** making them environment-resistant.

Power Pack Performance

Operating from engine-generated three-phase a.c. power, the new ATR-200A is designed to operate from an input of 200 volts ±5%, 400 cps. ±5%. Under this condition, Westinghouse says the unit provides:

- **Voltage regulation to within 1 volt.**
- **Recovery time of less than 0.2 sec.**
- **Ripple of less than 1 volt.**

The unit operates satisfactorily when input voltage or frequency vary as much as 10% from nominal, showing only slight degradation of regulation.

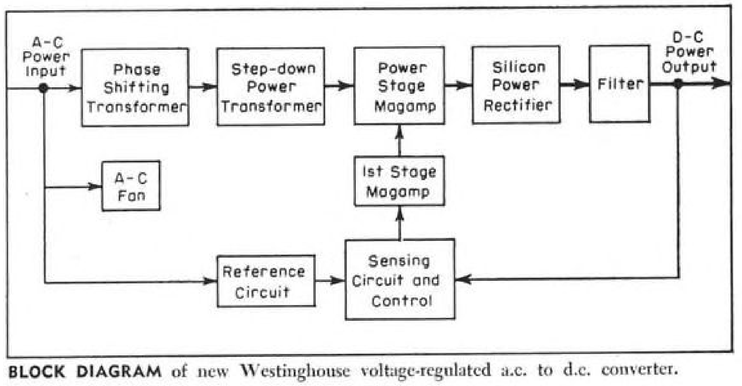
Voltage regulation is accomplished by a two-stage magnetic amplifier, which compares the output of the power pack with a 28-v. reference voltae obtained from a VR tube (see block diagram, below.)

The mag amplifiers are wound with silastic-covered wire impregnated with glass-epoxy resin and are designed for 1,000 hours life at ambient temperatures up to 120C, Westinghouse says.

Two or more of the Westinghouse units can be operated in parallel to supply a common load. Under these conditions, load will be divided equally among the several units to within ±5%, according to B. O. Austin, of the company's Aircraft Equipment Department, which developed the new unit.

Overload Characteristics

When input voltage is 200, and the frequency 400 cps., the overload characteristics of the single power pack



BLOCK DIAGRAM of new Westinghouse voltage-regulated a.c. to d.c. converter.

match or exceed those of the d.c. generator it replaces, according to Austin. For example, the unit can withstand the following repeated overload cycles at rated input voltage and frequency for seven hours:

- **150% load for five minutes,** followed by 50% load for 10 minutes.
- **250% load for one minute,** followed by 50% load for 10 minutes.

Weight Saving

Making allowance for the increased alternator (a.c. generator) capacity required, plus associated cables and controls, the new 200-amp. power pack system weighs 63 lb. This compares with a figure of 93 lb. for previously available static power packs and 71 lb. for the equivalent d.c. generator (and accessories) it replaces. The new ATR-200A occupies a volume of 1,650 cu. in., about half the size of previous static power packs of comparable rating, which occupied about 3,000 cu. in.

Westinghouse is developing a line of both regulated and unregulated d.c. power packs, rated for 50, 100, and 200 amp. The weights of these units is as follows:

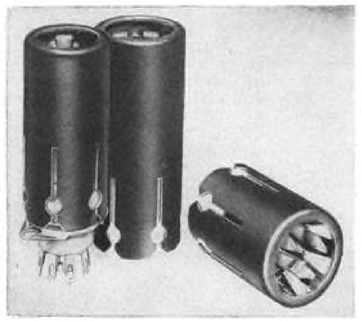
- **200 amp.:** 55 lb., regulated; 38 lb., unregulated.
- **100 amp.:** 36 lb., regulated; 17 lb., unregulated.
- **50 amp.:** 22 lb., regulated; 14 lb., unregulated.

All units are cooled by an a.c. motor-driven fan.

Tooling for Production

Although flight tests are not scheduled to begin until early 1956, the results of present environmental tests (altitude, temperature, humidity) lead Westinghouse officials to believe no major problems will turn up. As a result, the company is starting to tool up for production. Pilot quantities should be available by the end of the year, with large-scale production available early in 1956.

Full application data on the new power packs appears in Westinghouse Product Spec. No. 414744-Z, available from the company's Aircraft Equipment Dept., Lima, Ohio.



Tube Cooler

New heat-dissipating tube shield can be substituted directly for JAN-type shield without modification of existing equipment. Series TR is a modification of an earlier heat-dissipating shield which required a special base. New version reportedly drops bulb temperature as much as 50% under that achieved with JAN shields, and fits standard 7- and 9-pin miniature sockets. Manufacturer: International Electronic Research Corp., 177 West Magnolia Blvd., Burbank, Calif.

FILTER CENTER

►**Go East, Young Man!**—West Coast avionics firms that play up climate to attract engineers are getting a dose of their own medicine from General Electric. A recent GE ad in a Los Angeles paper reads: "Come Back East. Join the trek back to the Mohawk Valley where there are four seasons of the year. Are you too hankering for the green hills of home?"

►**Airline Power Conference**—Representatives of Eastern, National Northwest, Pan Am and United Air Lines attended a recent Westinghouse-sponsored two-day conference at Lima, Ohio, to acquaint themselves with a.c. power generation and distribution systems which may replace the long used 28-v. d.c. systems in new jet liners.

►**New Fuel Warning Gage**—New version of Minneapolis-Honeywell's transistorized fuel gage for the Grumman F11F-1 has a built-in warning system to show whether the distribution of fuel between tanks is satisfactory. The M-H device monitors a separate system which normally shifts fuel between tanks to maintain proper aircraft CG location. The M-H system continuously compares amount of fuel in forward and aft tanks, and indicates whether fuel balance is "safe" or "unsafe," in addition to indicating total fuel in both tanks.

►**A Lot of Printed Wiring**—General Electric expects to produce 1 million sq. ft. of printed wiring boards in 1956, representing a total of 5-6 million individual boards. This output will come from GE's newly acquired 100,000-sq. ft. plant in Auburn, N. Y., which a spokesman calls "probably the world's most completely mechanized printed wiring board production line."

Reliability Report—Aeronautical Radio, Inc.'s "General Report No. 1, Investigation of Electron Tube Reliability in Military Applications" (AW Apr. 5, 19, 1954), has been placed on the Defense Department's "Selected List of

Important Reliability Publications." The list is prepared by Defense's Advisory Group on Reliability of Electronic Equipment (AGREE). A few copies of the Arinc General Report No. 1 still are available at 50 cents per copy. Arinc's address: 1520 New Hampshire Ave., N.W., Washington, D. C.

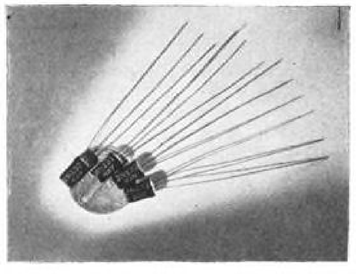
► **New Computer for Air Arm**—A new IBM 650 magnetic drum data processing machine has gone into use at Westinghouse Electric's Air Arm division in Baltimore for fire control studies.

► **Management Key to Survival**—"Survival in the mushrooming electronics industry during the next 10 years will depend upon mastery of business fundamentals rather than technical achievement." This is the view of Philip S. Fogg, president of Consolidated Engineering Corp. "The life blood of the electronics industry must continue to flow from the research lab," Fogg said, "but leadership and even survival . . . will be based upon management achievement in the non-technical aspects of the business." Fogg said the electronics industry grossed $8.8 billion last year.

NEW AVIONIC PRODUCTS

Components & Devices

● **Miniature transistors,** one-quarter to one-third the size of former units, are now available in four new types. Units all are P-N-P fused-junction germanium types and come in cases measuring only 0.31x0.20x0.14 in. Types 2N130,



2N131, and 2N132 are for use in audio or low-frequency applications; the 2N133 is a low-noise transistor for use in low-level audio circuits. Maximum ambient temperature is 85C. Application data is available from **Technical Information Service, Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass.**

● Miniature hermetically sealed aluminum electrolytic capacitors, Type 30D, for transistor circuitry, called "the smallest ever made," are available in wide range of capacitances from 1 to

110μfd, and in standard working voltages of 1, 3, 6, 10, 12 and 15 v. Maximum operating temperature is 65C, limiting their use in airborne equipment. Engineering Bulletin 320 gives application details. **Sprague Electric Co., Technical Literature Section, 327 Marshall St., North Adams, Mass.**

Miniature d.c. servo motor, Cat. 5BBY13DJ7, designed for airborne use, is available with differentially-wound or straight shunt field. Motor is rated at 0.002 hp. at 6,500 rpm., and draws 0.8 amp. from a 28-v. d.c. supply. Motor can be geared to provide output speeds as low as 130 rpm. **General Electric Co., Specialty Component Motor Dept., Ft. Wayne, Ind.**

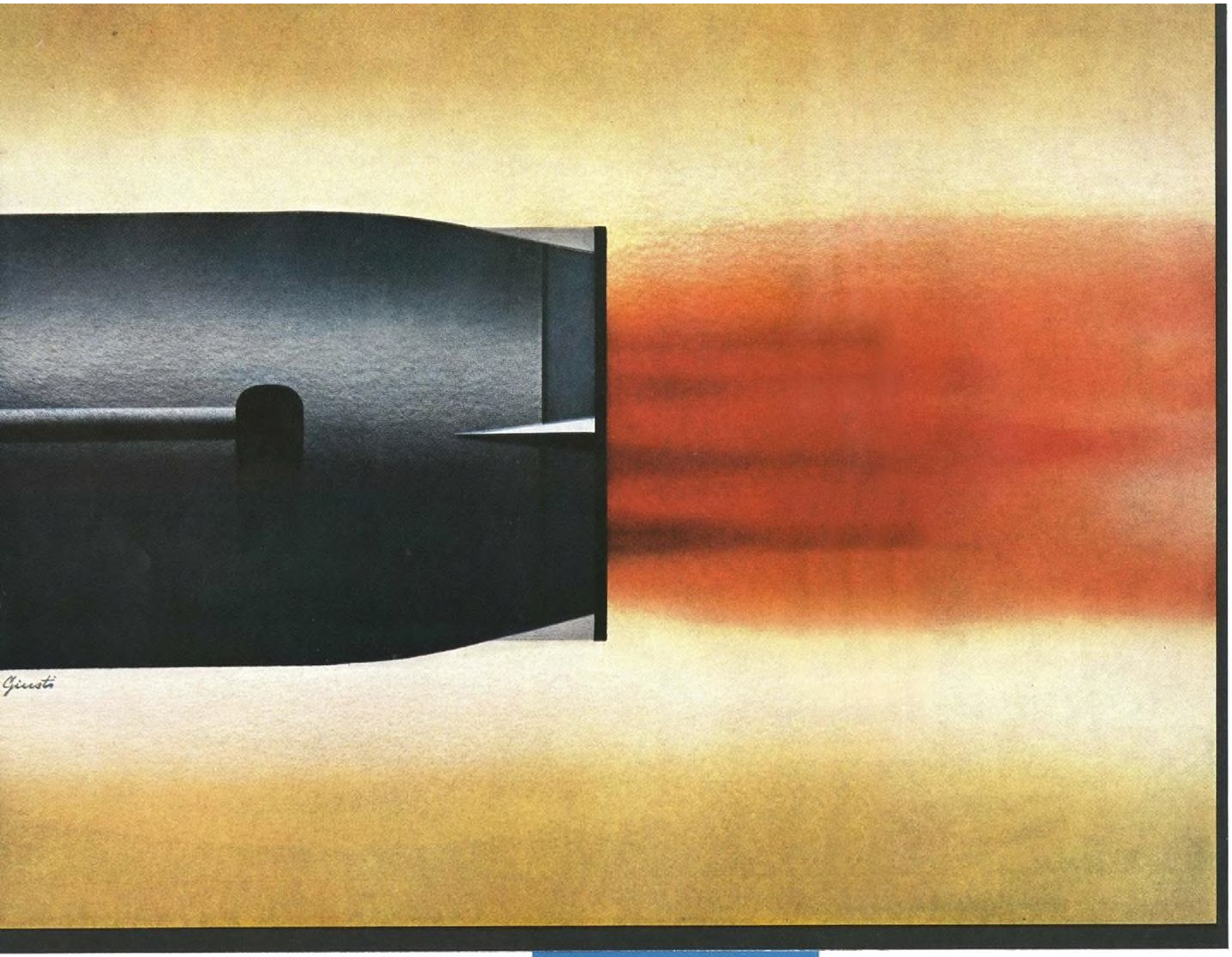
Rate gyroscopes, with 100% flotation in silicone fluid, are available in a new line which offers choice of angular momentum up to 10^6 gm. $cm.^2$/sec. Driving motors can be d.c., a.c. hysteresis or governed induction type. Maximum size is 2½ in. dia. x 4½ in. long. Choice of damping systems is offered. **Gyromechanisms, Inc., Halesite, N. Y.**

Constant-speed alternator drive for 20-kva. machine weighs only 39 lb., approximately 20 lb. lighter than other constant-speed drives of the same rating, according to manufacturer. Unit maintains constant output speed of 8,000 rpm. for input speeds of 3,900 to 8,300 rpm., and has a continuous rating of 32 hp., with a higher short-interval rating. Speed control is maintained within 1%, or better if required. **General Electric Co., Aeronautic & Ordnance Systems Div., Schenectady, N. Y.**

Laboratory Equipment

Audio frequency wave analyzer, Type FT-FNA, includes analyzer, and two-axis recorder for automatic or manual analysis of vibration and noise levels. Unit offers a choice of logarithmic or linear scale and has a 5-inch wide chart. Sensitivity is adjustable between 1 microvolt and 100 volts. Device also offers choice of narrow (10 cps) or wide-band (200 cps) selectivity. **Federal Telephone & Radio Co., Instrument Div., 100 Kingsland Road, Clifton, N. J.**

High-voltage power supply, delivers 100 to 5,00 v.d.c., with 8 ma. at 5,000 v. Regulation is ½% or better, no load to full load, and with line variation of 105 to 130 volts. Response time is quoted at 5 milliseconds from 1 kv. to 5 kv., with ripple at 0.05% and stability at 0.25%. Multi-turn pot permits extra-fine degree of control on setting output voltage. **Neutronic Associates, 87-16 116th St., Richmond Hill 18, N. Y.**



Lycoming harnesses the hot breath of a new era

Now, in the lungs of Lycoming's advanced gas turbines developed for the Military—the turbine principle finds new usefulness, this time for helicopters. Employing broad knowledge and bold thinking in aerodynamics, thermodynamics, and metallurgy, scientists of Avco's Lycoming Division have achieved in the T 53 turbine important design advantages: dramatic compactness (never before has 800 H. P. been housed in so little space), versatility in installation and operating characteristics, high efficiency, ruggedness, long life, and low production cost. The T 53, developed in close cooperation with the U. S. Air Force and U. S. Army Transportation Corps for helicopter use, also broadens the benefits of turbine power to fixed wing aircraft and many other mobile and stationary applications. Through advanced turbines—as well as improved reciprocating engines, better components, finer precision parts —Lycoming translates research into practical realities for defense, for peace.

