Aviation Week

Including Space Technology

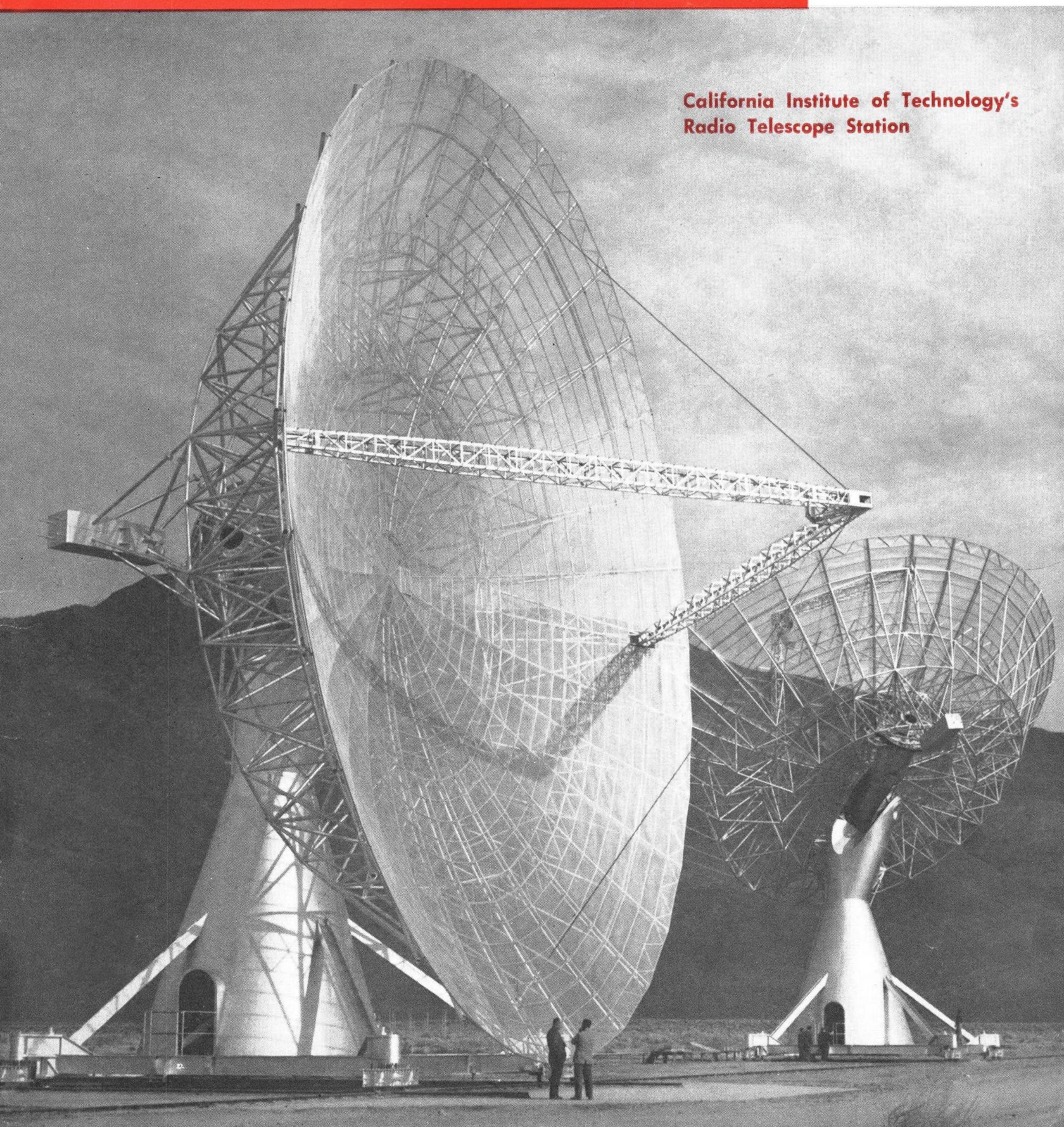
75 Cents

A McGraw-Hill Publication

May 25, 1959

SPECIAL REPORTS:

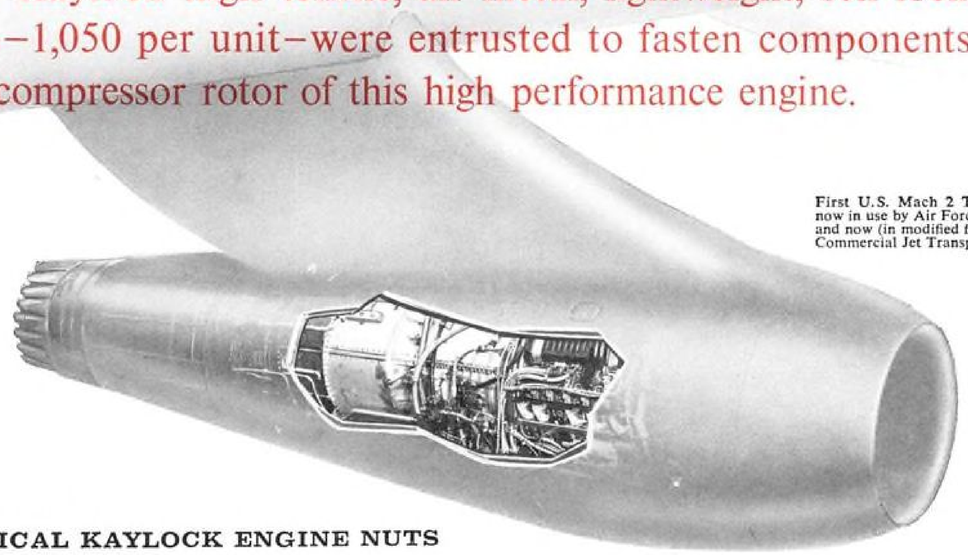
- Atlas Bases
- Titan Testing



California Institute of Technology's
Radio Telescope Station

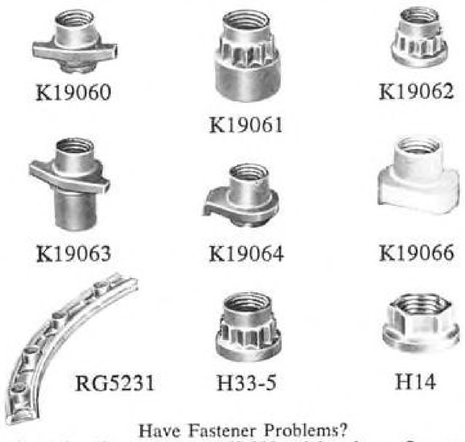
Kaylock nuts…built to "play with fire!"

America's most powerful Turbojet Engine points its nose at Mach 3. At these speeds, critical components endure enormous stresses. Fasteners must be built to literally *play with fire*. That's why Kaylock high tensile, all metal, lightweight, self-locking nuts–1,050 per unit–were entrusted to fasten components of the compressor rotor of this high performance engine.



First U.S. Mach 2 Turbojet now in use by Air Force, Navy and now (in modified form) on Commercial Jet Transports.

