The Redstone Rocket

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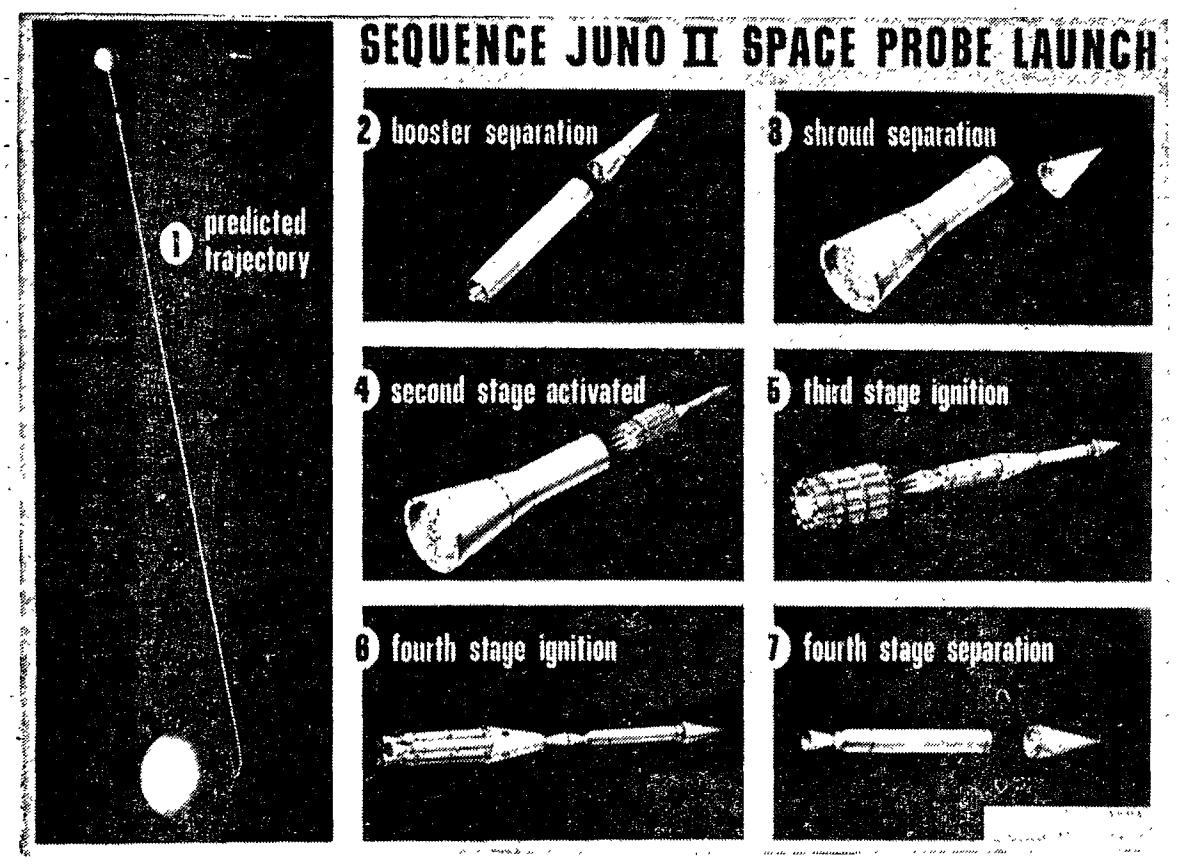
Space Probe Will Orbit Sun



Army-NASA Pioneer IV Successfully on Its Way

Pioneer IV, the Army-NASA deep space probe, successfully fired aloft at 11:00 Monday night by a Juno II rocket, today was speeding on its way to pass the Moon and go into orbit around the Sun.

The 13.4-lb. gold plated satellite was blasted heaven-ward from Cape Canaveral, Fla., by a 60-ton, 4 stage rocket based on the Army's Jupiter Intermediate Range Ballistic Missile, developed by the Army Ballistic Missile Agency.

The National Aeronautics and Space Administration said Pioneer IV was expected to pass within 35,000 miles of the Moon (about 221,000 miles from Earth), with its closest approach due about 1:00 p.m. today. Its speed by this time will have dropped to 3,500 miles per hour, compared to the 24,890 mph. speed soon after launching.

NASA officials said the space probe has ample velocity to go into an orbit around the Sun. Pioneer IV will go into a solar orbit somewhat larger and more elongated than that of the Earth it was added. About one year will be required for each trip around the Sun.

U. S. ground stations may be able to track the radio-equipped robot for a distance of 300,000 to 400,000 miles from the Earth NASA announced. It's batteries were expected to last about 50 hours after passing the Moon.

The primary goal of the Pioneer IV space experiment is to extend and enlarge man's knowledge of radiation intensities in deep space.

The scientific experiment, is being conducted by the NASA and the U. S. Army. NASA, in charge of the project, is responsible for conducting a national program of space exploration.

Preparation and launching of Pioneer IV was the responsibility of the Army Ordnance Missile Command's Ballistic Agency at Huntsville, and the NASA Jet Propulsion Laboratory at Pasadena. This is the same team which launched the Explorer satellites and on Dec. 6, 1958, the Pioneer III space probe.

Pioneer III made a major scientific contribution in the discovery of dual bands of radiation high above the earth. It attained an altitude of 63,500 miles.

General Objectives

The payload of this probe is

(See SPACE PROBE on Page 2)

Today's Rocket Has Full Details of Probe

The full story of the historic Army-NASA space probe project is told in today's Redstone Rocket.

In addition to front page stories and pictures on Pioneer IV, readers will find numerous other details about the many and complex facets of this great space exploration undertaking on pages 2 through 8, and scattered through succeeding pages.

ARGMA Gets $2.2 Million Contract For 'Little Joe'

The Army Rocket and Guided Missile Agency has received a $2,200,000 contract to furnish for the National Aeronautics and Space Administration a number of Sergeant-type rocket motors which will form the basis for a new rocket to be known as the "Little Joe."

Details of the Little Joe were announced by NASA last week. NASA said the vehicle, consisting of a cluster of four rocket motors, will be used in the early phases of the Mercury manned satellite project.

The motors, variations of Sergeant motors, will be loaded by the Thiokol Chemical Corporation's Redstone Division, according to ARGMA officials Static testing of the motors will be performed by ARGMA. Clustering of the motors will be NASA's responsibility, not ARGMA's.

Thiokol will also produce small rockets which will be attached to the side of the vehicle to provide assurance that the latter will attain the desired initial acceleration, NASA said.

Little Joe will be similiar in name only to the Army's Little John, a long-range artillery rocket. Little Joe's functions will be scientific, not military. NASA announced the vehicle will be used, perhaps at Wallops Island, Va.,

(See ARGMA GETS on Page 9)

IT TOOK ALL KINDS

Best Efforts of a Lot of People Accomplished Historic Launching

It required the best efforts of a lot of people, of all kinds of backgrounds, training and specialization to accomplish the historic launching of the Juno II space rocket.

Some of them, only a few, are world-famous for their exploits in rocketry. Most are relatively unknown because their work is performed in secrecy since it contributes to the nation's defenses.

For many of them, this has been a period of fulfillment which began with the feverish acclaim heaped upon the Explorer I earth satellite. That single achievement, more than anything which had gone before, or which has been accomplished since, redeemed the world-wide reputation of the United States and suddenly focused attention upon Huntsville, Ala., and the Army rocket programs.

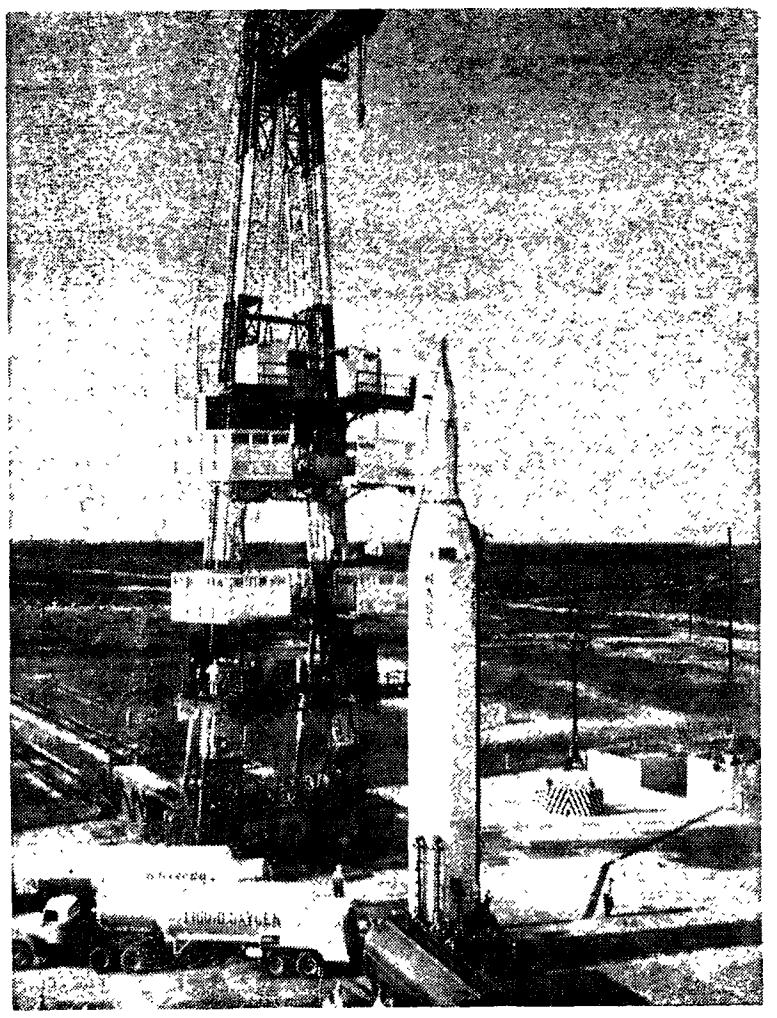
'Batting .500'

Two more successful earth satellite launchings followed, three other attempts failed. Brig. Gen. J. A. Barclay, who succeeded to the command of the Army Ballistic Missile Agency March 31, was to remark that a ".500 batting average would still win the major league title!"

The attention of the nation's press, the television commentators, the radio pundits, focuses upon the things which come out of Redstone Arsenal — all too often, neglecting to mention that these "things" are created by people, by men and women.

Perhaps this oversight can be attributed to the fact that satellites, deep space probes, and giant ballistic missiles are still so new, so incredible, so fantastic and "out-of-this-world" in concept and performance, that the most acute and well-informed observers are dazzled.

(See BEST EFFORTS on Page 3)



THE GANTRY is pulled back from the Army-NASA Juno II space probe to permit the fueling and LOXing of the test vehicle at the Missile Firing Laboratory at Cape Canaveral, Fla.

MANY PRE-LAUNCH OPERATIONS MADE PROBE POSSIBLE

Hundreds of pre-launch operations made possible the launching of the Army-NASA Juno II Space Probe which culminated in a fiery blastoff from its pad at the Army Ballistic Missile Agency's Missile Firing Laboratory launch complex in Cape Canaveral, Fla.

From the time the countdown began hours beforehand with the activation of the rocket's telemetry antennas to the final key sequences—"Firing Command!" . . . "Ignition!" . . . "Main Stage!" . . . "Liftoff!"—a team of men

(See MANY on Page 3)

Tracking System Answers: 'Where Is Probe Going?'

Parabolic antenna, modified phase-lock receiving system, parametric amplifier, and radiometer are all everyday terms to the modern space scientist, who is just as interested in tracking a space vehicle as he is in launching one.

To answer the all important space age question, "Where is it going?", Army, industrial and university scientists have joined to develop improved tracking systems which will receive signals coming from vehicles in the far reaches of outer space.

The University of Illinois, General Electric Corporation and International Telephone and Telegraph Corporation are cooperating with the Army Ballistic Missile Agency's Guidance and Control Laboratory and Research Projects Laboratory in carrying out this vital research. The launching

(See Tracking System on Page 2)

Col. LeVine Heads Arsenal Armed Forces Day Planning

Photo Inside

Lt. Col. Lester H. LeVine has been named as Redstone Arsenal chairman for this year's celebration of Armed Forces Day in Huntsville on May 16.

Col Levine is Chief of the Weapons System Division in the Office of the Assistant Chief of Staff for Military Applications and Training, Headquarters, Army Ordnance Missile Command.

Col. LeVine was formerly with the office of the Deputy Chief of Staff for Military Operations, Department of the Army, at the Pentagon.

Was in Puerto Rico

Prior to his assignment to the Pentagon, Col. LeVine was an infantry battalion commander and regimental executive officer at Camp Losey, Puerto Rico.

He entered the Army in July 1940 and during World War II saw duty in the Asiatic-Pacific theater with the 503rd Parachute Infantry regiment, participating in the jump on Corregidor in February of 1945 which was a part of the retaking of that island from the Japanese. In December 1945 he was assigned to the 11th Airborne Division in Japan as Acting G-1 (Assistant Chief of Staff for Personnel) and Assistant Adjutant General.

In 1947 he returned to the United States and the following

(See COL. LEVINE on Page 9)

The Redstone Rocket

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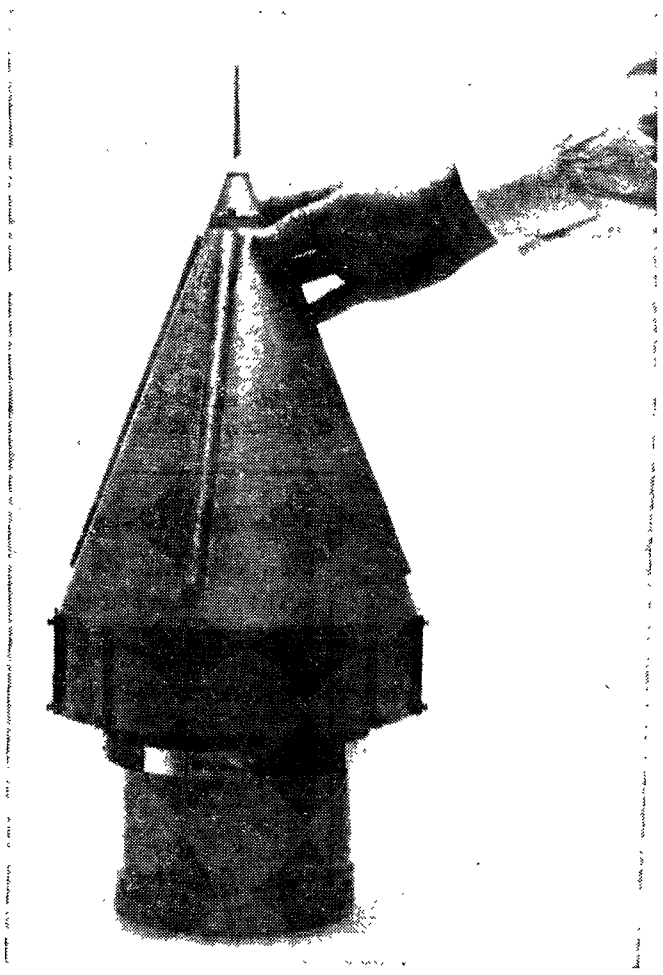


THIS IS THE PAYLOAD'S exterior configuration, before application of the paint striping to provide a temperature balance. The fiberglass cone is washed with a thin coating of gold to provide conductivity and serve as a radio antenna. The cylindrical section at the bottom, clamping the payload to the final stage rocket motor, stays with the rocket motor after the payload and motor are separated.

Space Probe

(Continued From Page 1)

essentially the same as Pioneer III, and the same general objectives apply, as follows:

1. To measure effectively the intensity of cosmic radiation in deep space.

2. To establish a high velocity trajectory into cislunar space in a further test of guidance and propulsion techniques.

3. To flight test instrumentation designed for possible use in later experiments.

Second Launching

The launching vehicle was the Juno II, a four stage rocket which is based on the Army's Jupiter Intermediate Range Ballistic Missile. This was the second launching of the Juno II; it was first used in the Pioneer III experiment.

The Jupiter booster, for its role as the Juno II first stage, is elongated to increase fuel capacity. This part of the vehicle was developed and fabricated by the Army Ballistic Missile Agency. Atop the booster is a three-stage high speed upper assembly, consisting of solid propellant rockets, which was furnished by the Jet Propulsion Laboratory. The upper assembly is almost identical to that employed in the Army Jupiter-C satellite launching vehicle.

Overall height of the missile is 76 feet When fueled, it weighs about 60 tons.

Instrumented Payload

The instrumented payload is 23 inches long and 10 inches at maximum diameter. It contains the scientific experiments and communications equipment. Weight of the payload is about 14 pounds, slightly heavier than Pioneer III. The additional weight results from minor changes which are expected to provide better data on the functioning of the instruments.

The principal scientific experiment in the probe will be provided by the Physics Department, State University of Iowa. This is a radiation counter. The University also provided the radiation measuring equipment carried in the earth satellites. The probe counter will measure the intensity and energy level of cosmic radiation.

Also installed in the probe is a camera shutter mechanism which is being tested for possible incorporation in a later probe.

Approximately half of the probe's weight represents a transmitter and batteries. The single transmitter will operate on 960.05 megacycles. This is a change from the normal IGY frequency of 108.03 megacycles and is expected to provide greater range. Transmission will be constant throughout the life of the batteries.

First Seven Hours

During the first seven hours of flight the probe was tracked by conventional ground stations of the Army-IGY networks. This data reported the performance of the launching vehicle and permitted early evaluation of the velocity attained by the probe and its trajectory in space.

At about the seventh hour of flight, the probe entered the range of the giant space communication station of Goldstone Lake, Camp Irwin, Calif. Equipped with an 85-foot "big dish" antenna this station is capable of receiving radio signals from a transmitter hundreds of thousands of miles away in space. Construction of the station was completed in November 1958. The Jet Propulsion Laboratory operates the station.

The batteries carried in the probe were expected to operate for 70 hours.

