UNITED STATES NAVY AND MARINE CORPS BASES, DOMESTIC

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what the bomb camera sees. As his objective appears on the screen, he aligns the camera and locks the weapon on the target. Because the *Walleye* can glide for several minutes, it diminishes the pilot's danger by lessening his exposure to antiaircraft batteries that might be sited near the target.

Ten years later, early in 1978, NAFI Indianapolis was elevated to a full naval center under the new name of Naval Avionics Center.

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INYOKERN/CHINA LAKE, CALIF., NAVAL AIR FACILITY, 1943–

Authorized in late 1943, Naval Air Facility Inyokern, redesignated China Lake in 1955, began to service all aircraft at the Naval Ordnance Test Station, Inyokern/China Lake (q.v.). Its mission has been to provide support for research, development, and test and evaluation work in connection with guided missiles, aircraft weapons delivery systems, aircraft rockets, rocket launchers, underwater ordnance, and aviation fire control and target drone operations.

Typical of this work is that one of the Navy's smallest but most effective units, Guided Missile Unit 61 (GMU-61), which was established in 1952 to flight test the *Sidewinder* and to render technical assistance during the fleet evaluation of the missile. Personnel of this unit are screened for combined technical and operational backgrounds, with its aviators qualified in both jets and shipboard duty and the enlisted personnel rated as Aviation Guided Missilemen and Aviation Ordnancemen. All cooperate with the missile engineers of the China Lake Aviation Ordnance Department of the Michelsen Laboratory.

In addition to test and development work, the men of GMU-61 have trained key men from ships, squadrons, and shore activities; produced training films and pilot handbooks; and visited new facilities receiving the *Sidewinder* to assist in weapon indoctrination.

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INYOKERN/CHINA LAKE, CALIF., NAVAL ORDNANCE TEST STATION, 1941–

Although the Naval Torpedo Station, Newport, R.I., the Naval Proving Ground at Indian Head, Md., the Naval Surface Weapons Center at Dahlgren, Va. (q.v.), the Naval Gun Factory, Washington, D.C., the Naval Research Laboratory, the Naval Ordnance Laboratory, and the submarine station at New London, Conn. (q.v.), all performed research and testing, following World War I various scientists as well as naval officers saw the need for a special facility that would concentrate upon research and development of rockets. Among the scientists were Arthur B. Webster; Louis Ten Eyck Thompson; Robert H. Goddard; Dr. Robert A. Millikan and Albert A. Michelson, University of Chicago; and Vannevar Bush, of MIT and, after 1939, of the Carnegie Institution. Among the naval officers were Theodore S. Wilkinson, George F. Hussey, William S. Parsons, and Clyde S. McDowell. An important step in fostering civilian-naval cooperation came in 1933, when the Secretary of the Navy established a Liaison Committee on Naval Research to cooperate with the National Research Council.

By 1940, with the need for war-related research self-evident, Bush obtained approval from President Franklin D. Roosevelt to create a National Defense Research Committee, of which he became chairman. His task was to harness scientists to the war program. One of the 725 colleges and universities that offered its professors to Bush was the California Institute of Technology (CalTech). On 30 August 1940 the head of its Radiation Laboratory, Dr. Charles C. Lauritsen, suggested to President Millikan that CalTech explore the possibility of producing guided missiles as well as proximity fuzes, rockets to speed bombs so that they could pierce ships' steel decks, jet-assisted takeoff for aircraft, and various other projects, with Goddard to help develop the propellant for a 4.5-inch aircraft rocket. With approval from Bush's new Office of Scientific Research and Development (OSRD), in mid-1941 CalTech obtained the use of the Coast Artillery Range at Barstow, Calif. Meanwhile it tested rockets similar to bazookas at Eaton Canyon, Calif., and also worked on a target-rocket in connection with the National Bureau of Standards.

Following Pearl Harbor, OSRD gave two of its largest contracts for rocket work to CalTech in the west and to George Washington University in the east, the latter supporting projects at Indian Head, Md., and at the new Allegany Ballistics Laboratory near Cumberland, Md. At CalTech facilities at Morris Dam, near Azusa, Calif., work proceeded on ahead-thrown weapons for ASW warfare (the Mousetrap); at the CalTech Guggenheim Laboratory, on jet propulsion for aircraft; at Eaton Canyon, on dry-extruded rocket propellants. Meanwhile CalTech produced the submarine detection system known as the magnetic anomaly detector and a retrorocket as well. (An aircraft that detected a submarine on MAD could not drop its bombs on it. The retrorockets, however, when fired backward from the aircraft, stopped in mid-air and fell vertically.) By mid-1942, in addition, CalTech in seventy days designed and produced 4.5-inch barrage rockets which, when fitted onto smaller craft, were used in every major landing in both the Atlantic and Pacific.

