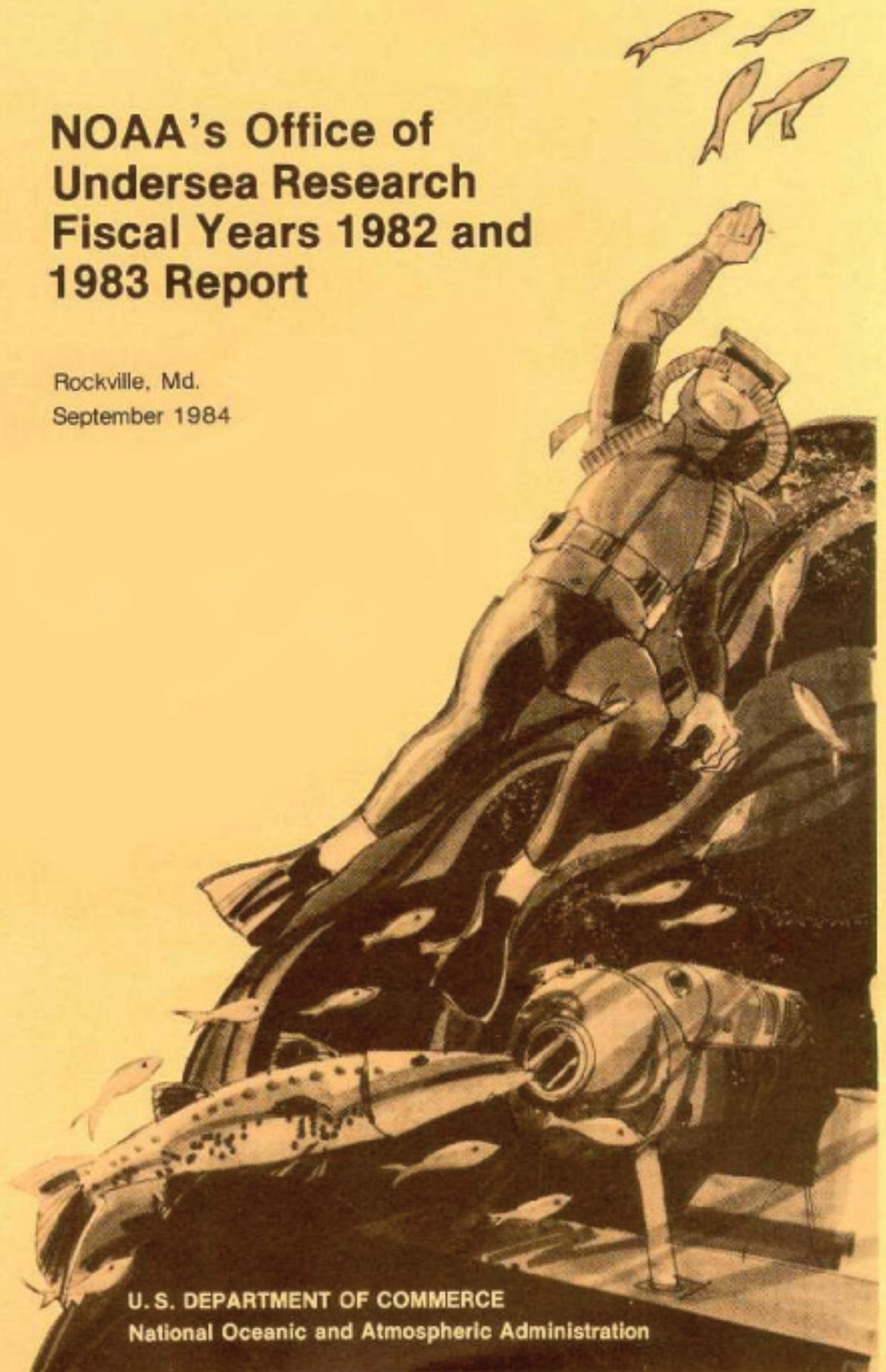




# NOAA's Office of Undersea Research Fiscal Years 1982 and 1983 Report

Rockville, Md.  
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U. S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration

## SECTION II

# NOAA's NATIONAL UNDERSEA RESEARCH PROGRAM

### HISTORY

The responsibility for developing programs for the assessment, protection, development, and utilization of the U.S.'s coastal zone resources was given to NOAA at the time the agency was established. NOAA's Undersea Research Program was initiated in 1977 to provide manned underwater facilities and other research support for scientific investigations of coastal marine environments and for research into underwater biological, geological, and ecological problems.

