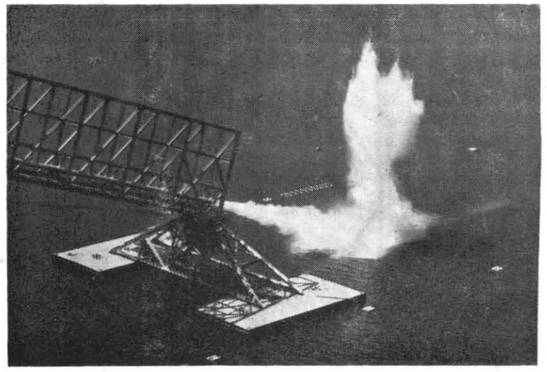
Pasadena Develops Underwater Weapons



THE VARIABLE-ANGLE LAUNCHER simulates the release of projectiles from aircraft at controllable velocities and angles of attack and is adjustable to any vertical angle up to 40 degrees. One end of the 300-foot all-welded launching bridge rests on a bridge connecting two floating barges. The other is moved up and down a concrete ramp balanced on a counterweight car. Compressed air propels missiles out of the launching tube. A battery of high-speed motion picture cameras record the performance of projectiles as they enter the water.

A NAVY DIVER descends into the tank for a demonstration before a group of visitors at last year's open house on Armed Forces Day. Navy divers have many duties, but chief among them at the Morris Dam Test Range is the retrieving of missiles fired from the Variable-Angle Launcher. Missiles launched at Morris Dam are "static." They do not explode, since the object of testing here is to study water-entry performance. Divers retrieve the missiles, which are launched again and again for the purposes of these studies.

What We Do at Pasadena Annex

The principal objective of the Pasadena Annex of the Naval Ordnance Test Station is to provide underwater weapons for the Fleet through a program of research, development, and testing.

Located on the same peninsula at Morris Dam as the Variable-Angle Launcher, are the shops, test pits, and laboratories for the underwater propulsion applied research groups.

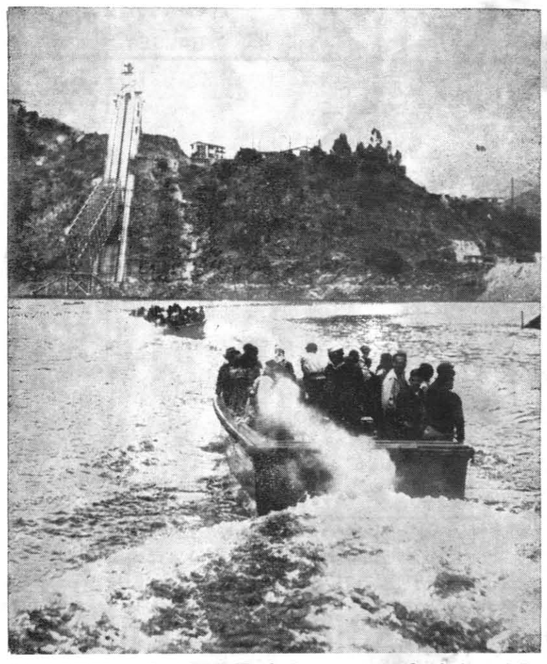
There, test stands for model performance studies provide facilities for final engineering and design work on new engines and engine components.

Sea Ranges

Underwater and air-to-water rockets are also tested in extensive deep-water facilities at San Clemente Island, sixty miles off the California coast, and on a sea range operated from a base located at the U.S. Naval Station, Long Beach.

Foothill Headquarters

At 3202 E. Foothill Boulevard in Pasadena are the headquarters of Pasadena Annex. Here also are located the Hydroballistics Laboratory, the Structures Laboratory, the Hydrodynamic Simulator (designed to subject torpedoes mechanically to the same conditions they would encounter in sea runs), the headquarters of the Underwater Ordnance Department, and divisions of the Engineering, Public Works, Supply and Fiscal, and Personnel Departments, as well as the Command Administration division for Pasadena Annex.



BOAT RIDES on the lake at Morris Dam are a popular feature of the Armed Forces Day open house. Normally, this water transportation is for the Navy divers who use it to reach the location of missiles which they retrieve for relaunching. Pictured above are two boat loads of visitors on a tour of the lake at last year's open house. The Variable-Angle Launcher is in the left background. Passengers pass a small-caliber-test range also located at Morris Dam.