TYPICAL KAYLOCK ENGINE NUTS



WHY KAYLOCK? Because only Kaylock nuts offer advantages every design engineer wants—

RELIABILITY —every thread carries its full load. Kaylock nuts have no weakening slots. No built in "stress raisers."

LIGHTER —Kaylock Jet Engine Nuts are approximately 50% lighter than old style nuts.

SMALLER —Kaylock nuts have smaller envelopes. Use smaller wrenches. Permit bolt center line to be moved closer to load.

SELF-LOCKING —Resilient, elliptical locking device maintains consistent self-locking torque. No sharp edged slots to cut into threads of mating bolt.

Have Fastener Problems?
Send for Kaynar's new 160,000 psi brochure. Our compliments, of course. Just fill in coupon below and mail to:

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Box 2001, Terminal Annex • Los Angeles 54, Calif.
Rush my FREE copy of the new Kaylock 160,000 psi brochure.
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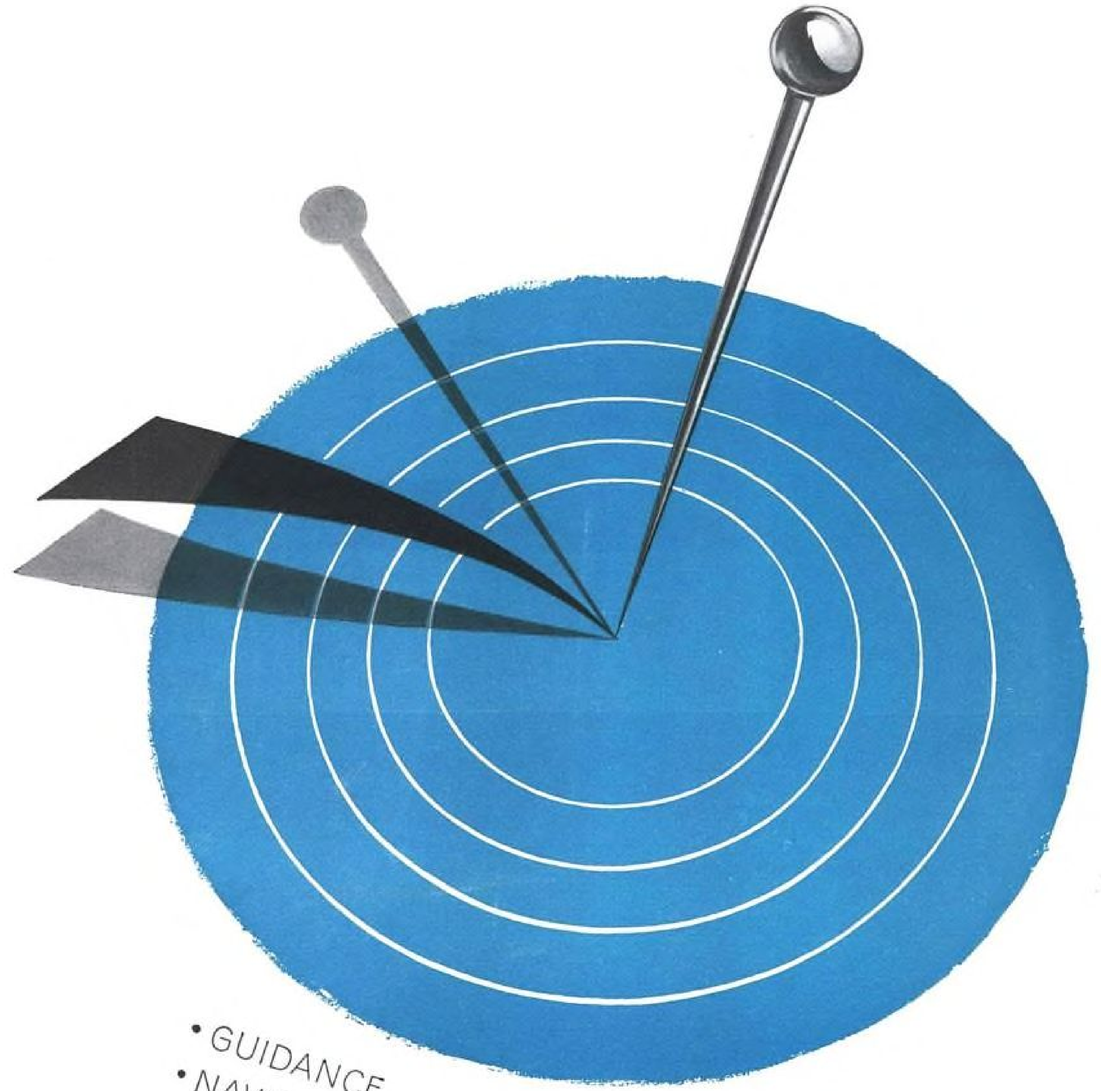
Home office and plant: Write Box 2001, Terminal Annex, Los Angeles 54, California. Branch offices, warehouses and representatives in Wichita, Kansas; New York, N.Y.; Atlanta, Georgia. Canadian Distributor: Abercorn Aero, Ltd., Montreal, Quebec.



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• NAVIGATION
• BOMBING

So Flexible, *it can be adapted to various type missiles, manned or unmanned aircraft – use star-field pattern for matching interplanetary guidance–*

So Uncanny, *it can be launched from barren areas where there are no fixed ground reference points and strike a precise target thousands of miles away–*

So Pinpoint Accurate, *it can hit its objective with a single missile–rather than needing a salvo.*

Pinpoint

–A PRIME CAPABILITY OF

GOODYEAR AIRCRAFT

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AVIATION CALENDAR

June 1-3—Third Annual Summer Conference on Vacuum Metallurgy, New York University's College of Engineering, University Heights, Bronx, N. Y.

June 1-3—National Symposium, Institute of Radio Engineers' Professional Groups on Microwave Theory & Techniques, Harvard University, Cambridge, Mass.

June 3-5—13th National Convention, Armed Forces Communications and Electronics Assn., Sheraton-Park Hotel, Washington, D. C.

June 4-5—Third National Conference, Institute of Radio Engineers' Professional Group on Production Techniques, Villa Hotel, San Mateo, Calif.

June 5-6—Annual Meeting of the Army Aviation Assn. of America, Shoreham Hotel, Washington, D. C.

June 5-6—10th Annual Maintenance & Operations Meeting, Reading Aviation Service, Inc., Municipal Airport, Reading, Pa.

June 8-11—Semiannual Meeting and Astronautical Exhibition, American Rocket Society, El Cortez Hotel, San Diego, Calif.

June 12-21—23rd French International Air Show, Le Bourget, Paris, France.

June 13-23—International Conference on Information Processing, UNESCO House, Paris, France.

June 14-18—Semiannual Meeting, American Society of Mechanical Engineers, Chase-Park Plaza Hotel, St. Louis, Mo.

June 16-17—Industry Missile and Space Conference, Sheraton-Cadillac Hotel, Detroit, Mich. Sponsor: Michigan Aeronautics and Space Assn.