Under the program, the first regional underwater research facility was established in St. Croix, Virgin Islands, in 1977. The habitat, HYDROLAB, which had been newly refurbished and purchased by NOAA, was the focal point of the Caribbean program. A review in 1978 of the needs of the undersea research community indicated that the usefulness of NOAA's program would be increased if several undersea research facilities, each located in a scientifically important geographic area, were established. Placing undersea laboratories at scientifically strategic locations permits scientists to take advantage of local personnel and research resources and to develop a better understanding of all of the Nation's coastal zone areas.

To assess the merits of various geographical areas and the ability of institutions to operate a national program, NOAA informed more than 400 academic institutions of its plans to develop and maintain national undersea laboratories. Of the 15 organizations responding, 9 were selected and asked to submit detailed feasibility studies. These studies were thoroughly evaluated by a panel of scientists and engineers familiar with the needs of undersea research and with NOAA's goals and priorities.

The University of Hawaii, the University of Southern California, and the University of North Carolina at Wilmington were chosen to submit formal proposals and became the sites for the second, third, and fourth components of NOAA's national undersea research program. In 1980, NOAA signed cooperative agreements with each of these institutions, thus formally initiating the National Oceanic and Atmospheric Administration's National Undersea Research Program.

In 1982-83, plans were initiated to develop a fifth regional facility off the northeastern coast of the United

States. Headquarters for the new undersea research program are located at the University of Connecticut at Avery Point. Figure II-1 shows the locations of NOAA's existing undersea research program headquarters.

### **NOAA's National Undersea Research Program at Fairleigh Dickinson University (St. Croix)**

The first and most active component of NOAA's undersea research program was the Caribbean-based program operated by the West Indies Laboratory of Fairleigh Dickinson University. The focal point of the program has been and continues to be the habitat HYDROLAB, which is situated on the seafloor of the Salt River Canyon, off the north-central coast of St. Croix, U.S. Virgin Islands. Figures II-2A, B, C, and D show various views of the habitat.

In the first 3 years of the Caribbean program's operation, more than 40 science missions involving 500 days of saturation diving were conducted from the HYDROLAB facility. As tables II-1 and II-2 show, this level of activity continued during fiscal years 1982 and 1983. In FY 1982, 16 undersea research efforts involving scientist/aquanauts from 20 institutions, several disciplines, and 2 foreign countries (Kuwait and France) were carried out; and in FY 1983, a total of 13 HYDROLAB-based missions were conducted. The scientific purpose of these research projects ranged from studies of the life history and behavior of coral reef organisms to the chemical ecology and histocompatibility of sponges to the development and testing of underwater fish marking and release techniques. Photographs taken during these HYDROLAB saturation dives are displayed in figures II-3A, B, C, and D. The results of several HYDROLAB missions have been published in the open literature or were reported on at the first annual symposium (see section IV).

### *Facilities*

In 1977, the Ocean Agents Company refurbished the habitat for NOAA's use. Several views of the HYDROLAB in place on the Caribbean seafloor can be seen in figure II-2. This underwater platform is approximately 5 meters long and 2.5 meters in diame-