Prior to liftoff the upper stages were rotated. The speed of rotation was increased during flight. When it enters the cislunar area a special de-spin device will be activated. Small, wire-like arms will be extended perpendicularly from the payload. Spin momentum will be transferred to these arms to reduce the rotational speed. They will then be cut free of the payload and its rotation will continue at a rate of about nine revolutions per minute. This will permit test of a camera shutter.

Purpose of the rotational spinning is to achieve stabilization.

A VERY SPECIAL MISSILE

Here's the History of AM 14

The missile was AM 14. It was given that designation several months ago when fabrication of the booster was begun at the Army Ballistic Missile Agency.

It was a special missile, a Juno II, with a special space mission.

AM 14's booster arrived at Cape Canaveral by air from Huntsville on Feb. 2. Then began a series of several hundred individual tests and checkout functions which culminated in the launching of the NASA Pioneer IV deep space probe.

The missile was prepared and launched by ABMA Missile Firing Laboratory and NASA's Jet Propulsion Laboratory. JPL developed the high speed upper assembly and was responsible for the checkout and operation of that portion of the missile.

Lab Conditions

AM 14 was fired under closely controlled laboratory conditions. During its four-minute powered flight, it was expected to telemeter back to earth 69 separate items of information which are vital to a complete record of its performance.

Liquid oxygen tank pressure, slant altitude, the temperature of engine mechanisms, flow rate of liquid oxygen, mounting velocity time of the various separations, vibration of the upper stages after separation — these are the types of information Army and NASA scientists needed to evaluate the performance of the vehicle.

This is the reason for the exhaustive firing preparations at the Army Firing Lab which stretch into a period of days, and weeks. Missilemen are quick to point out that such missiles as AM 14 are fired under scientific, laboratory conditions. Tactical missiles with military missions are fired under far less stringent conditions.

Dr. Kurt Debus, Director of MFL, was in charge of the checkout and launching of the missile. An indication of the complexity of the firing preparations can be seen from a brief account of a few of the operations.

Erected on Pad

The missile was erected on ABMA's Pad 5 Feb. 4. Vertical and azimuth alignments were performed, the antennae were tuned, electrical and punematic connections were made and calibrations were started on the guidance and control systems.

In the days that followed, a great deal of attention was given to the measuring instruments to assure accurate functioning. The power plant checks were underway. Spare parts — which might suddenly be pressed into service —arrived and were checked out; these were for such missile subassemblies as control computer, program device, and gyros.

The ST-90 stabilized platform, the heart of the amazingly accurate Jupiter all-inertial guidance system, was installed and tested in the missile. The combined gyro-guidance control tests were performed. The calibration of the angle-of-attack meter was completed, and continuing radio frequency checks with the range were initiated.

By mid-February the various possible launching times, down to the second, had been firmly established and cleared with the Atlantic Missile Range authorities. All was progressing well — the preparation of AM 14, which was one of two giant missiles the firing lab had on the pads at that time, was an estimated eight hours ahead of schedule.

Tested by JPL

The Juno II upper stage assembly had arrived and was subjected to rigorous testing by JPL technicians. The payload, both flight and spare units, were satisfactorily tested on the cluster under spin conditions. The heat-protecting shroud for the upper assembly had arrived from Huntsville, and a week before the scheduled launch, the shroud and the upper stages were installed on the booster at the pad, and AM 14 was ready for final systems checks and a simulated flight.

More than 300,000 separate parts are contained in the Juno II space vehicle. During these days of exhaustive checking, a few components whose performance was less than expected were removed from the system and trustworthy replacements were installed.

Finally, at X-3 days, a complete countdown and flight simulation were performed. No difficulties were encountered, and the missile was on time. The next day the last details were wrapped up, and the launch day countdown began without hitch on Feb. 28.

Delay Forced

Low overcast skies, below minimum safety requirements, forced the range to call a halt to the preparations The next day, Sunday, March 1, was expected to offer better conditions from the range safety point of view. A technical difficulty in the payload forced another postponement.

When AM 14 blasted from the pad to outer space Monday night, everything humanly possible to assure maximum performance had been taken care of.

The heavens-bound Juno II was on her way.

Tracking System

(Continued From Page 1)

of the latest Army-NASA deep space probe, Pioneer IV, provides the opportunity for further testing of new equipment and techniques.

The International Telephone and Telegraph Corporation's experiment is being conducted in connection with the tracking station operated by the Guidance and Control Laboratory at Huntsville.

14-Foot Dish

The station employes a 14-foot dish (parabolic antenna) with a modified phase-lock receiving system, whic tracks by means of change in frequency of signals received. Signals are recorded on standard tape and graphic recording equipment.

In connection with the system, IT&T is testing the use of a parametric amplifier, a device which amplifies the signals. The IT&T amplifier utilizes non-linear capacitor diods for amplification. Important data regardng the performance of the system is being obtained as it tricks Pioneer IV.

Robert Felsenheld heads the project for IT&T, assisted by Ward Huey. Guidance and Control Laboratory personnel responsible for operation of the racking station are employed with the Radio Frequency Development Section, Instrumentation Branch. Otto Hober heads the Branch: Grady Saunders is Section Chief.

Thomas A. Barr is in charge of the station, assisted by Paul Swindall, William Edens, and Leslie Thomas. Also participating in the project are John Gregory and Ronald Glass, Chrysler Corporation employees assigned with the Guidance and Control Laboratory.

Ga. Station

In addition to the local station, The Guidance and Control Laboratory supervises operation of a tracking station at F. Stewart, Ga. which utilizes a 10-foot parabolic antenna and a phase-lock receiver with standard magnetic recording and digital print-out equipment for Doppler shift measurements.

General Electric Coropration is conducting its tracking experiments at Schenectady, N. Y., utilizing a four-Helix antenna with a specially designed parametric amplifier. Signals are fed first into a double-side-band convertor, which tracks on the side band of a signal rather than on the carrier for better modulation detection, and then into a standard receiver. Signals are recorded on a two-channel tape recorder.

The General Electric team includes A. D. French, project engineer; Dr. J. P. Costas, communications consultant: Roy E. Anderson, and Gunther Fenner. French and Dr. Coast are from the Heavy Military Electronics Department, Syracuse. Fenner, who designed the highly sensitive parametric amplifier, and Anderson are from the General Engineering Laboratory at Schenectady.

Ideal Location

Schenectady is considered an ideal location for "listening to" space probe rockets launched from the Atlantic Missile Range Canaveral, Fla., since there is little interference as a result of the tilt of the earth's axis and rotation, which normally causes blank spots at most other tracking stations.

Meanwhile, at the University of Illinois, a 28-foot dish atop the Electrical Engineering Building is scanning the skies for signals from Pioneer IV.

Signals received are fed through a tuned cavity working into a crystal mixer. The local oscillator is crystal controlled and extremely stable. A radiometer, like that used in radio astronomy, is employed to track at great distances. Data is recorded on strip chart and magnetic tape recorders.

Professor George W. Swenson Jr., and Professor Harold D. Webb are supervising the project, assisted by Richard Sydnor, research associate. Actual tracking is accomplished by changing the position of the antenna to receive the strongest signal The location of the missile in space is determined by the antenna's position.

Data Transmitted

Data concerning Pioneer IV obtained from these various tracking installations is being transmitted to the Army Ballistic Missile Agency ,where the launching vehicle for the space probe was developed.

In addition to the local station and the Ft. Stewart station, the Army Ballistic Missile Agency operates a tracking station at the launching site, Cape Canaveral Fla. This station utilizes a 6-foot parabolic antenna, phase-lock receiver, and tape recording system It is operated by Jim White of the Agency's Misile Firing Laboratory.

Army Now Well Into 2nd Decade Rocket Research

With the launching of the Pioneer space probe the Army is well into the second decade of its intensive research in rockets and their use in outer space.

The Army organized its first rocket battery in 1846. When rifled cannon were introduced in 1860, interest in rocket applications died out in military circles. It was revived during World War I when Dr. Robert H. Goddard, the "father of modern rocketry," conducted rocket experiments under Army sponsorship. The end of the war curbed further progress.

In World War II, Army rocket activity was sharply increased by the formation of a Rocket Branch in the Ordnance Department in 1943. Next year the Jet Propulsion Laboratory, California Institute of Technology, was assigned by Ordnance to investigate the feasibility of developing long-range. surface-to-surface guided missiles.

Activated in '44

The White Sands Proving Ground was activated in New Mexico in 1944 to test rockets.

The real impetus came when the Army brought Dr. Wernher von Braun and his team of 130 rocket specialists to the United States in 1945 and established them at Fort Bliss, Texas, near the White Sands ranges. At White Sands they continued experiments with captured German V-2 rockets. In the Fall of 1945 the first American-developed ballistic missile rocket, the WAC Corporal, was successfully tested at White Sands.

In 1949, the Bumper rockets, V-2s with WAC Corporals mounted in their nose sections, made their appearance. For the first time man-made objects were hurled out of earth's atmosphere One of these rockets achieved an altitude of 250 miles, a new record.

Made Debuts

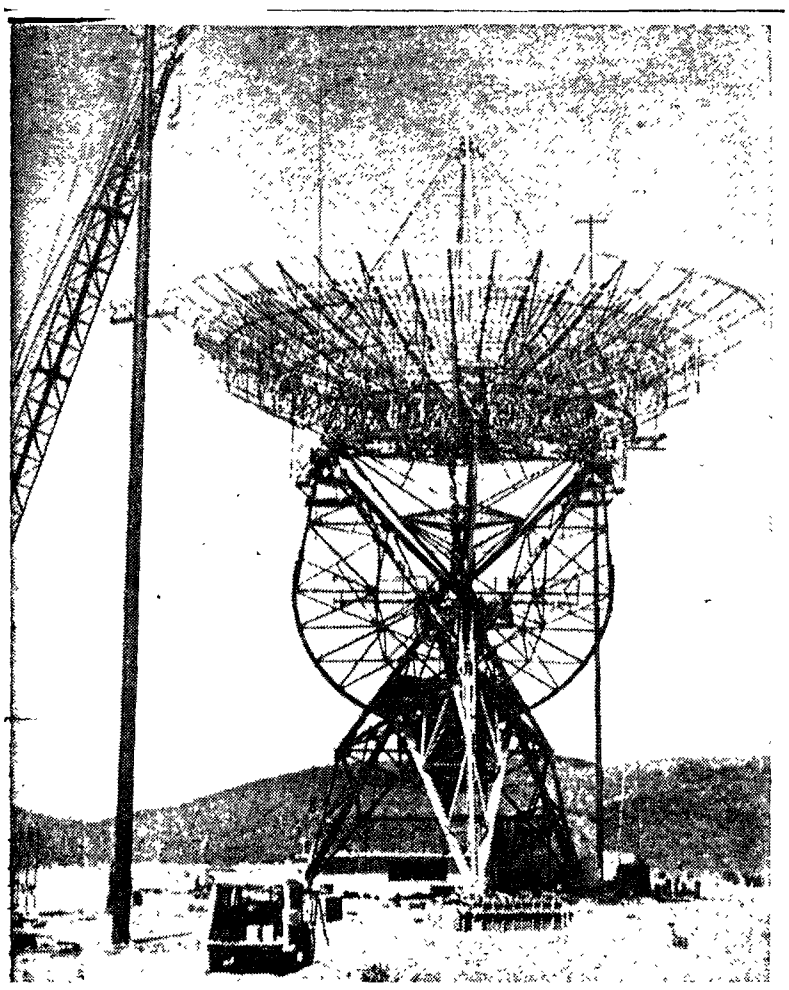
During the same year the Corporal and Hermes missiles made their debuts. Redstone Arsenal was selected as the center of Army rocket development. Dr. von Braun and his team moved to the Arsenal.

At Redstone development of the giant Redstone Ballistic Missile began in 1952. This is now an operational Army weapon system The Army Ballistic Missile Agency was activated Feb. 1, 1956 to develop the Jupiter Intermediate Range Ballistic Missile, the first weapon of its type to be launched successfully in the U. S.

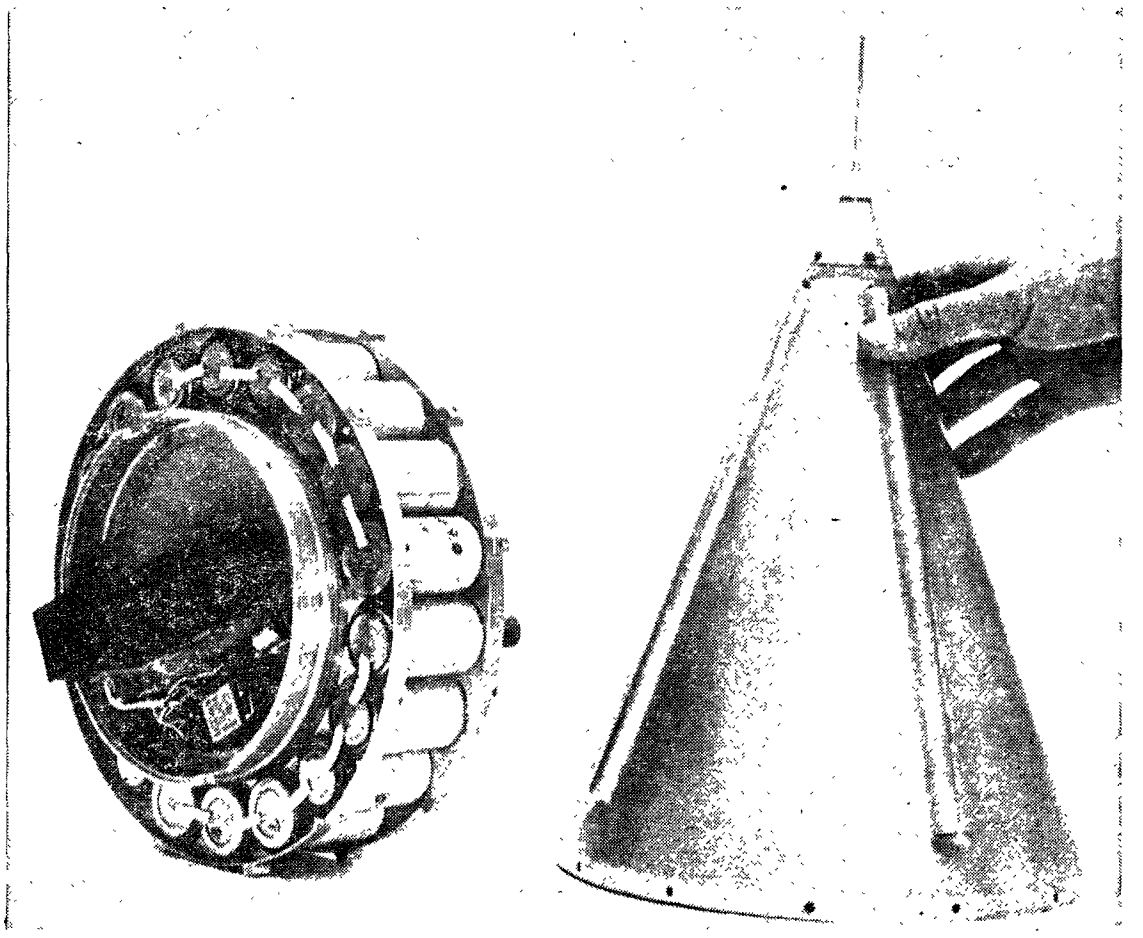
A modified version of the Redstone, called the Jupiter C, was used to launch three Explorer earth satellites beginning with the first on January 31, 1958.

Pioneer III space probe, launched by the Army for the National Aeronautics & Space Administration, attained an altitude of some 65,000 miles and provided invaluable scientific data.

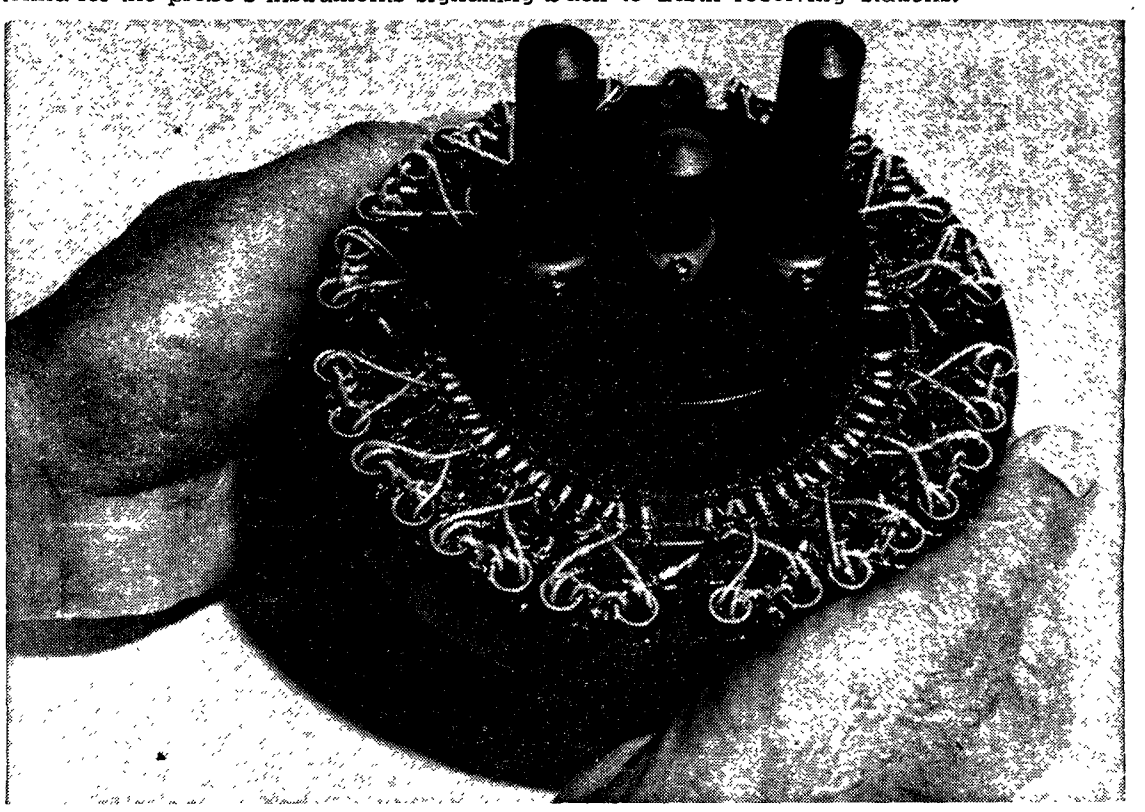
This space probe is designed to obtain further information about the spatial environment; for example, to measure more accurately the band of high radiation detected by the Explorers at extreme altitudes.



