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UNITED STATES NAVY AND MARINE CORPS BASES, DOMESTIC

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To provide complete technical and engineering support for air breathing propulsion systems including their accessories and components, and fuels and lubricants, to the Naval Air Systems Command and the fleet by: managing and performing applied research and development leading to new propulsion systems; participating in the development and evaluation of new propulsion systems; conducting propulsion systems tests and evaluation as necessary to ensure successful mission accomplishment and assisting in the determination of corrective action necessary for the resolution of operational service problems, and to perform such other functions and tasks as directed by the Commander, Naval Air Systems Command.

Among the most important functions of the NAPC are to explore and develop aircraft propulsion systems particularly for air-breathing V/STOL, patrol and jet flight training systems, and multiple application core engines. The work is undertaken in concert with the Naval Air Systems Command, various Navy laboratories, the National Aeronautics and Space Administration, and other interested civilian and military agencies of the government. Engine performance and aircraft design analysis and evaluation are carried on through computer simulation. Among other products tested are variable cycle, parametric, and turbojet/turbofan engines; coatings for turbine blades; turbine blades themselves; remote burners; surface alloying of bearings and gear steels by ion implantation to reduce metal fatigue and increase corrosion resistance; air refueling nozzles and caps; and various kinds of high-pressure and low-pressure turbines. NAPC also studies and experiments with petroleum fuels and lubricants (the Navy must test all JP 5 oil, for example, which it acquires from more than twenty-five different refineries worldwide), and bearing and gear materials. In addition it tests synthetic fuels obtained from oil shale. Exxon and Standard Oil of Ohio have cooperated in these last experiments, while the Southwest Research Institute has tested diesel marine fuel as an emergency aircraft fuel, and General Electric has been testing roller bearings for engines having contrarotating rotors, such as those in helicopters. Tests of these and of other products have been carried on for such engines as those of the F4 *Wildcat*, F14 *Tomcat*, F16, and F18 *Hornet* fighter aircraft; the Navy Tomahawk Sea Launched Cruise Missile; the Air Force Air Launched Cruise Missile; the engines used in the AV-8B *Harrier* jump jet; the *Harpoon* missile weapon system; target drone engines; reciprocating engines; and Light Airborne Multi-Purpose Systems (LAMPS) as well. Work on controlling air pollution has involved tests not only of engines but of the air over naval airports, and work continues on suppressing infrared signatures of naval aircraft and helicopters. Suitable instrumentation, data acquisition, and data processing systems are used for many of the test projects and by the supply and personnel managers as well.

The various test and other facilities house such machines as compressors and exhausters, exhauster turning gears, refrigerator condenser tubes (needed to cool cruise missile engines), test cells, exhaust gas coolers, and computers programmed to conduct tests.

NAPC gives high priority to the cost reduction program (for which it received

an Achievement Award Certificate in 1980), awards for employee suggestions, safety and health programs, its equal employment opportunity program, blood drive, energy conservation program, and on-base and off-base training and education for its personnel. A current shortage of qualified engineers due to retirements and transfers has called for an increase in the summer aid program for disadvantaged youth ages sixteen through twenty-one. Some of these do minor engineering work, but the bulk of them perform clerical, janitorial, supply, and public works functions.

In 1958, when it employed eleven officers and 456 civilians, the value of the plant approximated \$35 million. In November 1982 the authorized work force was 8 naval officers and 589 civilians.

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TUSTIN, CALIF., MARINE CORPS AIR STATION (HELICOPTER), 1969-

First known as a lighter-than-air base (LTA), then as Naval Air Station (LTA), Santa Ana (q.v.), the 548 acre site now used by the Marine Corps started as a Marine Corps Air Facility on 1 May 1951 and on 1 September 1969 had its name changed to Marine Corps Air Station (Helicopter). The great visitors' attractions there are the two huge hangars, built during World War II to house blimps, rather than the Marine station, which is tucked into a narrow pie-shaped tract enclosed by the intersections of the Newport, San Diego, and Santa Ana freeways. Los Angeles is but thirty-five miles to the southeast.

Headquarters and Headquarters Squadron, which has no aircraft, administers, supports, and maintains the station. It is comprised of about 40 officers, 340 enlisted men, and 200 civilian employees. A major tenant command, Marine Air Group (MAG) 16, has about 1,900 Marines in ten squadrons of CH-46 *Sea Knights* and CH-53 *Sea Stallions*. Prospective helicopter pilots, whether newly trained or making a transition from fixed wing aircraft, obtain instruction from Helicopter Training Squadron 301, which uses both types of helicopters just mentioned. A similar unit is based at Santa Ana, while some MAG units are at the Marine Corps Auxiliary Landing Field at Camp Pendleton (See San Diego, Calif., Naval and Marine Corps Bases), about fifty-five miles to the southeast. Helicopter types include observation, gunships, and heavy lifters, with training facilitated by the sparse population in the rugged hills near the station. In those hills are thirteen Confined Area Landing sites at altitudes ranging from 1,000 to 5,000 feet. The Marines use only 42 percent of the acreage at the station; the other 900 acres is leased out for the raising of farm products, with the government receiving the revenue.