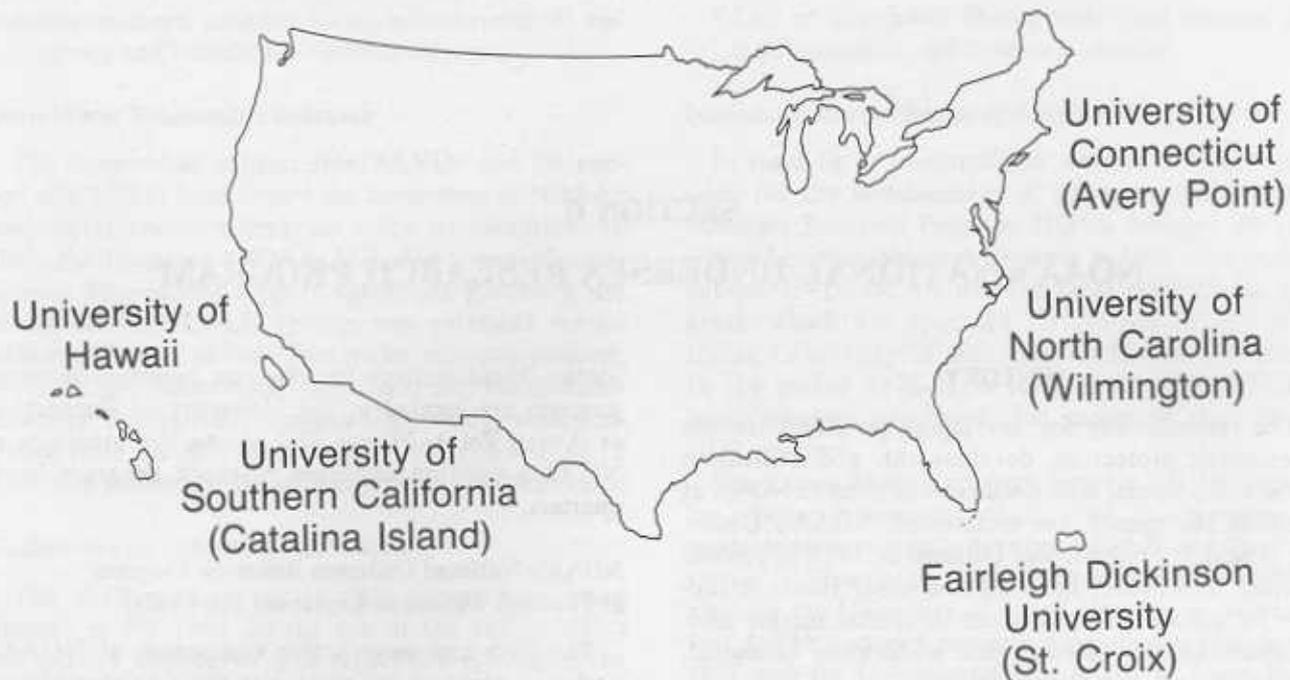


Figure II-1.—Map showing locations of OUR's national undersea research laboratories.

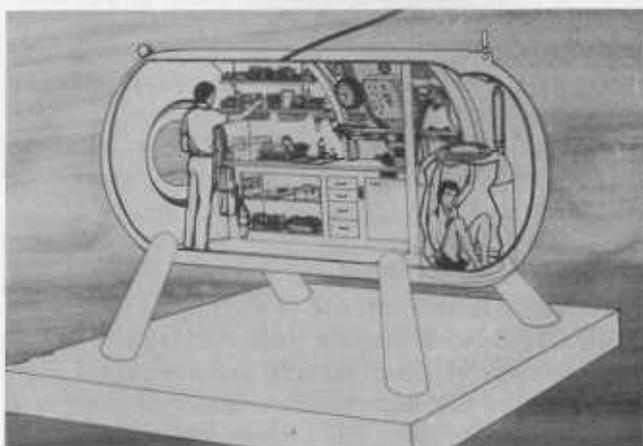


Figure II-2A.—Cutaway view of the habitat HYDROLAB.

ter. It has the capability to support four divers operating in the saturation mode for periods of 14 days.

The HYDROLAB is submerged at a depth of 15.2 meters, but excursion dives can be made to depths of 40 meters using the habitat as a base. The HYDROLAB has a double-lock entrance compartment and a 24-inch (diameter) entrance hatch. (Fig. II-4 shows a diver entering the habitat's hatch.) The facility has six external viewports, running water, electricity, heat, and three bunks for aquanaut/scientists. A diver support barge, shown in Figure II-5, supplies utilities to the habitat.

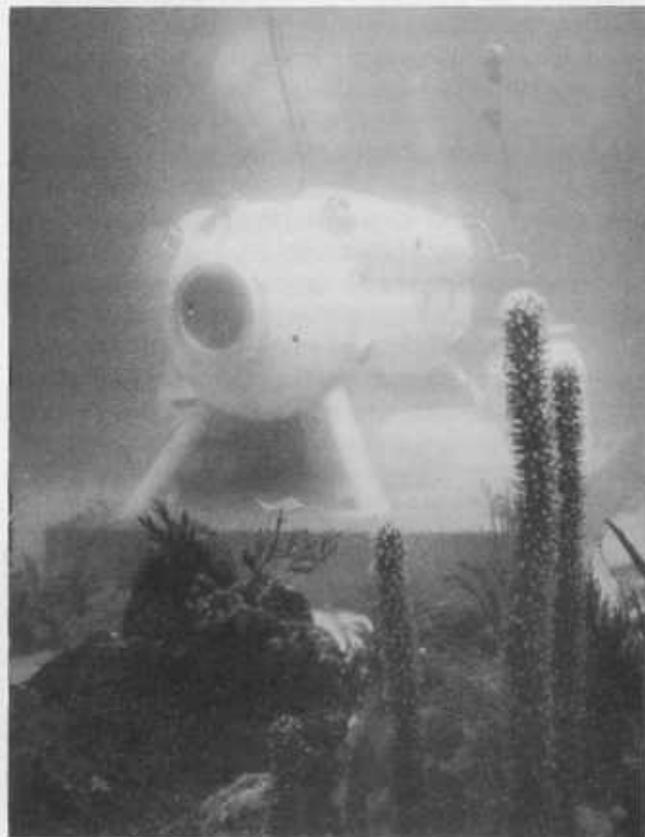


Figure II-2B.—Habitat HYDROLAB in place on the seafloor.