THIS GIANT DISH-SHAPED ANTENNA, 85-feet in diameter, was built by the US Army at Goldstone Lake, California, to track Pioneer IV and later spatial vehicles. Its range is now estimated at 400,000 miles. By 1962, when fully operative, the antenna will be able to receive radio signals from space at ranges of 4,000,000,000 miles. The Jet Propulsion Laboratory operates the station.



MERCURY BATTERIES, at left, powered the radio transmitter, cosmic radiation counter and other instrumentation in Pioneer IV. Batteries were expected to operate continuously for 70 hours. At right, the conical shroud placed over instruments of Pioneer IV was plated with gold to improve conductivity. The metal surface also served as the antenna for the probe's instruments signalling back to Earth receiving stations.



THIS IS THE RADIATION experiment on board Pioneer IV. It consists of two Geiger-Mueller tubes and a voltage supply tube (the small tube in the center.) The experiment was suggested by Dr. James A. Van Allen, head of the physics department at the State University of Iowa. Data from the early part of the trajectory, while the probe was in the radiation belt discovered by the Army's Explorer satellites, will enable further estimates to be made as to the energy levels and physical limits of this mysterious radiation.

Best Efforts

(Continued From Page 1)

Sooner or later, some enterprising correspondent is going to dig behind the rockets and unearth the story of the people — a new kind of people, perhaps, but still very much like other human beings. They buy homes, sometimes; they rent apartments, the exist in trailer courts. Some wear uniform, the majority do not.

Thousands Came

Thousands of them came from Alabama, Tennessee, Georgia, Mississippi, from regions poor in industry, offering uncertain futures to engineers, scientists, and highly skilled technicians.

Other thousands poured into Huntsville from all parts of the United States, from private industry, from universities, colleges and high schools, from training camps, from other Government installations, from research institutions.

What brought them here? What keeps them here?

Well, you can find many answers. Some will tell you it is the challenge of the unknown, pushing forward into areas of knowledge which yesterday were subjects of interest only to science fiction writers. Some will say it is the opportunity of association with that small group of men, headed by Dr. Wernher von Braun, who have more experience in ballistic missile development than any other similar group in the Free World.

Various Reasons

Some looked for opportunity, others for a better life made possible through increased earnings. Some wanted to share in building novel weapons systems to defend their country.

A few, disappointed for one reason or other, have left — most have stayed. They have withstood the usual difficulties of dislocation and moving, a veritable flood of discouraging rumors, attacks by competitive groups and organizations, enticements offered by people who want to buy brains and know-how.

Maj. Gen. J. B. Medaris, their top commander, believes most of them have a common incentive—the desire to be a part of a creative organization which specializes in tackling, and accomplishing, the impossible in the face of almost insuperable odds.

No Counterpart

Hundreds of trades, hundreds of semi-professional and professional talents and skills are represented among the 20,000 military and civilian people who keep everlastingly at their daily chores on Redstone Arsenal. Possibly no other research and development center in the world has such a diversification of human capabilities—certainly there is no counterpart in the Free World.

These are the men and women of the Missile Command, the Ballistic Missile Agency, the Rocket and Guided Missile Agency, the Guided Missile School, the Redstone Arsenal; of Chrysler, and Thiokol, and Rohm & Haas, and of many other contractors, big and small, who share in the tremendous stir of activity and progress which is the sum of it all.

Today they feel the thrill and satisfaction of another "first"—but they are secretly looking forward, with renewed anticipation, to the challenge of the next "first," and the next.

Many

(Continued from Page 1)

who have dedicated their talents, education, experience, and toil to the field of missilery were responsible for the experimental flight of the Space Probe.

Within the blockhouse a group of scientists, engineers and technicians turned page after page of the Countdown Procedure, performed countless pre-launch relays and operated the instrument panels while the electronic "countdown clock" ticked away each second.

500 Launchings

The man who directs the famed Missile Firing Laboratory team has probably launched more ballistic missiles than any person in the Free World. With more than 500 launchings of research and development missiles to his credit, Dr. Kurt H. Debus has directed the launching of all the Army's big rockets since the first Redstone Ballistic Missile in 1953.

Formerly the chief test engineer at Peenemuende in 1943, Dr. Debus makes his operational headquarters at Cape Canaveral where he serves as one of ten laboratory team members in Dr. Wernher von Braun's Development Operations Division.

Teamwork has been constantly stressed by Dr. Debus who persistently refuses to single out any member of his launch group as "the man who pushes the button." Instead Dr. Debus points out that each step in the countdown procedure carries a significant responsibility. The reliability with which these steps are performed by the team as a whole determines the results of the acid test which will spell success or failure.

Key Groups

Several key groups within the Missile Firing Laboratory contribute to the mission of launching of a huge test vehicle with an experimental pay-load. One of these groups is headed by Dr. Hans F. Gruene. In addition to his position as Deputy Director to Dr. Debus, Dr. Gruene directs the Guidance and Control Group which is responsible for the electrical ground and missile network equipment in the prefiring, firing, and post firing of guided ballistic missiles. Dr. Gruene's assistant, Robert "Bob" Moser, is the scheduling and "countdown" coordinator for the Army Ballistic Missile Agency's missile firings.

The Mechanical Engineering and Ground Handling group under the supervision of Albert Zeiler and his assistant Robert E. Gorman performs all mechanical functions pertaining to the space vehicle from the time it is flown into Patrick Air Force Base until it is fired. This group is also responsible for the fueling of missiles with exotic liquids when required and for the final mechanical preparation of the missile on the pad for firing.

The Data Coordination Office is responsible for the preflight evaluation, reduction and distribution of data acquired by electronic and mechanical instrumentation recording systems as well as data obtained through mathematical computations. The Office is under the supervision of Charles A. Thoman.

The Engineering, Measuring and Tracking group, headed by Karl Sendler who has designed and developed measuring systems and related ground instrumentation, is responsible for the entire electronic field, such as onboard measuring-radio frequency systems pertaining to ground instrumentation and various tracking systems employed. He is assisted by Grady F. Williams who has been engaged in Army missile work since 1950.

Parker's Job

The Program Coordination Engineering Service and Administrative Office, headed by Clarence C. Parker, coordinates all programs, renders technical reports, supervises support and supply actions, checks the safety program and provides research and development photography. Parker is assisted by Don Hardin.

The Military Support Office, staffed by officers and enlisted men, perform duties in the electrical, mechanical and industrial engineering fields at the Missile Firing Laboratory. Many of the officers and the enlisted men have engineering degrees. Among the enlisted men are "Scientific and Professional" soldiers whose educational background enable them to perform highly technical assignments. The Military Support Office is headed by Capt. Kjell Thorstensen whose office also provides vehicle support for the Laboratory.

The Army's Missile Firing Laboratory operates two firing complexes, each with two firing pads, a blockhouse and electronic and optical tracking stations.

The launching areas are adjacent to each other on the Cape's southeast coast area. Each site is equipped with huge gantry service structures which contain the missile through final preparation and fueling. One service structure services two launching pads.

Hangars D and R

The Firing Lab's two assembly buildings, Hangars D and R, house much of the laboratory's total activity. Incoming missiles flown from the Army Ordnance Missile Command in Huntsville, are given exhaustive tests and pre-flight evaluation.

The Missile Firing Laboratory employs facilities for optical instrumentation and electrical tracking systems. Optical instrumentation sites utilize motion picture cameras and several types of tracking, trajectory and ballistic cameras for this purpose. Tracking stations downrange employing electronic and optical instrumentation furnish an accurate and reliable record of the Space Probe's power flight performance.

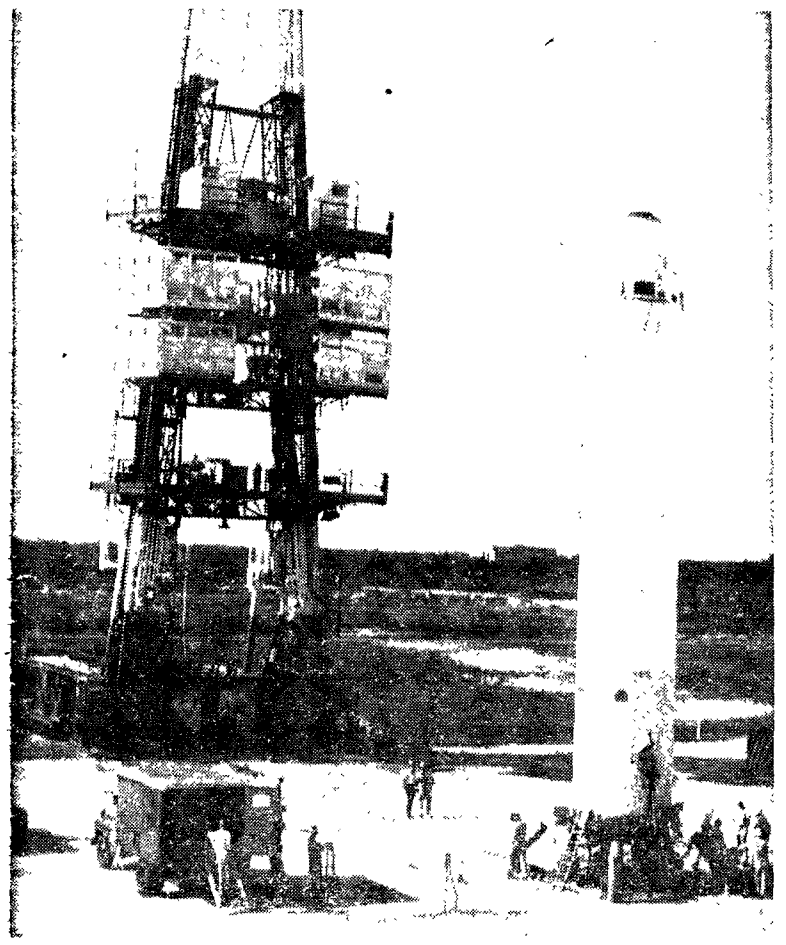
Hundreds of Industrial Firms Contributed to Jupiter Used in Probe

Hundreds of industrial fabricators and suppliers contributed to the modified Jupiter Intermediate Range Ballistic Missile used as the first stage in launching the Army's space probe.

The Jupiter was developed by the Army Ballistic Missile Agency, an element of the Army Ordnance Missile Command. It will be deployed by the U. S. Air Force.

The Chrysler Corporation, Detroit, is the Jupiter prime contractor, although the booster used in this project was fabricated by ABMA at Huntsville. Chrysler furnished engineering services and some hardware.

Major Jupiter subcontractors are Ford Instrument Co., Long Island City, N. Y., guidance and control components; and Rocketdyne Division, North American Aviation, Canoga Park, Calif., propulsion. For this project Reynolds Metals Co., Sheffield, Ala., built the shell of the rotational launcher.



POWERFUL MAIN STAGE section of Juno II launching vehicle is placed on the launch ring at Cape Canaveral, Fla Service tower in background, which moves on steel rails, was then positioned alongside the missile. It is equipped with elevators and work platforms to accommodate men assembling the 76-foot tall Juno II.

* * *

Modified Jupiter Served as First Stage of Probe

The Jupiter IRBM, in modified form, served as the first or booster stage of the Army-NASA Juno II Space Probe. Fabricated for this mission by the Army Ballistic Missile Agency, an element of the Army Ordnance Missile Command, the Jupiter was topped with upper stages and a scientific payload provided by the Jet Propulsion Laboratory of NASA. The Juno II vehicle measures 76 feet.

The guidance and control systems are located in the forward portion of the Jupiter and provide the sole source of guidance after liftoff. This missile must "think" for itself and adjust to its environment. An angle-of-attack meter protrudes from the tip of the Juno II's cone and resembles an arrow. The meter senses deviations, tilts or changes in direction of the rocket while it traverses the earth's atmosphere and transmits this information back to the guidance and control equipment installed in the instrument compartment of the Jupiter. The meter functions during the first 120 seconds of flight to ensure that the configuration follows its correct flight path.

Guidance and control systems employ gyroscopes and a stabilizing platform for constant alignment. Flight instructions are "read" by remote control into the rocket prior to liftoff. These instructions can, by remote control, be changed up to within 20 minutes of firing.

A guidance correction factor by internal measurement can correct for side velocity of a jet stream, which the rocket might encounter at extreme altitudes, or other side-slipping phenomenon. Gyroscopes control the rocket up to cutoff of the first stage by means of pitch, yaw and roll systems. After separation of the instrument compartment the same gyroscopes provide control signals which operate air nozzles, using compressed air, mounted in the tail of the truncated instrument compartment. By means of this spatial attitude control system, the alignment of the remaining stages and the probe with respect to trajectory is achieved before high-speed stages are ignited.

The Jupiter first stage of the JUNO II rocket employs a guidance system which utilizes the Delta-Minimum inertial guidance scheme. The guidance system, originally perfected by Army scientists for the Redstone Ballistic Missile, derives its name from the system's principal feature. This is the use of a precalculated flight path to which the missile is constrained during essentially the entire propelled flight.

Through simple control action the system corrects for perturbations as soon as they occur and deviations from the standard flight path are small. Even relatively large thrust deviations can be accommodated with no cross coupling between measuring axes.

The Delta-Minimum scheme employs two or three mutually perpendicular measuring axes, with the constraint to the precalculated flight path, which can be with respect to velocity or both velocity and displacement, is applied to one or more of the axes according to the accuracy requirements of the missile.

The Guidance and Control Laboratory, one of ten laboratories under the direction of Dr. Wernher von Braun, Director of Development Operations Division at the Army Ballistic Missile Agency, is headed by Dr. Walter Haeussermann. Guidance and Control wanted to get the angle-of-attack meter out in front of the missile as a refinement to the guidance of the gyroscopic system. The Structures and Mechanics Laboratory designed a shroud device after the Aeroballistics Laboratory provided data essential to determine the best angle for the cone.

The Jupiter was the first U. S. IRBM to be launched successfully. In May, 1958 the Jupiter development team launched and recovered, with assistance from the Navy, the first full scale, heat-protected IRBM nose cone, demonstrating that a practical solution had been found for the aerodynamic reentry heating problem. In July, 1958 another full-scale Jupiter nose cone was successfully recovered.

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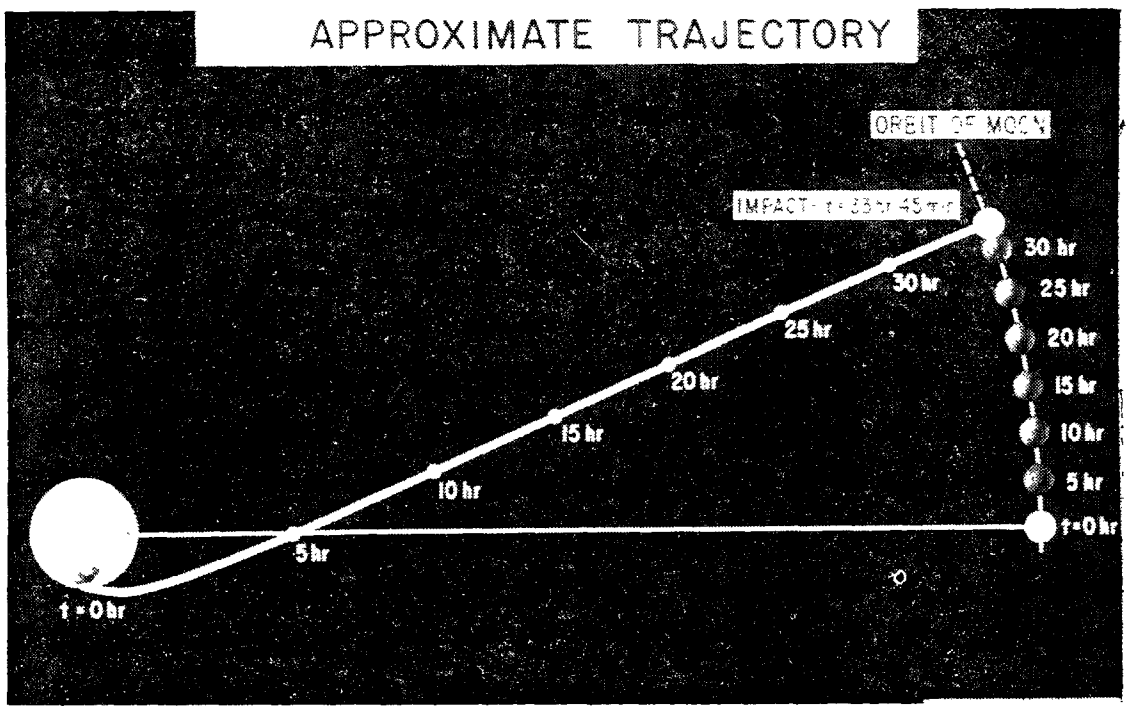

Calculations Were Begun on Probe Trajectory Before First Explorer

Shortly before the Free World's first scientific earth satellite, Explorer I, was hurled into orbit on January 31st of this year, calculations were begun on the trajectory of the Army's deep space probes.

Initial data from the Future Projects Analysis Branch of the Aeroballistics Laboratory of the Army Ballistic Missile Agency were provided in the form of mathematical equations.