With the potentialities of rockets proved, the Navy and CalTech turned to producing air-to-air rockets. These were first fired from a TBF-1 on 14 July 1943. Now additional space had to be acquired for testing them and for training the pilots who would fire them. For testing and training purposes, many aircraft as well as test ranges were needed. Goldstone Lake, hard and dry and permitting tests of up to eight miles, was overcrowded by 1943. In May 1943 the Marines

permitted the Navy to use part of Camp Pendleton, but this range provided only minor relief. At this time Comdr. Sherman Everett Burroughs, a combat pilot who had served as fleet gunnery officer on Adm. William F. Halsey's staff, entered the picture. Burroughs was eager to obtain a large naval proving ground not only for rocketry but for all forms of aviation ordnance. In March 1943 he was assigned to the Bureau of Ordnance as aviation assistant to the director of the Research and Development Division, Capt. William Moses. Following a visit to the Army Air Corps base at Eglin Field, Fla., Burroughs and Moses agreed that their bureau needed a similar large proving ground. On a subsequent flight over the Mojave Desert, CalTech and naval personnel saw a hard-topped emergency landing strip near the village of Inyokern and the vast expanse of the dry playa of China Lake. Fortunately, water, electricity, telephone, railroad, and highway facilities were nearby. If the Navy could obtain the site, it would be independent from the Army Air Corps for its rocket-testing program, and the clear weather and high number of good flying days per year foretold good conditions for pilot training.

Carving out a large section of the interior of California succeeded through the efforts of Rear Adm. Marc A. Mitscher, Commander, Fleet Air, West Coast, who won agreement from the Commanding General, Fourth Air Force, and approval from the Interdepartmental Air Traffic Control Board. Additional support came from Rear Adm. John S. McCain, in the new billet of Deputy Chief of Naval Operations (Air); haste was enjoined by the knowledge of what the Germans were doing with rockets at Peenemunde. Helpful also were Rear Adm. W.H.P. Blandy, Chief of the Bureau of Ordnance; Capt. James C. Byrnes, the bureau's administrative head for ordnance stations; and Comdr. John H. Sides and Commander Parson, upon whom Blandy depended for advice on scientific matters. Pressure came from the fact that all other naval air test and training facilities were overloaded.

With plans largely prepared by Captain Burroughs, construction began in early November 1943 on Naval Ordnance Test Station, Inyokern, an area covering 900 square miles, roughly the size of the State of Rhode Island. Its mission would be to test, develop, and evaluate air weapons and train men in their use. The first rocket test occurred on 3 December 1943. By April 1944 the nucleus of a naval air facility appeared while Carrier Aircraft Service Unit 53 serviced all aircraft at the station. Included in the construction were a machine shop for manufacturing experimental and prototype models of aviation ordnance, physical laboratory and heat treating laboratory, chemical and explosives laboratory, electrical laboratory, electronics laboratory and repair shop, precision instrument and bombsight shop, optical laboratory and repair shop, propellant plant, and controlled temperature-pressure laboratory. Costs estimated by the Bureau of Yards and Docks were $23,739,473. These costs escalated later because instead of the 1,000 persons expected, by 1953 there were 10,000 persons in the community of China Lake and another 5,000 in nearby Ridgecrest, and also because many additional facilities were added. Indeed, more construction was undertaken at Inyokern between 1943 and 1948, at a cost of $54,952,221, than would be undertaken in the next twenty years.

Following World War II, CalTech's Salt Wells Pilot Plant produced rocket propellants needed in the manufacture of the nonnuclear explosive charges used in atomic bombs for the Manhattan Project and its successor, the Atomic Energy Commission, while work continued with a full spectrum of research, development, and pilot production of guided missiles, underwater ordnance, and other systems.

With feedback provided from the combat zones, NOTS had developed the new 5-inch high velocity aircraft rocket HVAR (Holy Moses). In the summer of 1944 it came up with a still larger rocket nicknamed Tiny Tim. Approximately a thousand pounds in weight, it could be carried only by the TBF, TBM, and F4U. Rocket launchers and sites soon appeared, as did HVAR, a 4.5-inch high velocity spinner barrage rocket for use by aircraft against submarines.