The turbine era is here. A broad variety of future non-military applications of gas turbines awaits the ingenuity of industry. If your plans are in any way linked to power—turbine or reciprocating—now is the time to look to Lycoming! Write on your letterhead to Lycoming, Stratford, Conn. Ask for T-53 booklet.

FOR A COPY OF THIS GUISTI ILLUSTRATION, SUITABLE FOR FRAMING, WRITE TO PUBLIC RELATIONS DEPT., LYCOMING, STRATFORD, CONN.

ENGINEERS WANTED: For top-flight men, Lycoming offers unusual opportunities to explore new scientific frontiers that lead to outstanding and rewarding careers. Write to Vice President, Industrial Relations, Stratford, Conn.

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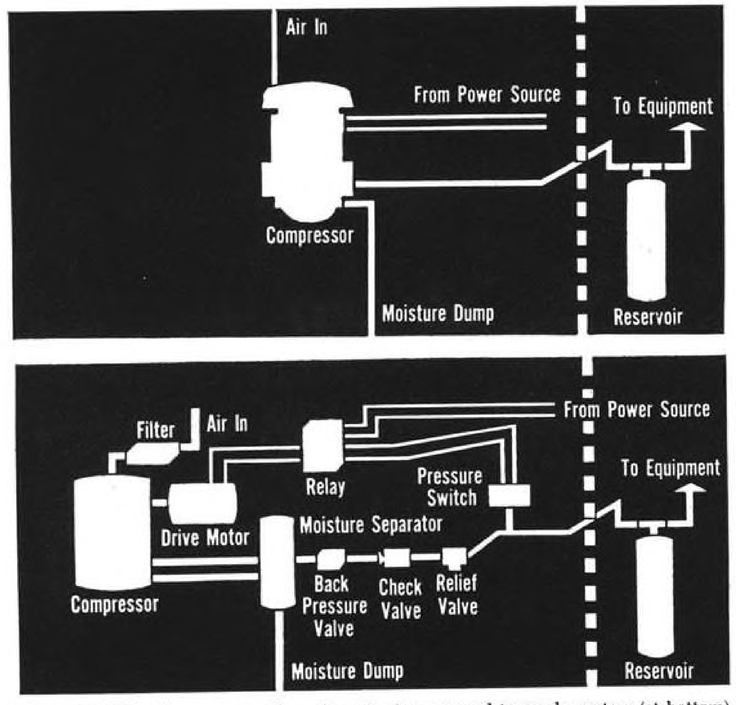
TODAY'S MILITARY SERVICES, WITH THEIR TREMENDOUS TECHNOLOGICAL ADVANCES MADE POSSIBLE THROUGH SCIENCE, OFFER A VITAL REWARDING CAREER



COMPACTNESS of new pneumatic package (top) as opposed to regular system (at bottom).

Pneumatics Fade, Hydraulics Gain As Supersonic Power Sources

By George L. Christian

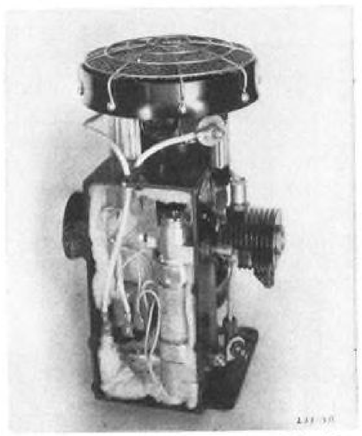
Minneapolis—The days of high-pressure pneumatics as the power source for ancillary systems in supersonic jet aircraft appear to be limited.

More and more, designers are turning to hydraulics.

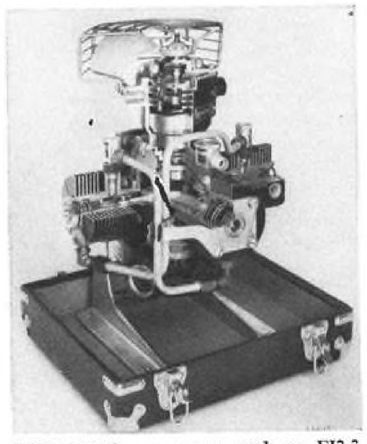
The change has been recognized—and admitted—by R. T. Cornelius, president of the Cornelius Co., one of the nation's first suppliers of aircraft pneumatic systems. And he has only to point to the century-series of fighters to back up his admission.

The once-vital high-pressure pneumatic systems have been omitted entirely in all the currently-built century-series—the F-100, F-101, F-102, F-104 and F-105—as well as in the F8U Navy fighter and the B-58 bomber. Even the B-52 has only a small high-pressure system to supply compressed air for rear turret gun charging and radome pressurization.

Design of hydraulic pumps, motors and other components has advanced to the point where Cornelius engineers can make hydraulic systems competitive with pneumatic systems from a weight and space standpoint. This, in turn, makes it practical to take advantage of the hydraulic system's ability to supply energy continuously (the pneumatic system delivers air only intermittently, because air is normally used faster than pumps can compress it).



NEW pneumatic package designed by Cornelius.



HYDRAULIC compressor used on FJ2-3, F7U-3.

Exit Pneumatics

Also, the switch to rockets in fighter aircraft is eliminating the need for gun charging, usually done pneumatically. Rocket launching is best accomplished electrically.

The complete B-52 accessory system is driven by a pneumatic system, but the pressure is low. Air is bled from the ship's eight turbojet engines. It operates air-driven "power packs" which produce all electrical and hydraulic power, runs the air conditioning systems and water injection pumps of the big bomber.

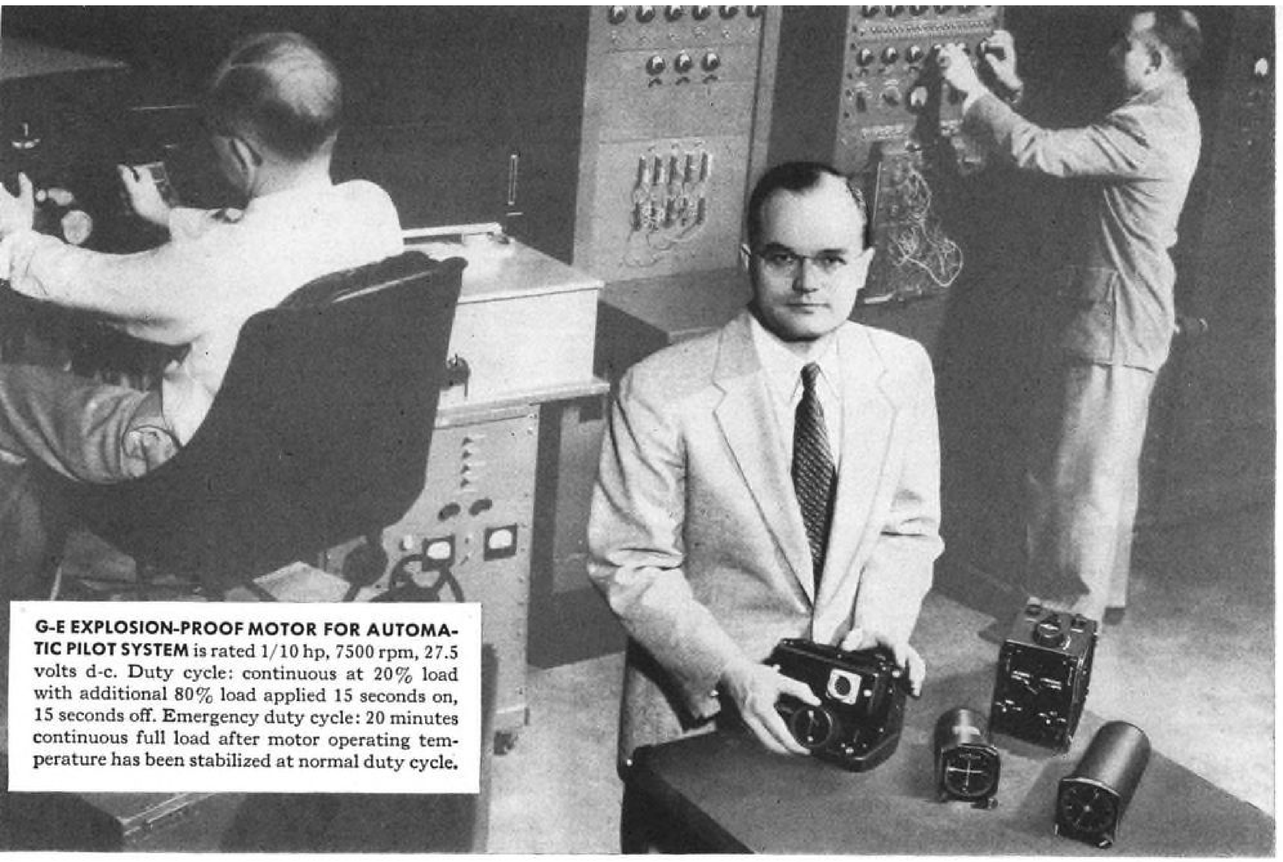
Cornelius, however, has not stood still on pneumatic design. Cornelius-developed 3,000-psi. "packaged" pneumatic systems of reduced weight and size are going into several jet fighters and some older piston-powered planes.

Too Many Drive Pads

By using hydraulics, Cornelius believes it will be possible to reduce the number of accessories, which now clutter turbojet engines, to only two. Both would be hydraulic pumps, one for power flight controls, and the other to drive all accessories through hydraulic pump/motors.

This would cure one of the headaches troubling jet engine manufacturers—where and how to provide enough drive pads to accommodate the many accessories needed to supply the growing power demands of electrical, hydraulic and pneumatic systems (AW May 9, p. 63).

Cornelius told AVIATION WEEK his firm has been working for over a year on



G-E EXPLOSION-PROOF MOTOR FOR AUTOMATIC PILOT SYSTEM is rated 1/10 hp, 7500 rpm, 27.5 volts d-c. Duty cycle: continuous at 20% load with additional 80% load applied 15 seconds on, 15 seconds off. Emergency duty cycle: 20 minutes continuous full load after motor operating temperature has been stabilized at normal duty cycle.

G-E aircraft motor specialists help solve drive problem on new Collins automatic pilot

E. H. Fritze, Controls Engineer, Collins Radio Co. (pictured above) says: "In the development of a new automatic pilot system, we were faced with an electric-drive problem. When two other suppliers failed to meet our requirements, we called in General Electric.

"In conferences between our engineers and G-E aircraft-motor specialists brought in by our local G-E Sales Engineer, we arrived at a solution to our problem. Sample motors were delivered in three weeks, saving us considerable engineering time and expense. We find service like this very valuable," Mr. Fritze concludes.

EXTENSIVE TESTING BACKS SERVICE

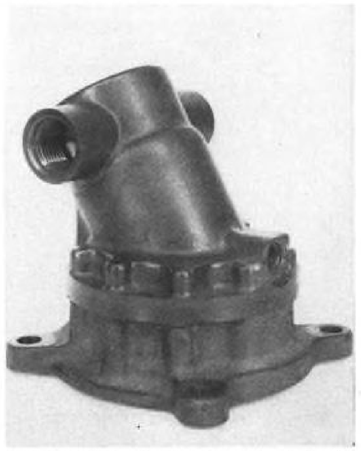
When G.E. develops a new aircraft or armament motor, extensive environmental testing facilities are called into play. For example, the G-E motor for Collins was subjected to, and passed an insulation test, vibration test, shock test, and an accelerated life test. Such testing assures conformance with your most exacting requirements.

G-E SERVICE FOR YOUR DEVELOPMENT

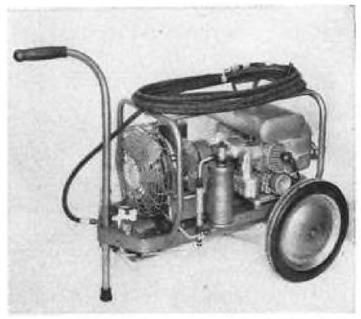
If you have a development that calls for an aircraft or armament motor, the same fast, effective service provided the Collins Radio Company can be yours from General Electric. Just contact your local G-E Apparatus Sales Office early in your planning. Or write giving full details to Section 704–57, General Electric Company, Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



SMALL (5 in. long) Cornelius hydraulic motor operates at 96% efficiency.



SPECIAL portable compressor designed for R.C.A.F. to service landing-gear struts.

a series of hydraulic pumps that are less than half the weight of equivalent capacity pumps now on the market. These pumps are now running at an efficiency of 96%, but refinements now underway are expected to increase this figure.

First in the series is a pump which has a displacement of 1 cu. in./rev. The unit, now on test, develops 25 hp. and delivers 6 gpm. at 1,500 rpm. The fixed-displacement version of this new pump weighs 4 lb., the variable-displacement copy a 6 lb.—much less than half the 16 lb. of a pump of comparable displacement currently on the market.

The series of pumps Cornelius has under development ranges in size from 1/16 to 4 cu. in./rev. The company says the price of the lightweight pumps will be competitive with others on the market.