These equations expressed the flight of the probe from the earth to the vicinity of the moon and were in turn translated into symbols and fed into the high speed computer by the Trajectories Study Unit of the General Electric Co. under contract to ABMA.

By using these methods of computing trajectories, the Future Projects Analysis Branch was able to determine the amount of weight that could be flown into deep space.

1,000 Trajectories

Utilization of the electronic high speed printer made possible the job of calculating more than 1,000 trajectories. The huge computer requires only 10 seconds to compute a simplified trajectory from the end of the propelled flight to lunar regions, whereas eight hours would be the minimum time for a skilled mathematician to do the same job using a desk calculator.

The more refined trajectories which simulate the actual probe flight from the end of the propelled flight to the moon area would take a person 250 hours to compute. This can be done by the high speed computer in 5 minutes.

The ascending or propelled flight portion of the probe's flight takes somewhat longer due to the influence of earth's atmosphere. The machine requires 20 minutes to do the job which would otherwise require two and one-half years. The machine also corrects its errors during operation. To attempt a similar problem would probably leave man utterly frustrated.

Several hundred propelled flight trajectories and probe orbits had to be run in order to establish a useful grid of cutoff conditions for further final interpretation and choice of the actual 20 trajectories prepared for the different times at which a launching of the space probe might be fired.

Numerous Runs

After numerous runs of a preliminary nature, trajectories were finally established that adhere to the strict limitations imposed upon the final configuration of the missile itself.

From these standard trajectories, many more physical aspects were investigated. Everything than can possibly happen to a missile in flight was simulated on the computer to ascertain the limits at which the missile might be allowed to wander from the pre-computed flight before the command destruct button was pressed. Cutoff of the engine was simulated to find impact points along the flight path.

Finally, after all the possibilities of failure were investigated thoroughly standard trajectories were run from lift-off to encounter with the lunar region, varying standard parameters to determine the tolerance which must be adhered to.

The teamwork of the Future Projects Analysis Branch of the Aeroballistics Lab and the Trajectory Studies Group of General Electric Company has been a important keynote of the project.

Personnel closely involved in trajectory computions are:

For Trajectories Studies-General Electric: Bill Smythe, Chief; Dan Harton, Ralph Roddy and Bill Martin.

Dr. E. D. Geissler heads the Aeroballistics Laboratory.

For Future Projects Analysis Branch of the Aeroballistics Laboratory, were Dr. R. F. Hoelker, Chief; William Miner, Deputy Chief; Otha C. Jean, Art Schwaniger and Pfc. John Schrader.

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MISSILE FIRING LABORATORY technicians in the blockhouse at Cape Canaveral, Fla., are shown during a countdown preparatory to the launching of the Army-NASA space probe. Test coordinator Bob Moser, standing rear with glasses, has performed this intricate job for the Army's satellite and space ventures on many occasions.

AOMC Embraces Key Installations In Alabama, Florida, New Mexico

The Army Ordnance Missile Command, the organization responsible to NASA for the space probe project, embraces key installations engaged in rocket, missile and space programs in Alabama, Florida and New Mexico. Maj. Gen. J. B. Medaris is the Commanding General.

The Command is charged with all Army Ordnance responsibilities in the missile-space field. This includes development, production, storage and maintenance of Army rocket and guided missile weapons systems, and conducting space projects as assigned by the National Aeronautics and Space Agency and Advanced Research Projects Agency.

AOMC's resources and capabilities cover a wide range, from prototype production of the Jupiter IRBM, basic research in many areas, test facilities, and the launching of long-range rockets and space vehicles. Fourteen major weapons systems are under its jurisdiction. Annual expenditures in support of these programs are about two billion dollars.

Redstone Is Hq.

Redstone Arsenal, Ala., serves as headquarters for the Command, the Army Ballistic Missile Agency, and the Army Rocket and Guided Missile Agency. Also under the Command are the White Sands Missile Range, and the post command at Redstone Arsenal.

Total personnel strength of the Command is about 27,500, of whom 4,600 are military and 22,300 are civilians. Of the latter, more than 3,100 are employed by Army contractors operating on the installations.

Following are brief statements about each AOMC segment:

Army Ballistic Missile Agency — ABMA, commanded by Brig Gen. J. A. Barclay, is America's first and only Agency created exclusively for the performance of technical service responsibilities for long range ballistic missiles and space vehicles.

This encompasses research and development, fabrication of components, prototype production, static testing and launching, and resolution of logistics support and field maintenance problems.

The Agency, with the Jet Propulsion Laboratory, was responsible for the space probe project, as well as the Army's Explorer satellite series.

Programs Listed

ABMA programs, in addition to space research, include the Redstone, Pershing and Jupiter ballistic missiles. Facilities include, a large twin-vertical test stand, cold calibration stand, blockhouse, development shops and assembly buildings capable of fabricating complete missiles; metallurgy, rubber and plastics laboratories, a computation laboratory and supporting facilities. The plant is ideally suited to the development and prototype production of large rockets,

Dr. Wernher von Braun heads the Agency's Development Operations Division. Development Operations consists of 10 laboratories: Aeroballistics, directed by Dr. E. D. Geissler; Computation, Dr. H. Hoelzer; Fabrication and Assembly Engineering, Hans H Maus; Guidance and Control, Dr. Walter Haeussermann; Research Projects, Dr. Ernst Stuhlinger Missile Firing (at Cape Canaveral) Dr. Kurt Debus; Structures and Mechanics, W. A. Mrazek; Systems Analysis and Reliability, E. W. Neubert; Test, Karl Heimburg; Systems Support Eqiupment, Hans Hueter.

The present strength of ABMA is about 6,800, of whom 5,000 are Civil Service employes, 360 military, and 1400 contractor.

ARGMA's Work

Army Rocket and Guided Missile Agency — ARGMA, commanded by Brig. Gen. J. G. Shinkle, is charged with development procurement, production, industrial engineering, industrial mobilization, maintenance and repair parts supply and stock control of Ordnance rockets and guided missiles. This includes all Army surface-to-surface and surface-to-air missiles except the ballistic missiles for which ABMA is responsible.

ARGMA is also assigned specified national and support missions for other types of rockets, JATOs and target drones.

The ARGMA organization has directed the development of such Army weapons systems as the surface-to-surface Sergeant, Corporal, Honest John, Little John and Lacrosse; and surface-to-air Hawk, Nike-Ajax, Nike-Hercules, Nike-Zeus, and Plato. Some of these are already deployed and others are nearing field use.

ARGMA's work in solid propellants is conducted on the Arsenal by the Thiokol Chemical Corp., and the Rohm and Haas Chemical Co., which operate government-owned facilities.

Major Elements

Major elements of the Agency include three Divisions — Research and Development, Industrial and Field Service — which have the national Army mission in their respective fields; the Ordnance Missile Laboratories, a series of labs which are devoted to research, developing and testing operations carried on within the confines of the Arsenal.

Redstone Arsenal — RSA, commanded by Col. Keith T. O'Keefe, is the U. S. Army installation which is the home and headquarters of the U. S. Army Ordnance Missile Command, the Army Ballistic Missile Agency, the Army Rocket and Guided Missile Agency, and the Ordnance Guided Missile School. The Arsenal, in addition to furnishing a base of operations and all necessary support, also operates the Redstone Depot.

The organizational structure falls under the four major Army areas, administration, security and safety, operations and training, and logistics. In addition there is a control office, directly responsible to the commander and his deputy, a judge advocate section, adjutant and executive officer.

Facilities Supplied

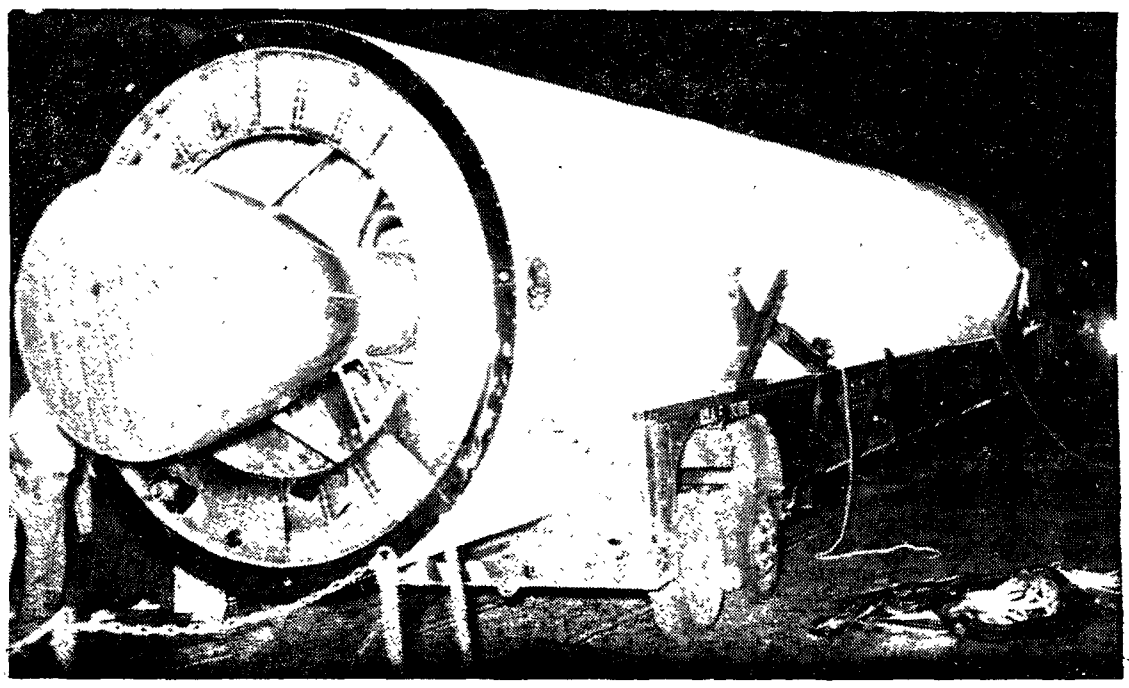
Physical facilities and utilities are also supplied to contractor organizations on the Post including two research companies, Thiokol Corporation, and the Rohm and Haas Company, as well as offices for other contractors having liaison representatives and instructors in missile operation and maintenance located here.

White Sands Missile Range — WSMR is the Army's overland missile test range. It covers a 4,000 square mile area north of El Paso, Texas. Maj. Gen. W. E. Laidlaw is the commander.

Primary mission of the Missile Range is the testing of intermediate range rockets and guided missiles. This includes general supervision and coordination of scheduling, range safety, and instrumentation for all flight testing.

All branches of the military services, plus a large number of industrial firms and academic institutions, are located on the installation. The Missile Range employs about 6,000 civilians and has a military strength of about 3000.

WSMR was activated in 1945, and since that time has served as the principal overland missile range. The first rocket tested was the "TINY TIM" on Sept. 26, 1945. Each service has contributed in the construction of rocket testing facilities. All use the same firing range and to a great extent, the same personnel in firing and instrumentation of rocket flights.



AT THE HANGER—Giant main stage booster, airlifted to Cape Canaveral launch site from Redstone Arsenal, as it appeared in the Army hangar at the Cape before being moved to launching pad.

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WANTADS GET RESULTS

U.S. Entered Space Age Jan. 31, 1958, With Explorer I

The United States and the Free World entered the Space Age on Jan. 31, 1958, with the launching of the Explorer I earth satellite by the Army.

This was the first of several space projects assigned to the Army by the Department of Defense and the National Aeronautics and Space Administration. The Explorer satellite series, and the Pioneer II space probe conducted in December, have contributed scientific data of great importance to man's effort to explore outer space.

Directing the Army's participation in the national space program is the Army Ordnance Missile Command at Huntsville, Ala. A unit of the Command, the Army Ballistic Missile Agency, conducts the assignments using modified versions of Army-developed rocket systems.

Belt Discovered

The greatest achievement of the Explorer was the discovery and subsequent investigation of the Van Allen Radiation Belt which circles the earth. Scientists participating in the International Geophysical Year consider this among the most important findings of the worldwide research program.

Explorer I detected a deadly band of radiation beginning at about 600 miles altitude. The exact nature and intensity of the radiation was not known, but it was apparent that this obstacle could block or greatly delay man's entry into space.

The number of particles encountered per second was some 1,000 times greater than what had previously been considered normal.

Explorer III, launched March 26, carried more sophisticated instrumentation. The radiation band discovery was confirmed and knowledge of the distribution was greatly extended with the more elaborate radiation equipment, plus a taperecorder which made possible readings representative of the total orbit.

New Package

The instrumentation carried on the first two satellites was not capable of distinguishing between the types and energy levels of radiation. A new package was designed, and launched by the Army July 26 in Explorer IV.

These instruments, like those orbited in the earlier Explorers, were designed by Dr. James A. Van Allen and associates at the State University of Iowa. Van Allen, chairman of the Iowa physics department, is a world pioneer in radiation research.

Explorer IV contained four radiation counters instead of the one each carried by I and III. This system of four detectors gave excellent data on the distribution and energy level of the radiation. In order to obtain a wider geographical coverage, the satellite was launched to orbit at 51 degrees inclination to the equator, instead of the 34 degree inclination of previous U. S. satellites.

RESUME OF RADIATION FINDINGS

Dr. Van Allen recently made a report to the American Physical Society on the findings of Explorer IV, covering the entire operating lifetime of 3,600 recorded passes. Some of the main points made in the report are as follows:

1. "The detectors of 1958 Epsilon (Explorer IV), designed with the knowledge of earlier results, have provided a vastly more full and detailed knowledge of the distribution and nature of the radiation. . . ."

2. "We regard it as established that the great radiation belt around the earth consists of charged particles, temporarily trapped in the earth's magnetic field. The rapid diminution of intensity at the lower altitudes is almost certainly due to atmospheric scattering and absorption. . . ."

3. "We propose that the radiation belt is the reservoir whose leakage of particles is the direct cause of visible aurorae. It is further suggested that solar plasma replenishes the reservoir from time to time, working its way into the outer reaches of the earth's magnetic field when its density is sufficiently great, then being trapped in the field.

Pattern Distorted

"On the occasion of the arrival of new batches of gas, the pattern of magnetic field lines at great altitudes and hence at high latitudes is distorted, thus permitting the leakage of particles from the reservoir into lower altitudes at a rate greatly exceeding that which is usual for the quiescent situation."

4. "The radiation belt may well be the seat of a distributed 'ring' current encircling the earth; and the pertubations of the belt due to arrival of solar plasma may be directly responsible for magnetic storms."

5. "Also it may well be that steady leakage of energetic particles contributes significantly to the general heating of the atmosphere at all latitudes."

Further Data

(Since these investigations were made, further data of great significance were obtained from the NASA-Army space probe, Pioneer III. It was discovered that there are actually two radiation bands surrounding the earth. Radiation in both of these bands is so intense as to preclude a continous orbit of a manned vehicle at certain altitudes without harmful effects on the passenger Van Allen predicts, however, that man could orbit between the two layers without harm from radiation.)

OTHER EXPLORER CONTRIBUTIONS

Explorer I confirmed man's ability to control temperature within an artificial satellite. Scientists of the Jet Propulsion Laboratory who conducted the heat experiment were assured by results that their technique for temperature control is adequate for the successful operation of sensitive electronic equipment.

The internal temperature was maintained between 32 and 104 degrees Fahrenheit—well inside the tolerance needed to protect instrumentation from heat or cold failure. Outside temperature, measured at the shell, fluctuated between 14 and 167 degrees Fahrenheit. Inside temperature, of course, is easily within the range acceptable for human survival.

In the third area of Explorer I's instrumentation, it was determined that micrometeorites offered no serious hazard to orbiting vehicles. Two wires on the Explorer I erosion gage were fractured during the firing of the last stage; no additional fractures occured during the satellite's lifetime. The impact microphone inside the vehicle registered the collision of several small particles on the shell.

Pictures Used

Visual and photograpic observations of the Explorers are contributing to still another area of science. The satellites were sighted and photographed hundreds of times. These pictures have been used to compute and predict more precise orbital data for other satellites, and are being analyzed to provide information about the earth's equatorial bulge, and anomalies in the earth's gravity.

Two of the three Army-launched satellites are still orbiting. Explorer I is expected to stay aloft five to seven years: Explorer IV's lifetime may end in 10 to 11 months. Explorer III, its batteries exhausted and missions completely fulfilled, reentered June 28, 1958.

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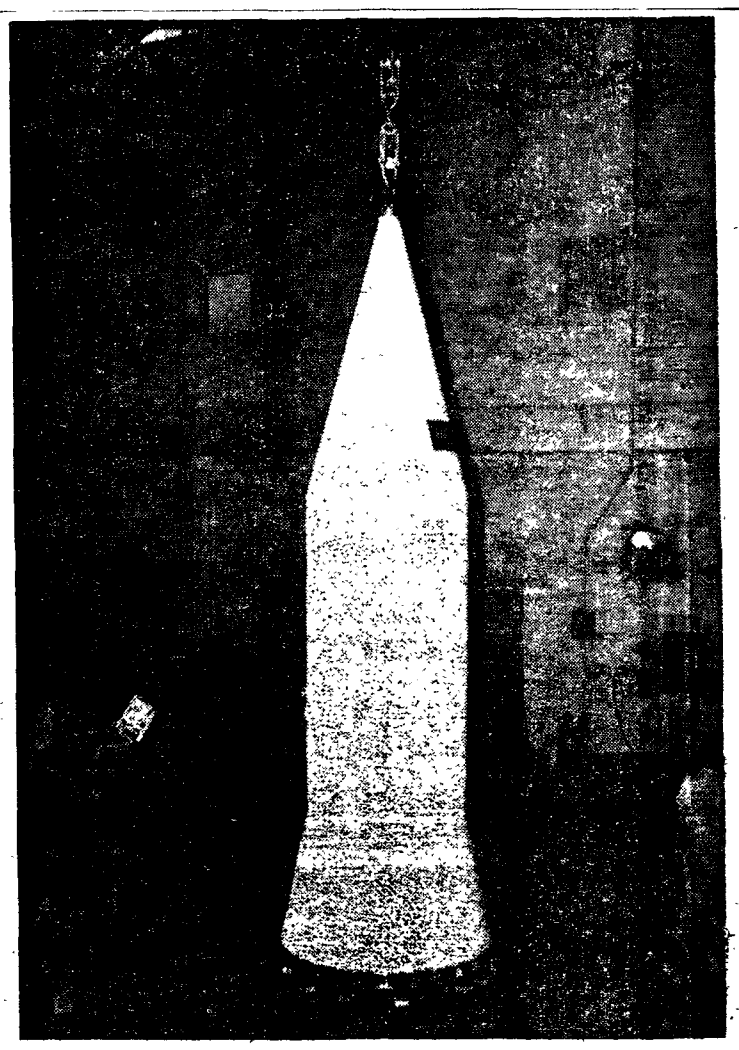

PROTECTIVE SHROUD designed and fabricated by ABMA technicians awaits the moment when it will be placed atop the Juno II to shield the upper stages and Pioneer IV payload from intense aerodynamic heating encountered as the giant vehicle roared through Earth's atmosphere enroute to outer space.