June 16-19—National Summer Meeting, Institute of the Aeronautical Sciences, Ambassador Hotel, Los Angeles, Calif.

June 18-20—15th Annual Meeting, Institute of Navigation, U. S. Merchant Marine Academy, Kings Point, L. I., N. Y.

(Continued on page 6)

AVIATION WEEK Including Space Technology

May 25, 1959
Vol. 70, No. 21

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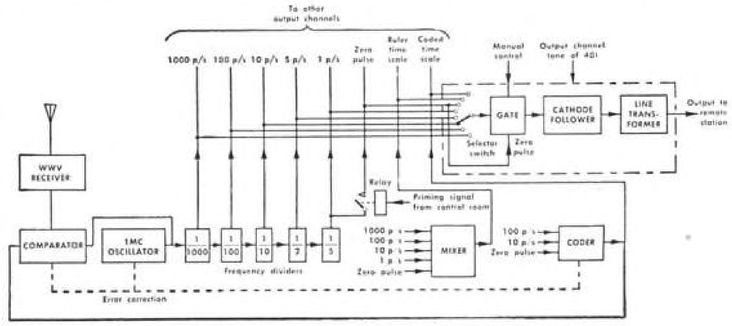
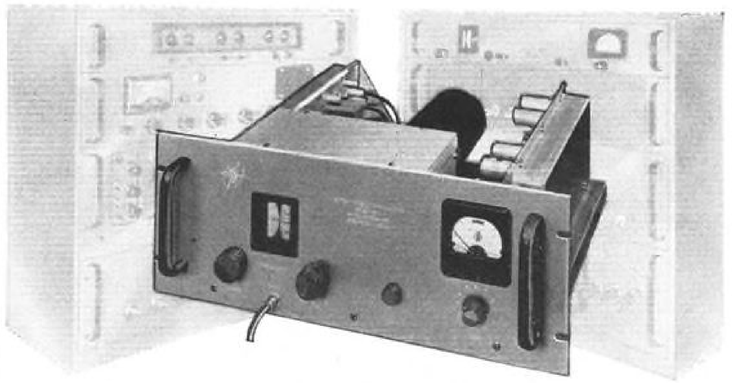
AN INTEGRATED TIMING SYSTEM FOR TRACKING AND CONTROL OF MISSILES



Schematic diagram of Central Timing Station



The Hycon Eastern Integrated Timing System, when used as a central station timer, meets the requirements of most range instrumentation with one comprehensive unit. At pre-programed times during the shoot, time markers are supplied to recording instruments and switching pulses are supplied to recording and control instruments located in remote slave stations.

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Tomorrow's Timing Systems . . . Today

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75 Cambridge Parkway Dept. W Cambridge 42, Mass.

AVIATION CALENDAR

(*Continued from page 5*)

June 21-26—Summer-Pacific General Meeting and Air Transportation Conference, American Institute of Electrical Engineers, Olympia Hotel, Seattle, Wash.

June 23-25—33rd Meeting, Aviation Distributors and Manufacturers Assn., St. Francis Hotel, San Francisco, Calif.

June 24-26—Second National Symposium, Nuclear Industry Division, Instrument Society of America, Idaho Falls, Idaho.

June 29-July 1—Third National Convention on Military Electronics, Sheraton-Park Hotel, Washington, D. C. Sponsor: Institute of Radio Engineers' Professional Group on Military Electronics.

June 29-July 3—Summer seminar on Plastics—Its Mechanical Properties, Design and Applications, Pennsylvania State University, University Park, Pa.

July 1-10—U. S. National Soaring Competition, Harris Hill, Elmira, N. Y.

July 4-8—All-Woman Transcontinental Air Race from Lawrence, Mass., to Spokane, Wash. For information: All-Woman Transcontinental Air Race, Inc., 2611 East Spring St., Long Beach 6, Calif.

July 16-17—Third biennial joint meeting, Radio Technical Commission for Aeronautics and Los Angeles Section of the Institute of Radio Engineers, Ambassador Hotel, Los Angeles, Calif.

July 28-29—Quarterly Regional Meeting, Assn. of Local Transport Airlines, Westward Hotel, Anchorage, Alaska.

July 30-31—Quarterly Regional Meeting, Assn. of Local Transport Airlines, Fairbanks, Alaska.

July 30-31—Sixth Annual Symposium on Computers and Data Processing, Denver Research Institute, Stanley Hotel, Estes Park, Colo.

Aug. 4-5—Second Annual Western Regional Meeting, American Astronautical Society, Ambassador Hotel, Los Angeles, Calif.

Aug. 5-7—William Frederick Durand Centennial Conference on the problems of hypersonic and space flight, Stanford University, Stanford, Calif.

Aug. 17—First National Ultrasonics Symposium, Institute of Radio Engineers' Professional Group on Ultrasonics Engineering, Stanford University, Stanford, Calif.

Aug. 18-21—Western Electronic Show & Convention, Institute of Radio Engineers, Cow Palace, San Francisco, Calif.

Aug. 24-26—Gas Dynamics Symposium, American Rocket Society, Northwestern University, Evanston, Ill.

Aug. 31-Sept. 5—10th Annual Congress, International Astronautical Federation, Church House, Westminster, London.

Sept. 2-4—1959 Cryogenic Engineering Conference, University of California, Berkeley, Calif.

Sept. 7-13—1959 Farnborough Flying Display and Exhibition, Society of British Aircraft Constructors, Farnborough, England.

Sept. 16-17—1959 Engine and Operations Symposium, Airwork Corp., Millville, N. J.

Oct. 12-16—15th General Convention of the International Air Transport Assn., Tokyo, Japan.

XX

This is the twentieth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Flame-Hardening Alloy Steels

When the surface of steel is subjected to direct application of flame and heated above the transformation range, then hardened by quenching, the process is known as flame-hardening. Its primary purpose is to surface-harden without affecting core properties. Jets of flame are played directly on the steel, and hardness penetration can be made to vary considerably. Usually in alloy steels this depth will range from 0.03 to 0.12 in., the actual figure depending upon the method of heating and quenching used.

Unlike carburizing, flame-hardening does not involve the absorption of extraneous elements by the steel. There is no alteration of the chemical composition. To put it simply, the steel must have its own self-hardening characteristics; cannot be dependent upon carbonaceous salt baths, gases, etc.

Flame-hardening is not a substitute for the conventional furnace method. Each has its uses. The particular virtue of flame-hardening is that the flames can be directed to localized areas. The furnace, on the other hand, is generally more economical and feasible when parts produced in large quantities must be hardened all over.

Any type of hardenable steel, alloy or carbon, can be flame-hardened, and there will usually be no scale or pitting. The alloy content is the governing factor when determining the quench. In some cases a rapid quench is required; in others, it can be as slow as air-cooling. Tempering presents no problems, for flame-hardened steel can be tempered as if hardened to the same point by other methods.

A list of typical flame-hardened parts would include such familiar items as gear and sprocket teeth, and certain types of cams and rollers, shoe treads, etc. This list is by no means exhaustive; it could include many other parts that often require a localized hardening treatment, especially for wear-resistance.