Custom-Built Seals

Cornelius credits the high efficiencies of its hydraulic equipment to the fact that the company designs and builds all of its own bearings and shaft seals. Since both types of components are designed for specific applications instead of coming off-the-shelf, they are the smallest, lightest, strongest units which can do the job.

One company-developed seal, which has been on test for 2,500 hr., has yet to develop a leak. (Leakage is defined as any evidence of bubbles during a submersion test).

Another design refinement which permits the company to extract the utmost in efficiency from the pump includes a special, very small universal joint to drive the cylinder block. Novel design of the joint permits the cylinder block to be considerably smaller in diameter than before.

The block itself is made of hardened steel, which allows use of much thinner walls than if the block were made of a softer metal such as brass. Small cylinder block circumference allows cylinder ports to be extra large, leading to high pump efficiency. Also, cylinder bores are finished to two micro-inches.

High pump efficiency provides a heat bonus to airframe hydraulic system engineers. The lower a pump's efficiency, the more heat it rejects into the hydraulic system; the more efficient it is, the more desirable it is for today's literally "hot" airplanes.

A new Cornelius design concept for hydraulic motors incorporates a method of continuously lubricating the pump's

valve plate. Result is a unit which delivers high starting torque.

First models have produced starting torques of up to 90% of running torque. Development of the design will lead to pumps with starting torques comparable to those of electric motors —about 200-300%—Cornelius predicts. Weight penalty for this feature will be about 50%.

Packaged Pneumatics

The Cornelius packaged pneumatic system wraps into a single unit containing the compressor, inlet air filter, starting relay, radio noise filter, moisture separator with automatic condensation dump and heating element, back pressure valve, check valve, relief valve and pressure switch. Its advantages:

- **Saves space.** The entire air supply system takes only a little more room than the compressor alone in a conventional pneumatic system.
- **Reduces weight.** Up to 5 lb. is saved by eliminating separate system components plus associated tubing, fittings and connections.
- **Cuts leakage.** Integrated system reduces to a minimum the number of potential leakage sources, such as flared connections and O-ring seals.
- **Saves time.** Unit can be removed and replaced as a package, eliminating need for replacing several individual components.

The packaged system is powered by a Model 130 compressor rated at 2 cfm., 3,000 psi. Among planes using the system: Grumman F11F-1, Chance Vought F7U-3, North American FJ-2, -3, -4, McDonnell F2H-3 and F3H, Lockheed P2V, Grumman S2F, Martin P5M.

The systems are available with a.c., d.c. or hydraulic motor drives.

New Compressors

Cornelius has two new air compressors under development. First is a 4-cfm., 3,000-psi. unit, which will be approximately the same size and slightly lighter than the present 2-cfm. Model 130.

Space and weight savings will be due largely to the new lightweight hydraulic motor which will drive the compressor.

The other new unit will be an 8-cfm., 3,000-psi. air pump whose weight and size have not yet been fully determined.

Another development which the company has completed and delivered to Wright Field is a modification of two Model 130 compressors to deliver 5,000 psi. at 1.5 cfm.

The Cornelius compressors have low starting friction (they use ball and needle bearings throughout) and rings on all pistons have been eliminated. The high starting torque of the motor

allows it to be started the compressor against 3,000-psi. loads at–65F, making it unnecessary to "blow down" the compressor discharge line.

A patented piston cross head design eliminates side thrust on the piston, minimizing wear on pistons and cylinder walls.

In the pneumatic component field, Cornelius is marketing a zero-leakage air check valve which will not leak at pressures up to 4,500 psi. nor with differential pressure as low as 0.5 psi. Its features include:

- **Metal-to-metal high-pressure seal** combined with rubber-to-metal low-pressure seal.
- **Streamlined poppet** and "straight-through" air flow providing high flow capacity with minimum pressure drop.
- **Rubber seat** designed to prevent "wash-out" during high surge flow conditions. The rubber used is impervious to compressor lubricating oils.
- **Poppet spring** not exposed to or affected by air flowing through valve.
- **Large seating** area allowing valve to function under icing conditions and when exposed to foreign particles in the air flow.

Other Cornelius developments are single or dual emergency air brake valves which meter air to the brakes, allowing controlled rate of deceleration; conventional valve dumps all the air and locks the brakes.

The Cornelius Co. was begun in 1930 when Dick Cornelius and his father ("We didn't have a dime between us") started building "junk" in a garage. The junk was oil burners to convert coal furnaces.

When beer came back in 1932, the father-son team gradually drifted into beer dispensing equipment.

In 1940, the Army Air Corps handed Cornelius an air compressor made by a large U. S. manufacturer and asked him to build it in quantity for B-29 gun turrets (for gun charging). Cornelius did not like the compressor's design, so he and his co-workers created and built a three-stage, 0.4-cfm., 1,500-psi. compressor in 10 days. Since no electric motor was available to drive the unit, the Cornelius group designed and built a ½-hp. motor for the compressor. The motor was half as heavy and much smaller than anything that had been available.

This put Cornelius in the aviation business, and he has been in it ever since.

During the last war, the company made thousands of compressors for the B-29—seven per plane. Five were for the ship's gun turrets; two for dual bomb bay doors.

The company gradually expanded into the design and manufacture of pneumatic components such as air bottles, pressure regulators, valves and anti-G valves.

When a demand arose for hydraulic motor-driven compressors, the company developed its own. One reason was so it could remain independent of outside suppliers. Another was that the pump had to have a straight-through shaft to drive the compressor on one end and a cooling fan on the other, and suitable pumps then on the market were all angled.

The pump was built integrally with the compressor, eliminating weight and space required by mounting flanges.

Company technicians could not find precision machines needed to do the job they wanted on the pump, so they bought the best available and converted the machines to manufacture pump parts the way they wanted them. Cornelius describes his pump as a "metallurgical nightmare."

Among the non-airborne uses of Cornelius compressors are the servicing of aircraft landing gear struts, accumulators and emergency air bottles; supplying of air for demand type breathing apparatus such as that used by fire fighters, and charging underwater diving equipment.

In 1952, the company moved into a new, 64,000-sq. ft. plant in Minneapolis. Today Cornelius employs about 350 persons and does a $5-million yearly business.

Light Alerts Pilot Of Power-Line Peril

A warning light that tells pilots of dangerous power cables will be manufactured by the Airway Signal Corp., Vancouver, Wash.

Developed under the direction of Prof. H. J. Dana, of the division of industrial research, Institute of Technology at Washington State College, the new light can be positioned on the power line spans with a remote-controlled trolley which pushes the light onto the span, clamps it in place, and returns it for removal (AW Jan. 7, 1952, p. 54).

The light takes its current from the induction field around the power line, eliminating need for connections.

Civil Aeronautics Administration is reported to have approved the device after tests by the National Bureau of Standards.

Fifteen of the experimental lights are being tested, two in Missouri and 13 in the Pacific Northwest.

A modification, in which a booster transformer increases the light's brightness three to four times, adapts it for lines carrying low current. The modified unit is being tested now near the Pullman-Moscow airport, a few miles from the State College campus.

Ground Broken For TWA Idlewild Base

Plans are being made for a $12-million hangar facility designed to become the heart of Trans World Airlines' new $15-million Atlantic division maintenance base at Idlewild Airport.

The hangar dimensions will allow it to hold 12 Super Constellations simultaneously and to accommodate aircraft with tails up to 44 ft. high. The structure will be of dual cantilever design and concrete construction. It will be over 800 ft. long and 400 ft. wide—the width including two 160-ft. aircraft bays and an 80-ft. center section for offices and shops.

The 65-ft.-wide door leaves will operate in groups of three, providing openings up to two-thirds the length of the hangar.

The parking apron of 12-in. concrete will hold up to 22 Constellation-type aircraft at once. Telephones will be placed at the various aircraft parking areas to allow instructions for parts or other requests to be called in instead of requiring time-consuming trips to the hangar.

Other buildings on the base will be a commissary and an automotive garage, ground for which has been broken. Completion of the entire base is sched-

uled for mid-1957.

The hangar plans are being prepared by Ammann & Whitney, New York, and Burns & McDonnell, Kansas City, Mo.

Slick Modernizes Ground Equipment

Slick Airways is spending close to $75,000 on a cargo-handling reequipment program designed partly to replace and partly to supplement present equipment.

The freight carrier's program calls for nine Clark forklifts, two Lafferty electric tug bars, four Toledo scales, two baggage carts and three Chevrolet high-lift trucks. The equipment will be located at various Slick ground stations.

The modernization program was begun this summer and is expected to be completed soon.

OFF THE LINE

First commercial carrier to service-test BG Corp.'s new platinum electrode spark plug is Western Air Lines. Tests ending in November will determine whether the RB39R plug can go a full 1,000 hours without removal. WAL's route structure is such that the tests will give good short-run information and cruise data, according to BG. The plug has a ¾-in.-20 hermetically sealed "all weather" top, and is approved for installation in all models of Pratt & Whitney Aircraft R4360, R2800, R2000 and R1830 engines. BG says the RB39R has been successfully service-tested by the Air Force.

All-weather spark plug for executive aircraft seals against moisture, dirt and salt, regardless of altitude. AC Spark Plug, maker of the HSR-86, says dependability of the plug at all altitudes has been proved by millions of hours of flight on military and commercial planes.

TWA is using a standard agitator-type clothes washing machine in tests of a new method of cleaning the disk-type pressure engine oil strainers installed on all of the airline's engines. Six of the strainers are placed in the machine simultaneously; Drews carburetor cleaner solvent is added and the machine turned on; in five minutes the strainers are clean. Previously it took a half-hour to clean a single strainer.

Beryllium-copper strip rolled to .001 ± .0001-in. thickness is used as the pressure-sensitive diaphragm in an aircraft ice-detection control system. Minute variations in pressure on the strip are transmitted to electronic circuits which amplify the "danger signals" transmitted by the ultra-sensitive diaphragm. Maker of the strip is American Silver Co., 36-07 Prince St., Flushing, N. Y.

United Air Lines is adding a two-story hangar and new flight kitchen to its Seattle-Tacoma Airport facilities at a cost of over $1 million.

Boosted C-46F

Twin Marbore jet engines installed under fuselage of Transocean Air Lines C-46F have boosted takeoff payload by 10,000 lb., according to the airline. Experimental ship shown here recently completed a coast-to-coast roundtrip.

WHAT'S NEW

Telling the Market

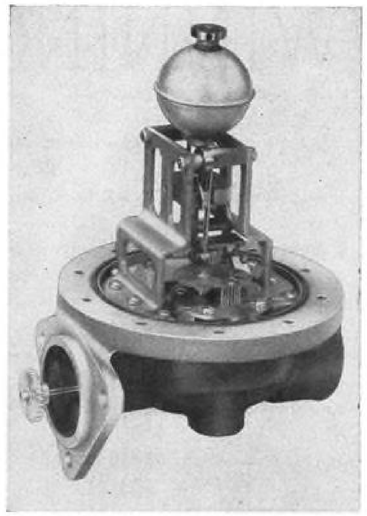
Automatic tracking theodolite and data reduction system. Project Digest No. PD-20, Cook Electric Co., 2700 N. Southport Ave., Chicago 14, Ill. . . . **Handbook on Boron Carbide and Elemental Boron,** booklet and precision grinding and lapping machines, Catalogue No. 1843, Norton Co., Worcester 6, Mass. . . . **Resistor Engineering Guide,** International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

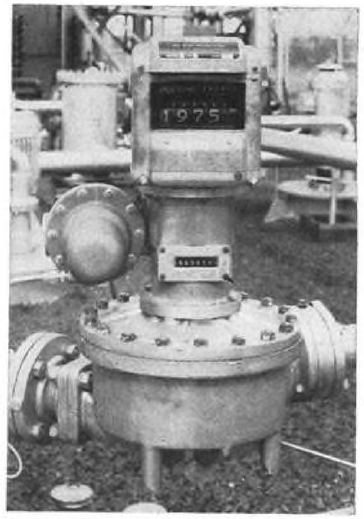
"Kel-Ray" projectors, gamma ray sources for industrial radiography, booklet, Metal & Thermit Corp., 100 E. 42 St., New York 17, N. Y. . . . Wall charts: **How to Select the Right AN Connector** and **How to Specify the Complete Connector Assembly,** Deutsch Co., 7000 Avalon Blvd., Los Angeles 3, Calif.

4MA and 5MA **Push Button Actuators,** Data Sheet P99; **Appliance Switches,** Data Sheet 106, Micro Switch, Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. . . . **Epocast 4-B and 4-B-2 Filled Epoxy Resins,** Bulletins EP-S4-10a, b,c; **Epocast 4-C and 4-D Filled Epoxy Resins,** Bulletin EP-55-61, Furane Plastics, Inc., 4516 Brazil St., Los Angeles 39, Calif.

Electric heating elements, Publication EC-53, Cutler-Hammer, Inc., 445 N. 12th St., Milwaukee, Wis. . . . Series 6300 **differential pressure switches** for aircraft and missile system applications, catalog sheet, Southwestern Industries, Inc., 5880 Centinela Ave., Los Angeles 45, Calif. . . . No. 99 cold-applied **paving joint sealer for jet airfields,** bulletin, Presstite Engineering Co., 3798 Chouteau Ave., St. Louis 10, Mo.

Special report, **Radiant Heating and Snow Melting for Airport Installations,** made by Engineering Service Dept., A. M. Byers Co., Pittsburgh, Pa. . . . **Electrolimit Jig Borers,** specifications and applications, Circular No. 587; **Vertical Precision Hole Grinder No. 2E,** Circular No. 589, **Developments in Numerical Control,** Circular No. 591; **New 24-in. Precision Plain Optical Rotary Table,** Circular No. 593; **42-in. Precision Plain Rotary Table,** Circular No. 594, Pratt & Whitney, Division Niles-Bement-Pond Co., W. Hartford 1, Conn.





DENSITOMETER (left) provides continuous measurement of fuel density and enables ground fueling meter (right) to record fuel delivery directly in pounds. Revere Corp. of America is developing other similar installations for inflight refueling and for aircraft.