With the end of the war impending, the Bureau of Ordnance asked Dr. L.T.E. Thompson to supervise the selection of civilian personnel to work at Inyokern and then to direct its research, development, and test work, thus revealing that NOTS would be continued in peacetime even though experimental work elsewhere was largely abandoned. From a wartime station serving the rocket program of CalTech and the rocket training needs of the fleet, NOTS became a permanent center for weapon research and development. Its direction would come from the Navy, for "the professors wanted out." In any event, NOTS came under new management when Capt. James Bennett Sykes relieved Captain Burroughs on 18 August 1945. Sykes presided over a program that had to refine the hastily developed wartime rockets and go forward with advanced weapons for undersea warfare, air-to-air rockets, and an entirely new ordnance discipline encompassing guided missiles.

In 1946 the Army Air Forces had drafted plans to develop an unspecified 5,000-mile guided missile. In 1947, while the services were trying to adjust to the new National Security Act, Adm. Chester W. Nimitz, the Chief of Naval Operations, warned the bureaus of Aeronautics and Ordnance not to air their differences over the production of naval missiles. During his economy wave of 1948 President Harry S Truman ordered missile work dropped completely. In 1949, when work resumed, Secretary of the Navy Francis P. Matthews publicized the fact that the Navy had engaged in the production of missiles for purposes besides experiments, the latter having been carried on since March 1949 in a converted seaplane tender, the *Norton Sound*. Truman's order to stop work on missiles notwithstanding, the Convair division of the General Dynamics Corporation continued the research involved in the Army Air Forces weapon. Meanwhile, missile development had so proliferated that Secretary of Defense James V. Forrestal had on 13 December 1949 requested the three service secretaries and the military chiefs to coordinate the program. Among other things, a board appointed by the service secretaries recommended that three proving grounds be established on a joint-use basis, and in January 1950 the Joint Chiefs of Staff

approved three guided missile proving grounds and ranges, one for the Army in New Mexico, one for the Navy in California, and one for the Air Force in Florida.

Whether produced by the Bureau of Aeronautics or the Bureau of Ordnance, NOTS provided the testing of missiles until November 1947, when Rear Adm. Daniel V. Gallery, Deputy Chief of Naval Operations (Guided Missiles) suggested to the two chiefs of bureau that a natural division lay in the air-launched and ship-launched categories. In consequence, the Bureau of Ordnance prohibited any air-launched missile development at Inyokern, thus depriving the scientists there of a chance to translate an aerial rocket into a guided missile, and established at Chincoteaque, Va. (q.v.), a Naval Air Ordnance Test Station to test and develop aviation ordnance and guided missiles. Similarly, the Bureau of Aeronautics established the Naval Air Missile Test Center at Point Mugu, Calif. (q.v.), to test and evaluate guided missiles. Nevertheless, a scientist associated with NOTS since 1945, Dr. William B. McLean, insisted that guided missiles should be considered as ordnance rather than aircraft. To guide a missile to its target, he came up with an infrared seeker that would correct the missile in flight and lead it right up to target impact. He had created the *Sidewinder*, named after the Mojave Desert rattlesnake. In 1947 *Mighty Mouse* followed—a slim, four-foot-long Folding Fin Aircraft Rocket. By 1973 about 50 million of them had been produced for the armed forces.

From CalTech NOTS also inherited its underwater weapons program. Particularly desirable was an effective aerial torpedo with greater speed in order to match the greater speed of new ships. Weapon A was soon forthcoming: a depth charge containing 250 pounds of high explosive propelled by a rocket motor to a maximum range of 800 yards. It remained in the inventory from 1951 to 1969, when it was replaced by another NOTS product, ASROC (ASW rocket).

A red-letter day at NOTS was 8 May 1948, when the Michelson Laboratory was formally dedicated. It remains the Navy's most complete weapons research establishment. Another memorable day was 8 June 1963, when President John F. Kennedy and his party visited while on a tour of West Coast installations. Still another came in 1967, when a reorganization of the Navy's laboratories resulted in consolidating them and renaming many of them as "centers of excellence." In consequence NOTS became Naval Weapons Center, China Lake.

In 1976 NWC China Lake acquired a new $3.6 million laboratory devoted to laser and other optical research and development projects. It is named after Dr. Charles C. Lauritsen, a pioneer in nuclear physics and rocket research.

During the last decade the approximately 3,850 civilians and 880 military people at Naval Weapons Center, China Lake, have done research and development work on air warfare systems (except ASW warfare systems) and missile weapons systems, and use the national range facility there for parachute test and evaluation. Included are about 600 discrete programs in a plant valued at $1 billion, covering 1,800 square miles, and in recent years funded at $300 million annually.

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IONA ISLAND, N.Y., NAVAL AMMUNITION DEPOT. *See* New York Navy Yard.