Welcome Aboard

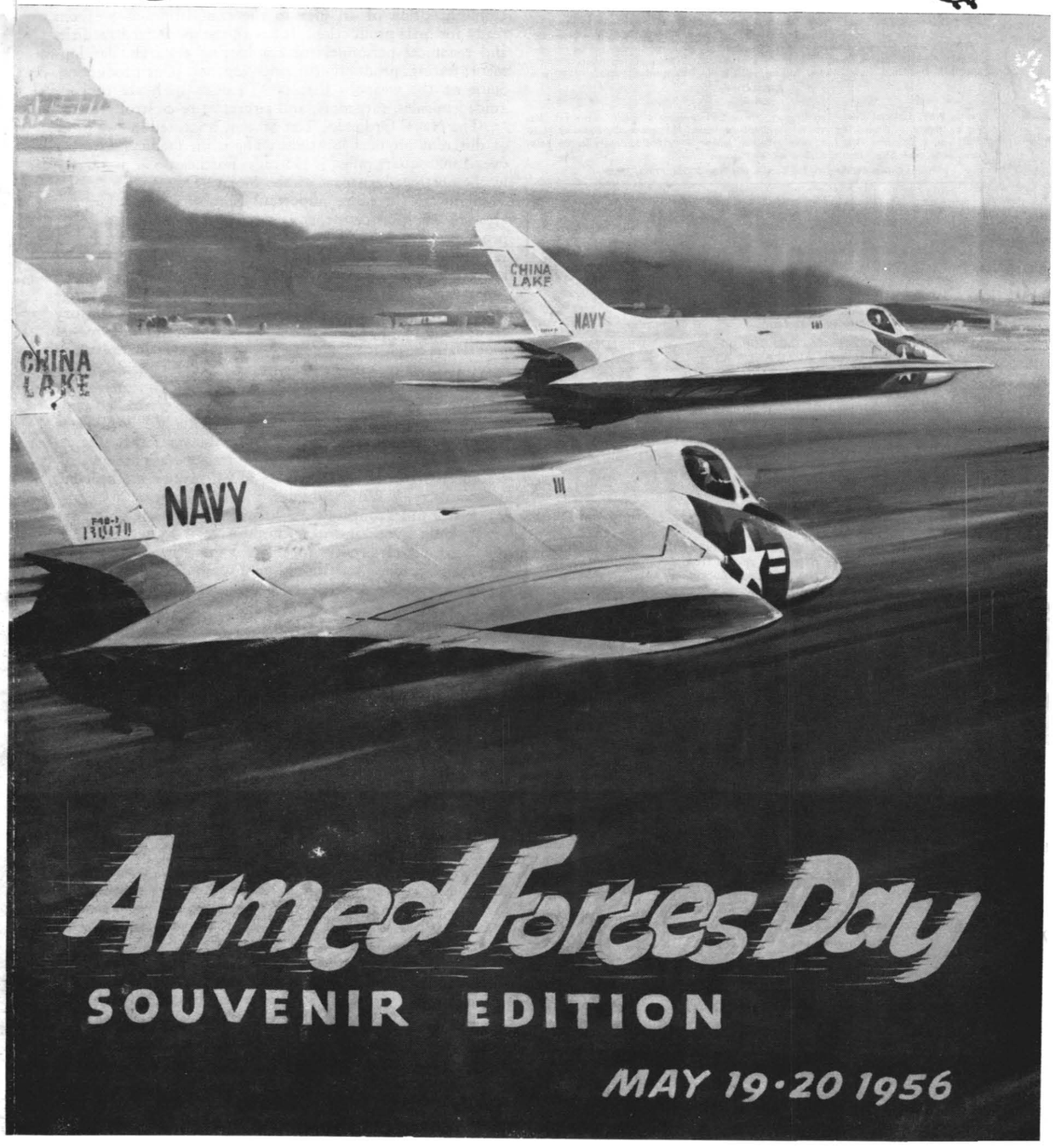
On behalf of all of us of the NOTS Pasadena team, I extend a welcome to each of you who are observing Armed Forces Day by visiting our Morris Dam Test Range. We hope you will enjoy your experience.

In addition to the guided tours of various work areas, you may watch the firing of torpedoes from the Variable-Angle Launcher and see the Navy divers in action, and we invite you to tour the lake in Navy launches.

We trust your visit to the Morris Dam Test Range will be an enjoyable one, and that it will give you a good idea of the results of the teamwork here between the Navy and its civilian scientists, engineers, and technicians.