Meter Measures Fuel in Pounds

Direct measurement by weight of fuels transferred in refuelling operations on the ground or air-to-air will be provided by gravity metering systems developed by the Revere Corporation of America.

The company claims its new equipment, combining volumetric and density measurements to provide a fuel measurement in pounds, will be:

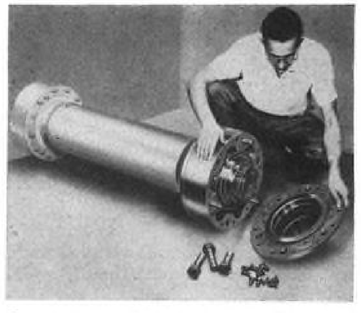
- **Accurate** to plus or minus 0.5%, for
- **Flow Rates** from 250 to 2,200 lb. per min.,
- **Densities** from 5.5 lb. per gal. to 7.4 lb. per gal., and
- **Temperatures** from −65 deg. F to plus 140 deg. F.

First units now being tested by USAF are for ground handling of fuel. These can be mounted on trucks or fixed fuelling installations.

The next units are for installation in air-to-air refuelling equipment. Revere, also is developing a design for use in aircraft, which will provide the pilot with a direct reading in lb. of fuel consumed in flight.

The equipment consists of an accurate but conventional volumetric meter a density meter, a mechanical converter and a standard register. In operation, the volumetric meter drives a piston which is coupled to the converter. At the same time, the density meter, called a densitometer, feeds a density factor signal into the converter. The converter automatically multiplies density and volume, with the result registered on the counter in pounds.

The equipment eliminates separate sampling and calculation of fuel density by the direct mechanical measurement of density during actual fuel flow. The Densitometer is a servo-controlled, self-balancing hydometer. A movable weight rides on a beam which has a float at its end. The assembly is immersed continuously in a flow of fuel. An hydraulic-motor-driven lead screw automatically positions and repositions the weight to balance out the moment resulting from the buoyancy of the float. A gear train transmits the result of this activity as a density measurement to the converter.



Largest Universal Joint

This 14¼-in. o.d. universal joint is believed by its manufacturer to be the largest ever made. It is used to transmit power at constant velocity from engine by dynamometer on TWA's propellerless engine test stands recently installed at the carrier's Kansas City, Kan., overhaul base (AW May 23, p. 69). The joint was designed and built by Rzeppa Joint Div., Gear Grinding Machine Co., Detroit.

LETTERS

Facts About Airpower

I should like to take this opportunity to commend AVIATION WEEK for its bold, courageous and patriotic editorial policy. I know of no other publication that contains so much valuable aeronautical information and, at the same time, points up so clearly the pertinent facts as to the true state of our national defense.

Because this latter information must be of great concern to all Americans I have long wished that your publication could reach an audience beyond the circles primarily interested in aviation. Consequently, I was glad to have an opportunity to quote from your own excellent editorial of July 11, 1955 ("Kidding the Public on Russian Airpower") in my article in *This Week* Magazine, which has a popular circulation of about 12,000,000.

Like yourself, I strongly feel that unless the American people as a whole are enlightened on the subject of airpower and aroused to spontaneous action to remedy the chronic ills that plague our national defense planning, we will continue to retrogress vis-a-vis our potential enemy to the point of disaster.

ALEXANDER P. DE SEVERSKY
30 Rockefeller Plaza
New York 20, N. Y.

CAA Door Is Open

In the Sept. 12, 1955, issue of your magazine, Capt. R. C. Robson again directs his criticism toward the traffic control studies in progress at the CAA Technical Development Center at Indianapolis ("Echo From ACC," p. 151). He reports that a previous verbal foray against the same activity in your May 17, 1954, issue resulted in his being taken to task "by those connected with the program."

The Franklin Institute of Pennsylvania, which has worked with us in these studies, did write a letter to the editor protesting Capt. Robson's earlier remarks. This letter was dignified and restrained, it was never published, and to my way of thinking could not be described as taking anyone to task.

For our own part, we have never taken issue with Capt. Robson. We certainly do not agree with his views in this instance, but we respect his right to air his opinions, or those of his friends, however ill-founded they may be.

As was pointed out in the Franklin Institute letter, our door is always open. We welcome honest and informed criticism and suggestions, and are glad to discuss our work with anyone having a legitimate interest. Capt. Robson has never paid us a visit. If he has a sincere desire to offer some constructive thoughts, outside the public press, on traffic control development, we would be glad to see him at any time.

D. M. STUART, Director
CAA Technical Development and Evaluation Center
Indianapolis 21, Ind.

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.

KLM & Britannia

On page 9 of AVIATION WEEK of Aug. 15 it was stated that "KLM Royal Dutch Airlines has advised Bristol Aeroplane Co., it would consider the turboprop Britannia transport only as a freighter aircraft."

This statement has come to the notice of both KLM and the Bristol Aeroplane Co. and we wish jointly to inform you that the statement is entirely without foundation.

R. J. VOGELS
Director of Public Relations
K.L.M. Royal Dutch Airlines
P. O. Box 121
The Hague, Netherlands

P. E. GORDON-MARSHALL
The Bristol Aeroplane Co., Limited
Filton House
Bristol, England

(AVIATION WEEK's *information came from a responsible official involved in the KLM-Bristol discussions.*—ED.)

Area Rule Limited?

Let me contribute the following comments concerning the subject of the article on the NACA supersonic design formula and related editorial in the Sept. 12 issue of AVIATION WEEK, pages 12 and 154 respectively.

The simplicity of the "area rule" for determining the most efficient figuration of supersonic flight aircraft and missiles, derived by the NACA and recently so widely publicized, would indeed be gratifying—if it were strictly correct; unfortunately, it appears that it is not.

Although this rule affords useful results, it does not ascertain the optimum possible figuration. Furthermore, the information obtained applies roughly for just sonic speed, while for supersonic speeds the Coke-bottle restriction of the body should be considerably aft of that dictated by the area rule.

It should be noted that while the sonic condition is important as to the structural strength of the aircraft, the condition at the design supersonic speed is determinant for the capacity required and the fuel consumption of the propulsion equipment. It seems illogical to shape an aircraft to suit a condition lasting at most a few seconds, in spite of the fact that (owing to the accumulative effect) the conditions at exactly sonic speed are most severe.

As is well known, at sonic and supersonic speeds, wave resistance constitutes by far the major component of the total drag; it leads to compression energy continually being propagated away from the aircraft.

Wave-Producing Contours

Correspondingly, it should be emphasized that the shape of the ideal least resistance revolution-body prototype for sonic or supersonic speeds is essentially determined by its wave producing characteristic and only to a much lesser degree by sectional area relations.

Therefore, it is the wave-producing contours (intersection of wave producing surfaces with planes transversal to flight) upon which the balancing of the actual aircraft with the ideal prototype is to be foremostly based.

Evidently, these contour relations are different from sectional area relations: while the former are linearly proportional to dimensions, areas vary with their square. Besides, a wave-generating contour pattern is directional in emission of wave energy, so that in the aircraft's vicinity the wave energy is distributed unevenly and only at considerable distance the energy distribution becomes uniform (chiefly owing to refraction); for instance, while the wave energy emission from a circular contour is uniform in all directions, it is larger in the direction of the small axis of an oval contour.

Lessening the Shock

The proposition is of course, to penetrate into the resultant Mach front steadily and with least resistance due to composite shock generation. As far as wave resistance is concerned, that means avoidance to the best practicable extent of locally intensified shocks due to superposition of waves originating from various parts of the aircraft.

This object is achieved by basing the development of the actual aircraft figuration from the body of revolution prototype, upon the wave-producing contour aspect rather than upon sectional areas; in this regard both length and orientation of these contours are influential.

Secondly, for speeds higher than sonic, due allowance would strictly have to be made for the rearward bending of the Mach waves as, with increasing Mach number, they transform from plane to conical: this effect tends to shift the required Coke-bottle insweep farther aft of the indication by the area rule. However, the taking into account of this tendency appears justified only when very high supersonic speeds are concerned.

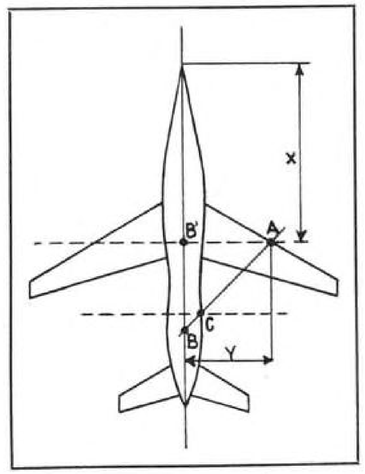
The involved relations become indeed even more complex when reflection of the Mach waves by parts of the aircraft is to be taken into account.

Influence of Sectional Areas

Thirdly, in regard to the influence of sectional areas, it is to be considered that air mass displacement relations (which conform to sectional areas) can become effective only in different transectional planes and the distance of the respective plane separation is a function of the location of the concerned section element and of the flight speed.

In other words, such causal relations do not apply for the same transaction. A point of the aircraft surface cannot sense, as it were, the magnitude of sectional areas present in the same transverse plane; the Mach front supplies at most vague indication of the vicinity of objects moving with the same speed and in the same direction.

These relations are illustrated by the accompanying sketch and, with regard to the argument to be presented, let it be reminded that an aerodynamic disturbance cannot be transmitted through the air faster than with sonic velocity.



Thus, an area element near **point A** cannot have any flow displacement effect on the fuselage section forward of **point C**, which is situated on **line AB**; with **point B** so located that during the interval an aerodynamic disturbance from **A** would reach point **B'**, the aircraft travels the distance **BB'** (at M = 1, **AB' = BB'**).

The same argument applies to any point of the aircraft's surface (by which of course sectional areas become respectively effective). Therefor, also the effect of areas tends to place the insweep of the fuselage towards aft of that indicated by the area rule.

Refined Procedure

Consequently, the formula recommended by Mr. Whitcomb can at best be regarded as a rough approximation.

Apart from the due discipline of a rigorous treatment of this significant subject, in the writer's opinion, the entailed design error is conspicuous enough to warrant substitution of the area rule by a refined procedure, one which takes into account the essential of the above stated relations. A graphical method for finding the optimum figuration could be particularly suitable.

In the age of thorough analytic approach to engineering problems, it appears entirely unjustified to rely on a rule-of-thumb for answers of such vital import as the design of aerial weapons, where even little may count much.

ERNEST LAGELBAUER
Lagelbauer Kinejet Corp.
410 East 13 St.
New York 9, N. Y.

AVIATION WEEK

Buyers' Guide

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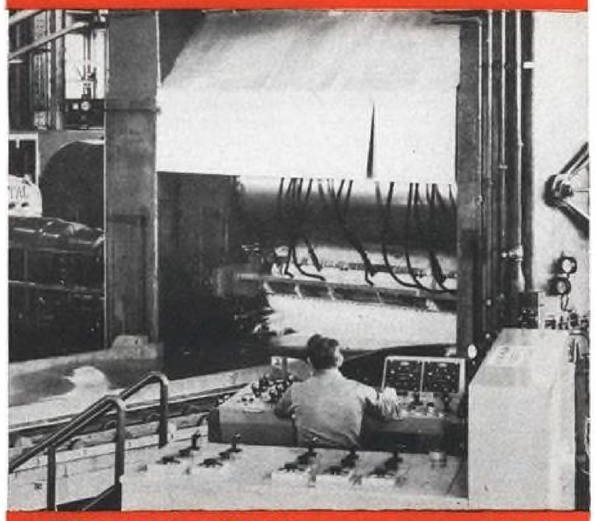
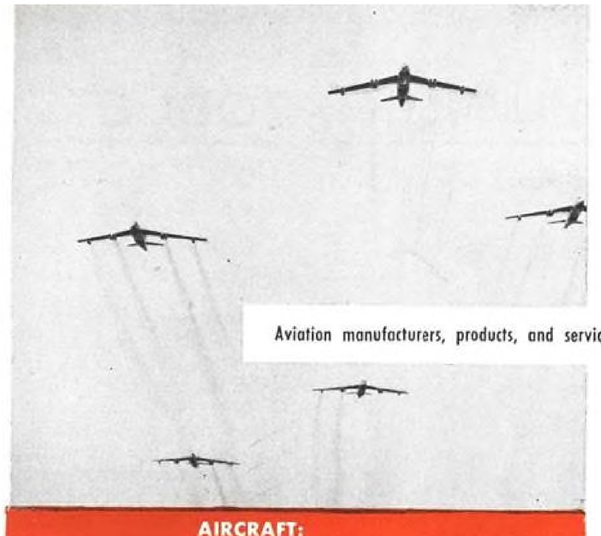
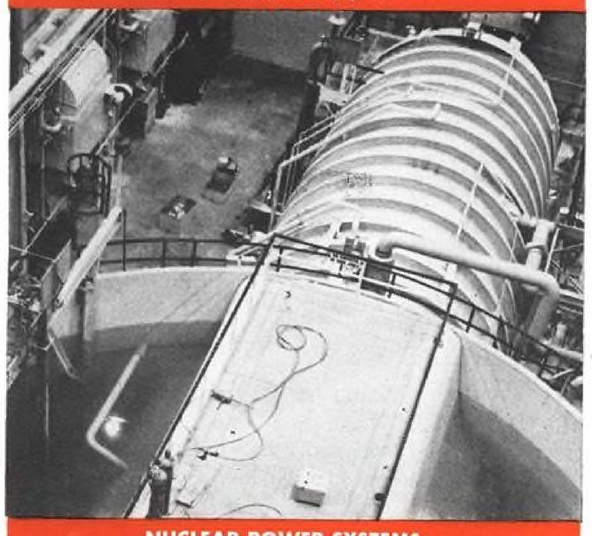
MISSILES:
Airframe and components
Equipment, including ground-handling,
Powerplant



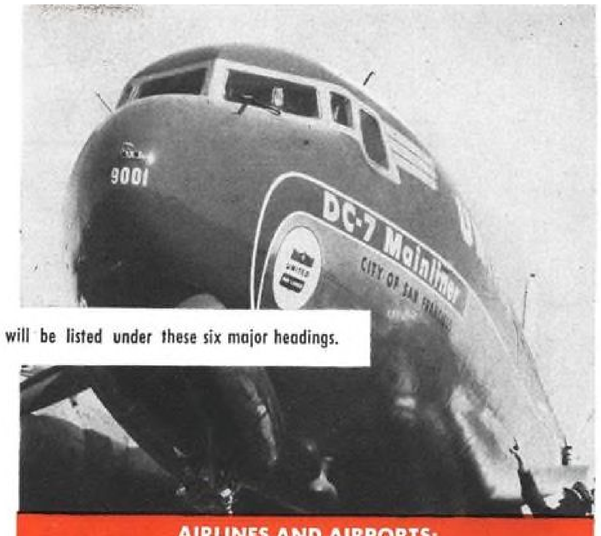
SUPPORTING GROUPS: Data systems computers, punch-card systems etc., Electrical, Ground equipment, Hardware, Hydraulics, Instrumentation, Materials including fuels, chemicals, plastics, metals, etc. Tooling including machine tools, optical jigging systems, hand tools



AIRCRAFT:
Airframe and components,
Landing gear, Powerplant
Armament, Fixed equipment



NUCLEAR POWER SYSTEMS:
Accessories and components
Design services
Reactor fabrication



AIRLINES AND AIRPORTS:
Scheduled carriers, Non-scheduled
carriers, Cargo carriers,
Ground equipment, Lighting

AVIONICS: Communications systems & equipment, Radar-fire control systems & equipment, Instrumentation and controls, Navigation systems & equipment, Components and devices, Test equipment, Computers & data processing equipment

Aviation manufacturers, products, and services will be listed under these six major headings.

