Portion of AUTEC Main Base looking seaward. Uncompleted harbor facilities in upper right.

Project AUTEC

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The following article was presented by LCDR Daniel at the ASCE Convention at Miami Beach, Florida, 31 January - 4 February 1966.

The little publicized Atlantic Underwater Test and Evaluation Center, known better by the acronym AUTEC, is nearing completion of the construction phase. Project AUTEC is a joint undertaking between the U. S. Navy and the British Admiralty to provide these two countries with a water range complex to test and evaluate weapons and weapons systems associated with antisubmarine warfare.

After searching the free world for the best water area for the AUTEC, the Tongue of the Ocean, approximately 150 miles east of Miami, in the Bahamas, seemed made to order for the task. It is a very deep body of water, averaging some 1000 fathoms, about 150 miles long, some 40 miles wide, completely enclosed on three sides. Andros Island lies on the west and very shallow banks are on the south and east. The Tongue gets its name from its shape. It can be likened to the Grand Canyon resting on the ocean floor. The Tongue of the Ocean, being a cul-de-sac, with sparse population around it makes commercial ship traffic minimal. This lack of ship traffic is important to the ranges, not so much for the physical absence of ships, but the lack of noises that they would introduce into the water medium.

The Tongue of the Ocean is jokingly referred to as the "bathtub." It will be a highly instrumented and well understood body of water. Oceanographic factors will be monitored and recorded from throughout the range areas.

There will be three primary ranges located in the Tongue of the Ocean associated with AUTEC. These are:

1. The Sonar Range
2. The Acoustics Range
3. The Weapons Range

The Sonar Range will be used to develop and evaluate advances being made in Sonar equipment. These equipments are vital to a submarine in detecting the presence and location of another craft in its general area. Also on this range Sonars already installed aboard Navy craft will be calibrated.

The Acoustics Range, containing a hydrophone array, mounted on a taut vertical cable anchored in 1000 fathoms, and with its upper end terminating at a submerged buoy. The hydrophones are connected to the shore facilities by submarine cable. On this range

submarines will be directed to make passes at the hydrophones at different depths, varying distances and varying aspects. The submarine generated noises will be collected and recorded by the shore terminal equipment. These noises can then be analyzed. In this way, for a particular boat, it can be determined what piece of mechanical equipment on board is producing the noise. Once the culprit is found and its noise-making abilities are minimized, then of course the next noisiest piece of gear is sought. The ideal is to have our boats run submerged through the seas without generating any noise whatsoever. In this manner a submarine would be extremely difficult to detect. In this regard the water medium is a difficult one in which to work. Varying pressures, temperatures, currents varying both in direction and velocities, varying salinities, surface wave conditions and background noises all tend to frustrate the oceanographer. The anti-submarine game is primarily one of hide and seek. The water medium tends to favor the hider and hinder the seeker.

The Weapons Range, also located in the Tongue is 5 miles wide and 50 miles long, running roughly parallel to the east coast of Andros. There are five shore tracking stations along the coast. These stations will be capable of tracking in three dimensions both underwater and in-air. There is a family of anti-submarine weapons whose trajectories include both an in-water and an in-air phase. These tracking stations will be manned full time. They will have the capabilities of collecting the tracking data from both underwater and in-air instrumentation and transmitting it back to the main base where it will be recorded as well as displayed in real time.

In addition to the three ranges that have been discussed, we are constructing a four station navigation aid network that covers the Tongue of the Ocean Area. This system allows any surface ship or aircraft that is equipped with the highly compact receiving gear to fix his position to a great degree of accuracy in a minimum of time and with little effort.

The AUTEC is being built for the U. S. Navy Bureau of Ships. Participating in the project are most of the Navy's Bureaus, Laboratories and Offices to varying degrees. Many of the defense contractors of this country are participating as well. The shore installations have been designed and being built by the Navy's construction agent, the Bureau of Yards and Docks.

Field surveys for site selections began in the spring of 1961. Detailed topographic and hydrographic surveys as well as sub-surface conditions, meteorological data and sources of native construction materials continued into 1962. Final design was started in mid-1962 and completed in late 1963. Concurrently with the final design, the U. S. State Department and the British Foreign Office were negotiating the international agreement between the two countries. Before consummation, this agreement had to receive the concurrence of the Bahamian Government. The agreement was signed 11 October 1963 and the first construction contract was advertised 10 days later.

Some of the factors bearing on the design were:

1. Construction was to be accomplished in a primitive and logistically difficult area.

2. Due to location in the hurricane belt all facilities would be designed with a wind loading of 150 mph.

3. Wood materials to be avoided due to termites.

4. Fresh water is scarce and rainfall highly variable.

5. An absence of quality concrete aggregate, both coarse and fine, exists.

6. High summer temperatures would add to concrete placement problems.

7. A very exposed location to the elements of the sea.

8. The surface of all the sites is flat, low lying and composed of hard oolitic limestone, covered with potholes of diameters from 2 inches to 20 feet and of similar depths. The entire surface covered with scrub vegetation to a height of 15 feet growing out of the potholes. The brush is impenetrable on foot.

9. The Center is a test and evaluation facility, with no defensive or offensive capabilities; therefore, it was desired its appearance should be more like a university than an industrial facility.

10. The structures were to be compatible with the climate, the topography and the setting.

11. The Center was to be of permanent construction, austere yet habitable, and to stay within a very tight budget.

The Architect and Engineer has accomplished an outstanding job in satisfying these somewhat diverse requirements.