W. T. GRONER
Captain, USN

Rocketeer



Rocketeer

Published every Friday at the
UNITED STATES NAVAL ORDNANCE TEST STATION
CAPTAIN F. L. ASHWORTH, UNITED STATES NAVY
Commander

The Rocketeer, an authorized Navy publication printed weekly by Hubbard Printing, Ridgecrest, Calif., with appropriated funds and in compliance with NAVEXOS P-35, Rev. November, 1945. The Rocketeer receives Armed Forces Press Service material which may not be reprinted without AFPS permission. All photographs are official U. S. Navy photos, unless otherwise specified. Deadlines: News stories, Tuesday, 4:30 p.m.; photographs, Tuesday, 11:30 a.m.

F. E. LANEY
Editor

Phillys Wair, Editorial Clerk; Peg Gregory, Annex Correspondent (Foothill, phone ext. 35); Art by illustration Group, Technical Information Department. Photography by Rocketeer Photo Staff — H. E. Dremann, PH1; T. E. Long, PH2; Ken Antholt, PH2. Photographers for the Pasadena page are — Shav Monsen, A. E. Block, and Jeanne Smith.

Office: Building 35, Top Deck — Telephone 71354, 72082, 71655

Events, Bus Schedule For Armed Forces Day

ARMED FORCES OPEN HOUSE BUS SCHEDULE
(Saturday, May 19, 1956)

Event: N.A.F. Air Show (9 to 12 a.m.)

ORIGINATING POINT	TIME BUSSES AVAILABLE AT ORIGINATING POINT 8 to 9 a.m.	DESTINATION
Station theatre (entrance)	(Buses leave every 15 minutes)	N.A.F.
East side Hangar No. 1 (hangar with control tower)	End of Air Show 12:00 (buses leave as loaded)	Station theatre (entrance)

☆ ☆ ☆

Event: Michelson Laboratory and Aeroballistics Laboratory Tours (1 to 4:30 p.m.)

(Buses will go from the theatre to Michelson Laboratory and then to Aeroballistics Laboratory. Buses will return from Aeroballistics Laboratory to the Station theatre via the Michelson Laboratory.)

ORIGINATING POINT	TIME BUSES AVAILABLE	DESTINATION
Station theatre (entrance)	12:30 to 4:30 p.m. (Buses leave every 15 minutes)	Michelson Laboratory and Aeroballistics Laboratory.

☆ ☆ ☆

Event: SNORT Track Shoots at 1 p.m., 2:30 p.m., and 4 p.m.; also tours of the SNORT Building.

ORIGINATING POINT	TIME BUSES AVAILABLE AT ORIGINATING POINT	DESTINATION
South End Michelson Laboratory Parking Lot	12:30 to 3:30 p.m. (Buses leave every 15 minutes)	SNORT Track
SNORT Track	1:15 to 4:45 p.m. (Buses leave every 15 minutes)	Michelson Laboratory Parking Lot

☆ ☆ ☆

ARMED FORCES OPEN HOUSE BUS SCHEDULE
(Sunday, May 20, 1956)

Event: Michelson Laboratory and Aeroballistics Laboratory Tours (1 to 5 p.m.)

(Buses will go from the theatre to Michelson Laboratory and then to the Aeroballistics Laboratory. Buses will return from Aeroballistics Laboratory to the Station theatre via the Michelson Laboratory.)

ORIGINATING POINT	TIME BUSES AVAILABLE	DESTINATION
Station theatre (entrance)	12:30 to 4:30 p.m. (Buses leave every 15 minutes)	Michelson Laboratory and Aeroballistics Laboratory

What Is NOTS ?

The Naval Ordnance Test Station (NOTS) is the Navy's largest ordnance research and development center. The work here provides the Navy and other fighting forces of this country with superior weapons.

NOTS is able to carry ordnance developments through from inception of an idea to the completion of weapons ready for mass production. It has all the specialized facilities and technical personnel for conducting research, development, testing, production engineering, and pilot production. Some of the weapons that NOTS deals with are rockets, guided missiles, torpedoes, and aircraft fire-control systems.

The Naval Ordnance Test Station is located in a number of different physical locations. The main facility, covering over 1,000 square miles, is 155 miles northeast of Los Angeles in the northwestern part of the Mojave Desert.

Some of the more important Station resources in this area are facilities for rocket research, development, and pilot production in both the solid- and liquid-propellant fields; facilities for warhead and high-explosives research; extensive test ranges and test tracks; facilities for the development and evaluation of aircraft fire-control systems; networks of range instrumentation; data-assessment laboratories; a laboratory for providing aeroballistics data on gun-launched rocket models; a large-scale computing installation for involved computations in ballistic, chemistry, and statistical studies; engineering facilities and machine shops; an all-weather test laboratory for testing ordnance items under controlled temperature and humidity conditions; a materials testing laboratory; a major air facility for providing aircraft services for development and evaluation of test operations; and research laboratories equipped for investigations in the fields of chemistry, ballistics, physics, and mathematics.