The latest developments in military procurement will be covered in a special report. Included in the detailed information to be presented will be: Air Materiel Command—Air Research and Development Command buying practices, personnel listings—by name, procurement centers, etc.; All-inclusive listings of manufacturers of aeronautical and allied products, sectionalized for maximum utility under six major headings: **Aircraft, Missiles, Avionics, Supporting Groups, Nuclear Power Systems, Airlines and Airports.**

Indexing is set up to provide quick, easily referred-to locators for all products. In addition, advertisements and product listings will be keyed to each other for ready reference. AVIATION WEEK's BUYERS' GUIDE also will carry Trade Name and Distributor listings—making this publication **the most complete single source of buying information available to the aviation industry today.**

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Kaman HOK-1 helicopter rescuing flood victim in Farmington, Conn., area. (Hartford Times Photo)

NEW AVIATION PRODUCTS

Face Mask Provides Wide Vision

New Scottoramic face mask has a one-piece plastic safety lens which increases side and forward vision. A double lip seal makes the mask more comfortable, resulting in less fatigue. Non-fogging is assured by the circular air-washing action of the cool air or oxygen supply.

The mask is designed for aviation, industrial and fire-fighting use. Microphone and air hose are optional equipment.

Scott Aviation Corp., 275 Erie St., Lancaster, N. Y.

Lox Tanks Hold 50-500 Gal.

Three liquefied gas storage and transfer containers developed for use with liquid oxygen and nitrogen have working pressures of 50 psig. and design pressures of 180 psig.

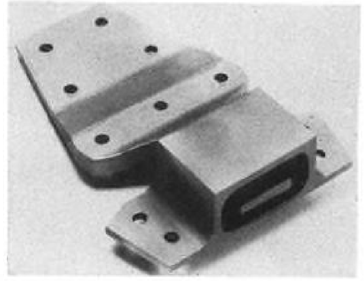
• **Model Lox 50** holds 50 gal. or 5,762 cu. ft. of gaseous oxygen at 70F. The liquefied gas container weighs 447 lb. and is mounted on an MB-1 trailer. A built-in pressurizing coil permits a pressure build-up from 0 to 50 psig. in less than five minutes. The container will hold a vacuum below 50 microns consistently with liquid oxygen in the tank and has an evaporation rate of 2.5 to 4.5% by volume each 24 hours.

• **Model Lox 150** high-vacuum transportable liquefied gas storage and transfer container, holds 150 gal. or 17,286 cu. ft. of gaseous oxygen at 70F. The unit weighs 890 lb. A pressure of 50 psig. can be built up in less than five minutes. The container has an evaporation rate of less than 2.1% of volume each 24 hours.

• **Model Lox 500** storage and transfer container for liquid oxygen and nitrogen, weighs 2,340 lb. The tank can be pressurized to 50 psig. in less than five minutes. With liquid oxygen in the tank, the unit maintains a vacuum of less than 15 microns for extended periods of time. The manufacturer reports that models in use have held a vacuum below 5 microns for several months. Guaranteed vacuum loss is less than 10 microns per day. Capacity is 500 gal.

All three models are designed to USAF specifications.

Ronan & Kunzl, Inc., Cryogenic Div., Marshall, Mich.



Sandwich Mount Damps Shock

Aluminum and rubber sandwich support bracket and shock mountings, have been developed by Stillman Rubber Co. and Lockheed Aircraft Corp., to support after-body engine sections of the Lockheed 1049A.

The Flexmount was designed to withstand applied loads in shear and additional loads caused by engine vibrations. Loads are taken out by 11/2-in.-dia. bolts, with the vibration completely absorbed by a Neoprene rubber core (1 5/8x1 1/4x1 1/4 in.) bonded to the aluminum. Operating temperatures range from −65 to 175F.

Stillman Rubber Co., 5811 Marilyn Ave., Culver City, Calif.

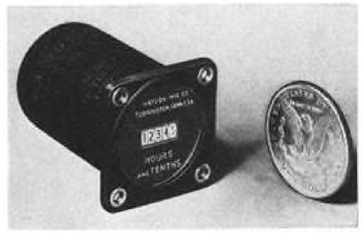
Sealant for Jet Airfields

Paving-joint sealant for jet airfields resists effects of fuel and tailpipe heat. It was designed for sealing sawed and formed joints in Portland cement concrete.

The sealant is supplied in two components: a liquid base consisting of synthetic rubber, plasticizers, vulcanizing agents, activators and inert fillers; and

a dry curer consisting of accelerators blended with suitable extenders.

Presstite Engineering Co., 3798 Chouteau Ave., St. Louis, Mo.



Elapsed Time Indicator

Small elapsed time indicator for aircraft has a synchronous motor drive, comes in a 1¼-in.-dia. case 2¾ in. long. It weighs less than 6 oz. and uses 2 w. of 115-v. 400-cycle power.

The indicator is available in two models—one indicating hours in 1/10 hour steps, the other minutes in 1/10 minute graduations to 9,999.9 min. The units are glass-to-metal hermetically sealed.

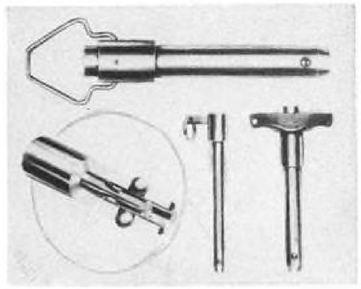
Haydon Manufacturing Co., Inc., Torrington, Conn.

Sequence Valves for 3,000 Psi.

Series 4000 line of slide-type sequence valves for 3,000-psi. hydraulic service features low leakage and low pressure drop.

The valves are supplied in either plunger-operated or lever-operated models, provide flow in either direction from pressure port to outlet port when plunger is depressed. When plunger is extended, flow is blocked from outlet port to pressure port.

Aircraft Products Co., 300 Church Road, Bridgeport, Pa.



Safety Locking Pins

New Ball-Lok pins embody a fast lock and release principle and positive safety lock. Pins are single-action type, either push or pull. The release button must be depressed to disengage the lock at the time the pin is pulled.

Pins are also available in remote control and mallet driven types.

Made by **D. W. Price Corp., Los Angeles;** sold by **Rowe Sales Co., 2140 Westwood Blvd., Los Angeles 24, Calif.**

Aluminum Valves for Planes

Two-way aluminum-alloy flow valves for aircraft oils, fuels, air or fuel vapors are available in 1¼ and 2-in. sizes. They are said to be 50% lighter and have smaller envelope than conventional offset-flow two-way valves. Contacting surfaces are electrofilmed to provide lubrication and positive action.

Units have a working pressure of 60 psi., proof pressure of 120 psi. and are for temperatures from −65 to 160F.

Allen Aircraft Products, Inc., Ravenna, Ohio.

Balances Duct Pressures

Pressure compensator for balancing the end thrust of a pneumatic metal ducting system is applicable to bleed air systems in turbojet and turboprop-powered aircraft.

The primary bellows in the pressure compensator provides for thermal expansion, flexure and misalignment of the duct system. Compensators are made in sizes up to 8 I.D., handle air pressures of 250 psi. or over and temperatures up to 900F.

Arrowhead Rubber Co., Metal Products Division, 2310 Curry St., Long Beach, Calif.

ALSO ON THE MARKET

Environmental testing chamber permits simultaneous, individual testing of two portions of an operating system to temperatures ranging from −100 to 200C. The unit is suited for testing automatic control equipment and airborne systems where elements of the same equipment must operate under different environmental conditions.—Harris Refrigeration Co., 365 Walden St., Cambridge, Mass.

Kodak contour projector, Model 8, is a portable, bench-type unit adaptable for either horizontal or vertical projection gaging and "right reading." Designed for economical checking of small parts . . . . **Model 14-5,** designed for handling heavy parts, is equipped with a heavy-duty worktable supported by a 5-in. O.D. column, a full 17.5-in. throat clearance and a 26x8-in. worktable.—Eastman Kodak Co., Rochester 4, N. Y.

Coated abrasive wheel polishes all types of metal for plating, painting without using fine grit set-up wheels, rag or sisal buffs or brushes. The polishing and grinding wheel consists of hundreds of pieces of cloth-coated abrasives.—Minnesota Mining & Manufacturing Co., Dept. A5-266, 900 Fauquier St., St. Paul 6, Minn.

WHO'S WHERE

(Continued from page 9)

Arthur Settel, U. S. public relations director for KLM Royal Dutch Airlines.

Lyn Malin, sales and publicity representative at Sydney, Australia for United Air Lines.

L. K. Lee, technical advisor of engineering research and development dept. of Mechanical Div. of General Mills, Inc. Other changes: **George H. Geick**, asst. manager of systems analysis; **Dr. Otmar M. Stuetzer**, chief of electron physics laboratory.

Arthur H. Zink, purchasing agent of Teletronics Laboratory, Inc., Westbury, L. I., N. Y.

Philip W. McLane, chief engineer of Fletcher Aviation Corp. Other changes: **Lloyd H. Swanson**, director of engineering personnel; **Robert S. Ricketts**, master production planning; **Howard Cordell**, personnel manager; **Stanley Christensen**, contract administrator; **Todd Derlachter**, comptroller; **Murray E. Liebman**, statistical quality control, **Raymond G. Brewer**, assistant to the president; **Herbert C. Parker**, consulting engineer of Washington, D. C. office; **George S. Kaibel**, Dayton office representative.

Martin W. Rogers, director of quality control of National Co., Inc.

George Shevlin, public relations director of Kawneer Co.; **W. J. Woodruff**, general manager of Appliance Products Div.

Robert W. Matlock, chief engineer of Zenith Aircraft, Div. of Zenith Plastics Co., Gardena, Calif.

Robert M. Van Tassel, chief industrial designer for Joy Manufacturing Co., Pittsburgh, Pa.; **William C. Russell**, general manager of the St. Louis Div.

Joe Egy, sales manager of Cline Electric Manufacturing Company's Aircraft Products Div.

Stanley Johns, St. Louis district sales manager of J. B. Ford Div. of Wyandotte Chemicals Corp. **George C. Prziborowski**, industrial sales, San Francisco district office of Wyandotte Chemicals Corp.

Ralph Cokeley, military aircraft hydraulic systems representative at Wright Field for Vickers Inc.

Peter Maler, sales promotion manager of Astron Corp., E. Newark, N. J.

Frederick A. Winzer, Jr., general sales manager of The Weatherhead Co., Aviation Div., Antwerp, Ohio.

W. H. Collins, Northeastern District sales manager for Trent Tube Co.

Walter W. Armstead, Jr., Indianapolis sales office of Allegheny Ludlum Steel Corp.; **Neale Carter**, Birmingham district sales office.

A. S. Chivers, sales manager of Barry Controls Inc., Watertown, Mass.

John W. Becker, Syracuse district sales manager of Allis-Chalmers Mfg. Co.

Bernard Goldman, liaison engineer & editor of Ford Instrument Co., Div. of Sperry Rand Corp.

Wayne S. Blackman, chief application engineer of American Electronic Mfg., Inc., Culver City, Calif.

Bert G. Maynard, resident engineer, Republic Aviation Corp. at Servel, Inc.

Paul L. Van de Velde, operations manager at Idlewild for Airwork Atlantic Ltd.

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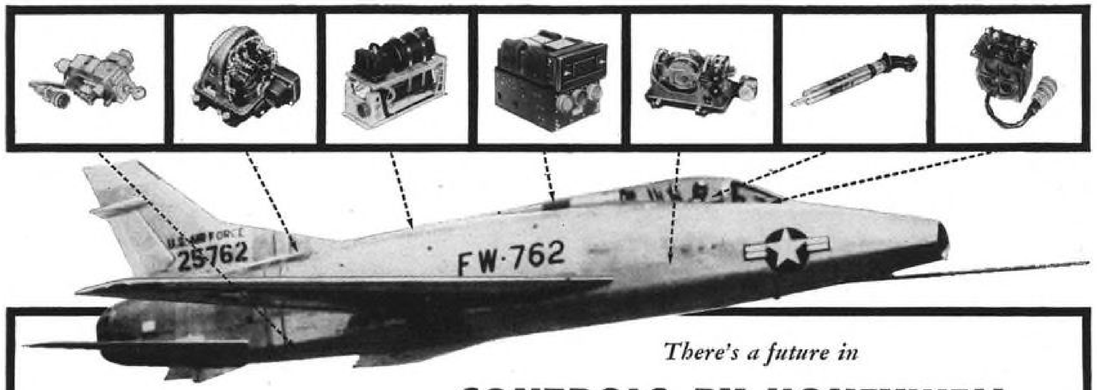

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(Continued from opposite page)

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Names on Request	Hours	@ HP	Gas Gls hr	Oil Qts hr	Replaced with
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C	951	655–680	51	1½	Super-92
D	900	650	50–52	3	Super-92
E	900	680	50	2	Super-92
F	871	690	50.5	1	Super-92
G	860	675	50	2–3	Super-92
H	740	600	48	2	Super-92
I	670	660	52.5	1–2	Super-92

If you want to know about the Super-92, ask the pilots who fly them. After all, what manufacturer or dealer will "approve" a competitive product he cannot supply himself*, or state other than "opposition" when asked about it? (Do the Giants "approve" the Dodgers?)

