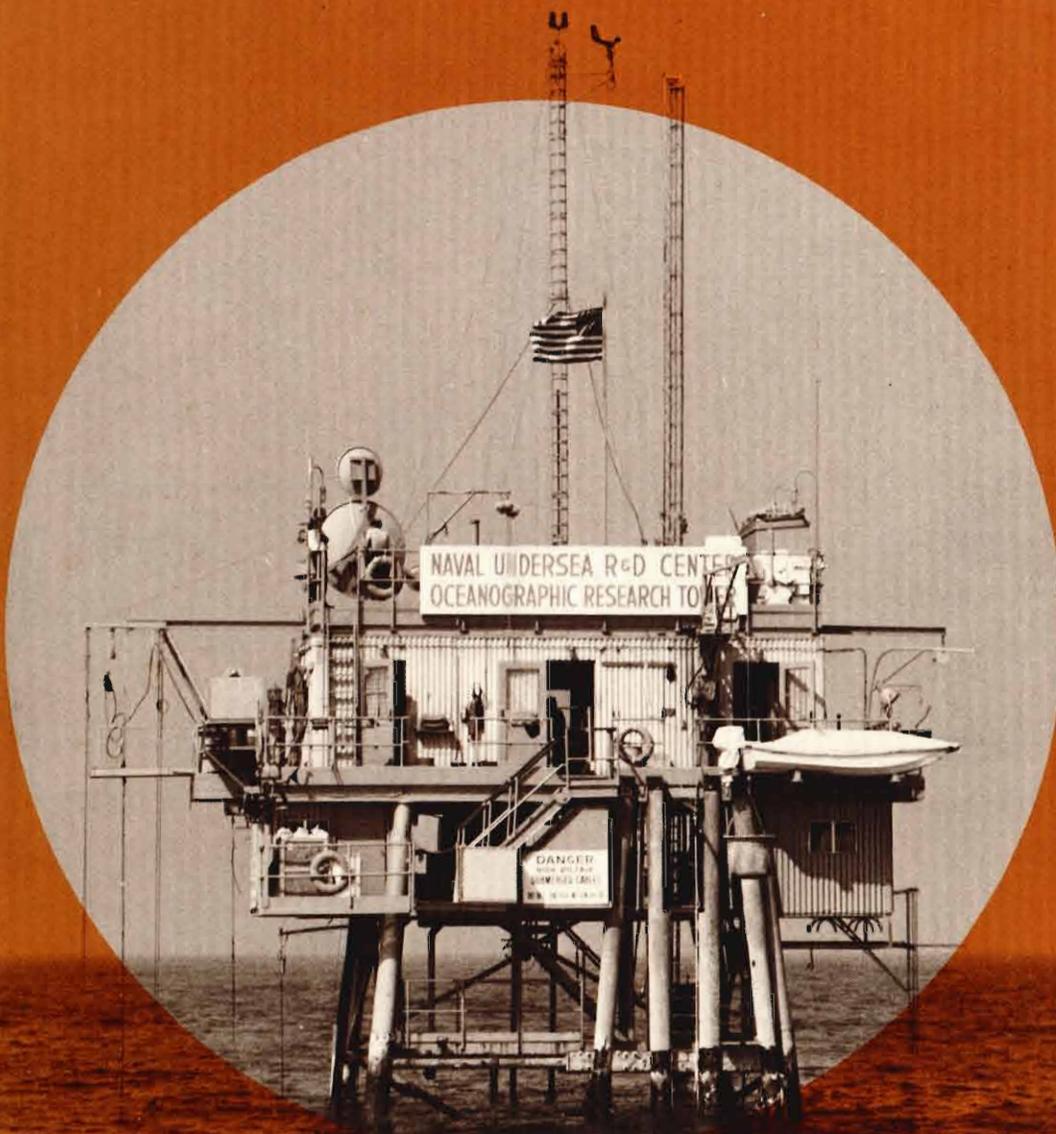
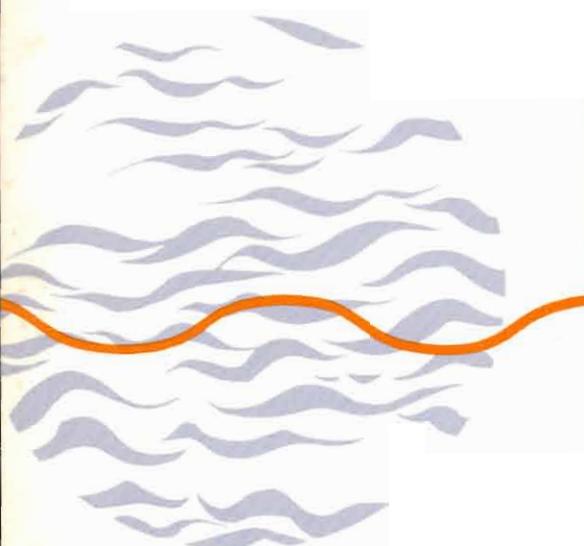