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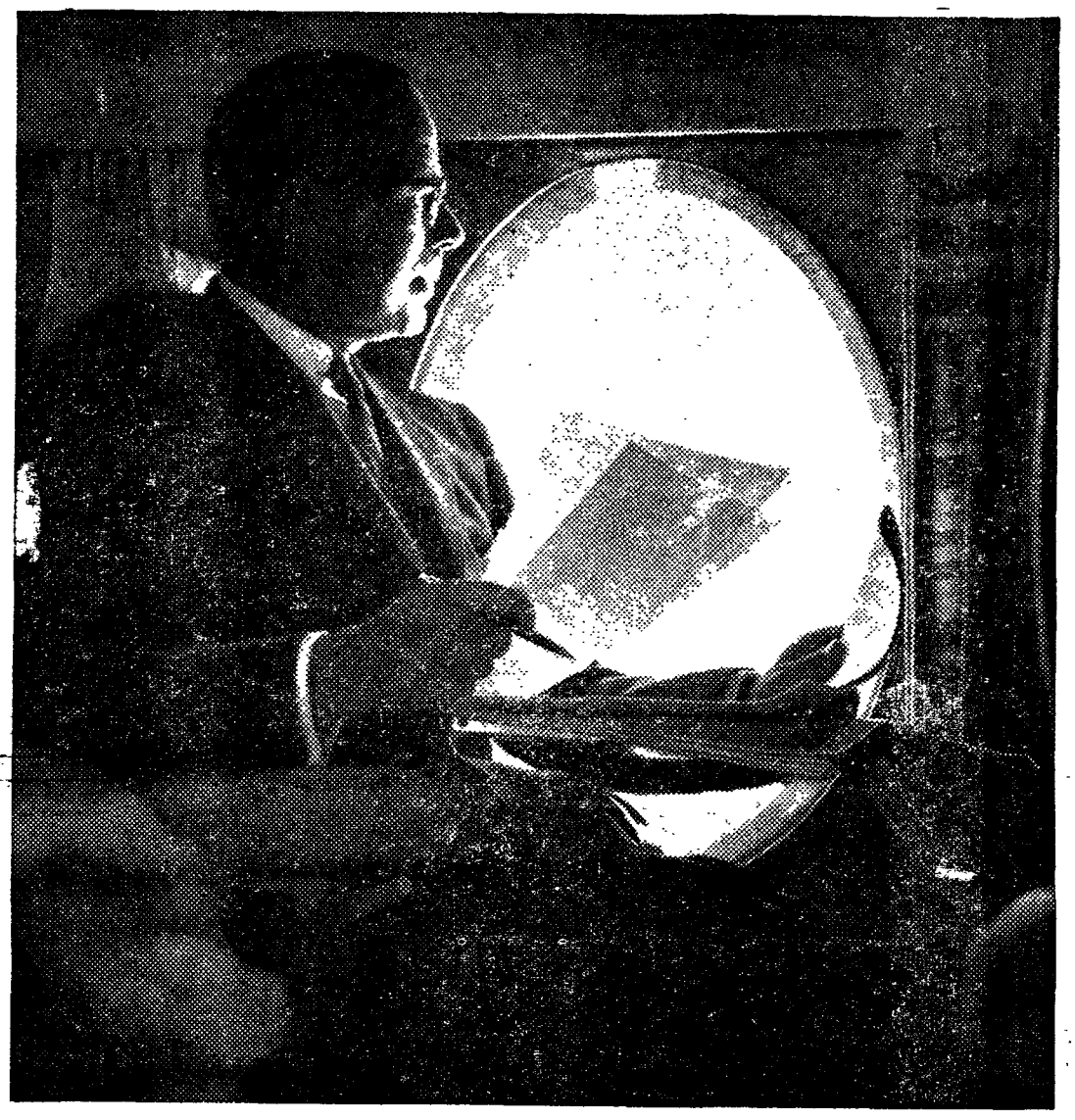

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IN SECOND MISSILE

Several Improvements Made Over First Probe Launch

Several improvements were made in the second Army-NASA Juno II missile, based on information gathered from the first launching Dec. 6, 1958.

Only the close working relationship of the 10 laboratories in the Development Operations Division of the Army Ballistic Missile Agency made these modifications possible in the brief period between the firings.

Close contact was maintained through project officers in various laboratories with Bill B. Greever, an engineer in the Structures and Mechanics Laboratory, serving as overall Juno II project officer.

After First Firing

After the first firing telemetered data was gathered and analyzed, functions of intricate components studied and possible improvements suggested. Feasible ideas had to be placed on paper in detailed engineering designs so that skilled craftsmen in other laboratories could give body and shape. The proposed modifications had to be tested and incorporated with related missile parts.

Successful accomplishment of modifications without delaying the firing schedule is an example of the Army's maxim that inventions can be scheduled in research and development work—and the result of many long hours of tireless labor by employees of the Missile Agency.

To insure at least three additional seconds vital burning time to the first-stage Jupiter engine, the Test Laboratory conducted numerous static firings on the concrete test tower at ABMA. A new arming procedure was adopted for a fuel depletion switch which is designed to cut off the flow of RP-1 fuel and liquid oxygen simultaneously when one is depleted. If one liquid becomes exhausted and the other continues to enter the engine, an explosion could occur and destroy the missile.

New Procedure

The switch cannot operate until it is armed. The new procedure requires arming the switch as late as possible after liftoff.

To improve the accuracy of the upper stages, it was decided to increase the spin rate of the cluster to about 750 revolutions per minute. This required that the upper stages be made structurally stronger.

Electric motors spin the cluster around a central shaft at its base. To make the fast-spinning assembly more stable, and therefore more accurate, a circular track was designed to be fastened inside the walls of the protective shroud covering the cluster near the top of the second-stage ring of 11 rockets.

Six Wheels

Six small rubber-tired wheels attached to the cluster roll around in this ring, turning at a speed of about 7000 rpm, with a surface speed of about 130 feet per second. This is roughly equivalent to an automobile traveling 100 miles per hour.

Fabrication Laboratory personnel began work on the ring as soon as rough hand sketches of the design became available. James H. Chesteen and William J. Franklin gathered parts and material to rush the work along.

Numerous endurance tests were performed by Structures and Mechanics Laboratory to see how long the rubber would last, if it would tear loose from the rollers, and how the shroud would be affected. Personnel worked day and night under the supervision of James T. Sawyer, Structural Test chief, and Robert S. Garrett, test engineer.

Filter Added

The Guidance and Control Laboratory added a high frequency filter to its computer system to prevent noise of the speeding rollers from affecting the signals relayed from the angle-of-attack meter mounter on the nose of the shroud to the guidance equipment in the instrument compartment of the first-stage Jupiter.

This modification and tests to see if the spin motor could carry the additional load were made by Friedrich W. Brandner, Juno II project engineer for the Guidance and Control Laboratory, and D. L. Teuber, engineer.

Work on the shroud required that it remain at ABMA past the original schedule for shipping to Florida. This posed special handling problems for the Systems Support Equipment Laboratory, which sees to it that the missile, liquid oxygen trucks, fuel trucks, and other equipment are in place at the Cape on time.

The Systems Analysis and Reliability Laboratory had to sandwich checks of each modification into its regular schedule of component testing. Project officer here was Shirley P. Hale.

Calculations Begun

More than a year ago, shortly before the Army's Explorer I satellite was whirled into orbit, calculations were begun on the trajectory of a deep space probe. Otha C. Jean, Juno II project officer in the Aeroballistics Laboratory, was responsible for initial data in the form of mathematical equations expressing the flight of the probe from the earth to the vicinity of the moon.

This data was transferred by Computation Laboratory personnel to machine language and fed into high speed computers by the Trajectories Study Unit of General Electric Co., under contract to ABMA. More than 1,000 trajectories were calculated to provide alternate firing times for Missile Firing Laboratory personnel at Cape Canaveral. Tom Yarbrough was project officer in the Digital Projects Branch of the Computation Laboratory.

Speer in Charge

After launching, the Computation Laboratory also evaluated tracking information on the initial powered flight, using the doppler technique to determine velocity of the probe. Dr. Fridtjof A. Speer was in charge of tracking data evaluation. With the assistance of Herman F. Kurtz, he developed the evaluation technique used on this and the first Army-NASA space probe.

The Research Projects Laboratory coordinated the scientific experiments carried in the payload to insure maximum amounts of valuable data on radiation in outer space.

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Agency Charged With Probe Embraces Key Elements

The Army Ordnance Missile Command, the organization responsible to NASA for the space probe project, embraces key installations engaged in rocket, missile and space programs in Alabama and New Mexico. Maj. Gen. J. B. Medaris is the Commanding General.

The Command is charged with all Army Ordnance responsibilities in the missile-space field. This includes development, production, storage and maintenance of Army rocket and guided missile weapons systems, and conducting space projects as assigned by the National Aeronautics and Space Agency and the Advanced Research Projects Agency.

AOMC's resources and capabilities cover a wide range, from prototype production of the Jupiter IRBM, basic research in many areas, test facilities, and the launching of long - range rockets and space vehicles. Fourteen major weapons systems are under its jurisdiction. Annual expenditures in support of these programs are about two billion dollars.

Redstone Arsenal, Ala., serves as headquarters for the Command, the Army Ballistic Missile Agency, and the Army Rocket and Guided Missile Agency. Also under the Command are White Sands Missile Range and the post command at Redstone Arsenal.

Total Strength

Total personnel strength of the Command is about 29,000, of whom 6,000 are military and 23,000 are civilians. Of the latter, more than 4,000 are employed by Army contractors operating on the installations.

Following are brief statements about each AOMC segment:

Army Ballistic Missile Agency —ABMA, commanded by Brig. Gen. J. A. Barclay, is America's first and only Agency created exclusively for the performance of technical service responsibilities for long range ballistic missiles and space vehicles.

This encompasses research and development, fabrication of components, prototype production, static testing and launching, and resolution of logistics support and field maintenance problems.

Agency Responsible

The Agency, with Jet Propulsion Laboratory, Pasadena, Calif., was responsible for the space probe project, as well as the Army's Explorer satellite series.

ABMA programs, in addition to space research, include the Redstone, Pershing and Jupiter ballistic missiles. Facilities include a large twin-vertical test stand, cold calibration stand, blockhouse, development shops and assembly buildings capable of fabricating complete missiles; metallurgy, rubber and plastics laboratories, a computation laboratory and supporting facilities. The plant is ideally suited to the development and prototype production of large rockets.

Dr. Wernher von Braun heads the Agency's Development Operations Division. Development Operations consists of 10 laboratories: Aeroballistics, directed by Dr. E. D. Geissler; Computation, Dr. H. Hoelzer; Fabrication and Assembly Engineering, Hans H. Maus; Guidance and Control, Dr. Walter Haeussermann; Research Projects, Dr. Ernst Stuhlinger; Missile Firing (at Cape Canaveral), Dr. Kurt Debus; Structures and Mechanics, W. A. Mrazek; Systems Analysis and Reliability, E. W. Neubert; Test, Karl Heimburg; Systems Support Equipment, Hans Hueter.

The present strength of ABMA is about 6,800, of whom 5,000 are Civil Service employes, 360 military, and 1400 contractor.

ARGMA's Mission

Army Rocket and Guided Missile Agency—ARGMA, commanded by Brig. Gen. J. G. Shinkle, is charged with development, procurement, production, industrial engineering, industrial mobilization, maintenance and repair parts supply and stock control of Ordnance rockets and guided missiles. This includes all Army surface-to-surface and surface-to-air missiles except the ballistic missiles for which ABMA is responsible.

ARGMA is also assigned specified national and support missions for other types of rockets, JATOs and target drones.

The ARGMA organization has directed the development of such Army weapons systems as the surface-to-surface Sergeant, Corporal, Honest John, Little John and Lacrosse; and surface-to-air Hawk, Nike-Ajax, Nike-Hercules, Nike-Zeus, and Plato. Some of these are already deployed and others are nearing field use.

ARGMA's work in solid propellants is conducted on the Arsenal by the Thiokol Chemical Corp. and the Rohm and Haas Chemical Co., which operate government-owned facilities.

Major Elements

Major elements of the Agency include three Divisions — Research and Development, Industrial and Field Service — which have the national Army mission in their respective fields; the Ordnance Missile Laboratories, a series of labs which are devoted to research, developing and testing operations carried on within the confines of the Arsenal.

Redstone Arsenal—RSA, commanded by Col. Keith T. O'Keefe, is the U. S. Army installation which is the home and headquarters of the U. S. Army Ordnance Missile Command, the Army Ballistic Missile Agency, the Army Rocket and Guided Missile Agency, and the Ordnance Guided Missile School.

The Arsenal, in addition to furnishing a base of operations and all necessary support, also operates the Redstone Depot.

The organizational structure falls under the four major Army areas, Administration, security and safety, operations and training, and logistics. In addition there is a control office, directly responsible to the commander and his deputy, a judge advocate section, adjutant and executive officer.

Facilities Supplied

Physical facilities and utilities are also supplied to contractor organizations on the Post including two research companies, Thiokol Corporation, and the Rohm and Haas Company, as well as offices for other contractors having liaison representatives and instructors in missile operation and maintenance located here.

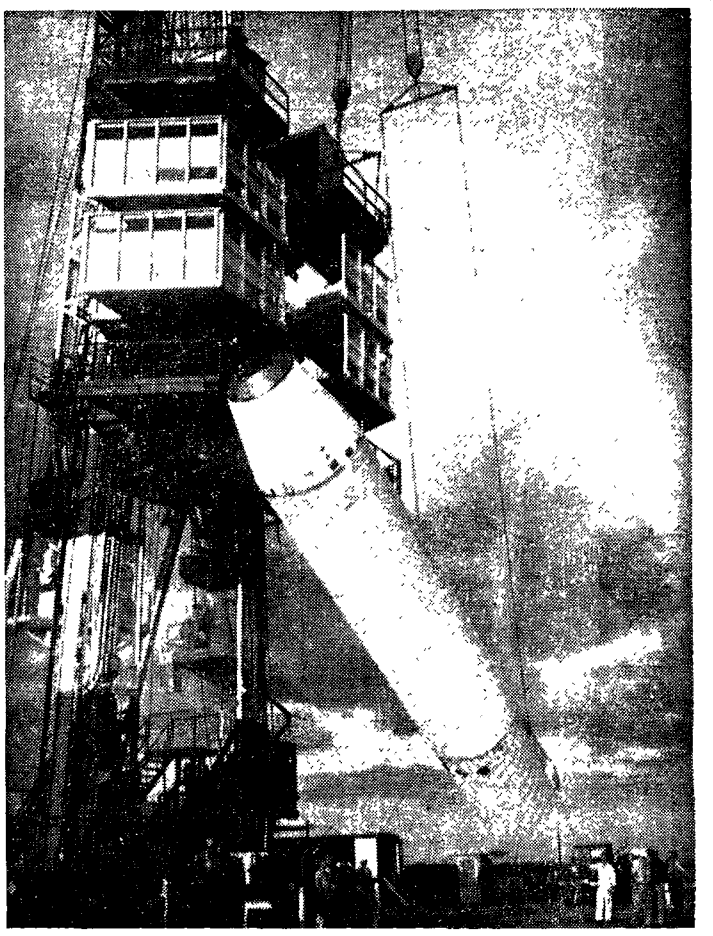
White Sands Missile Range — WSMR is the Army's overland missile test range. It covers a 4,000 square mile area north of El Paso, Texas. Maj. Gen. W. E. Laidlaw is the commander.

Primary mission of the Missile Range is the testing of intermediate range rockets and guided missiles. This includes general supervision and coordination of scheduling, range safety, and instrumentation for all flight testing.

All Branches

All branches of the military services, plus a large number of industrial firms and academic institutions, are located on the installation. The Missile Range employs about 6,000 civilians and has a military strength of about 3,000.

WSMR was activated in 1945, and since that time has served as the principal overland missile range. The first rocket tested was the "TINY TIM" on Sept. 26, 1945. Each service has contributed in the construction of rocket testing facilities. All use the same firing range and to a great extent, the same personnel in firing and instrumentation of rocket flights.



JUPITER BOOSTER, modified at the ABMA Fabrication and Assembly Engineering Lab for this mission by elongating fuel tanks to increase burning time, is carefully raised into position by Cape Canaveral service tower crane.

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DISCUSS ARMED FORCES DAY—Discussing initial planning for this year's Armed Forces Day celebration on May 16 are (left to right) Lt. Col. Lester H. LeVine, who has been named Redstone Arsenal chairman for the event; Huntsville Mayor R. B. Searcy; and Maj. Raymon S. Dotson, last year's Arsenal chairman.

Completion of MFL Building Addition At Cape Is Due Soon

Construction of a 10,148 square foot addition to the Engineering and Laboratory Building at the Missile Firing Laboratory, Cape Canaveral, Fla., is scheduled for completion this month.