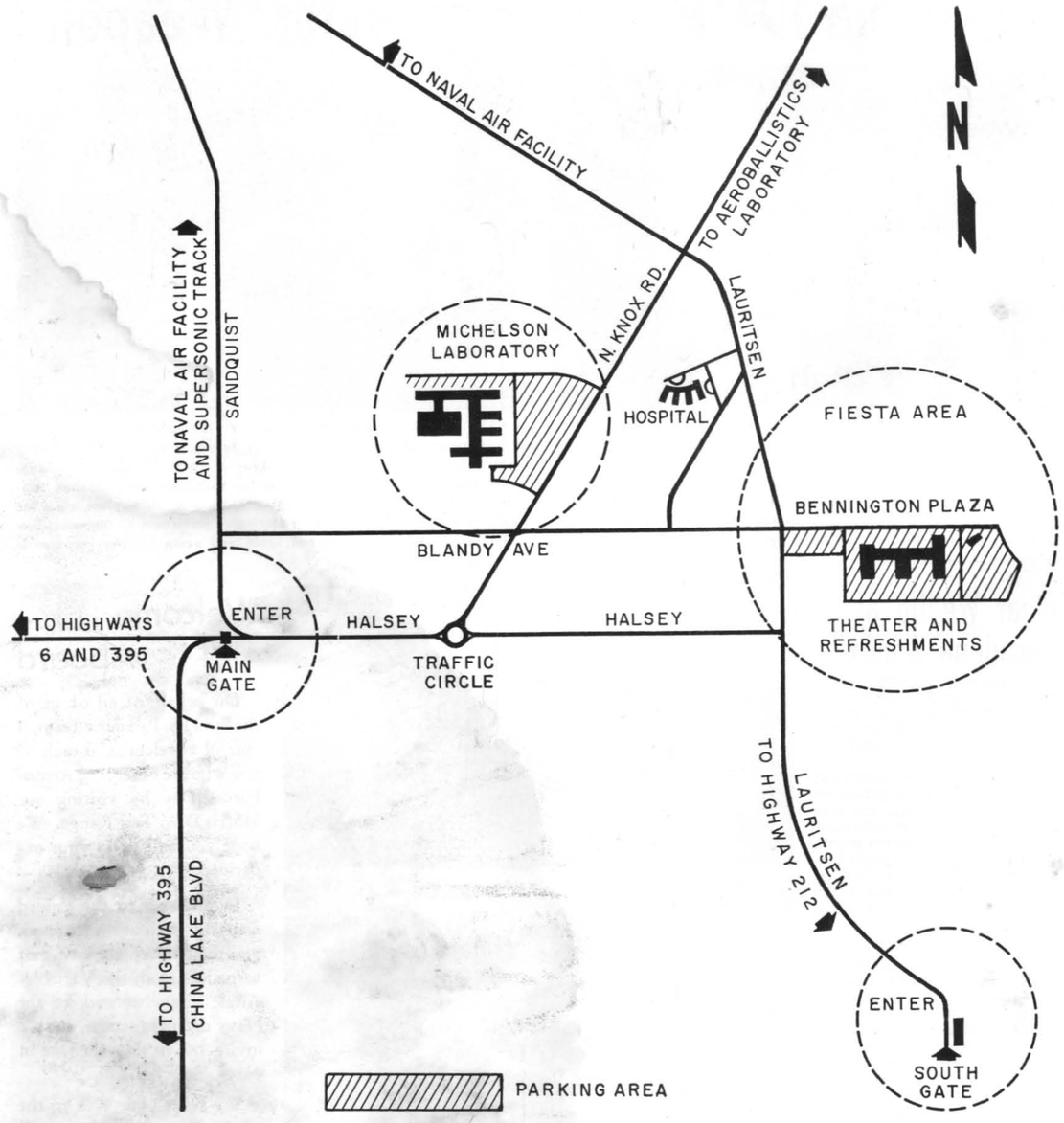
A few miles southeast of the main Station area is a 750-square-mile tract known as the Mojave B Range, which is used for special aircraft-rocket and gunnery firings. This area also includes the Randsburg Wash Projectile Range, which is used for rocket- and projectile-fuze tests.

Mission

The mission of the Station is to support the Bureau of Ordnance by originating and analyzing new ideas in ordnance, and by advancing them through research, development, experimental production, test, and evaluation, and by assisting in introducing the resultant weapons and techniques into production and service use. The program of the Station is planned jointly by the Bureau of Ordnance and the Station, and is fully integrated and positively directed toward accomplishing the mission.