# OCEANOGRAPHIC RESEARCH TOWER



**available as a fixed platform  
for shallow water research**



**2** A wind recorder is located at the top of the tower.

**1** A lift system to handle instrument racks or other equipment can handle up to 1000 lbs.

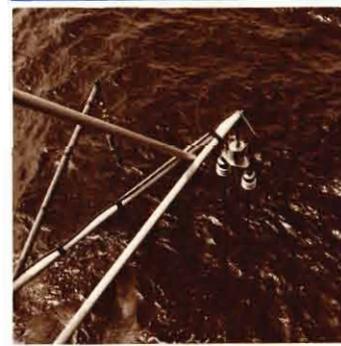


**3** An electro-magnetic current meter measures ocean current speed and direction.



### STABLE PLATFORM

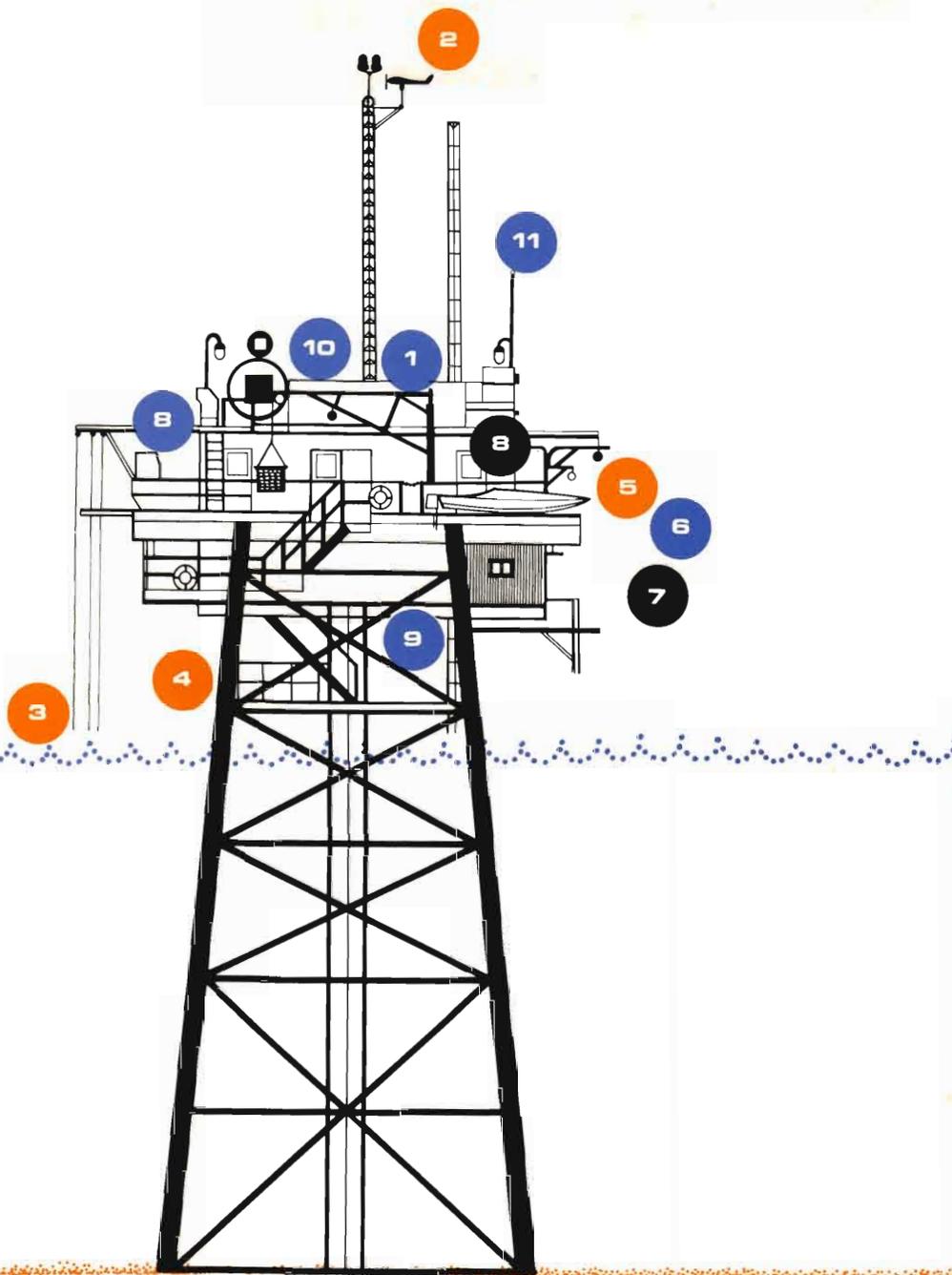
Its stability, based on slanting steel legs extending 63 feet into the ocean floor, assures continuous oceanographic and meteorological measurements from a fixed location. Versatile and adaptable, the tower can be used for studies of the atmosphere, the shallow water ocean environment, the sea floor, and for equipment evaluation. Several investigations, related or isolated, can be conducted simultaneously, since the tower affords oceanographic research capability in three dimensions; distance, depth, and time. Experiments at the air-water interface can be made and compared with routine atmospheric and oceanographic data taken concurrently.