The $195,259 addition, a two-story wing 115 foot 4 inches long and 44 feet wide, has been under construction by Diversified Builders, Inc., since September 1958.

When completed it will house administrative and engineering offices now located in Hangars D and R. The hangars will then be available for the laboratory purposes for which they were originally intended.

Civilian Employes' Injury-Free Period Ends After 91 Days

The disabling injury-free period for Arsenal civilian personnel ended last week at approximately 5,400,000 man-hours and 91 consecutive days when an employee received a severe finger injury RSA Safety Division officials announced. On the following day, another civilian employee was injured in an automobile accident on post which was also listed as a disabling injury.

The injury-free period just ended was the second period of excellent work performance reaching over 5,000,000 man-hours without a disabling injury within the past 12-month period, the other period having been worked last July, August, and September.

Safety personnel urge that civilian employees resolve to continue their safe work performance in order to reach a coveted goal of 100 consecutive days without a disabling injury.

Association of U. S. Army Chapter Issues Call for Membership

Civilian employees and military personnel of Redstone Arsenal who are eligible for membership in the Association of the United States Army are invited to join the Association as members of the Tennessee Valley Chapter.

General membership is open to individuals who are honorably discharged, or retired from Armed Forces; members of National Guard, or Army Reserve not on active duty, and other personnel who have held appointive office in D. A. Service Membership is open to all active duty members of U. S. Army. Associate membership is open to active duty personnel of other services; to civilian employees of D. A. not otherwise qualified; and to any individual who supports the objectives of the Association; and who meets such requirements promulgated by Council of Trustees.

Membership fees are $5 per year; $9 for two years and $12 for three years. Membership also entitles an individual to receipt of the National Magazine "Army", published monthly.

For additional information regarding the Association, interested personnel may contact Capt. D. L. Voohrees, Adjutant, RSA, extension 3816.

Patronize the Rocket Advertisers

* * *

Col. LeVine

(Continued From Page 1)

year was assigned to Ft. Bragg, N. C., where he served as Assistant Adjutant General. This was followed by an assignment as Action Officer G-1 at Headquarters, Third Army, Ft. McPherson, Ga., Prior to his assignment to Camp Losey, Puerto Rico, in 1952, Col. LeVine attended the Command and General Staff College at Ft. Leavenworth, Kan.

Decorations, Awards

His decorations and awards include the Bronze Star with cluster, Purple Heart, Commendation Ribbon, Presidential Unit Citation, Phillippine Liberaton, Combat Infantry Badge.

He holds BS and MS degrees in Educational Research from Massachusetts State College. He is a master parachutist.

Col. and Mrs. LeVine have two children, Edward, age 16, and Ronald, 14. Col. LeVine is the son of Mr. and Mrs. Mark E. LeVine of Boston, Mass.

ARGMA Gets

(Continued from Page 1)

as well as at Cape Canaveral, Fla., to send prototype or sample-model space capsules high into the sky.

NASA said this work would shed light on launching and other problems that might develop later with the manned capsule in the Project Mercury satellites.

Maj. Bassler Assigned To Missile Range Post

Maj. Robert E. Bassler, Jr., has been assigned as a project officer with the Army Ordnance Missile Command Field Office at the Atlantic Missile Range in Florida.

Maj. Bassler was formerly assigned as a student at the Ordnance School, Aberdeen Proving Ground, Md. He was graduated from the U. S. Military Academy in 1946 and completed his Master's degree in mechanical engineering at the Massachusetts Institute of Technology, Cambridge, Mass., in 1952.

Maj. and Mrs. Bassler have two sons, Robert E. III, 6 years old, and Thomson S. 5 years old.

Movie Schedule

Wednesday, 4 March, "Forbidden Island" starring John Hall. Time 1315, 1745 and 1945.

Thursday and Friday, 5 and 6 March, "Rio Bravo" starring John Wayne, Dean Martin and Ricky Nelson. Time 1315, 1745 and 1945.

Saturday, 7 March SPECIAL MATINEE, "The Spirit of St. Louis" starring James Stewart. Time 1000.

Saturday, 7 March, "Alaska Passage" starring Bill Williams and Nora Hayden. Time 1745 and 1945.

Sunday, 8 March, "Across the Bridge" starring Rod Steiger and Marla Landi. Time 1400, 1745 and 1945.

Monday, 9 March, "Jeanne Eagles" starring Kim Novak and Jeff Chandler. Time 1315, 1745 and 1945.

Tuesday, 10 March, "Watusi" starring George Montgomery and Taina Elg. Time 1745 and 1945. NO MATINEE.

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— Plus —

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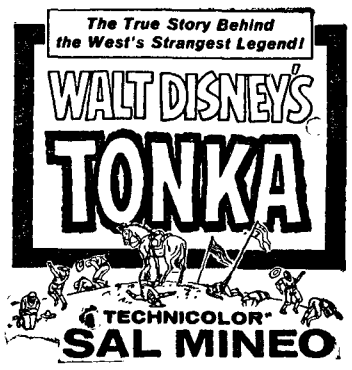

WOODY'S DRIVE-IN

OPEN 6:00 - START 6:30

THURSDAY & FRIDAY

LEO GORCEY and THE BOWERY BOYS · "JINX MONEY" A JAN GRIPPO PRODUCTION with HUNTZ HALL

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"IN BETWEEN AGE"
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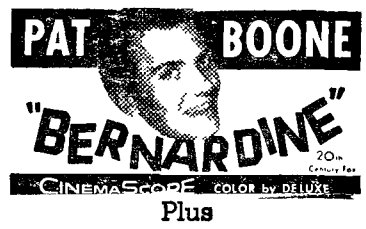
- LEE PATTERSON

SATURDAY



Plus

SUNDAY & MONDAY

— plus —

"BUNDLE OF JOY"
- DEBBIE REYNOLDS
- EDDIE FISHER

WHITESBURG DRIVE-IN

LAST TIMES TONIGHT

— Plus —

THURSDAY & FRIDAY

DEBORAH KERR
DAVID NIVEN
BONJOUR TRISTESSE
CINEMASCOPE TECHNICOLOR

SATURDAY

— Plus —

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SUNDAY & MONDAY

TUESDAY & WEDNESDAY

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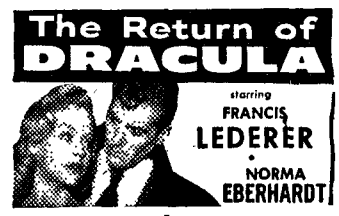
"HUNTSVILLE'S FINEST"

LAST TIMES TODAY

THURS. - FRI.



—plus—

SATURDAY

— Plus —

SUN., MON., TUES.

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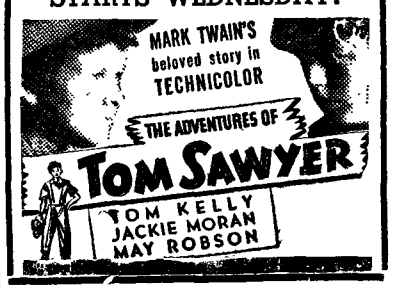
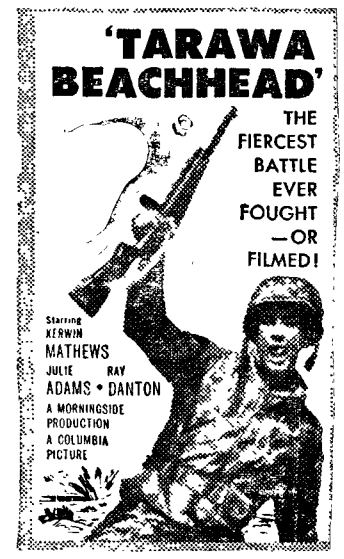
"UP PERISCOPE!"

STARTS WEDNESDAY!

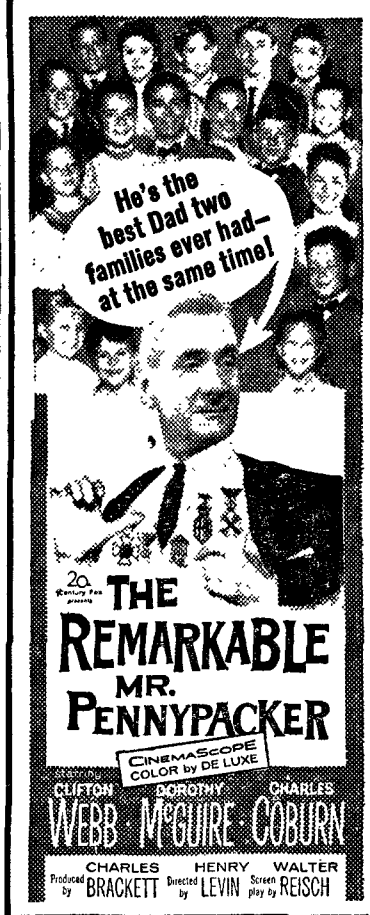


GRAND THEATRE

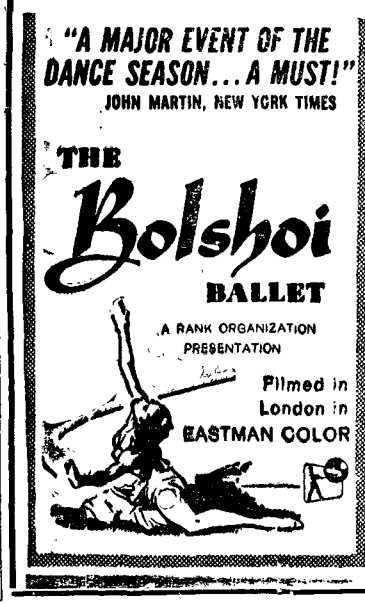
THURSDAY & FRIDAY



SUN., MON., TUES.



WEDNESDAY ONLY!



Social News

INTERNATIONAL WOMEN'S CLUB TO HOLD DINNER-DANCE SATURDAY

The International Women's Club at Redstone Arsenal will hold a dinner-dance on Saturday, March 7, at the Hawk Room, Squirrel Hill Officers Club, beginning at 7 p.m.

Hilding Holmberg and his orchestra will provide music for the occasion. Theme for the decor will be France and Belgium.

The International Women's Club stands for creating friendship among all nations and welcomes all those interested to attend this event. Reservations should be made early as only 180 guests can be accommodated.

For more details call Mrs. Van Dam, JE 6-4665.

Mrs. Leatherman Wins Toastmistress Club Speech Contest

Olie Leatherman, past president of the Huntsville Toastmistress Club and wife of Dr. C. D. Leatherman of OGMS, was recently awarded first place in the final runoff between previous winners in the speech contest that has been conducted by the local Toastmistress Club during the past two months. The winning speech was a humorous one, entitled "Bridge is More Than a Game."

Mrs. Leatherman will represent the Huntsville Toastmistress Club in the area speech contest to be held in Birmingham on 14 March.

Second place went to Mrs. L. K. (Eleanor) Wood, past president of the Memphis Toastmistress Club and previous three-time first-place winner (club, area, and council levels) as representative of her club in Tennessee. Third place went to Mrs. Edith M. Gibbs, past president of the Huntsville Toastmistress Club, and Chief of the Data Processing Application Branch of ARGMA's Field Service Division.

Contest judges making the selections were: Maj. M. D. Parker, Chief of Research and Curriculum Division of OGMS, a frequent speech contest winner for Toastmasters, having recently successfully reached the national level; A. A. Stewart, member of Huntsville Toastmasters Club Nr. 1932, and Deputy Chief of ARGMA's Field Service Division; and Thurman C. Burns, educational chairman of District 48 for Toastmasters Club International, and member of the RSA S-4 staff.

Toastmistress for the evening was Mrs. Meme S. Warren, of Civilian Personnel Office, ARGMA, who was introduced by the club president, Mrs. Cora Carr Briskey, of the RSA Control Office.

Guests at this dinner meeting included: Mayor and Mrs. R. B. Searcy; Mrs. Bernice Peterson; Miss Anna Lee Farrar; Mrs. Patrick Pruitt, Mrs. Joe VanValkenburgh, Jr., Mrs. Marvin D. Parker; Mrs. Douglass G. Pamplin; Miss Charlotte Clark; Miss Jill Spencer, Stanley O. Houck; Dr. J. E. Spencer; William H. Burns, Dr. C. F. Bjork, Maj. R. N. Flint; Lt. Col. C. E. Michaels and Lt. Col. Ernest W. Ewbank.

Sutherland Voted Top Toastmaster Talker

Frank Sutherland, speaking on "So You Can't Sleep," was voted the best speaker at last week's meeting of the Redstone Toastmasters Club.

Other speakers on the program were Collins Hess, who gave his first speech, on "Working With Mass Production." Walt Slay covered "The Fourth Member of the Learned Profession." Bill "Mud" Greene gave a dissertation on "Wine Not."

General Evaluator Al Ginsburg headed a slate of evaluators; T. C. Burns, H. Schepler, E. Williams, and S. Dobbs. Bob Reeder served as parliamentarian, Dave Holden as grammarian, and Ernest Williams as "Ah-counter" and Joke master. Toastmaster was Bob Shumaker, who also won the "Ah-scar" award.

Topicmaster Bob Cramer presented a story of the clash of mythical gridiron powers, the Podunk University of Polecats and the Maple Hill Zombies.

President Jack Caryi presided. Douglass Pamplin of Raytheon was voted into active membership. Col. Hankley was a guest for the evening.

Winners in Bridge, Canasta Announced

The bridge and canasta groups of the Redstone Arsenal Officers Wives Club met Thursday for weekly competition with the following results:

Duplicate Bridge: four tables, Howell movement, first, Mrs. R. W. McNamee, Jr., and Mrs. C. C. Young; second, Mrs. L. L. DeNoya and Mrs. James Fagan; third, Mrs. Russell Parker and Mrs. R. J. Dombrow.

Party Bridge, six tables, first, Mrs. B. E. Parkins; second, Mrs. R. E. Neunlist; third, Mrs. D. B. Keever; low, Mrs. R. W. Fleagle.

Canasta: two tables, high, Mrs. Joachim Severino; low, Mrs. James Goewey.

Wives Club members interested in participating in this activity are welcomed by the group. Next canasta competition will be held tomorrow at 12:30 p. m. at the Squirrel Hill Officers Club. For reservations call Mrs. Fred Lokay, ext. 8541.

At the Service Club

"Sports Thrills of 1957," a color film of key plays in 1957 professional football championship games will be shown on Friday, March 6, at 6:30 p. m. Highlights of the major league All-Star Classic, par-busting in the '57 Miller High Life Open golf tourney, and other sports thrills will be seen.

* * *

The bridge tournaments are on again! On Sunday afternoon Speer and Olmsted won the tournament with Tate and Null in second place.

* * *

March 9, join us for coffee at 8:00 and Bingo at 8:15 P. M.

Larry Elliott and his Orchestra will play for the dance on March 10 starting at 8 p. m. Remember, all men are to wear a Class A uniform or coat and tie. Elaine Powell is the featured vocalist. A 30-minute variety show will be given during the evening.

* * *

Dance classes are held each Wednesday night at the Service Club. Instructions on foxtrot start at 7:30, tango at 8:15, and jitterbug at 9 p. m. If you haven't attended these classes, we invite all girls to join us next Wednesday night. Ray Pisani is always happy to see a new girl join his classes.

* * *

The Best of Pro-Football will be shown Friday, March 13, at 6:30 p. m. Scenes from a dozen pro-football contests will be seen, such as the Detroit, Lions 31-27 won over the Baltimore colts, the Philadelphia Eagles stunning 17-7 upset of the Cleveland Browns, and many other thrillers.

* * *

"Holiday on Ice of 1959" will be in Birmingham on March 21. The Service Club will make a tour to Birmingham on this date. The bus leaves at 2 p. m. A dance at the Y. M. C. A. will be held at 8 p. m. with the Birmingham hostesses entertaining. Have you signed up for the trip?

* * *

The Rocket Service Club 1959 All-Army Entertainment Contest on March 19 will be held in the lounge at 7:30 p. m. Ted Scott will give a monologue from "The Time Of Your Life." The following enlisted men will participate in the contest: Kenneth Ford, Bill Hudley, Ray E. Dreeman, Jere J. Will, Harold G. Warner, G. C. Melton, Joseph Richter, Warren L. Harbert, Stanley T. Blakely, Charles L. Adams, Rogers E. Whiting, Richard Wolfe, and Robert Morgan.

* * *

The Metropolitan Opera House of New York will present "Fledermaus" on Monday, May 4, and "Tosca" on Tuesday, May 5, at 8 p. m. at the Birmingham Municipal Auditorium. The Service Club will sponsor a tour to Birmingham on one of these dates if enough people will sign up for the trip. The deadline to sign up is Monday, March 9. Please let us know if you are interested in going with us on this tour.

BARBARA

140 Officers Wives Gather for 'Brunch'

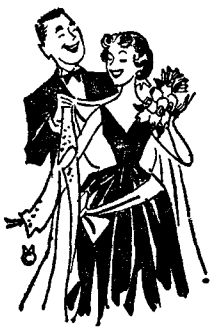
More than 140 officers wives gathered Feb. 24 for "Brunch" at the Squirrel Hill Officers Club.

The event, sponsored by the Executive Board of the Redstone Arsenal Officers Wives club, was open to the entire club membership.

As an icebreaker, road maps cut into five pieces were distributed among those attending, one piece to each person. Object was for persons having pieces to the same map to find each other and match the pieces together again.

Decorations were carried out in a patriotic theme in keeping with George Washington's birthday. Tables were highlighted with cherry logs split by minature hatchets and the buffet table featured a bouquet of red and white chrysanthemums, carnations, and snap dragons tied with a blue bow.

The bouquet went as door prize to Mrs. J. A. Myers. whose road map contained Huntsville, Ala.



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FOURTH TACTICAL JUPITER LAUNCHED

The Army launched another Jupiter intermediate range ballistic missile over the Atlantic Missile Range Thursday night in continuation of the development test program.