When seeking information about flame-hardening methods, please feel free to consult with our technical staff. Bethlehem metallurgists will gladly cooperate, and you can depend upon their suggestions. You can rely on Bethlehem, too, as a source of alloy steels, for Bethlehem makes the complete range of AISI standard grades, as well as special-analysis steels and all carbon grades.

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Environmental temperature problems common to this kind of "winter" beset fuels and lubricants and hamper the operation of many types of sensitive equipment.

But SAFEWAY dispels such problems by packaging *controlled heat* for application *everywhere*. Among the wide variety of heating blankets and woven-wire heating elements which have been engineered by SAFEWAY to meet exacting specifications are:

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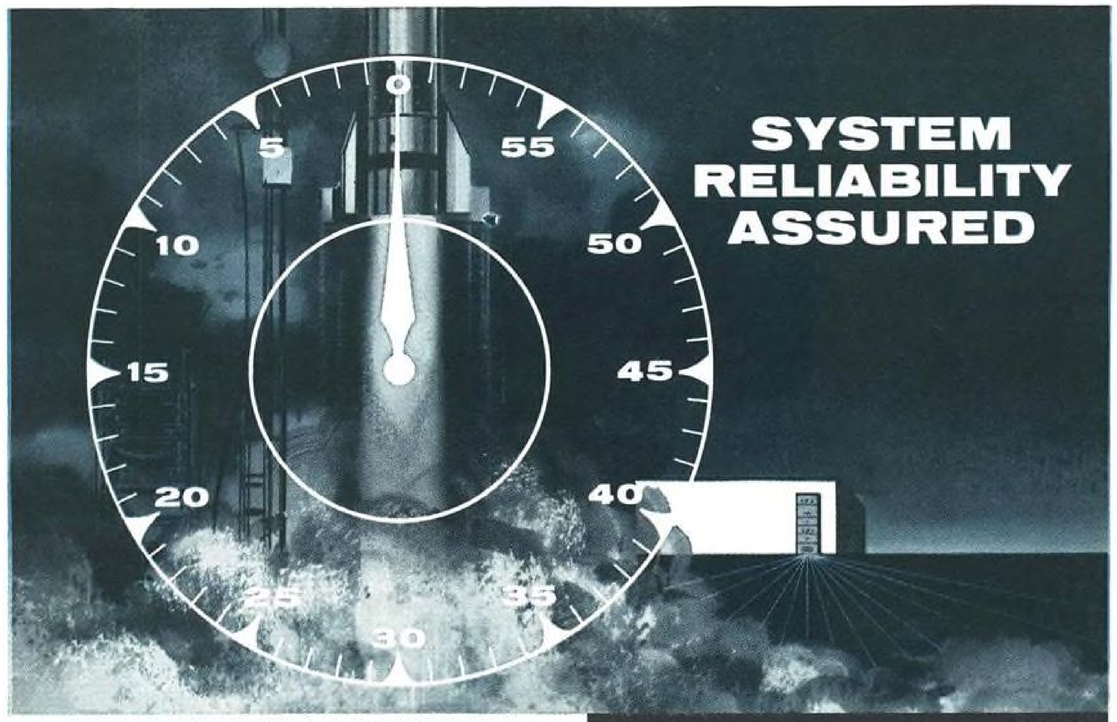

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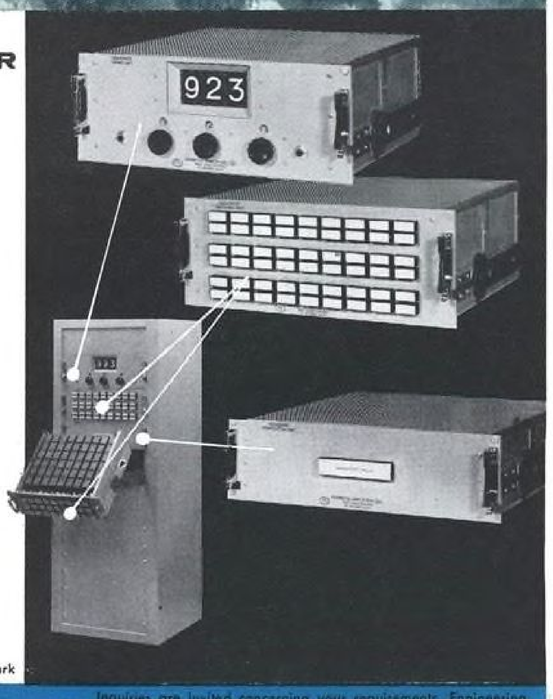
SOLID STATE-STATIC PROGRAMMER

Programmer equipment which provides a flow of unerring functional commands—accurately spaced in time—is mandatory for successful operation during the critical count down phase of missile launching.

The Automatic Sequencer shown utilizes a Stat-pack® system and accomplishes precision timing, switching and verification.➢➢ Sequential count down commands are initiated by the Timing Unit, capable of counting down from 999 seconds in 0.1 second intervals with an accuracy of 1%.➢➢ The Switching unit picks off the time points, and employs Stat-Pack® magnetic switches to control 27 functions—at 20 watts output per function. Visual display is provided for Initiate and Response for each function.

Automatic monitoring of each function is accomplished by the Verification Unit. It provides response signals for recognition of compliance for each function, and will halt sequential commands upon non-compliance. The Automatic Sequencer is the latest addition to Magnetic Amplifiers, Inc. proven group of Solid State—Reliability Assured Systems.