The Main Base, located two miles south of Fresh Creek on the east coast of Andros, will be the center

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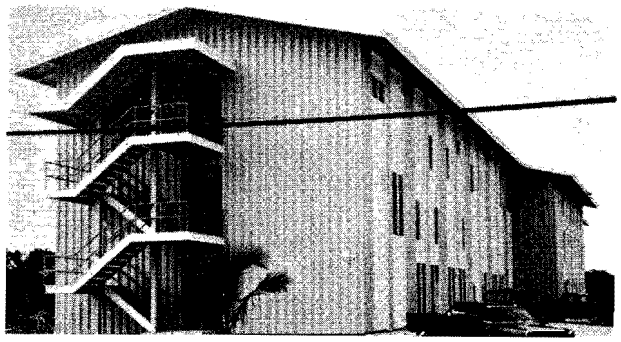
Typical outlying site. Eight of these sites are under construction, ranging from 20 to 150 miles from the Main Base. They are accessible only by aircraft or boat.



300-man barracks building at the Main Base. Concrete slab thickened at edges; rigid steel frame; double insulated steel panel sidewalls; fenestration is moveable jalousies.

of all operations. Under construction is a complete, self-sufficient, naval facility, built from scratch. The first construction contract was awarded 4 February 1964 and is scheduled to be completed 10 March 1966. Subsequently, additional contracts have been awarded, all to have the same or an earlier completion date. The value of the construction work under way is approximately $17 million. The total cost of the project including instrumentation and collateral equipment is $125 million.

Under way or already completed as the Main Base is an administration building; 300-man barracks; 300-man subsistence building; 75-man BOQ, with a detached mess; laundry; public works shop; transportation shop; warehouse; fire station; 3700 kw diesel power plant; 16-acre water catchment area; 1.5 million gallon ground level water tanks; petroleum products tankage and piping system; medical dispensary; community facilities consisting of a chapel, Navy Exchange, tailor, cobbler, barber shop; recreational facilities; helicopter port and hangar; radio station; radar surveillance tower and building; salt water pumping station and evaporators utilizing waste heat from the Diesel engine in the power plant to supplement the rainfall for use as potable; magazines; 40,000 square feet of shop, containing machine, battery, plating, electronics, electric, carpenter and paint shops, entirely covered by overhead cranes.

A complete road system and harbor facilities are under way. The latter consisting of a 50-feet wide by 400-feet long, steel pile, concrete deck pier, 2000 feet by 2000 feet turning basin and 200-feet wide by 5000-feet long channel dredged to a depth of 20 feet. Approximately 6,000,000 cubic yards of hard material involved. All this material had to be drilled and blasted for removal. Over a mile of breakwater is being constructed to minimize wave action within this burning basin and alongside the pier. The breakwater concept is relatively new in this country. Utilizing precast prestressed concrete piles, driven in two parallel rows 10 feet apart and spaced 3 feet apart a crib is formed. The top of the crib is held by cast-in-place beams. The crib is then filled with 5-ton stones. Utility systems are going in, including an automatic dial telephone system. The heart of the base will be the Command Control Building. Here is the shore terminus of all the instrumentation. Each range will have its own electronic laboratory in this building, each custom designed to their specific requirements. It is here the tracking data will be displayed, range safety will be housed, the data analyzed and the potentialities of the anti-submarine warfare art will be realized.

In addition there are eight outlying sites, ranging in distance from the Main Base from 18 to 150 miles. With the exception of the nearest, there is no road transportation available to these outlying sites. Supervision and inspection forces must be moved about by air, utilizing bush-type aircraft either land or amphibian, depending upon the destination. Construction materials and equipment are moved by sea. These sites are small on the order of 20 to 40 acres each and with a design population of about 10 men each. Due to their remoteness and logistic problems, they require nearly one-half the contractors effort.

At this writing the AUTEC has been commissioned, but not yet functioning. The construction work is still proceeding on schedule and the electronics installers have arrived on site. It is expected the AUTEC will be fully operational in late 1966.

The Atlantic Undersea Test and Evaluation Center is a bold undertaking of the free world's Navies to advance the state of the art in Anti-Submarine Warfare.

INSPECTION TOOL FOR NORDBERG DIESEL ENGINES

The use of less manpower, faster accomplishment of work, easier operation, more safety to delicate components of costly equipment, and greater accuracy in connecting rod journal diameter readings, resulted from the implementation of a beneficial suggestion submitted by Alfredo Estella, a diesel electric plant controlman at the Public Works Center, Subic Bay.

Mr. Estella suggested the use of a special tool for inspecting connecting rod bearings of Nordberg diesel engines. Prior to the adoption of his idea, connecting rod journals were inspected by entering the engine's crankcase and making the inspection inside the engine. The very limited space made movement extremely difficult so that much time was expended not only by the inspector but also by support personnel outside the engine. Further, a complete and thorough check of crankpin journal was not possible nor was cranking of the engine. The old method called for the opening of the journal with the use of a pipe, 1¾" in diameter, set on engine bed plate.

Mr. Estella's suggestion calls for the placement of the 3" x 34" pipe in the crankcase frame after the connecting rod bolts are pulled out. The bearing box is turned subsequently and the 1¾" x 11' pipes are slipped in. Pulling out the box from the crankcase is made easier and inspection outside lends to a more thorough and complete job. Even the outside diameter of the journal is measured very accurately for future reference.

Based on 12 bearing boxes per engine, 120 manhours are saved per engine at each inspection. There are four Nordberg diesel engines at PWCen Subic's power plant and each engine is inspected four times a year on the average.