Recreational facilities abound in the area. The Pacific Ocean is only a few miles to the west, and fishing and camping are available in the Santa Ana

Mountains. Except for a swimming pool and golf course, the base has a full range of recreational facilities. There is a pool at El Toro, only seven miles to the southeast.

Men from Tustin have seen many faraway places. MAG-16, for example, was deployed to Japan between 1952 and 1960, then to Taiwan, Okinawa, and Thailand, and in 1965 to Vietnam, where it remained for five years, returning to Tustin in 1971. Since then it has trained and supported ground units at Camp Pendleton and assisted Reserve aviation units during their summer active duty periods. Sub Unit No. 2 of Marine Air Base Squadron 16, which provides ground support for MAG-16, was the first Marine Corps unit deployed to Vietnam, and remained there until 1971. The first and oldest tactical helicopter squadron in the Marine Corps is Medium-Helicopter Squadron 161. It was the first such squadron to prove itself in combat, which occurred in Korea. Following two tours in Vietnam, it returned to Tustin, but in 1980 was deployed to Okinawa. The histories of Marine Medium Helicopter Squadrons 163, 164, and 268 run quite parallel, as do those of Marine Heavy Helicopter Squadrons 361, 363, 462, and 465, with most of these squadrons rotating between Tustin and Okinawa.

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TWENTYNINE PALMS, CALIF., MARINE CORPS AIR GROUND COMBAT CENTER, 1952-

Twentynine Palms had served gold prospectors well before World War I. After the war many veterans obtained homesteads there because the environment prolonged the life of those who had been subjected to gas attacks. The site was used by the Army for training glider and tank crews in 1940 and for training fighter pilots in 1943. On 4 August 1944, the Navy commissioned an auxiliary air station there that specialized in training in bombing and strafing. From the end of 1945 to 1952, however, the site lay dormant.

In 20 August 1952 a Marine Corps Training Center was established at Twentynine Palms with 120 Marines on board. Its mission was "to provide personnel, material, and services for the maintenance and support of the Marine Corps forces assigned." Located in the southern Mojave Desert about fifty miles northeast of Palm Springs, it has been developed into the largest Marine Corps base in the world, with 932 square miles, or 600,000 acres—larger than three Quanticos. Much of the area remains as it has always been—rough desert with temperatures reaching up to 110°F in summer, (and up to 172°F on the airfield mats), with cold winters, and some rattlesnakes, gila monsters, and scorpions.

The current mission of the base is to serve as a training and impact area, with

emphasis on the latter. Here the Corps fires its big guns, including those of the First Field Artillery Group, homebased at Twentynine Palms. Involved are 155mm, 8-inch, and 175mm howitzers. Also tested are bombs and missiles. Army, Air Force, and Navy men use the various ranges to test their weapons, and during summer exercises Regulars and Reservists live at Exercise Support Base while they earn their designations as "desert rats." Force troops and the base are supported by the Seventh Engineer Battalion, about 200 Marines who can build anything anywhere. Repair to heavy weapons, including sophisticated aiming and calibrating devices, is the specialty of the Provisional Maintenance Co., while housekeeping is done by Headquarters and Service Battalion. Among the schools is the Redeye School, which trains Marine gunners to shoot the Redeye portable ground-to-air missile. The Marine Corps Communications and Electronics School, with an average enrollment of 1,600, trains almost all Marines in these fields in subjects ranging from basic electronics to how to operate a Tactical Air Control Center.

Given the isolated nature of the base—except for Palm Springs, it is three to five hours to Las Vegas, Los Angeles, and San Diego—recreational facilities abound. During 1974 a new \$800,000 gymnasium was commissioned. Special Services issues recreational equipment of all kinds. In addition to intramural sports there are outdoor tennis, handball, volleyball, and basketball courts and football and baseball fields. There are three swimming pools, a nine-hole golf course, horse stables, and various hobby shops. Nearby mountains attract those given to hiking and exploring and especially "rockhounds," that is, persons interested in stones. If one must visit a city, it is 150 miles to Los Angeles and 250 miles to Las Vegas.

Because of the summer temperatures, all Marines at Twentynine Palms live in air-conditioned, hotel-like accommodations, mostly two to four men to a room. New quarters for women Marines were opened in 1974. The Marine Exchange is one of the most complete in the world.

Twentynine Palms has its own Expeditionary Airfield. Completed in 1976, it can handle planes as large as the C-5A *Galaxy*, the largest transport aircraft in the American military inventory.

On 1 February 1957 the name of the installation was changed from Marine Corps Training Center to Marine Corps Base, and on 15 February 1979 to Marine Corps Air Ground Combat Center. On 30 April 1980 the Combined Arms Command (a new name for the former "Palm Tree" exercises) was activated to provide a command headquarters for Fleet Marine Force (FMF) Pacific, units, and on 16 May it became the headquarters for the Seventh Marine Amphibious Brigade, which trains forces associated with the Near-Term Prepositioning Ships Program. Exercise Gallant Eagle 82 was the largest field exercise in the history of the Rapid Deployment Task Force, with good lessons learned because the climate and topography resembles that of Southwest Asia and the Persian Gulf. Involved were ninety amphibious assault vehicles (amtracs), fifty-three M60A1 tanks, seventy-two tube-launched missiles, and various rockets, mortars, and