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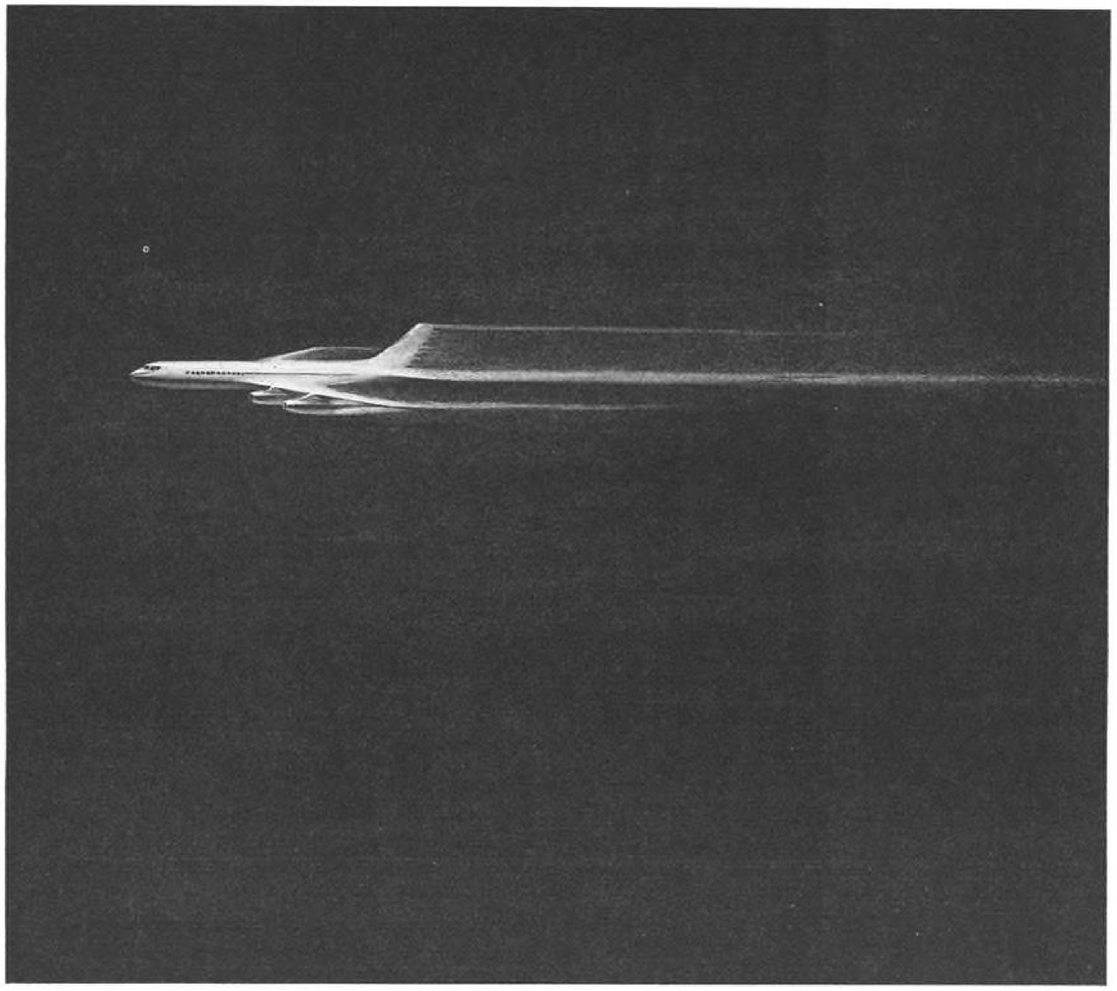

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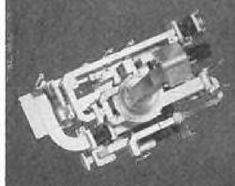

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... an all-weather attack weapon system with unlimited talents for limited war

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With Vigilantes aboard its carriers, the Navy will have globe-ranging power to control limited war — from brushfire to tinderbox.

For the Vigilante will deliver any weapon — bomb or missile, conventional or nuclear — day or night, in any weather, at any attitude, from any altitude, a full thousand miles from its carrier. No target can hide from its radar eye. It can be used as a rapier in limited war... as a bludgeon in all-out conflict.

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May 25, 1959

Aviation Week
Including Space Technology

Vol. 70, No. 21
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COVER: California Institute of Technology's radio telescope station is in Owens Valley, six miles north of Big Pine, Calif., which is 250 mi. north of Los Angeles. The twin 90-ft. radio telescope dishes are mounted on tracks and can be brought in close proximity or moved as far as 1,600 ft. apart. The $1.5 million installation, which is used to make interferometry measurements, is operated by California Institute of Technology for the Office of Naval Research.

PICTURE CREDITS

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76,715 copies of this issue printed

EDITORIAL

Canadian Aviation's Fifty Years

Canadian aviation is marking its fiftieth anniversary this year. The first aircraft in Canada lifted off the frozen lake surface at Baddock, Nova Scotia, on Feb. 23, 1909. This Silver Dart biplane piloted by J. A. D. McCurdy was significantly the product of a joint Canadian-U.S. venture that established a pattern of cooperation that still holds true today. It was in 1907 that Alexander Graham Bell founded the Aerial Experiment Assn. with Canadians McCurdy and F. W. "Casey" Baldwin and, from below the border, Glenn Curtiss and Lt. Thomas Selfridge on leave from the U.S. Army.

This was the beginning of the Canadian aircraft industry that today is the third largest industry in the Dominion, employing about 35,000 people and ranking ninth in value of goods and services produced.

Canada contributed its share of top World War I fighter aces. Ten of the Royal Air Force's 27 leading aces were Canadians, and the names of Billy Bishop, Raymond Collishaw, W. G. Barker and Roy Brown embroider the legends of air combat in the canvas, wire and spruce era.

Between wars, Canadian aviation played a significant role, as it still does, in opening up the natural resources of the vast northern reaches.

The Canadian "bush pilot" with his pontoons and skis making landing fields of the myriad wilderness lakes was the pioneer prototype of all subsequent endeavors to pry open inaccessible territory from the air. Today, Canadian aviation operators, many of them little known outside their immediate areas, are performing spectacular jobs in routine fashion where nothing but airborne vehicles can operate. These jobs include the aerial supply of the DEW and mid-Canada radar networks; the suppressions of the budworm blight that saved a multi-billion-dollar paper pulp crop in New Brunswick; the construction of a railroad by air supply to tap the Labrador iron deposits; the construction of electric power lines by helicopter to harness hydraulic power to aluminum production in British Columbia, and the routine transport of people and goods in all kinds of weather that keeps the Canadian north and west on an operating economy.

RCAF Growth

During World War II, the Royal Canadian Air Force grew to a strength of 206,000 men and women and put 47 squadrons into combat operations overseas. Today, it provides an air division of jet fighters with NATO and is linked with USAF, Navy and Army units in the North American Air Defense Command, with RCAF Air Marshall C. R. Slemmon as vice commander of this joint enterprise. In tackling the air defense of the North American continent from supersonic aircraft and hypersonic missiles, the interests of Canada and the U.S. are inexorably intertwined.

As is so often the case in aviation, what was originally scheduled as a year of celebration for Canadian aviation has also turned into a year of crisis and question as to the future direction both the RCAF and the industry that supports it will take.

The fine production record of the Canadian aircraft industry during World War II and its post-war performance have demonstrated an ability to compete successfully in the international market in a variety of ways.

For bush-type transports with short field landing and takeoff requirements, it has been hard to surpass the de Havilland Canadian line of Beaver, Otter and Caribou.

In the art of adapting both British and American basic designs and adding a touch of its own that gives them distinctive performance, Canadair has an impressive post-war record with the Sabre jet fighter series using the Canadian-designed and built Orenda engine, the Argus anti-submarine patrol plane and now the CL-44 freighter which recently found a market among U.S. cargo lines.

The Avro Aircraft and Orenda Engine divisions of the British Hawker Siddeley group have struck out boldly on new designs with the Mach 2 Arrow all-weather fighter, the flying saucer and the tremendous Iroquois turbojet. But the Canadian defense budget has found it difficult to support the mounting costs of any new research and development program in the aerial weapons field. It is indeed fortunate that USAF has continued to support the Avro flying saucer project so that the validity of its principles can be determined by experimental performance.