**4** A wave staff measures wave height.

**5** A small hydrographic winch is available for Nansen casts.





**7** A sound velocimeter can be lowered from the small hydrographic winch.



**10** The top of the tower is available for the installation of various instruments, e.g., radar receivers, solar instruments and infrared devices.

**EQUIPMENT**

The oceanographic tower has four levels. The surface level is the entry deck and diving platform. Ladders lead to the second deck where winches and lifting equipment are located. The third or main deck is the primary work area. The sheltered area, with a walkway on all four sides, has an electronics room, a general purpose room, and a bunk room that sleeps six. The fourth deck above the shelter has antennae and wind recording and solar measurement instruments. Electrical shore power (30 kw) is available at 110 V, 220 V or 440 V AC. The main deck loading boom can handle 1,000 lbs. of cargo.

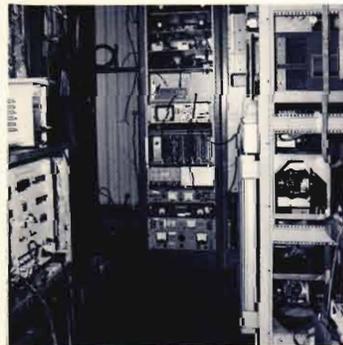
For further information and use costs concerning this unique facility, contact:  
 DALE E. GOOD - Coordinator or JON F. ENGSTROM - Oceanographic Services Manager  
 at the Naval Undersea Research and Development Center, Code 5044, San Diego, California 92132  
 (714) 225-6404 or AUTOVON 952-6404

**6**

A mechanical bathy-thermograph is available for temperature profiles.

**8**

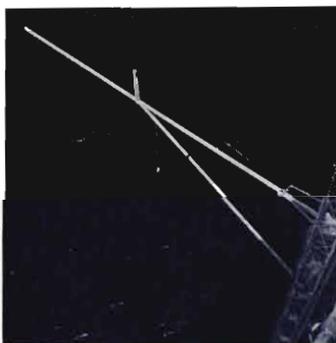
Adequate space is available for electronic instrumentation on a permanent basis or for project use.

**9**

The tower has track railings on three sides which can be used to raise and lower instrumentation to the sea floor.

**11**

A boom is available for raising and lowering instrumentation to the sea surface for measuring the air-water interface, as well as the dew point at the surface.