History

The Station was established in November 1943 by the Bureau of Ordnance. The primary function was to provide for wartime expansion of the work that the California Institute of Technology (CIT) had been doing for the Navy since 1939 in the development of rockets and other weapons under the Office of Scientific Research and Development (OSRD). Toward the end of World War II, the decision was made to make NOTS a permanent facility of the Bureau of Ordnance. Consequently, in October 1945 the OSRD activities of CIT were absorbed by the Station, and the present approach to weapon and weapons-systems development work was initiated.



NOTS ARMED FORCES DAY AREA MAP · MAY 19 · 20

FOR THOSE WHO WISH TO DRIVE their own cars, parking facilities will be available at the Naval Air Facility, the SNORT Track, Michelson Laboratory, and the Aeroballistics Laboratory. Routes to take in reaching demonstrations will be clearly marked by signs. A map of the Station, the demonstration areas, and routes to take in reaching these areas are depicted above.

Bus transportation will be available for every demonstration taking place during the Armed Forces Open House at NOTS. Buses will originate at Bennington Plaza (at the entrance to the Station theatre) or at the south end of the Michelson Laboratory parking lot. A schedule of bus transportation available is listed on another page of this edition; times of arrival and departure are given for your convenience.

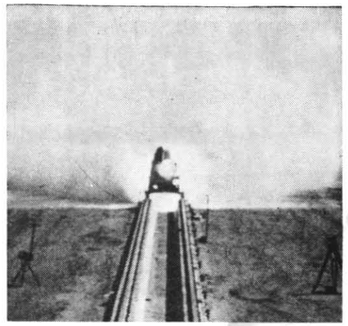
SNORT . . .

(World's fastest railroad)

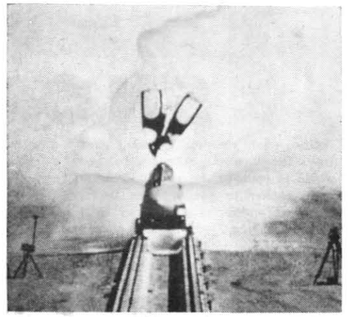
Streaking down the rails at nearly 1,100 mph, a seat ejection sled pops the canopy and up comes "Sierra Sam" (uncomplaining dummy) riding the ejection seat.

A WHIRLY-BIRD RESCUE demonstration will be featured during the NAF "air show" Saturday morning. The Navy has found many uses for the helicopter and it now plays a vital role in Navy operations on land and at sea.

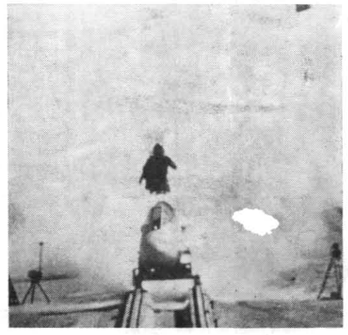
The action pictures appearing on this page are typical of the many demonstrations you will see during your visit to NOTS on Armed Forces Day. Every effort has been made by Station management to give you a good insight into the highly important defense work being accomplished here. Particularly emphasized is the research and test work that go hand-in-hand at this Naval activity. The "air show" at NAF will give you some idea about the speed and power of the Navy's air arm. The rocket-sled firing at SNORT will emphasize the research and testing necessary to keep abreast of the times in military aviation.



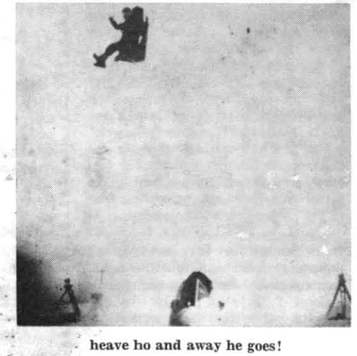
Here it comes . . .



off with the canopy . . .

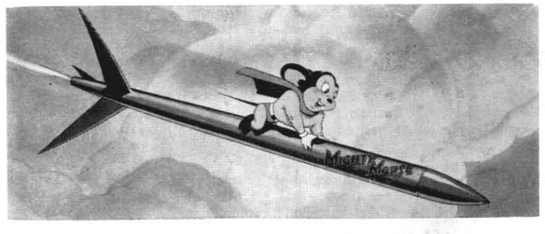


up pops "Sierra Sam" . . .



heave ho and away he goes!