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Automation Creates Jobs For Workers With Skills

There is new and reassuring information for those who fear that "automation" — the control of machines by machines — will mean fewer job opportunities. It comes from a special survey of 1,574 companies in metalworking industries recently completed by AMERICAN MACHINIST, a McGraw-Hill publication. More than one-fifth of the companies reported that they already have automatic loading, transfer or assembly machinery in operation. In these companies as a whole there has been a net increase in total employment since this machinery was installed.

According to the AMERICAN MACHINIST survey, of these companies with actual experience in automation

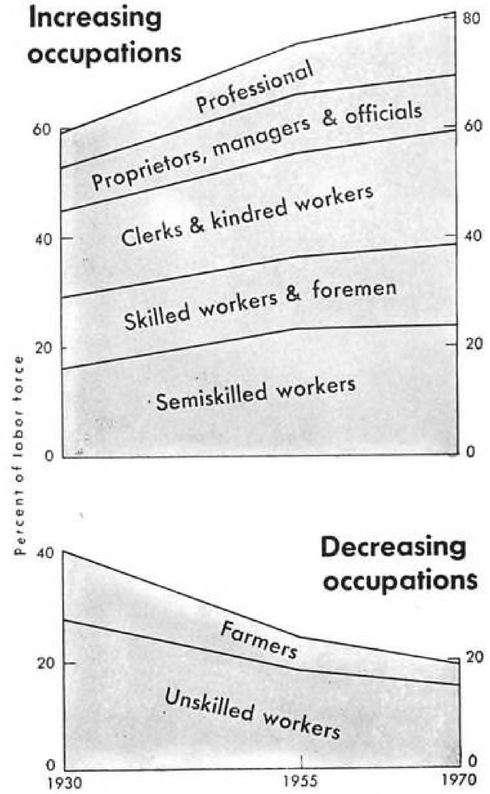
- 26% reported increases in employment averaging 21%
- 51% reported no change in total employment
- 23% reported decreases in employment averaging 16%

More Jobs for the Skilled

Of greater significance, however, is the response by 40% of these companies that they required more skilled maintenance men and by 21% of the companies that they had increased their engineering staffs. This indicates that automation is strengthening a trend already evident in the United States, a trend of expanding opportunity for those with industrial and professional skills and, relatively, of contracting opportunity for the unskilled.

The following chart shows how strong this trend has been over the past 25 years and how strong it may be expected to be over the next 15 years.

There has been a sharp decline in the percentage of unskilled workers in the nation's labor force and a corresponding increase in the percentage of those with varying degrees of skill.

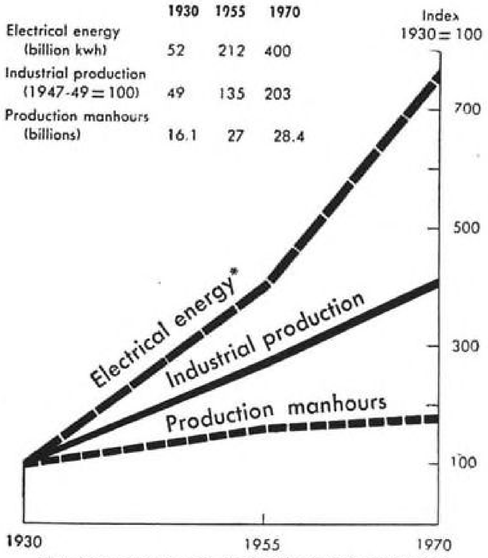


It is possible, of course, to cite cases of individuals and groups that do not conform to the charted trends. Farmers, for example, are becoming at the same time more skilled and less numerous. But this does not upset the broad proposition that opportunities are increasing for those who have skills.

Power and Production

Much of the basic explanation for the relative expansion of opportunities for those with industrial and professional skills lies in the increasing use of power-driven machinery. This has made possible a vastly greater increase in manufacturing production than in the manhours of human labor devoted to it. The following chart shows the relative increases in electrical energy and manhours of labor used in manufacturing since 1930 and the rise in industrial production.

	1930	1955	1970
Electrical energy (billion kwh)	52	212	400
Industrial production (1947-49 = 100)	49	135	203
Production manhours (billions)	16.1	27	28.4

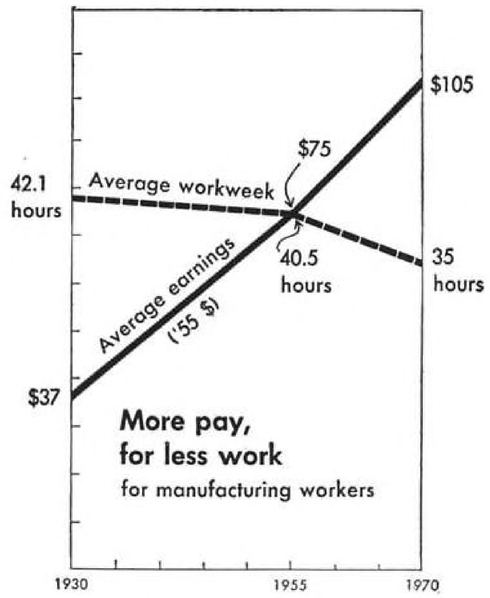


*Excludes power used in aluminum and magnesium reduction, both very heavy power users.

Power-driven machines have reduced the amount of human energy required for physical labor, but they have increased the need for skillful handling and maintenance. As the AMERICAN MACHINIST survey demonstrates, the same is true of automatically controlled machinery.

Higher Wages, More Leisure

The rising average wage of American industrial workers and the decline in hours per week that they must work reflect directly the extent to which the increase in industrial production has outstripped the manhours devoted to it. The final chart shows the increase in weekly wages (in dollars of constant purchasing power) and the decrease in the average workweek in manufacturing since 1930. It also shows the changes that may come in the next 15 years if present trends continue.



There are some who would slow what an earlier editorial in this series characterized as "the continuing process of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control." In doing so, they might make the world safer for those with no skill. The far more constructive course is to welcome the expanding opportunities now being provided and be sure that the nation's young people, who are now starting another school year, are prepared to take advantage of them.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw
PRESIDENT
McGRAW-HILL PUBLISHING COMPANY, INC.

Obsolete Nav Aids Threaten Prosperity

IATA warned that outmoded navigation aids jeopardize international airlines' economic future.

By Craig Lewis

New York—Inadequate, outmoded navigation aids are costing international airlines heavily and threaten the economic future of the industry, an International Air Transport Association technical committee warned here last week.

The state of navigation aids and ground organization on which the airlines depend lags five years behind current aircraft development, the Technical Committee report before the annual general meeting of IATA declared. It added:

"We operate our aircraft with exceptionally high standards. Rather than lower these standards, we are often forced to accept economic penalties.

"The magnitude of such penalties can become completely unbearable in terms of our future aircraft types if we are without necessary ground organization and navigation aids."

The committee pointed out that IATA member airlines have spent, or plan to spend, billions of dollars in new aircraft orders. (Pan American World Airways has made the initial order for U. S. built turbojet transports. Eastern Air Lines and American Airlines have ordered Lockheed Electras and British European Airways will order the new Vickers Vanguard in the turboprop field. Substantial orders for new turbine types are expected from other carriers.)

Economic Penalties

These aircraft are "fabulously expensive," the report said, but potentially can operate at lower seat-mile costs when flown in the most effective manner technically possible.

"Unfortunately," the report added, "we who have that technical responsibility know that there are very few, if any, international air routes in the world today where the standard of air navigation facilities and services will permit us to perform our part of the overall operation efficiently and economically."

The committee listed various factors which force an economic penalty on the airlines, including the need for excessive fuel loads, departure delays, slow handling due to inadequate terminals, inefficient routing or assignment to uneconomic altitudes because of inflexible traffic control, inadequate and delayed weather information and inefficient communications.

The committee estimates that one hour of non-productive flying of a modern aircraft costs $1,000 and points out that, even if non-productive flying amounts to no more than 2% of annual utilization, it will cost the airlines millions of dollars.

Greater Losses Predicted

In submitting the report, Raymond Dupre, Air France Vice President and Operations Director and chairman of the IATA Technical Committee, told the meeting that the airlines can look forward to greater losses than those suffered today because of inadequate facilities and services.

"Without adequate services and facilities," he said, "airline operators will be unable to satisfy the demands of the general public for an expanding air transport service, and I know that I speak for the entire IATA Technical Committee when I say we believe the events of the next few years will confirm our worst fears on the balance sheets of the airlines."

In a review of specific factors involved in air operations, the committee found that the airlines are suffering added economic penalties from the complexities of international air regulation. A campaign is being planned to bring international aviation law up to date and to keep it in step with technical advances.

An example of backward regulation cited by the committee is the fact that one country requires an airline to carry a radio operator in a day when the radio-telephone has replaced radio telegraphy, and there is no need for the required operator.

'Discount Tacan'

The committee urged the world governments to discount the present controversy in the United States over Tacan and to proceed with development of VOR systems. It estimated that it will be between 10 and 20 years before VOR facilities will have to be replaced.

The committee pointed out that Tacan still has to be proven operationally and that the system will need at least a decade of test and development before it can be applied on an international scale.

A growing interest was reported in an entirely new system called Inertial Navigation which is self-contained and independent of the ground. The new system was recently released from security and is being watched closely because of its potential flexibility and independence from extensive ground facilities.

In considering efforts to attain lower operating limits for approach and landing, the committee found that electronic devices have progressed to the point where immediate benefits must come from improvement of visual aids.

Improvement of threshold and runway lighting is viewed as the most pressing need. It was pointed out that such lighting improvements are also necessary to raise safety standards at current minima.

The committee said it is helping the aircraft manufacturers build better landing characteristics into their products in an effort to relieve the pilot during the critical landing period.

Full Control Recommended

Revision of flight rule criteria to bring them up to the standards of today's faster aircraft was discussed by the committee. The group concluded that the ultimate solution is full control of all air traffic at all times. Since this, obviously, is some time away, the report recommended enlargement of visibility and distance from cloud criteria to allow the pilot of a 300 mph. aircraft a theoretical period of half a minute to see converging aircraft and take action.

The need for streamlining weather procedures to bring them up to the requirements of longer flights was also reported by the committee. As aircraft which can fly 5,000 and 6,000 miles nonstop become available, the IATA group said, it will be necessary to eliminate complicated procedures and adapt them to longer range operations.

The committee noted that the International Civil Aviation Organization has completed the Meteorological Annex to the Chicago Convention and views the annex as a vital statement of meteorological needs and obligations which will aid the airlines in getting the services they need from the various governments.

In communications, IATA is trying to promote standardization of radio-

telephone procedures, since it has become the accepted medium of communication and "the Morse key of radio telegraphy is fast becoming obsolete and will soon become a museum curio."

The committee said that the electronic equipment carried in many aircraft is not adequate to the work required of it, especially in terms of limitations of the number of channels and frequency stability.

It was pointed out that aircraft must have modern equipment in order to take full advantage of ground aids.

The airlines were cautioned by the committee not to make the mistake of thinking that airborne radar is "the nostrum of all navigation and safety ills."

They were advised to stay fully aware of radar's limitations but, at the same time, to take full advantage of its value in increasing passenger comfort and as an additional navigational aid.

It is the hope of the committee that a 1956 ICAO Air Navigation Conference will extend the "approved organization" concept to maintenance personnel which is now applied to overhaul activity. Undert this concept, an entire maintenance and overhaul facility would be licensed by a government rather than licensing of individual personnel.

Fuel Restrictions Hit

Restriction of the use of current types of turbine fuel, such as JP-4 and kerosene, for use in turbine aircraft is opposed by the Technical Committee. After a two-year study, the airlines have concluded that there is not yet sufficient knowledge within the industry to permit recommendation of a single fuel type for civil turbine engines.

While it is too early to set specific performance requirements, according to the report, "objective operational requirements" already have been established. The committee said that helicopter traffic control is being developed with the super-highway concept, including parallel routing, overpasses and underpasses for cross traffic and clover-leaf systems at airway intersections.

The committee noted progress in regional activity, especially in Europe. Installation of a radio-telephone high frequency communications system which will allow elimination of Morse telegraphy by next July was cited as an important step in the European region.

It also was reported that the North Atlantic Treaty Organization has set up a coordinating agency for civil and air force traffic. Forecasting traffic increases in trans-Atlantic operations, the report noted that IATA members, non-scheduled and military aircraft made 60,000 crossings in 1954 and will probably make 90,000 crossings in 1959.

For the coming year, the Technical Committee will be led by Andre A. Priester, Pan American vice president, as chairman, with Capt. A. V. J. Vernieuwe, vice president of Sabena Belgian Airlines, and Capt. J. W. G. James, British European Airways flight operations director, as the new vice chairmen.

Fare Dispute, Invitation to Russia Highlight Annual IATA Meeting

A dispute over recent fare increases and requests by Western airline executives for Russia to lower the Iron Curtain were the highlights of last week's tenth anniversary convention of the International Air Transport Association.

The convention met in week-long business sessions and received reports from its various committees, including the report on the Miami Traffic Conference at which most first-class fares were raised.