The missile was programmed for approximately full range of 1500 miles.

This was the fourth tactical Jupiter to be launched, and second firing of a Chrysler-produced Jupiter. The Chrysler Corporations Missile Division, prime contractor, manufactures the Jupiters at the Army-owned Michigan Ordnance Missile Plant near Detroit. The missiles are flown directly from the assemby line to the firing site.

Early Jupiters were fabricated by the developer, the Army Ballistic Missile Agency.

Thursday's flight was a routine test of the tactical ballistic shell, 150,000-pound thrust engine, and the warhead and fuzing system.

Key officer and enlisted personnel of the AF 864th Strategic Missile Squadron (Jupiter), were present for the launching. Members of the Squadron observed and participated in the checkout, fueling and firing operations, which were conducted by ABMA's Missile Firing Laboratory.

The 864th is in advanced training at Redstone Arsenal.

Another mission of Thursday's launching was a continuation of the Army's "Operation Gaslight." A ship was stationed in the downrange impact area to record data on reentry of the missiles three sections, the nose cone, instrument compartment and booster.

Information sought included: radiation emitted by the sections, the aerodynamics effects and the shock wave characteristics.

Col. William C. Erlenbusch and Col. Glenn B. Daughton, commanders of the 864th and 865th Strategic Missile Squadrons, respectively, witnessed the launching. The Missile squadrons are in training at the Army Ordnance Missile Command with the Jupiter IRBM.

Mobile Maintainence Officer Capt. Glen M. Mathis, Jr., of the 864th was in charge of a group of airmen who participated in the check out of the missile and in pad preparations.

Master Sergeant Herman J. Schrubbe of the 864th monitored the slant altitude panel in the blockhouse during the launching.

Other airmen who participated in pre-launch preparations were T-Sgt. Ray G. Mehl, Pease Air Force Base, N. H; T-Sgt. Joe A. Huff, Sr., Barksdale AFB, La.; M-Sgt. Francis E. McCown, Hunter AFB, Ga., S-Sgt. Dwight J. Clark, Hunter AFB; M-Sgt. Boyd F. Williams, Lockbourne AFB, T-Sgt. Lawrence Head, Whiteman AFB, Mo., and T-Sgt. Walter E. Spencer, Jr., Carswell AFB, Texas. Chief Warrant Officer James Worner and Maj. Farnk Long of the 864th witnessed the launching.

Gen. Shinkle to Talk At Western Space Age Conference

Brig. Gen. J. G. Shinkle, Commander, Army Rocket and Guided Missile Agency, will speak on "Army Research and Development" at the Western Space Age Conference and Exhibit in Los Angeles tomorrow.

The event, which will be held Thursday through Saturday, is sponsored by the Chambers of Commerce of Los Angeles, Las Vegas, Phoenix, Portland, Salt Lake City, San Diego, San Francisco, Seattle, and Tucson. It will feature 10 acres of industry and government exhibits of missiles, aircraft, ground support equipment, and related components and services.

Besides Gen. Shinkle, other speakers will include such personalities as Erik Bergaust, well-known writer on missiles and space topics; Scott Crossfield, experimental test pilot and design specialist (X-15 test pilot), North American Aviation, Inc.; Maj. Gen. B. A. Schriever, USAF, Commander, USAF Ballistics Missile Division, Air Research and Development Command; Lt. Gen. Arthur G. Trudeau, USA, Chief of Research and Development, Department of the Army; Dr. Edward Teller, director, University of California Radiation Laboratory; Dr. Hugh L. Dryden, Deputy Administrator, National Aeronautics and Space Administration.

WANTADS GET RESULTS

Daniel Construction Co. Awarded Contract for Building

The Daniel Construction Co. of Birmingham, Ala., has been awarded a contract totalling nearly three million dollars for work at Redstone Arsenal.

Col. R. W. Love, U. S. Army District Engineer at Mobile, announced that the Corps of Engineers has accepted the Birmingham firm's low bid of $2,949,651.75 for constructing a massive concrete building to provide administrative space for the Army Rocket and Guided Missile Agency.

The building, which will have a floor area of about 208,000 square feet, will consist of three parallel wings, each three stories high, with interconnecting corridors. It will be known as the Missions Engineering Building.

The contract will also include repairing the roof on Vincent Hall, a class and laboratory building of the Ordnance Guided Missile School at the Arsenal, by removing the present wearing surface and installing a new wearing surface of synthetic latex.

The contractor is expected to start work shortly, complete the roof repair work in June of this year, and complete the Missions Engineering Building ready for use in August 1960.

Some football deft-nitions: Coach — A migratory worker; Clipping — What players carry in their pockets; Illegal Formation—Three students with two tickets; Midfield—Where the scalpers say the tickets are; End Zone—Where the seats really are; Sweep—What some players ought to do instead

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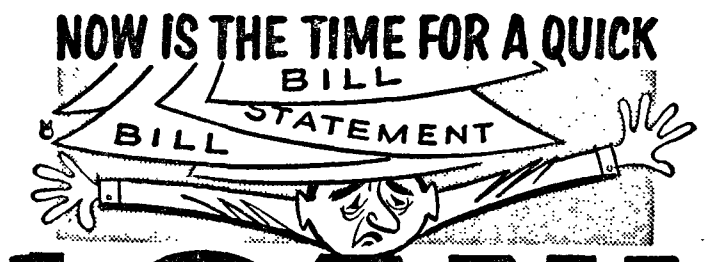

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TENTING TONIGHT—Boy Scouts from Troops 234 and 203 and Air Explorer Post 234, together with members of the Madison County Order of the Arrow (Scout honorary camping society), held a camporee on the Arsenal over the weekend. Several of the youngsters are shown above coping with the problem of erecting their tents for the night. The Scouts pitched camp off Hansen Road about one and one-half miles from Patton Road. Approximately 100 boys, all dependents of Arsenal military personnel, comprise the two troops and the Explorer Post. Rains Saturday night didn't dampen the boys' spirits—but by Sunday morning, adult leaders decided they'd better curtail that day's scheduled program of the camporee until another time, due to the inclement weather.

Nominations for Safe Worker, Supervisor Of Week Piling Up

The response to the request for nominations for the "Safe Worker" and "Safe Supervisor of the Week" has been so good that there is a considerable backlog of nominees from various organizations, according to officials of the RSA Safety Division.

Many supervisors and nominees have called to check to see if and when some of those nominated would be featured in The Redstone Rocket. Safety Division officials state that all nominees should have patience and that they will be eventually selected. Since only one worker and one supervisor is featured each week, it takes some time in some cases for nominees to be chosen. An effort is made to pass around the honors to various organizations within the installation."

The safety representative expressed appreciation for the interest in these weekly features.

Thiokol Stockholders Vote a Stock Split

At a meeting held February 19 the Board of Directors, Thiokol Chemical Corp., voted a 3 for 1 split in the outstanding capital stock.

They also voted to submit to the stockholders for their approval at the annual meeting on April 16, 1959, the necessary increase in the authorized capital stock.

Subject to such approval by the stock holders, the split will be effected by the distribution on April 30, 1959, to stockholders of record April 20, 1959, of two shares for each one share outstanding. The record date for the annual meeting of the stockholders will be March 10.

Scottish Rites Masons Lodge Formally Opened

On 23 Feb., the Illustrious Fred W. Clark, 33rd degree, Deputy for the Supreme Commander of Alabama of the Ancient and Accepted Scottish Rite Masons, formally opened the Huntsville Lodge of Perfection and installed E. A. Gunter as Venerable Master, Frank Hunter as Senior Warden, Bruce Pierce as Junior Warden, T. J. Combel, Jr. as Treasurer, and John Rist as Secretary.

Plans were made for the Spring re-union to be held in Huntsville on 11 Apr., when the 4th through 8th degrees will be conferred and on 18 April when the 9th through 14th degrees will be conferred.

All Master Masons interested in becoming Scottish Rites should contact any of the above mentioned officers at once.

Post Tennis Team Aspirants Called

Military personnel interested in playing on the RSA Tennis team should report today between 1530 and 1630 hours to Lt. Col. Ernest Ewbank (coach of the team) at the tennis courts in the Old Troop Area.

This team is scheduled to compete with neighboring Army installations and colleges and then enter the 1959 Third Army Tennis Tournament at Fort Benning, Ga., during the period 22-26 June.

Current movie version of Shaw's "The Doctor's Dilemma" features Julie Hopkins, a nocturnal nocturne. . . so what's his dilemma, anyway?

Safety Scoreboard

(As of 2 Mar.)

Days since last civilian disabling injury	3
Our Goal	30
Days since last military disabling injury	2
Our Goal	30
Days since last contractor personnel disabling injury	85
Our goal	90
Days since last government motor vehicle accident	9
Our Goal	30

RSA OFFICERS' MIXED BOWLING LEAGUE

Includes Games Bowled 23 Feb.

	Won	Lost
Peapickers	115½	54½
Bombers	106½	65½
Hi-Counts	95½	75½
Pindroppers	86	85
D-Yanks	79	92
Bowlweevils	70	96
Holyrollers	68½	102½
Blindmice	63	107

Men over 200—Usinger 206; Hess 207, 212; Paul 206.

DRIVING RECORD
(Government Vehicles
(As of 2 Mar.)

Organization	No. Accidents (1959)	Days Since Last MV Accident
Transportation Div (RSA)	2	28
Post Engineer Div (RSA)	7	15
Provost Marshal Div. (RSA)	2	24
Depot Operations (RSA)	5	9
All Other RSA	1	14
Thiokol (ARGMA)	1	46
All Other ARGMA	1	57
OGMS	3	19
ABMA	0	59

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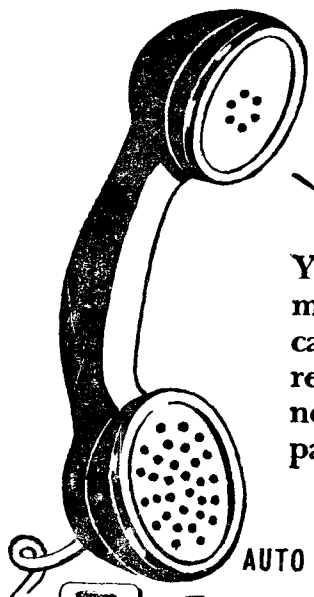

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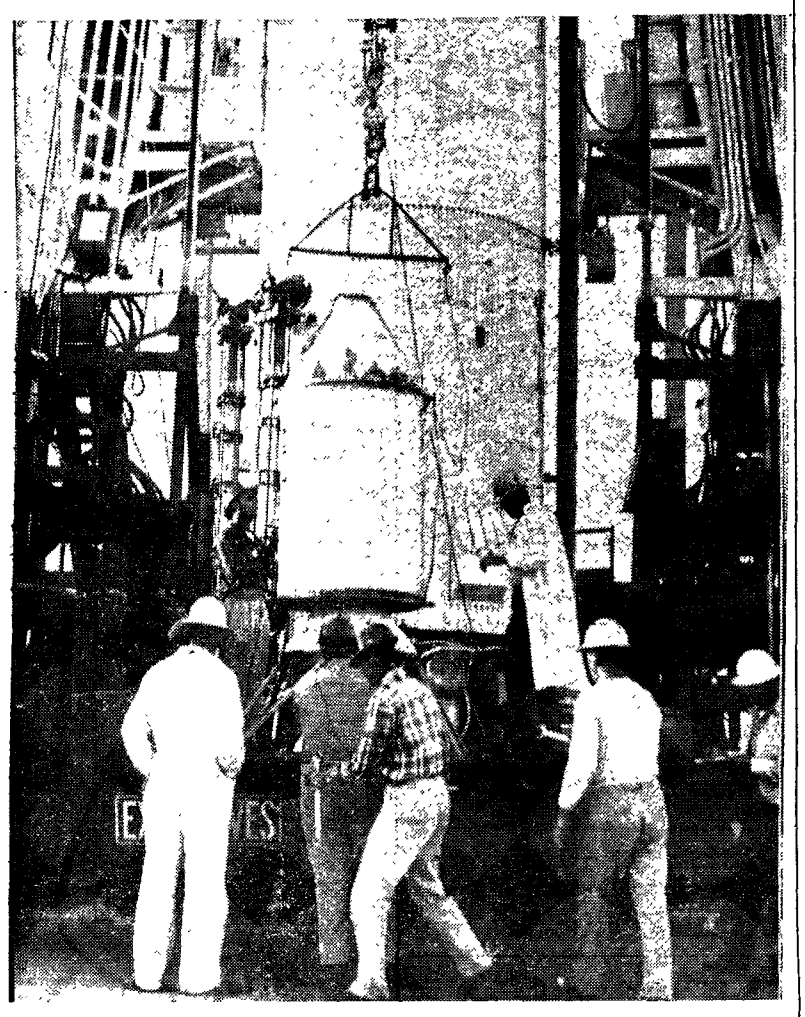
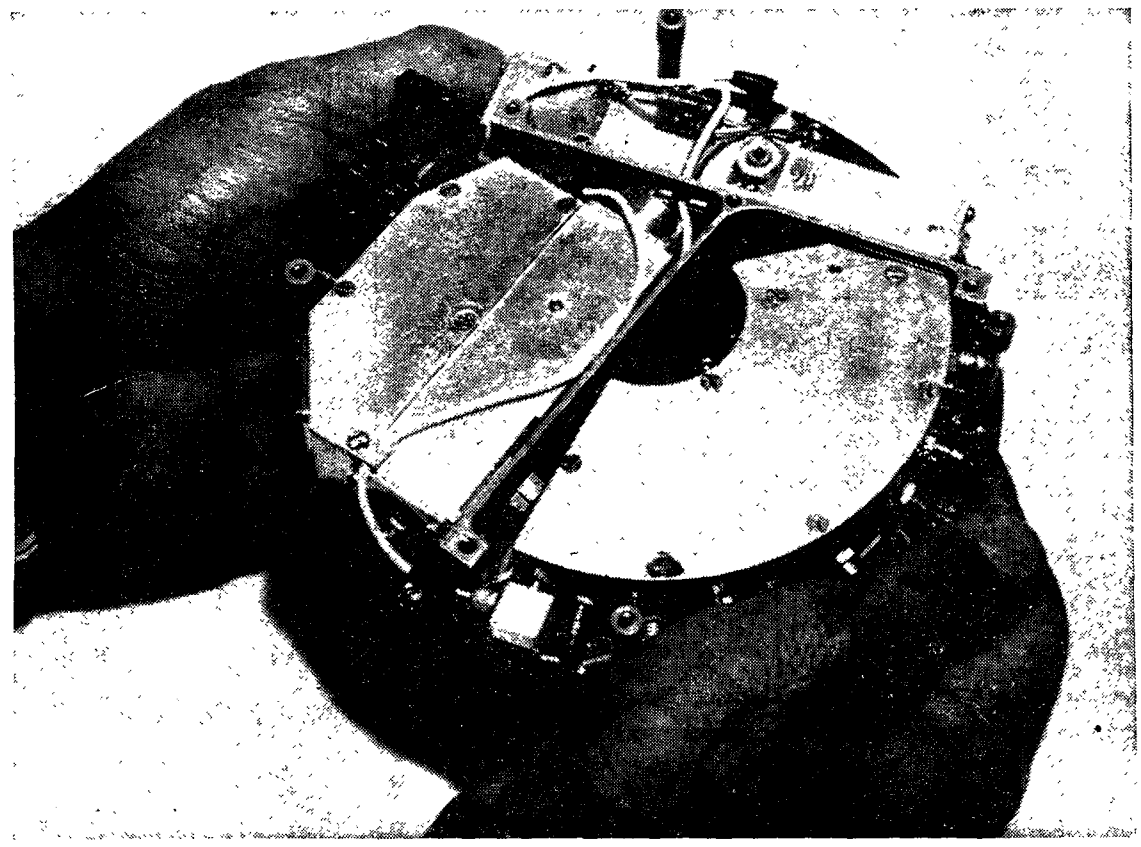
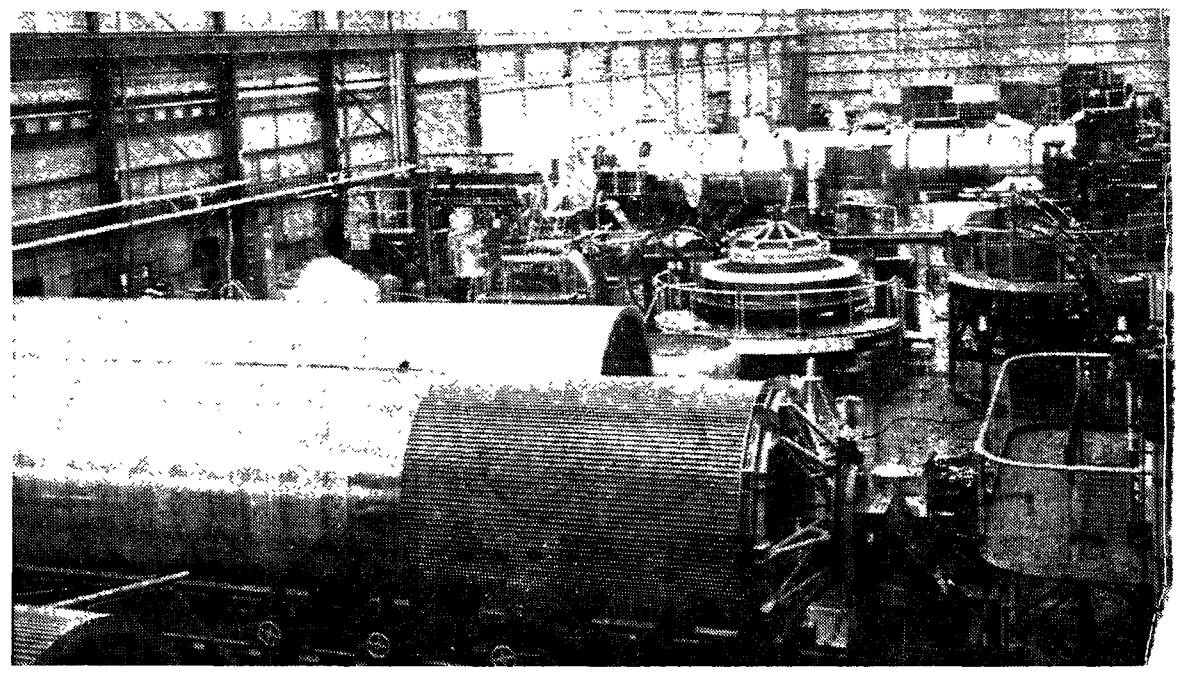


JET PROPULSION LABORATORY technicians at Cape Canaveral, Fla., prepare to hoist the upper-stage spin cluster to emplace it atop the Jupiter IRBM which serves as the first stage of the Army-NASA space probe.