NOTS DEVELOPED "MIGHTY MOUSE" ROCKET is fired high above the Eastern Sierra mountain range here on the Station. "Mighty Mouse" (artists drawing below) will be fired from Navy aircraft so that you may witness its performance during this Armed Forces Day celebration. Watch for the firing—it will be part of the "air show" at the Naval Air Facility.



WELCOME . . . TO CHINA LAKE

It is a distinct pleasure for those of us at the U. S. Naval Ordnance Test Station to welcome you on this the Seventh Armed Forces Day to be celebrated here.

The Station is proud of its achievements which contribute to the Nation's defense and, therefore, appreciates having the opportunity of showing you some of the types of work being done here at the Navy's largest and most complete ordnance research and development center.

In the final analysis, the weapons under development here are being made for you and all citizens of this country. It is indeed heartening, therefore, to observe by your presence that you are interested in what we are doing and how well it is being done. Only through such interest and support is it possible for those of us in the naval establishment — military and civilian alike — to make available the modern weapons needed to insure our national security and contribute, through military preparedness, to a lasting peace.

We sincerely hope your visit will prove interesting and informative.

CAPT. F. L. ASHWORTH, USN
Commander, NOTS

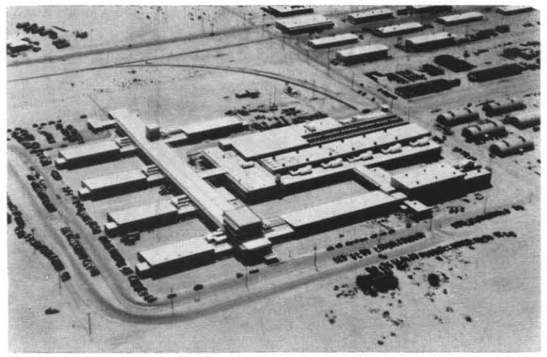
Welcome to the U. S. Naval Ordnance Test Station, one of your nation's largest research and development centers dedicated to the development of superior weapons for defense.

It is our sincere hope that you will enjoy the flying exhibitions, weapon displays, firing demonstrations, and tours of facilities arranged for you. At the same time, we hope your visit will give you an appreciation of the problems that weapon-development personnel face in determining and providing for projected operational needs of the naval forces.

Your attention is especially invited to the manner in which complete weapon development programs are carried out at this Station. Here, it is possible for our highly qualified scientific and engineering staff to conceive ideas for new weapons and through the use of our numerous ordnance facilities to turn these ideas into practical and reliable weapon systems ready for mass production by American industry.

We urge you to participate in as many activities as possible during your stay here.

WM. B. McLEAN
Technical Director



Open for visitation from noon to 4:30 p.m.

Michelson Laboratory

Michelson Laboratory is a completely air-conditioned concrete building that has nearly 10 acres of floor space in its two floors and is a memorial to Dr. Albert Abraham Michelson (1852-1931), a graduate of the U. S. Naval Academy and America's first scientist to win the Nobel Prize for Physics (1907).

It is the scientific center of the U.S. Naval Ordnance Test Station at China Lake. Space is provided here for specialized facilities that offer what is perhaps the largest group of scientists and engineers assembled in one place and devoting their efforts to weapon research, development and testing.

Following its start in 1944, this multi-million dollar building was ready for partial occupancy early in 1947 and was dedicated at a ceremony on May 8, 1948. It is built around a main corridor 762 feet in length from which eight, one-story wings extend from 168 feet in length to 312 feet. There is a three-story shop measuring 215 by 500 feet between two of the westerly wings that houses heavy machinery. **This shop, the laboratory equipment and other technical facilities represent a value of close to half a million dollars, while the building itself represents $8,000,000.**

Besides having refrigerated air-conditioning to meet the desert summer heat—and corresponding heating facilities to meet the winter temperatures that frequently drop below freezing—the reinforced concrete construction is earthquake resistant. Removable steel partitions are built in panels that are easily shifted to alter size and shape of rooms to accommodate changes in organizations and activities.

Among the departments that are housed in the building is Research with its physics and chemistry laboratories where pure and applied research is conducted in fields including gas dynamics, aerophysics, physical chemistry and combustion. Rocket Development has its offices and laboratories here to design and develop rockets, their components, propellants, special instrumentation, launchers and items of ordnance equipment.

Wide range of facilities offered the scientific personnel is shown in the laboratory by the huge heat-treat furnace that is one of the biggest in the west, and a deep-freeze machine for submitting metals to temperatures down to -120 degrees Fahrenheit.