## SPECIALIZED EQUIPMENT

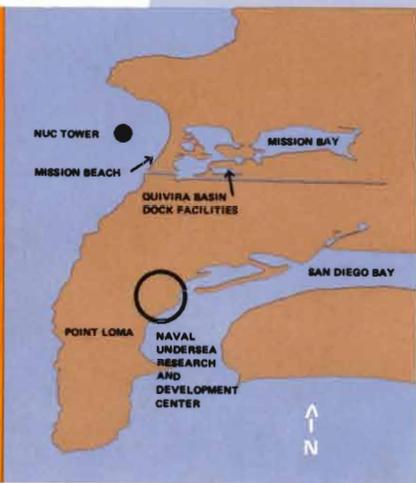
Specially designed equipment supports research performed at the tower. On three sides of the tower, vertical tracks allow instrument carts to be positioned from the second deck down to the sea floor. One instrument cart can be equipped with closed circuit television camera or motion picture camera. An acrylic bubble is being installed on the second deck. This one-atmosphere chamber for two observers can be lowered to the ocean floor and will provide a shirt-sleeve observation chamber for biological and water motion studies. In the waters surrounding the tower, there are approximately 150 temperature sensors, wave height sensors, and transducers hardwired to on-board instruments. Five arrays of thermistor beads continuously monitor the water thermal structure. An infrared radiation thermometer is available for remote measurement of the sea surface temperature. Among other equipments available at the tower are those to record dew point, wave motion, current speed and direction, sound velocity, and water clarity. A daily weather report, used by local authorities, originates at the tower.



## RESEARCH USE

Shallow water oceanography studies predominate. These studies encompass water motion, heat flow in sediment, sea surface slicks, seafloor chemistry, swell and wind waves, and internal waves. Underwater acoustic studies involving ambient sound, acoustic scattering, and sound attenuation are performed. Other projects are related to electromagnetic wave propagation, marine chemistry, marine biology, marine geology, and materials research. New equipment design can be evaluated from the tower as well as equipment calibration under predictable conditions. The tower permits field measurements in a laboratory environment.

• • • *neither a ship nor a shore installation, in itself, can provide the necessary conditions for study of the ocean's shallow water and associated coastal marine environmental problems. Such research requires access to the open sea, stability, a fixed location, and a constant power supply.* The Naval Undersea Research and Development Center's Oceanographic Research Tower meets these requirements. Installed in 60 feet of water approximately one mile off Mission Beach, San Diego, California, the tower is easily accessible by regular Center boat service, yet far enough from shore to provide a natural, open sea environment.



## TOWER PROGRAMS

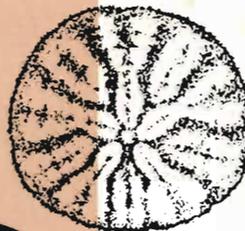
These programs have been or are currently being conducted from the oceanographic tower:

- Internal waves
  - Thermal structure
  - Horizontal currents
  - Vertical currents and turbulence
  - Speed, height, and direction of propagation
  - Coherence
  - Sea-surface slicks
- Surface temperature
- Swell and wind waves
- Acoustic studies
  - Biological factors
    - Ambient sound
    - Target identification
    - Acoustic scattering
    - Sound attenuation (plankton)
  - Physical factors
    - Sound attenuation (bubbles)
    - Sound velocity
    - Sound transmission
- Electromagnetic and wave propagation studies
  - VLF transmission
- Chemical studies
  - Salinity
  - Oxygen
  - Plant nutrients
  - Foaming properties
  - Radioactivity
- Biological studies
  - Water turbidity
  - Plankton distribution
  - Fish distribution
- Geological studies
  - Sea-floor topography
  - Sediment distribution
  - Subbottom structures
  - Mine scans
- Materials research studies
  - Organic coatings
  - Surface treatments
  - Cathodic protection
  - Metal alloys
  - Antifouling techniques
- Environmental testing of oceanographic instrumentation

## AVAILABILITY

While Center scientists use the tower in year round support of their many research programs, it is available to Government organizations as well as other users on a daily or monthly charter basis. The tower is manned during working hours by two mechanical technicians. Diving support is available through the Center's diving locker. Both economical and convenient, the NUC Oceanographic Tower can provide an answer to many shallow water research problems.

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**NAVAL UNDERSEA RESEARCH  
AND DEVELOPMENT CENTER**  
San Diego, California

*Reviewed and approved by R. H. Campbell, Cdr.,  
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