In welcoming the delegates on behalf of the United States Government, Civil Aeronautics Board Chairman Ross Rizley expressed disappointment over the fare increases. He observed that U.S. domestic carriers are receiving good public response to their new $160 excursion fare and predicted that "we will be seeing nonstop transocean flights at that rate or less, in high-speed aircraft."

IATA's new president, Juan Trippe of Pan American World Airways, urged Rizley to take a careful look at the work done at the Miami conference before he or the CAB acts on behalf of the U.S. Government.

In his address, Trippe observed that the international airlines are the instruments best equipped to implement the "Spirit of Geneva" generated at the Geneva conference of the major world powers.

Soviets Invited

Although Czechoslovakian and Polish airlines are IATA members, Trippe noted the absence of a Russian delegation and urged Aeroflot, the Russian state airline, to join the IATA ranks.

He said that such a move "would be timely and convincing evidence on the part of the Soviet leaders that they are really willing to lift, for tourist travel, the Iron Curtain which has so long separated the peoples of the West and the Communist worlds."

Retiring IATA president Max Hymans, president of Air France, told the delegates that the last barrier to international aviation is political—the Iron Curtain. He called it "a challenge to the western ideal of the freest possible circulation of men and their goods—that concept of the fastest transport by the most direct route which led our ancestors to cut the peninsulas and pierce the isthmuses at Suez, Panama, Kiel and Corinth."

Hymans said the ultimate solution to the problem lies in membership of a Soviet airline in IATA. He expressed the hope that it would happen in the coming year and make IATA a truly universal organization.

Western Routes to Moscow?

Several airlines are currently exerting pressure for operating rights in the Soviet Union. European operators would like to link Moscow and other Russian cities with their European systems, and the long-haul operators want to fly to and over the Soviet Union in order to shorten their routes to the Far East.

The IATA traffic conference reported to the delegates on the fare increases announced after the Miami conference this month. The main factor was a series of increases of up to 10% in first class fares on most world routes.

The report said that the increases are designed to cover increased costs of providing added luxury services demanded by first-class passengers. These added services include such features as Sleeperette seats, which will probably become standard for first-class service under the new fares.

Short-term agreements were reached on polar-route fares, but long-term solutions were left to next year's traffic conferences because of the present fluid state of polar operations.

The international airlines failed to reach any conclusions on the no-show problem, which is also unsolved by U. S. domestic airlines. Member airlines are making studies in their areas to serve as a basis for specific action next year.

The IATA executive committee reported that recommendations made to the Facilitation Division of the International Civil Aviation Organization should cut airline costs substantially if adopted and implemented by the various governments.

The recommendations included elimination of the passenger manifest, more expeditious custom clearance, amendments to crew license and certificate to help interchange operation,

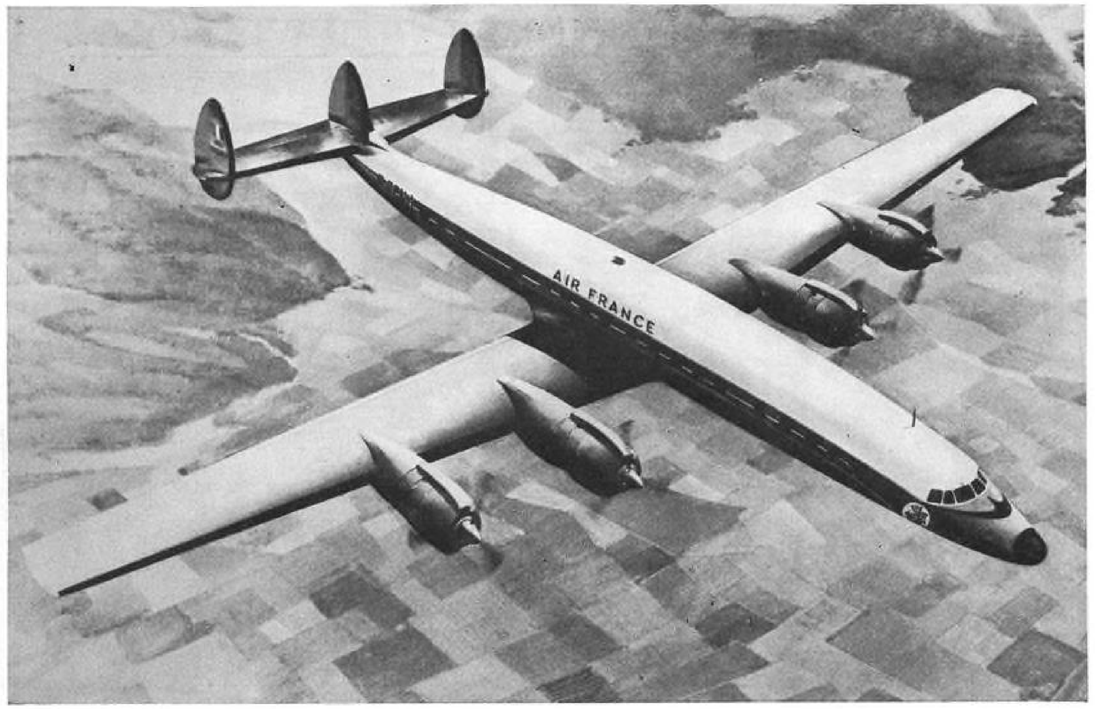
SIR ELLIS ROBBINS, Central African Airways Chairman (left picture), and Piers Winbush, Central African's general manager, read IATA Daily published by Aviation Week. At right, IATA members in session.

FIVE OF THE MEN who drafted IATA's original Articles of Association. L. to R.: Dr. Henry Gorecki, IATA Treasurer; Prof. John C. Cooper, IATA legal adviser; Maj. J. Ronald McCrindle, BOAC; Rene Briend, Air France, and Per A. Norlin, SAS.

JEROME LEDERER (left) presents Flight Safety Foundation Award to IATA Technical Director Stanislaw Krzyczkowski.

MAX HYMANS (second from left), Air France President and retiring IATA President, welcomes incoming president Juan T. Trippe, Pan American Airways head. At left, Ross Rizley, CAB Chairman; right, Sir William Hildred, IATA Director General.

IATA At The Waldorf



Lockheed 1649A

Artist's conception above and wind-tunnel model show extra wing length and high aspect ratio that have helped boost the speed of Lockheed's newest and fastest piston-powered Super Constellation—the 1649A—to above the 400 mph. mark (AW Oct. 10, p. 35). The new, thinner wing is 27 ft. longer (150 ft. from tip to tip) than any of its predecessors. Another change is in the engine placement; they have been placed five ft. farther from the cabin for added interior quietness.

The 1649A model has completed its 1,000 hr. in the wind tunnel, going through close-tolerance checks at speeds up to 570 mph. To gauge any interference between major components, the fuselage, nacelles, empennage, flaps were added one-by-one in the testing.

Lockheed already has received orders from Trans World Airlines and Air France for a total of thirty-six 1649As.

simplification of passenger documents and more attention to facilitation needs in planning new terminals.

The executive committee announced that John Slater, of the consulting firm of Coverdale & Colpitts, will make a survey of the traffic conference machinery. The traffic conference itself had complained of the pressure felt by delegates at the meetings and asked for some relief.

Enforcement Office personnel has been doubled in an effort to make the activities of the office as world-wide as possible. Consideration is being given to the appointment of a permanent chairman in order to give the enforcement operation more continuity and legal cohesion.

The executive committee told the convention that an IATA prorate agency will be established under the leadership of M. H. Van Pelt, formerly of KLM Royal Dutch Airlines. The agency will handle the accounting problems arising out of division of revenue from interline traffic between the airlines.

New IATA Members

IATA admitted three new members in the past year—Lufthansa, the German airline; Middle East Airlines and New York Airways, the first all-helicopter operator to join the organization. Seaboard and Western Airlines will become a member as soon as it starts its recently-authorized scheduled cargo operations across the Atlantic.

Nonsked Fights CAB

North American Airlines has petitioned the U.S. Court of Appeals for the District of Columbia to make a judicial review of Civil Aeronautics Board's decision in New York-Chicago service case and declare it "unlawful."

The Board turned down applications of North American in the case, but granted new route awards to Capital Airlines, Eastern Air Lines, Northwest Airlines, Trans World Airlines, and United Air Lines, to become effective Oct. 31.

North American's petition declared that CAB's conduct was "arbitrary and capricious and constitutes an abuse of discretion, unsupported by substantial evidence, and unsupported by necessary findings."

More VOR Stations

The Civil Aeronautics Administration has announced that 21 additional omnirange navigation aids will be installed in Europe and Asia, supplementing the 49 VORs already installed or programmed. The VOR installations are being financed by the International Cooperation Administration and by counterpart funds provided by the nations involved. Eleven of the new VORs will be installed in India; four in Pakistan; three in Greece; two in Turkey, and one in Lebanon.

UK Exports by Air

The British America Trade Center reports that produce and manufactured items exported by air from the United Kingdom in 1954 were valued at $169,000,000 and represented 2% of Britain's total exports. Air imports into Britain during the year totaled $119,000,000, or 1.3% of the total. Principal items exported by air, the trade center reported, were silver, platinum and jewelry ($20,400,000 worth), leather and furs ($8,100,000) and scientific instruments, photographic and optical goods, watches and clocks ($12,900,000).

Idlewild Expands

Construction of the International Arrival Building and two adjacent foreign-flag Airline Wing Buildings for the $60-million "Terminal City" development at New York International Airport is scheduled to begin sometime this week. A $697,162 contract was awarded last week to a New York City firm (Wortmann & Sons, Inc.) for the laying of the buildings' foundations. The Arrival Building will house federal services, such as customs and public health, and is scheduled for occupancy in 1957.

C-54 to the Rescue

The first of a scheduled 36 SC-54 air rescue planes (above) was delivered to the Air Force earlier this month by Convair's Fort Worth Division. The conversion of a conventional C-54 into an SC-54 includes the installation of blister-type windows in the rear of the fuselage and an oversized nose for special radar equipment. Additional avionic devices and rescue equipment also have been added to the interior.

Lufthansa Plans Route Expansion Middle East, South America

Route expansion plans aimed at reclaiming a large part of the global network it pioneered and operated prior to World War II were announced by Lufthansa German Airlines last week. The airline will resume Middle East and South American routes and inaugurate additional North American schedules during 1956.

Flights to Tehran will begin next summer with an extension planned later to an as yet undesignated Far Eastern terminal. By fall, Lufthansa will again fly between Hamburg and Buenos Aires via Rio de Janeiro. Lufthansa first surveyed Far Eastern and South American routes in 1926.

Service to Montreal and Chicago from Hamburg is scheduled to start this spring.

The expansion plans were announced by Lufthansa President H. M. Bongers, who also discounted rumors that Lufthansa was about to replace its American pilots and other U.S. crew members with German personnel. "These Americans," he said, "are going to be flying with us for a longtime, of course not forever."

U. S. flight captains, on loan from Trans World Airlines, are piloting the airline's transports with Germans as co-pilots. Lufthansa announced that it actually plans to double its number of American pilots before the heavy schedules of next summer. Navigators are on loan from Trans-Ocean Airlines.

Recently, Lufthansa announced that its capital would be raised from $7 million to approximately $18.4 million through a new stock offering. Bongers, however, notes that the West German government now is the majority stockholder and that only recently has private capital shown any inclination to invest.

"The trouble with attracting Europeans is that they want immediate returns on their investments," he said. "Lufthansa is a long range proposition."

A step toward implementation of Lufthansa's route expansion, was the signing this month of an air agreement with France on route exchanges. In addition to traffic routes to cities in France, Lufthansa has French permission to fly via Paris to points in Southern Europe, Africa, South America, the Caribbean, and Ireland to New York. France in return may fly via various German cities to Southeastern Europe, the Middle East, the Far East and Australia.

Northwest to Begin New York-Chicago Run

Northwest Orient Airlines last week announced plans to inaugurate direct service between New York and Chicago beginning Sunday with ten daily flights —four eastbound and six westbound.

With the start of the service, Northwest will offer trans-continental one-stop service across the northern tier of states.

First-class fares between the two points will be $45.10, one way; $85.70 roundtrip, both plus federal tax. Coach fares will be $33 and $66.

Three of the eastbound flights and four of the westbound will be operated on a first-class basis, using Boeing Stratocruisers. Douglas DC-6Bs will be used on the tourist flights.

USAF Is Challenged On MATS Policy

Air Force is charged with "inexcusable absence" of coordination in procurement in a report by the Senate Preparedness Investigating Subcommittee.

The criticism is based on investigation of a single case: the procurement of seats for transport aircraft of Military Air Transport Service.

MATS wanted to switch from military-type seats to more comfortable commercial-type seats. When seating replacements were needed for four C-118 aircraft, MATS called on several manufacturers to submit sample commercial type seats. "No authority whatever existed for initiating procurement for this type seat," the subcommittee report declared.

However, it was pointed out that "MATS was clearly encouraged to believe that it would receive authority to install new passenger seats by ambiguous communications from USAF headquarters." The indications were in memoranda from Brig. Gen. John Howe, Director, Maintenance-Engineering, Deputy Chief of Staff for Materiel, and from Brig. Gen. George Price, Director of Requirements, Deputy Chief of Staff for Development.

After MATS and manufacturers "had expended much time and money in the preparation and testing of sample passenger seats," notification was given by Brig. Gen. B. C. Kelsey, Deputy Director of Research and Development, Deputy Chief of Staff for Development, that there was no authority to change from military-type seats.

"This procurement should not have been set in motion prior to a positive and specific determination that a deviation from existing specifications was permissible," the report declared. "It is evident that there existed a lack of proper planning, coordination, and clear channeled communication between MATS headquarters and USAF headquarters. . . . It would also appear that an inexcusable absence of coordination existed between the Office of Requirements and the Office of Research and Development." The subcommittee directed the Secretary of the Air Force to investigate and advise it as to what action is being taken to improve procurement coordination within USAF.

Observing that "small business men who negotiate with the defense forces often come to be filled with a sense of futility in attempting to obtain firm agreements with the services because of frustrations attendant upon long, drawn-out procurement practices," the subcommittee added that complaints it has received "would seem to indicate that this feeling has a substantial basis in fact."