Possible Course

In view of the astronomic costs of modern research and development in the areas of supersonic aircraft, missiles and space vehicles, Canada's wisest course may be to develop cooperative programs with both Britain and the U.S., where the results of this basic research, development, design and testing can be applied to fairly well proven hardware adapted to meet Canada's specific defense and transport requirements. And, where U.S. hardware such as the Bomarc air defense missile is purchased for Canadian use, it is obvious that Canadian industry must be given an opportunity to compete fairly for the subcontracting and supply business associated with the weapon system. We suspect that Canadian industry will have to be considerably more aggressive on an individual basis to make adequate progress in this area.

One irritating point in this picture of the aviation business on both sides of the border is the 12½% duty the U.S. imposed on Canadian-built aircraft sold here. There is no similar Canadian duty on U.S. aircraft sold north of the border, and we fail to see any valid reason for the continuance of this unreciprocated measure.

Just as 50 years ago U.S. and Canadian citizens joined in the Aerial Experiment Assn. to lay the foundations of flying north of the border, so today they must both continue to work together for the defense of the North American continent and the continued development of its sound and expanding economy.

—Robert Hotz

WHO'S WHERE

In the Front Office

Charles E. Bartley, president, Rocket Power, Inc., Mesa, Ariz., recently organized subsidiary of The Gabriel Co. Mr. Bartley formerly was president of Grand Central Rocket Co. Also: **Frank A. Marion,** executive vice president of Rocket Power.

Stephen M. Jenks, executive vice president-engineering and research, United States Steel Corp., Pittsburgh, Pa.

G. T. Willey, vice president and general manager of The Martin Co.'s Orlando, Fla., division, succeeding E. G. Uhl who will return to the company's corporate staff at Baltimore, Md.

Gordon S. Burroughs, vice president in charge of the Military and Industrial Electronic Systems Department, CBS Laboratories, Stamford, Conn.

R. C. Chilton, vice president-development planning, Horkey-Moore Associates, Torrance, Calif.

Richard T. Orth, vice president-planning, Eitel-McCullough, Inc., San Carlos, Calif.

David B. Nichinson, vice president-engineering, Kollsman Instrument Corp., Elmhurst, N. Y.

Dr. Jerry McAfee and **Gen. K. D. Nichols** (USA, ret.), of Gulf Oil Corp., directors of Callery Chemical Co., Pittsburgh, Pa.

William P. Sloan, manager of Ryan Aeronautical Co.'s Washington, D. C., office. **Vice Adm. Charles F. Coe** (USN, ret.) will assume new duties in the Washington office as executive advisor to the vice president-military relations and military consultant to Mr. Sloan.

Chester Spurgeon, acting chief of the Office of Public Affairs, Federal Aviation Agency, Washington, D. C. Also: **Lucius W. Burton,** acting director of the new Bureau of National Capital Airports.

Dr. Bruce H. Billings, formerly vice president and director of Baird-Atomic, Inc., appointed assistant director of research and engineering, Department of Defense. Dr. Billings will be in charge of Special Projects, reporting directly to Dr. Herbert F. York.

Honors and Elections

Maj. Gen. Joseph D. Caldara, director of flight safety research for the Air Force, has received the Monsanto Aviation Safety Award for 1958 for having made the year's "most significant and lasting contribution to aircraft operating safety."

Peter Masefield, managing director of Bristol Aircraft, Ltd., has been elected president of the Royal Aeronautical Society, succeeding Sir Arnold Hall, chief executive of Hawker Siddeley, Ltd.

Changes

Conrad Kunze, assistant to A. C. Esenwein, executive vice president of Convair Division of General Dynamics Corp., San Diego, Calif. He will coordinate engineering and production methods in Convair's four operating divisions. **Wilbur E. Emish** succeeds Mr. Kunze as manager of industrial engineering at Convair-Fort Worth.

(*Continued on page* 135)

INDUSTRY OBSERVER

▶Watch for an announcement soon of a licensing agreement between Rolls-Royce, Ltd. and the Allison Division of General Motors Corp. for manufacture of the R.B. 141 bypass engine in this country. R.B. 141 is in the 12,000 lb. thrust class and is slated for use in the de Havilland 121 medium-range jet airliner. Biggest U. S. interest in the Rolls-Royce R.B. 141 is for possible application in the Douglas DC-9 medium-range jet transport design.

▶Martin Co. has designed a lunar housing simulator that would allow studies of men and equipment under conditions similar to those they would encounter at a moon base. Outer chamber would simulate space environment, allow study of techniques for transferring between free space and the artificial lunar environment.

▶Soviet development of feeding methods for use in space capsules includes a mixture of liquefied meats and milk products with the consistency of a thick chocolate malted milk and carried in a can with a tube attached. Another mixture of ham, cheese and bread has been reduced to the consistency of toothpaste and is carried in a squeezable tube.

▶Swiss air force technical decision on new equipment is expected within the next two months. Evaluation teams of pilots and technicians have just completed testing the Dassault Mirage 3, last of a series of aircraft flown and evaluated. Possible contenders include the Swedish Saab Draken, Italian Fiat G.91, Grumman F11F-1F Super Tiger and the Lockheed F-104. Reports are that tests of the Mirage were highly favorable.

▶Navy is considering the General Electric 2,570 shp. T64 turbine engine as a possible powerplant for an aircraft to fit into its "slow-plane" concept and provide a platform for the Eagle long-range air-to-air defense missile now under development. T64 also may be used by Navy in an STOL version of the Grumman S2F search plane.

▶Reaction control simulator for research and training of space pilots has been designed by the Martin Co.'s Denver Division. Spherical chamber riding on air bearings would house a space pilot and his controls. Chamber could be spun in any direction to learn what degree of disorientation pilot could withstand and still correct his attitude.

▶Air Force plans to refit some of its Lockheed RC-121 Airborne Early Warning and Control aircraft with new higher-power radars to extend the effective range of its SAGE air defense radars for guiding long-range Boeing Bomarc B interceptor missiles and North American F-108 interceptors. Prospective bidders for the program, known as Airborne Long-Range Input, or ALRI for short, received an Air Force briefing on the project last week at Wright-Patterson Air Force Base.

▶Watch for more insurance company funds to go into loans to the aviation industry. Significance is that only relatively limited amounts of insurance money are available for industrial lending, and such a loan implies confidence by the long-term insurance lender in the future growth and stability of the field. New loans by insurance companies in the last few months include $7 million in 5½% notes issued by Thiokol Chemical Corp. and $75 million in the 20-year-notes of General Dynamics Corp. Ryan Aeronautical Corp. also has just arranged for approximately $4 million in long-term financing from an insurance company.

▶Another entry in the growing list of tungsten rocket nozzle fabricators is the Rocket Engine Section of General Electric's Flight Propulsion Division. GE process uses wire-fed arc gun to spray tungsten on an intermediate material backed by graphite. Unlike high temperature plasma processes, GE says its process can be used to coat tungsten on any material that can withstand 375F. Company already has sold several tungsten nozzles which have been successfully test fired.

Washington Roundup

Nuclear Plane Decision

Defense Department and Atomic Energy Commission have assured the Joint Congressional Committee on Atomic Energy that a firm program for construction of a subsonic nuclear aircraft prototype will soon be submitted to the President and to the committee, probably within a few weeks.