THIS IS THE 1.1 POUND transmitter that sends tracking signals and telemetered information from Pioneer IV to ground stations. Powered by mercury batteries, the transmitter radiates 180 milliwatts of power and has a life expectancy of 75 hours. It broadcasts on a frequency of 960.05 megacycles.



THESE VIEWS show the interior hangars of the Fabrication and Assembly Engineering Laboratory at the Army Ballistic Missile Agency where the Army-NASA space probe's Jupiter IRBM "booster" was fabricated, assembled and its powerful motor attached.

Capt. Harris Assigned As a Project Officer

Capt. James H. Harris has been assigned as a project officer with the Army Ordnance Missile Command Field Office at the Atlantic Missile Range in Florida.

Capt. Harris has been assigned at the Ordnance Guided Missile School. He entered the Army in 1945, and completed his BS degree at the U. S. Military Academy in 1953.

During his service career he has received the World War II Victory Medal and the Parachute Badge.

Capt. and Mrs. Harris have four children, Linda, age 8, Susan, age 7, James age 4, and Leslie, 5 months old.

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POWERED, SPATIAL FLIGHTS

Tracking Involved Two Related Time Phases

Tracking of the Army-NASA deep space probe involved two related time phases: the powered flight of the Juno II launching vehicle, and the spatial flight of the probe itself.

The Army Ballistic Missile Agency, which provided the booster stage, guidance and control systems and the protective shroud installed on the vehicle, tracked throughout the powered staging.

This included the functioning of the first, second, third and fourth stages. When the fourth stage burned out, the probe was injected into its spatial trajectory. It then became a free moving body in space. The Jet Propulsion Laboratory, Pasadena, Calif., was to evaluate spatial tracking and communicate its data to the National Aeronautics and Space Administration, under whose programs the experiment is being conducted.

During the initial power flight, Army tracking stations located at the Ballistic Research Laboratory, Aberdeen, Md.; Fort Stewart, Ga., Cape Canaveral and Miami, Fla., received radio signals from the huge rocket.

CLOSE ACCESS HATCH — Missile Firing Laboratory personnel close access hatch on the Juno II assembly in preparation for the firing of the 76-foot space rocket.

Data Transmitted

This data was immediately transmitted to the Computions Laboratory of ABMA in Huntsville. Utilizing the doppler technique, comparable to the increased volume of a locomotive whistle as it approaches and receding volume of the whistle as the train moves away, scientists could determine the velocity of the rocket by the changes in radio signals.

The Laboratory's evaluations were transmitted to Cape Canaveral where Army and JPL technicians computed the performance of the rocket's sussessive stages and estimated its trajectory through Earth's atmosphere into space.

A JPL-operated station at Mayagues, Puerto Rico, "homed in" on the missile shortly after liftoff and as it moved away from the East Coast ground tracking stations. The Puerto Rico installation also received telemetry from the cosmic radiation measuring instruments inside the probe.

Another tracking station located at the University of Illinois was conducting a special experiment to obtain data on the angle of flight.

After 7 Hours

About seven hours after injection, when the probe had traveled approximately 50,000 miles, the giant 85-foot dish shaped antenna at Goldstone Lake, Camp Irwin, Calif., operated by JPL, began to receive radio signals from Pioneer IV.

Goldstone continued tracking until the 16th hour, when the probe was approximately 100,000 miles away and due to the Earth's rotation, had moved to the opposite side of Earth.

At about the 30th hour, Goldsttone was in ideal position for tracking as the probe neared the lunar region. Between the time Goldstone had again acquired the probe and continuing through about the 40th hour, the giant antenna was directly under the Moon.

Dr. Fridtjof A. Speer is in charge of AMBA tracking data evaluation. He performed the same function in the successful launching of the Explorer IV Earth satellite. With the assistance of Herman F. Kurtz, Dr. Speer developed the new evaluation technique. The process makes use of the IBM 704 computers available at the Missile Agency.

The following was the approximate schedule for acquistion and loss of signals at Goldstone:

Acquire Signal

Plus 7 hours - Goldstone acquired signal for the first time.

Plus 16 hours - Goldstone lost the signal as the rotational movement of the Earth caused Pioneer IV to set in the West like a star, interposing the mass of Earth between the antenna and the probe. Although it continued to send signals, Pioneer's voice was not heard on Earth during the next 14 hours.

Plus 30 hours - Pioneer IV rose like a star on the Eastern horizon. Data from JPL in Pasadena, emanating from a 704 computer, compiled during the previous period of acquisition and evaluated when the probe's signals were lost, enabled the big antenna to be pointed at exactly the location in space on the Eastern horizon where Pioneer IV rose.

Plus 33 hours - Pioneer IV passed the moon region while moon and probe were over the Southern horizon at Goldsone.

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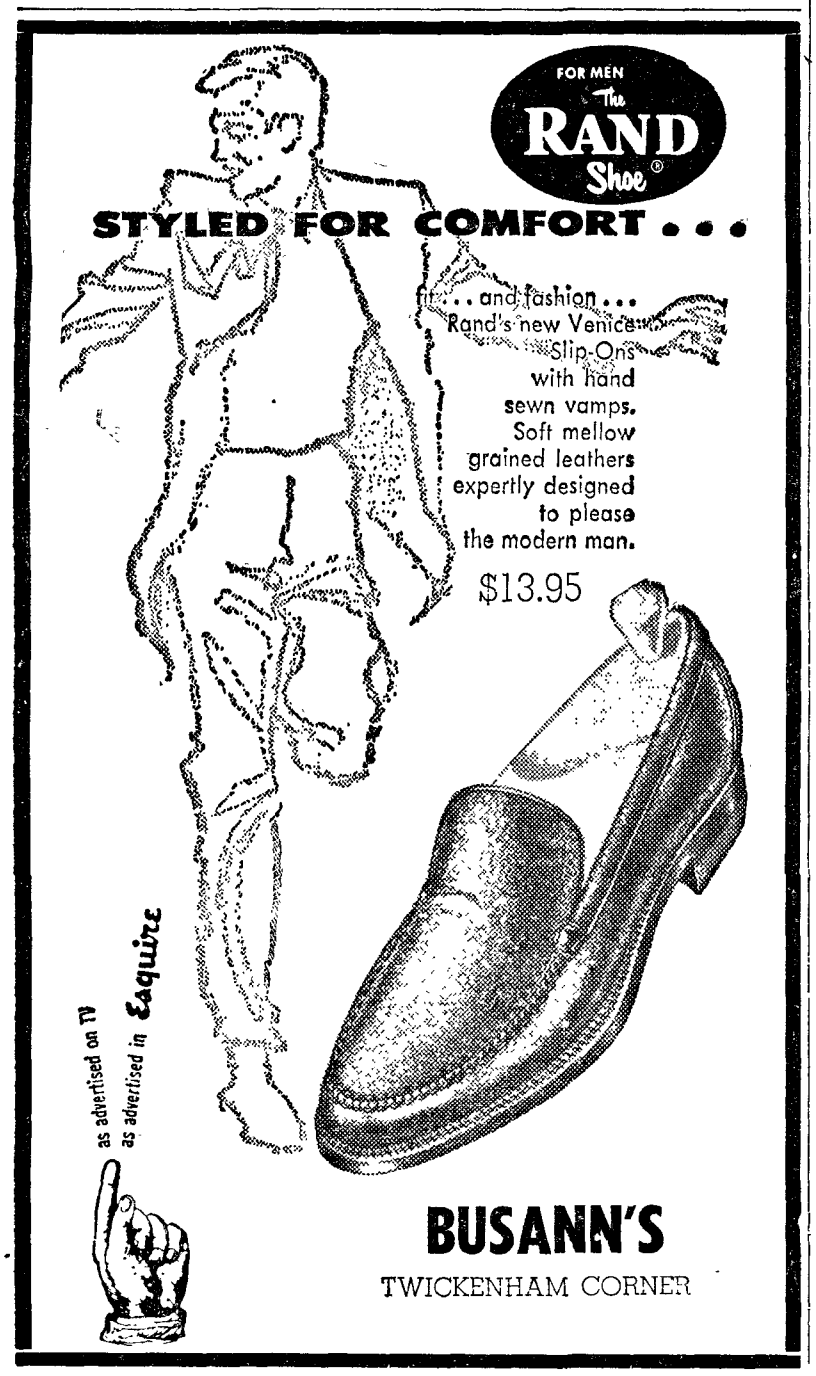

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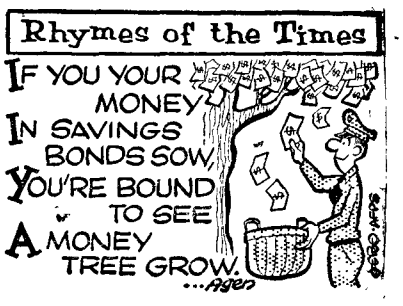

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AUCTION SALE—Our next auction sale will be held tomorrow night, (Thursday, March 5, at 6:30 p.m. There will be plenty of good used furniture and appliances and other useful items. Prizes given all during sale. (Use your cents to save dollars). Warehouse Sales Co., 5013 Governor Drive. Phone JE 6-2103. 1tc

WILL SELL equity in 45'x10' trailer for less than 50c on the dollar — or make me an offer. May accept car or will rent and move to the court of your choice. See at Lot 72, McAlister's Trailer Court. 1tc

FOR RENT — Nice 3 room furnished apartment, electric heat, air conditioned, also sleeping room for young lady, private entrance, private bath. Phone JE 6-2686 or JE 4-9493. 1tc

170 New Members Are Voted Into Local Lodge 1858 of AFGE

One hundred and seventy new members were voted into Redstone Arsenal Lodge 1858, American Federation of Government Employees, at the lodge's recent February meeting.

The Lodge was organized in November, 1958, with a membership of 100. Its membership now stands at over 3,000 Civil Service employees.

E. L. Lowther, Lodge president, commended the membership committee and all Lodge members for their efforts and urged continued cooperation in the membership drive now in progress.

During the meeting, Robert Bradshaw of Systems Analysis and Review Lab, ABMA, was elected executive vice-president of the Lodge. Also, James Holland and Glenn Test were named assistants to RSA vice-president Dennis Garrison, and Charles Nipper assistant to ABMA vice-president Norman Landry.

The next meeting of Lodge 1858 will be held in the Blue Room of the Russel Erskine Hotel at 7:30 p. m. Tuesday, March 17. All members, prospective members, and guests are invited to attend.

All job stewards and chief job stewards of the Lodge are reguested to be present at 6:30 p. m. for a training session.

Persons desiring information about AFGE should call JE 6-8319 or JE 6-1007.

WE BUY — SELL OR TRADE—AUCTION HOUSE, W. Holmes St Furniture sold off the floor each day of the week. Phone JE 6-2241. tfc

FOR RENT IN HARTSELLE—New 3 bedroom house. Carport central gas heat. 224 Petain St W. C. SIMS, 200 Haig St Phone SP 3-7179. 1tp

FOR RENT — 3 bedroom house in Arab, living room, dining room, kitchen, complete bath $75.00 per mo. See Henry Noles 519 4th St., N.E., Arab, Ala. 3-11c

FOR SALE — Owner leaving city Must sell 1955 National Trailer, 30 ft., excellent condition. See at Lot 65, McAlister Trailer Court, Phone JE 4-6818. 1tc

FOR RENT — Better than bachelor quarters, room for 3 men, new home, central heat, air conditioned, meals and transportation available. Phone JE 6-0552. 1tc

FOR SALE — 1958 Rambler 4-door Station Wagon, overdrive, 5,000 miles, one car owner, small equity, see at 2433 Crestwood Drive. 1tc

FOR SALE — 1 bedroom trailer, nicely furnished with air conditioning and metal awning. Sell cheap, for immediate sale. Inquire Lot 6, Paradise Park. 1tp

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FOR SALE — New brick home set on 4 lots 100'x150' in best residential section of Athens, 5 large rooms, hardwood floors in living room, hall and bedrooms, lino-plastic linoleum in kitchen and bath, built in cupboards, 2-4 divider basement rooms including laundry area with twin tubs, ideal for den, rumpus rooms or easily converted into downstairs apartment, 12x24' sunlite fiberglas carport with private drive, automatic gas heat, wired for 220 range, automatic water heater, plenty of room for recreation and expansion. Phone Athens 921-J evening or JE 6-4411, ext. 6332 work hours, ask for Baker. 1tc

Canisius College Awards an Honorary Degree to von Braun

Canisius College of Buffalo, N. Y., last weekend awarded an honorary degree to Dr. Wernher von Braun, ABMA's Director of Development Operations Division.

Dr. von Braun was cited for his leadership in science and pioneer efforts in the realm of outer space.

The Very Rev. Philip E. Dobson, S. J., president of Canisius, said such men as von Braun are among those "who regard technological and material progress as a means to the proper end—the achievement of the goals intended for us by God in His creation."

At a civic luncheon, von Braun said that men like himself must re-evaluate their capabilities as salesmen.

He said there was a widespread sense of apathy toward space problems, adding, "maybe we just haven't done enough of the 'hard sell' and have taken for granted that our audience accepted everything we said."

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ABMA Teams Calculate Payload's Trajectory

Far from the launching pad at Cape Canaveral, Fla., from where the Army launched its space probe, for NASA, a team of mathematicians is calculating the trajectory of the payload through outer space.

Aiding them in their task is an IBM 704 computer, located in the Army Ballistic Missile Agency's Computation Laboratory which houses one of the largest arrays of electronic computing devices under one roof in the world.

The 704 has been instructed by a complicated program to answer questions concerning the position, velocity, and direction of the probe at thousands of successive intervals of time.

Long before the Jupiter IRBM provided the thrust for the first stage of powered flight of the vehicle, scientists of the Aeroballistics Laboratory had given dozens of sheets of data containing possible launching conditions to the Computation Laboratory. Here the data, along with prepared program cards, were fed into the 704 computer.

Program Cards

The program cards contain the instructions necessary to cause the computer to solve the equations of a body in motion under the combined gravitational forces of the earth, the moon, and the sun.

The program cards were prepared by mathematicians of the Digital Projects Branch of the Computation Laboratory and tell the computer exactly what to do, i. e., multiply, divide, subtract add, store information, indicate errors and in certain cases to make decisions when confronted with mathematical or logical alternatives.

The pre-calculated trajectory has been furnished to Army and IGY tracking stations around the globe so that the payload can be located and tracked in its flight through lunar space.

Coordination between the tracking stations, the Flight Evaluation Branch of Aeroballistics, the Jet Propulsion Laboratory and the Computation Laboratory enables the calculated trajectory of the probe to be corrected to the actual trajectory during flight.

How It's Done

This is accomplished by feeding observations of position versus time into the computer and calculating the deviations necessary to correct the calculated trajectory. Positions at future times may then be relayed back to the tracking stations to enable them to anticipate the probe's flight.

The data received from the stations is first processed and "smoothed" by the 704, using programs prepared by Tracking Section of the Data Reduction Branch.

As early as July of last year, Computation Laboratory personnel under the direction of Dr. Helmut Hoelzer have been computing trajectories based on information supplied by Aeroballistics Laboratory and Research Projects Laboratory.

Digital Projects Branch personnel working on the calculations are Charles Hubbard, Chief; Project Leader Tom Yarbough, and Mathematicians Mildred Letherwood, Frank Besadesky, Joan Kassner and Betty Harrison.

Data Reduction Branch personnel include David Aichele, Chief, Tracking Section, and Mathematicians Paul Hurst, John Lynn, and Fred Rodriques.

LT. COL. WILLIAM D. RABON

* * *

Lt. Col. W. D. Rabon Assigned With ABMA

Lt. Col. William D. Rabon has been assigned as Special Weapons Coordinator with the Field Support Division at the Army Ballistic Missile Agency.

Col. Rabon was formerly Deputy Director, Unit Training Division, Special Weapons Training Group, Field Command with the Armed Forces Special Weapons Project at Sandia Base, Albuquerque, N. M.

A graduate of Mainland High School, Daytona Beach, he attended Clemson College for one year before entering the Army in 1940. He completed basic training at Ft. Benning, Ga., and received his commission as an officer in August 1942 at Aberdeen Proving Ground, Md. He is a graduate of the Command and General Staff College, Ft. Leavenworth, Kans.

During World War II, Col. Rabon served in Europe with the 6th Armored Division. He has also served overseas in Japan with the 11th Airborne Division and in Korea with the 4th and 30th Ordnance Battalions. He was awarded the Bronze Star with "V" in France in July 1944.

Col. Rabon is a Master Mason, Lodge Han Yung 1048, Seoul Korea. He and Mrs. Rabon reside in Huntsville with their two sons, Jack Alan, age 7, and Richard Frank, who is 6 years old.

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● PRIZES FOR FRIDAY, MARCH 6TH
$65.00 Lady's Rothmoor Spring Suit
$15.95 Lady's Spring Hat
$11.95 Margolin Handbag
$18.95 DeLiso Debs Shoes

● PRIZES FOR SATURDAY, MARCH 7TH
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