Considering the machine shop again, it has over 180 machine tools that include lathes, milling machines, a 400,000 lb. hydraulic testing machine that performs bending, compression and tension on specimens under test or on structural parts. An X-ray section houses three machines including one of 1,000,000 volts that can penetrate steel 8 inches thick; the section is protected by walls two feet thick covered with a layer of lead ¼-inch thick.

An altitude testing chamber is operated in the laboratory by the Engineering Department. This device can simulate a climb from sea level to 50,000 feet altitude in five minutes and dive back to sea level in half a minute. Temperature may be reduced to -67 degrees. To make such conditions possible, a refrigeration system with a capacity of 75 tons and 2400 horsepower in motors driving vacuum pumps and other apparatus is used.

Facilities for data assesment used by the Aviation Ordnance Department and Test Department make possible the accurate assessment of great quantities of data collected on the numerous Station ranges.

Open for visitation from noon to 4:30 p.m.

Aeroballistics Laboratory

The NOTS Aeroballistics Laboratory is a facility for the experimental determination of the aerodynamic and ballistic characteristics of models of ordnance vehicles, particularly rockets and guided missiles. It supplements the NOTS open-test ranges in establishing the fundamental principles governing the flight of missiles, especially at transonic and supersonic speeds. It measures the values of aerodynamic parameters for general use in design and performance prediction. It expedites the development of specific weapons.

The high degree of accuracy achieved at NOTS in measuring aeroballistic parameters is made possible by the design of the range building, the design and development of various optical and electronic instruments, and the development of a new technique of multiple-image silhouette photography.

The main range building encloses a test space 500 feet long, 40 feet wide, and 30 feet high. Inert models launched from a gun outside the building pass through the fields of view of 23 pairs of cameras arranged to provide overlapping coverage. Associated with each camera is an electrical-discharge flash lamp which illuminates the missile with light flashes of microsecond duration. The flashing rate is preset, as determined from the expected velocity of the model.

An accurate photographic record of the flight of a model is obtained by entirely automatic means. As the model travels down the range line, it passes light screens and photo-electric units at each camera station. These operate as triggering systems to initiate the flashing of the electrical-discharge flash lamps. The flashing of the lamps is stopped by a gating unit. During the time the lamps at each station are flashing, four to twenty photographs of the model are made as it passes through the 24 feet of range line in the field of view of each camera station.

In the NOTS Aeroballistics Laboratory, dynamic parameters and transonic data are readily obtainable. Here it is possible to make motion and flow studies and to observe the behavior of new types of missiles in rapid surveys at costs lower than for dynamic measurements by other means.

A unique feature of the range is the complex, integrated electronic system which produces accurately timed flash illuminations of microsecond duration in synchronization with the passage of a missile.

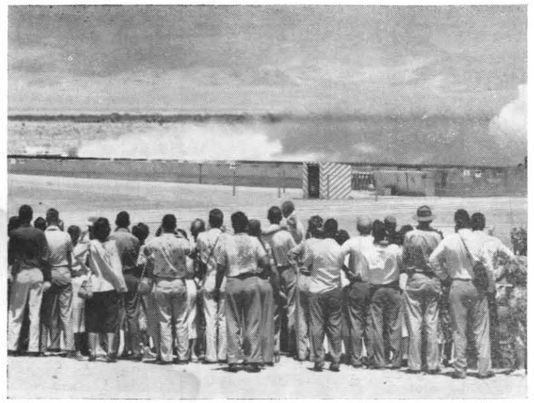
The passage of the missile through a series of light screens initiates the flashing sequence at each camera station. Electronic instrumentation assumes the duty of illuminating the missile a predetermined number of times. From the time a missile enters the field of view of the cameras until it leaves, the sequence of events is entirely automatic.

The special cameras used on the aeroballistics range are precision instruments.

All the range instrumentation is controlled and monitored. Action is initiated at a control console from which an operator directs events on the range and visually monitors the status and performance of the electronic and electrical circuits.

A simulated-flight system provides a complete check of the performance of the electronic instruments prior to the launching of a missile. The flight indications given by the monitoring system provides assurance that the range equipment will operate satisfactorily during a firing.

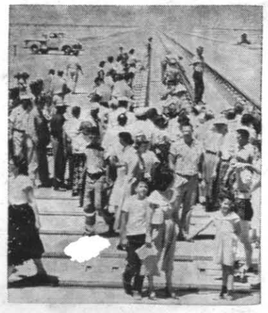
All camera stations are precisely calibrated with respect to a primary system of reference markers.



SNORT

Once each year on Armed Forces Day the fastest railroad in the world is open to the public. Thousands gather to see vehicles travel on it at speeds ranging over 1,000 miles per hour.