The assurances were made late last week during a meeting of key congressional and Pentagon officials. The session was called by members of the Joint Congressional Atomic Energy Committee in view of conflicting statements as to whether the late Donald A. Quarles, Deputy Secretary of Defense, had agreed to submit to the White House a program to accelerate the nuclear aircraft propulsion program and move forward with construction of two subsonic prototypes. Those attending the meeting were: Sen. Clinton Anderson (D.-N. M.), chairman of the Atomic Energy Committee; Rep. Melvin Price (D.-Ill.), chairman of the Subcommittee on Research and Development; Rep. James Van Zandt (R.-Pa.), ranking Republican on the committee; John A. McCone, chairman of the Atomic Energy Commission; Dr. Hebert York, Defense Department's director of research and engineering, and Hebert B. Loper, assistant to the Secretary of Defense for atomic energy.

Financial Storm Clouds

Watch for signs of another financial crisis in the Pentagon similar to conditions during the summer of 1957 when gross under-financing of major weapons development and procurement programs forced severe financial strictures on the aviation industry and its related technologies. Current indications are that the Pentagon will find itself close to $500 million short of the funds needed to finance programs scheduled for Fiscal 1960, with the real pinch coming in Fiscal 1961 when the gap between programs and financing may widen to as much as $2 billion.

Failure of top Pentagon officials to cut off current programs that are going down the military obsolescence curve and to make basic decisions between competing weapon systems is a major cause of the financial squeeze on new development programs. With an election year in 1960 when the Fiscal 1961 defense budget will reach the decisive point and the attention of both executive and legislative branches of the government, it can easily be diverted from the impending Pentagon crisis into a round of political battles.

ARDC Streamlining

Groundwork is being laid for a major streamlining of the Air Research and Development Command by its new commander Lt. Gen. Bernard A. Schreiver. Major goals will be to consolidate and realign field centers and to reduce the headquarters staff at Andrews Field near Washington. Gen. Schreiver has been a strong supporter of the Stever report (AW July 14, 1958, p. 29) and his streamlining moves can be expected to generally follow its major recommendations. Among the likely changes are:

- **Combine Cambridge and Rome** Development Centers into a single avionics development group.
- **Combine the Special Weapons Center** at Kirtland AFB and the Holloman Air Development Center into a single unit, with Holloman operating as a detachment of SWC and playing a diminishing role in the ARDC program.
- **Concentrate major propulsion** research at Edwards AFB, Calif., with existing facilities at Wright Air Development Center and Arnold Engineering Development Center directed from Edwards.
- **Emergence of the Ballistic** Missile Division at Inglewood, Calif., as the major missile development center with the Atlantic Missile Test Range and Patrick AFB operating as its test division.

R&D Personnel Shifts

Meanwhile, as a preliminary to any organizational changes, major personnel changes already have been made at ARDC. Maj. Gen. James Ferguson comes from the Pentagon as USAF director of requirements to become vice commander of ARDC on July 20, succeeding Maj. Gen. John Sessums, who is retiring. Maj. Gen. William M. Canterbury, now commander of the Special Weapons Center, will become deputy commander of ARDC for research, succeeding Maj. Gen. Leighton I. Davis, who goes to the Pentagon as assistant deputy chief of staff for development. Gen. Davis replaces Maj. Gen. Ralph Swafford, who becomes vice commander of the Air University. Other R&D personnel changes are:

Maj. Gen. Victor Haugen, now commander of the Directorate of Systems Management at WADC, will go to the Pentagon as director of development planning for the USAF deputy chief of staff for development, replacing Maj. Gen. Leland S. Stranathan, who becomes chief of the Caribbean Air Command.

Haugen also will inherit a small portion of the directorate of requirements which was formerly under the office of the Deputy Chief for Development. The requirements directorate itself, along with most of its personnel, was recently reassigned to the office of the Deputy Chief of Staff for Operations. It will be headed by Maj. Gen. Bruce K. Holoway who is being reassigned from the Tactical Air Command.

Maj. Gen. Charles McCorkle, former chief of guided missiles at USAF headquarters, will move to Kirtland as ARDC Special Weapons Center commander.

Space Unity

Unification of a sort has come to at least one part of the nation's space program. In the future, all satellites and space probes launched for the National Aeronautics and Space Administration will bear the label "United States" if they carry any label at all—regardless of what agency handles the launching. Some Mercury capsule models already bear this designation. Lunar probes launched last year were proposed by the services, funded by Advanced Research Projects Agency, transferred later to NASA, and launched by the services. Those fired by USAF carried only service labels. First Army-launched lunar probe was marked only "NASA." Then Pioneer IV carried the initials of both Army and NASA.

Standardizing the designation is one more attempt to demonstrate that the U.S. program is a unified, national effort.

—Washington staff

New Space Tempo May Increase Support For WS-117

Series of satellites contemplated to circle earth in polar orbit to provide continuous surveillance.

Washington—Increased tempo of space technology, both in the U.S. and Russia, is gaining strong fiscal support for Air Force's WS-117L advanced reconnaissance system, which has been largely financed thus far on a hand-to-mouth basis.

Ultimate application of the WS-117L system, now being developed by Lockheed Aircraft's Missiles and Space Division under jurisdiction of the Advanced Research Projects Agency through USAF's Ballistic Missile Division, contemplates a series of satellites—perhaps as many as a dozen. Each of these will circle the earth in a north-south orbit in a 90-min. period for continuous, effective surveillance.

Known by a variety of project code labels, including Big Brother, Pied Piper, Sentry and, most recently, Midas, this reconnaissance satellite, may evolve into one of the most important U.S. systems insofar as the data acquisition potential in the immediate space spectrum is concerned.

The program has progressed in the past with tenuous funding on a month-to-month basis, although at times—particularly last September—there were strong indications that the program would be accelerated. Recently AVIATION WEEK has learned, the program funding dwindled to a one-day period, then was extended to cover another 10-day span.

Now, the intention is, beginning with Fiscal 1960, to fund the WS-117L program on a yearly basis, and observers close to the picture believe that funding even on a quarterly basis would be a promising sign on future support. Definitive follow-on contract is expected to be inaugurated this month or early in June.

Early Part

The early part of WS-117L project, formerly known as Sentry/Thor, was broken out of the over-all program by the Advanced Research Projects Agency and given the designation Project Discoverer which is now being carried out to obtain north-south polar orbiting satellite trajectories from Vandenberg AFB, Calif.