SHORTLINES

► **Alitalia** has applied to Jordan for permission to start direct air service between Rome and Jerusalem.

► **Lake Union Air Service** of Seattle has received authorization from the Canadian Air Transport board to operate non-scheduled service to Vancouver Island and British Columbia.

► **Lloyd Aereo Boliviano** celebrated its 30th anniversary in September. LAB operates 17 aircraft between Bolivia and Argentina and Chile.

► **Mohawk Airlines** earned a net profit of $62,400 for the first half of 1955. Passenger revenues were $1,411,224, a 25% gain over $1,129,415 for the comparable period last year.

► **National Airlines** declared the regular quarterly dividend of 25 cents per share payable Oct. 14 to stockholders of record Oct. 4.

► **North Central Airlines'** net earnings for the first half of this year totaled $41,026, compared with a net loss of $161,787 during the similar period of 1954. Passenger and various other non-mail revenues increased 46% to $1,061,537.

► **Trans-Canada Air Lines** will start a new all-tourist service on its southern routes to Bermuda, the Caribbean and Florida. The change to tourist service is accompanied by an overall reduction of 27% in fares and a 32% increase of available seats.

CAB ORDERS

(Oct. 6-12)

GRANTED:

Seaboard and Western Airlines an exemption to provide free transportation to a Curtiss-Wright Corp. engineer on one U. S.-Europe round trip for in-flight observation.

Minneapolis-St. Paul Metropolitan Airports Commission permission to intervene in the North Central Airlines permanent certification case.

Seaboard and Western Airlines an exemption to perform flights from Munich to Detroit and New York, and from Rome to New York pursuant to a contract with the Intergovernmental Committee for European Migration.

United Air Lines, Trans World Airlines, Northwest Airlines, American Airlines, Eastern Air Lines and Capital Airlines exemption authority to make services granted in the New York-Chicago Case effective Oct. 30 so that schedule changes can be made simultaneously with Daylight Saving Time changes.

Riddle Airlines an exemption to operate from Fort Myers, Sarasota/Bradenton, Lakeland, Jacksonville, Daytona Beach and Fort Pierce, Fla., to New York carrying perishable products, live animals and human remains until 60 days after decision in the North-South Airfreight Renewal Case or until U. S. Airlines resumes operations to the points.

State of Ohio permission to intervene in the Erie-Detroit Service Case. Petitions of City of Utica, N. Y., Commonwealth of Massachusetts and the State of New Hampshire are denied.

Permission to intervene in the North Central-Lake Central Acquisition Case to the City of Kalamazoo, Mich., and the City of Gary, Ind.

American Airlines permission to serve Chicago through O'Hare Airport, providing O'Hare and Midway Airport are not served on the same flight.

APPROVED:

Resolutions between various carriers adopted by the International Air Transport Assn. relating to North Atlantic specific commodity rates.

Agreements between Ozark Air Lines, Lake Central Airlines and various other carriers relating to inter-carrier arrangements.

ORDERED:

Suspension proceedings involving certain non-certificated irregular air carriers terminated since they have become moot for various reasons.

National Airlines' petition to reopen the record in the North-South Airfreight Renewal Case on the issue of the holdings of Arthur Vining Davis in Riddle Airlines deferred until after oral argument is held.

Northwest Airlines to show cause why its mail rates for Pacific operations should not be set at the rates proposed by the Board in the International Service Mail Rate Case for the period starting Jan. 1, 1955.

United States Overseas Airlines to cease and desist from violating regularity, ticketing and tariff regulations of the Civil Aeronautics Act and the CAB Economic Regulations.

Letter of Registration of World Freight Forwarders (Air) suspended for failure to file quarterly reports, unless the reports are filed by Oct. 24, 1955.

DENIED:

Allegheny Airlines' petition for reconsideration of the Board's refusal to allow the carrier to intervene in the North Central-Lake Central acquisition case. Permission to intervene in the case is granted to the Airline Dispatchers Assn., AFL; the Air Line Pilots Assn., Intl.; the Postmaster General; the Mansfield Metropolitan Airport and Aviation Commission; the Vermilion County Airport Authority; the Zanesville Chamber of Commerce; the City of Youngstown, Ohio; the City of Columbus, Ohio; the Columbus Chamber of Commerce; the City of Dayton, Ohio; the City of Toledo, and the Toledo Chamber of Commerce.

Lake Central Airlines' application for exemption authority to operate between Cincinnati and Zanesville, Ohio.

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NEWS Edo NOTES

AMPHIBIOUS FLOATS PROVE STAMINA IN USE

Operating on rough gravel strips in the far north of Canada, a Cessna-Edo 180 amphibian has proven the rugged capabilities of the new Edo amphibious floats. Used in connection with the DEW-Line project, the Edo gear withstood grueling daily use with no difficulty whatsoever.

Since its introduction last spring the 180 amphibian, with a cruising speed of over 135 mph, has proven its exceptional performance under a wide variety of conditions. A 180 amphib has even flown from a Colorado lake 8,300 feet above sea level.

Inadvertent landings with wheels retracted have been made on at least five different occasions on both hard and soft runways with inconsequential results. Damage, if any at all, was confined to some wear on the keel strip, after which the plane was in the air within 15 minutes. Land and water landings were subsequently made without hitch.

To meet demand, production of amphibious floats has reached one per day in addition to production of standard Edo floats for Cessna, Piper and other aircraft. For more information send for new Edo float brochure.

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EDITORIAL

Jet Transport Race Gets Hotter

It is certainly no coincidence that the 11th annual general meeting of the International Air Transport Association in New York last week produced the biggest bustle over commercial airline equipment orders since the end of World War II. Never before has the problem of buying the proper type of new transports at the proper time loomed as such a critical problem for airline management. Never before has the international competiton between airframe and engine makers for airline business been hotter. For, as Peter Masefield, who is leaving the airline management field to sell gas turbine transports, recently told the Institute of Aeronautical Sciences in Seattle, the airlines sales game will be played for stakes that could easily total $9 billion during the next decade.

PanAm's Gambit

Ignoring for the moment the domestic picture, Pan American World Airways' recent $269 million order for Boeing 707s and Douglas DC-8s puts the jet transport race on the lucrative North Atlantic route into sharp focus. It now appears that the first turbojet commercial airliners that will link the United States with Europe nonstop in less than seven hours will be built in Seattle and flown by an American flag line. For our British competitors who have been proclaiming their leadership in commercial jet transports for many years, this will be another in a series of disappointments now plaguing their airframe industry.

The Boeing 707 jet transport will go into trans-Atlantic service during 1959, making the nonstop New York to London run in 6 hr. 15 min. Westbound it will be able to make the trip nonstop in normal summer weather but may have to stop for fuel at Gander against the strong westerly winds of winter.

The de Havilland Comet IV, due for British Overseas Airways Corp. service in the same year, could conceivably be used on the North Atlantic, although BOAC's current plans allocate the Comet to Empire routes to the Orient and Africa. On the North Atlantic, the Comet IV would be a one-stop transport eastbound with two fuel stops possibly required when bucking winter winds on the westbound run.

True Measure

Combination of its limited range, limited passenger capacity—58 seats compared to a maximum of 125 for the 707—and a 50 mph. slower cruising speed indicate that the Comet IV will not be an effective trans-Atlantic competitor to either the Boeing transport or the Douglas DC-8 now scheduled for Atlantic service during 1960.

During the IATA meeting we listened to Frederick B. Rentschler, chairman of United Aircraft Corp., advance the thesis that performance of a nation in commercial air transport is a more accurate measurement of its aircraft industry than are claims made for its military airpower. Mr. Rentschler reasons that governments can and frequently do cloak the true measure of their military strength—either to conceal their own deficiencies or to propagandize potential enemies. From our own experience we know this to be a fact.

On the other hand there is no way the facts on commercial aviation can be concealed from public appraisal. The public rides the airlines. It reads the annual airline balance sheets. The public knows if the transports actually do fly, knows their advertised schedules and knows when equipment is earning money for an airline by efficient operation or is swelling a deficit that often must be cured by national subsidy.

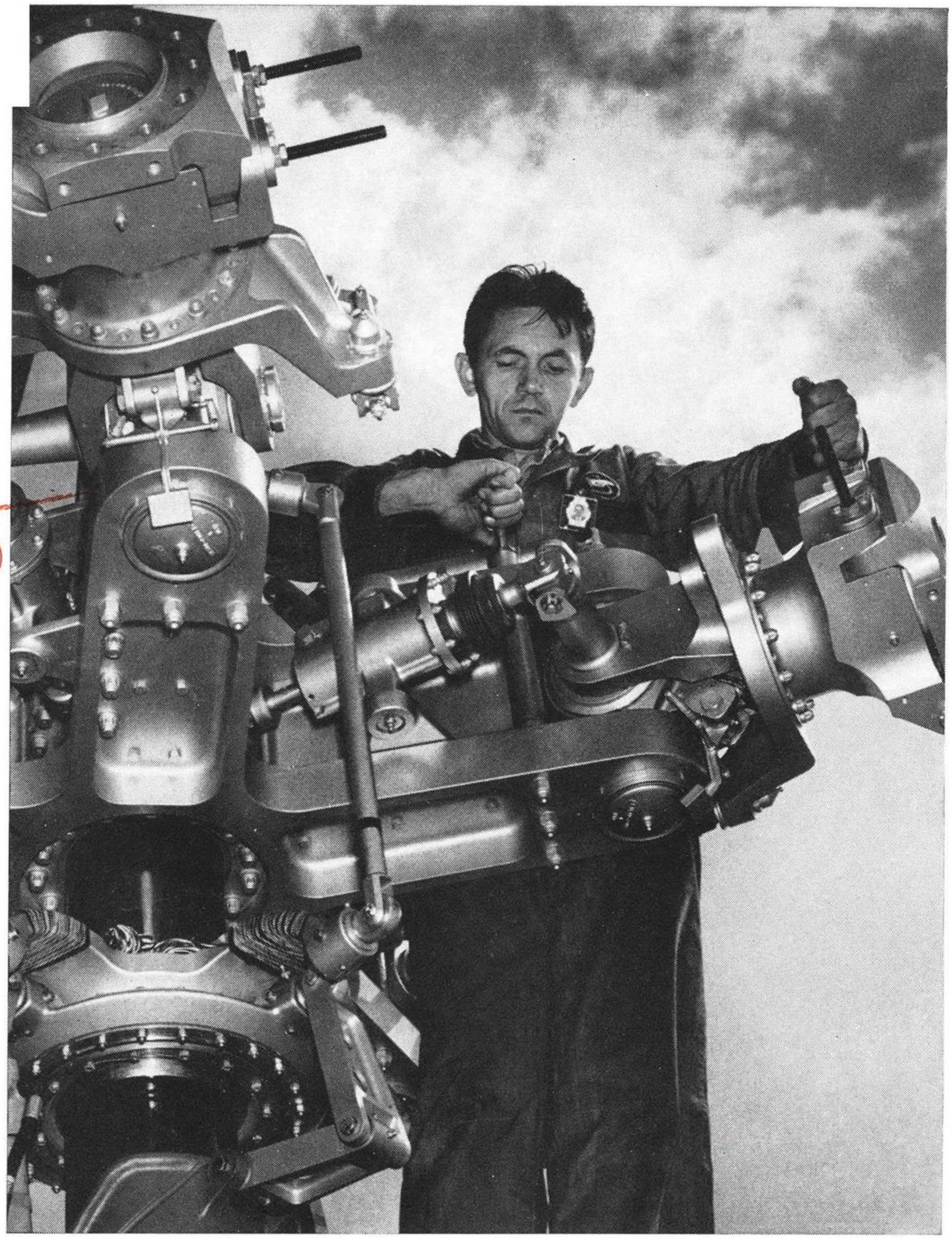
Thus, although commercial aircraft performance naturally lags several years behind military achievement, it is necessarily based on the foundation of military development, and it actually provides an excellent yardstick with which to measure the international airpower race, because the facts are plainly visible for all to see.

U.S. Leadership

Looking back on the history of the key trans-Atlantic run, it is interesting to note that pre-war United States airframe and engine manufacturers, teamed with Pan American Airways, were ready to fly this route several years before their international competitors. Operation on the route was delayed several years by political roadblocks designed to give European technology time to pull abreast.

During the post-war years, every transport operating regularly across the North Atlantic had an American airframe, and only a handful failed to use American engines. This is a position of unchallenged leadership of which American manufacturers can well be proud. It also has provided them with the necessary technical experience and understanding of commercial aviation's problems to overcome what was once a five-year British lead in gas turbine powered transports. There is little doubt now that American manufactured transports will continue their dominance of the North Atlantic route and other key international long range routes in the jet age of air transport that will begin in 1959. During the next 90 days, the managements of other major airlines facing Pan American's competition on the North Atlantic route will have to make their decisions on jet transport orders or risk major hazards. We predict there will be a lively scramble this fall to secure firm places on the jet transport production lines of Boeing at Seattle and Douglas in Santa Monica.

—Robert Hotz



Sikorsky rotor heads stress ESNA

A 16-year fastener field test

How many different stresses are exerted on this rotor head as it controls the cyclic and collective pitch of the five main blades of the Sikorsky S56 designed to transport 26 fully equipped troops? Since it also transforms engine power into forward motion or vertical flight, the stresses add up to an interesting but complicated problem in dynamics. Notice that Sikorsky has solved the fastening problems related to this rotor head design with dozens of standard hexagon and double hexagon Elastic Stop nuts.

They are self-locking, maintain precision adjustments and assure fastener security under the vibration and stress loads normal to helicopter flight.

Sikorsky Aircraft Company had been using Elastic Stop nuts for over a decade before it began developing rotary wing aircraft in 1939. They have been a steady ESNA customer for 27 years and Elastic Stop nuts have been a standard fastener on every new Sikorsky design.

If you recognize the practical value of almost three decades of "flight tested" experience on all types of air frames and engines . . . you'll rely on Elastic Stop® nuts.

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