The railroad is slightly more than four miles long and the vehicles which travel it are rocket-propelled sleds. The land speed record of



1,280 miles per hour was made here by such a sled. The railroad is known familiarly as SNORT and formally as the Supersonic Naval Ordnance Research Track.

Located on the Naval Ordnance Test Station, it will be open for your inspection today and three rocket-propelled firings will be made for Station visitors. SNORT was built by the Navy to bridge the gap between wind tunnel and free-flight testing. It enables researchers to test and recover guided missiles, rockets, airborne launchers, full scale aircraft and component parts under conditions approximating free flight in the supersonic range.

Aeroballistics tests can be made of projectiles or rockets fired or launched from the moving track carriage under simulated flight conditions. It is also possible to determine aircraft damage caused by impact at high speeds into a stationary target, artificial weather or gunfire and to test components such as aircraft pilot seats, parachutes or ordnance items.

Items to be tested are mounted on a rocket-powered sled which reach a speed as high as 1,280 miles per hour. The speed is reached quickly so that the sled may travel at top speed as long as four seconds and still have 10,000 feet of track left on which to stop. The sled is braked to a rapid stop by a finger protruding from the bottom which hits a graduated-depth trough of water between the rails in the last 10,000 feet.

During the time a vehicle takes to complete its run down the track, a wide variety of photographic and electronic instruments collect the data needed to analyze the performance of the object being tested.

The track is in constant demand since it is situated near the growing aircraft and defense industries of Southern California. Design engineers value it highly since it provides an opportunity to test the operating performance of components and systems in captive flight under conditions closely simulating those likely to be experienced in actual flight.

Movies Showing At Station Theatre

Movies telling the U.S. Navy's story will be shown at the Station theatre on Saturday and Sunday from 1:30 to 4:30 p.m. Armed Forces Day guests are invited to attend.

No admission charge will be made; the movies to be shown are:

- ★ **The Fighting Lady.**
- ★ **Command of the Seas.**
- ★ **To the Shores of Tripoli.**
- ★ **The Annapolis Story.**
- ★ **Take 'Er Down (submarine).**
- ★ **The Fighting Lady's Family.**
- ★ **History of Naval Aviation.**

NAF

One of the most popular events at China Lake during Armed Forces Day is the "air show" at the Naval Air Facility of the Station. This year the event is expected to be bigger and better than ever before and many arrangements have been made to give the spectator a real demonstration of speed and power.

The schedule of events for the morning "air show" is as follows:

- **8 a.m. — NAF open to visitors. Static displays arranged and open for visitors inspection.**
- **10.15 a.m.—Commence launching aircraft for aerial demonstrations.**
- **10:30 a.m. — Propellant and explosives demonstration.**
- **10:45 a.m. — Aircraft fly-by (Power for Peace).**
  - **—Catapult aircraft.**
  - **—Aircraft pick-up of DART tow target.**
  - **—Rocketry demonstration (strafing and bombing on designated targets).**
  - **—Recover aircraft on desert carrier deck.**
  - **—Aircraft aerial demonsration (high-speed fly-by of jets).**
  - **—Marine combat assault demonstration.**
  - **—Helicopter rescue demonstration.**
- **11:30 a.m.—Aircraft fire-fighting demonstration.**
- **12:00 a.m.—Air show closes, NAF area closed.**

A special event to be staged sometime during the morning will be a fly-over of a large flight of North American F-100's and F-86's. Over 60 planes will be in the "fly-over" and a real aerial maneuver is expected.

Aircraft to be displayed at the "air show" are: F9F-8, F2H2, A3D, A4D, F3H-2, F3D, WV-2, F6F Drone (with fox and charlie control), and aircraft belonging to the Civil Air Patrol.

Displayed in Hangar No. 1 will be the following exhibits: ordnance, survival, aerology, Civil Air Patrol, construction battalion equipment, Marine combat equipment, and special rockets.

Navy, Marine Leaders Send AFD Greetings

Armed Forces Day, 1956 is a double reminder; that our American way of life, with its freedom and justice for all has been dearly won; and that it is under grave challenge. Therefore, we must be strong and vigilant to preserve our liberty and the peace of the world. The strength of our Armed Services is dedicated to the goal of peace through power.

CHARLES S. THOMAS
Secretary of the Navy

★★★★

The observance of Armed Forces Day presents a timely occasion for every citizen to become better acquainted with the Nation's Amphibious Force-In-Readiness. I extend a personal invitation to all our friends to visit those Marine Corps Activities open to the public on May 19, 1956.

RANDOLPH McC. PATE
General, USMC
Commandant