Remainder of the presently planned WS-117L advanced reconnaissance satellite program using the Convair-built Atlas as a booster includes:

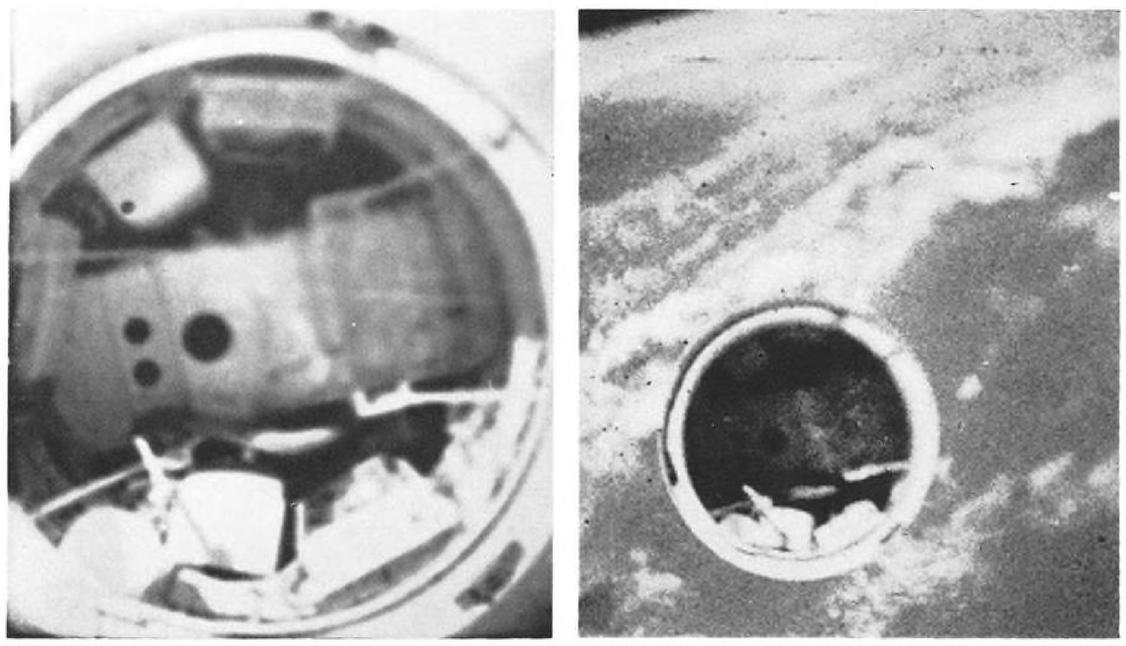
- **Initial firing of the Atlas**-boosted WS-117L vehicle, known as Sentry/Atlas, probably will be in January, 1960. Under this timetable, the program will overlap that of Project Discoverer which has deviated from its original time schedule but is being accelerated to include two-a-month firings. Discoverer also is an ARPA/BMD project, with Lockheed's Missiles and Space Division as principal contractor. Data amassed in Discoverer orbitings will be funneled into Sentry/Atlas, which will be a natural follow-on to the Discoverer program.
- **By mid-1960,** WS-117L Sentry schedule may be accelerated so that firings will be conducted at the rate of about one a month.
- **First firings in this series** will be from the Air Force missile Test Center, Cape Canaveral, Fla., since complete launching facilities for the Atlas booster vehicle are not scheduled to be ready at Vandenberg AFB in time to accommodate the initial phase of the program.
- **Reconnaissance capability** by optics will be attempted initially to reveal the view from orbiting vehicle. A record will be made by camera, and the film package will be ejected at a predetermined point in the orbit for recovery with parachute or an equivalent system.
- **Advanced plan contemplates** developing the exposed film in the satellite and reading out results electronically to a ground station. This sophisticated approach, although more complicated than the film recovery technique, is more in keeping with the desired returns from a satellite with true reconnaissance capability.
- **Infrared scanning development** for the WS-117L program will be known as Midas (AW Feb. 23, p. 34). Potentially, this satellite infrared sensing capability could be adapted for early warning of anti-ICBM emplacements in order to substantially extend the alert time for instituting tracking and interception. One limitation of the system is that for true effectiveness, the infrared sensor would be required to focus on the tail end of the ICBM where the heat of exhaust emerges.
- **Television camera scanning** is not now included in the Sentry scheme.
- **Previous plan for the nose** cone to embody a clamshell configuration which would open for viewing, once a firm projection, has now been changed. Inside of the open clamshell, petals were intended to be used as antennas, but a newer, more efficient arrangement has been devised which will obviate this antenna scheme and the necessity for the nose cone to open for viewing.
- **Second stage of the WS-117L** Sentry vehicle is scheduled to be the Bell Hustler rocket engine now being used as the second stage of the Project Discoverer vehicle, which uses a Douglas-built Thor as a booster. The Bell liquid-propellant engine, an advanced version of the powerplant originally designed to supplement the engines for Convair's B-58 Hustler bomber, will develop in excess of 15,200 lb. vacuum thrust, using unsymmetrical dimethyl hydrazine and inhibited red fuming nitric acid as the propellant combination.
- **Instrumented nose cone** coupled to the Bell second-stage engine will orbit as an integral unit comprising the satellite. This is the same scheme used for the Discoverer satellite polar orbit.
- **Total weight of Atlas payload**—second stage plus instrumented forward section—will weigh approximately 8,000 lb., indicating a substantial increase in payload capability over that of the Thor-boosted Discoverer satellite vehicle.
- **Nominal orbiting altitude** will be 300-400 mi. Circular or near-circular orbit will be a difficult goal.
- **Responsibility for building** the integral nose cone-Bell rocket engine second stage will be Lockheed's. The firm also will have responsibility for checkout and static test of the engine second-stage vehicle at Santa Cruz, Calif.

A number of subcontractors will be associated with Lockheed in the WS-117L program. Philco Corp. will supply space-ground communications equipment.

Eastman Kodak Co. and Itek Corp., Palo Alto, are concerned with reconnaissance aspects. Itek, in addition to having photo-optical capabilities, also works in the field of aero-space reconnaissance and in information retrieval.

Under contract from Air Research and Development Command's Rome, N. Y., Air Development Center, Thompson Ramo Wooldridge is working on a plan for handling over-all intelligence from the WS-117L satellite through its Reconnaissance Data Processing Project Office. Subcontracted to Thompson Ramo Wooldridge is Systems Laboratory Corp., which is concerned with analysis in the field of photogrammetry to resolve data received from the satellite. The program includes use of ground equipment which classifies, codifies and chops pictures for storage in convenient sizes. This equipment probably won't be available until the WS-117L program is well under way.

In connection with these photogrammetric calculations, orbital studies and attitude control procedures are involved because these are both related to the photogrammetric analysis.



SEPARATION of an Air Force Thor intermediate range ballistic missile nose cone from its booster 115 mi. downrange from Cape Canaveral, Fla., was photographed by a 16 mm. ACR Electronics Corp. camera installed in a re-entry vehicle data capsule designed by General Electric. Sequence indicates reconnaissance potential of WS-117L. Field of vision downward was 51 deg. Sequence, made at an altitude of 90 mi., shows (from left) forward end of the booster a few seconds after separation; the booster as it began to drop away while the re-entry vehicle continued on a programed ascent to a 300 mi. apogee; the booster falling farther back and curvature of the earth becoming quite evident, and (far right) the booster falling slightly to the right. Land mass is the Florida area and a weather front covering hundreds of miles can be seen. Data capsule, which weighed 65 lb., was automatically ejected from the re-entry vehicle and parachuted down; recovery was made by an Atlantic Missile Range vessel about 1,400 mi. downrange and 39 min. after firing.