Figure II-2C.—Aquanaut/divers at work in HYDROLAB's laboratory.



Figure II-2D.—Divers in habitat watching colleague enter.

Table II-1.—FY 1982 NOAA's National Undersea Research Program Missions at Fairleigh Dickinson University (St. Croix)

Participating Institutions	Date of Mission and Purpose	Principal Investigator
West Indies Laboratory, Fairleigh Dickinson University	10/26/81—11/7/81 Competitive Behavior of Colonial Invertebrates	Thomas Suchanek
West Indies Laboratory, Fairleigh Dickinson University	11/16/81—11/28/81 Foraging Behavior of Rainbow Parrotfish	John Ogden
National Marine Fisheries Service, NOAA	12/7/81—12/18/81 Development and Testing of Underwater Fish Marking and Release Techniques	Gregg Gitschlag
University of Maryland; Cornell University; University of Georgia; University of Rochester	1/12/82—1/19/82 Analyses of Fish and Invertebrate Coral Reef Communities	Marjorie Reaka
University of Washington; Sarah Lawrence College; Cornell University; University of California	2/1/82—2/13/82 Ecology and Behavior of Caribbean Garden Eel	Myra J. Shulman; Raymond Clarke
California State University; Moss Landing Marine Laboratory	2/22/82—3/6/82 Planktivorous Fish as Nutrient Importers in Tropical Reef Communities	Richard Bray
Johns Hopkins University; University of Texas at Austin; University of Maryland; Smithsonian Institution	3/18/82—3/25/82 Control of Behavior in Colonial Animals	Charles Wahle; Elizabeth Chornesky
University of Puerto Rico; Auburn University	4/5/82—4/16/82 Experimental Transfer of the Isopod <i>Antilocra chromis</i> to the <i>Brown Chromis</i>	Ernest H. Williams, Jr.
University of Maine; University of Georgia	4/26/82—5/8/82 Role of Productivity and Herbivory in Structuring Tropical Algal Communities	Robert S. Steneck
University of Maryland; University of Georgia; University of Newcastle-upon-Tyne (United Kingdom)	5/17/82—5/29/82 Analysis of Ecological Processes that Structure Fish and Invertebrate Reef Communities	Marjorie Reaka

**Table II-1.—Continued**

<b>Participating Institutions</b>	<b>Date of Mission and Purpose</b>	<b>Principal Investigator</b>
U.S. Virgin Islands, Department of Conservation and Cultural Affairs	6/7/82—6/17/82 Relationship of Coral Recruitment and Grazing Intensity to Distribution of Algae and Corals	Caroline Rogers
Kuwait Institute for Scientific Research (Kuwait); West Indies Laboratory, Fairleigh Dickinson University	6/24/82—7/2/82 Movements of Grouper Fish in Relation to Artificial Reefs	Nigel Downing; Camille Al-Zehar
Utah State University; University of Michigan	7/12/82—7/24/82 Dynamics of Diel Migratory Activity of Reef-Dwelling Demersal Zooplankton	David Liddell; Sharon Ohlhorst
University of Rochester; University of Washington; Woods Hole Oceanographic Institution; Utah State University; U.S. Navy Oceanographic Office	8/2/82—8/14/82 Taphonomy and Environmental Indicators of Extant Reef Biota	Carlton Brett
University of New Hampshire; University of Georgia; University of Washington	8/23/82—9/4/82 Competition Among Encrusting Colonial Invertebrates in Open Reef Habitats	Thomas Suchanek
University of Hawaii at Manoa	9/13/82—9/25/82 Social Organization of Rock Beauty Angelfish	Ernest S. Reese

**Table II-2.—FY 1983 NOAA's National Undersea Research Program  
Missions at Fairleigh Dickinson University (St. Croix)**

<b>Participating Institutions</b>	<b>Date of Mission and Purpose</b>	<b>Principal Investigator</b>
University of Maryland; University of Georgia; University of Pennsylvania; Harvard University	1/10/83—1/22/83 Patterns of Life History and Behavior in Coral Reef Organisms	Marjorie Reaka
National Marine Fisheries Service, NOAA; Texas A&M University; Office of Marine Operations, NOAA	2/3/83—2/10/83 Attraction of Pelagic Fishes to Midwater Structures	Ian K. Workman
Skidaway Institute of Oceanography; University of Georgia	2/21/83—3/5/83 Chemical Ecology and Histo- compatibility of Sponges	Nancy M. Targett
University of Puerto Rico; Auburn University	3/14/83—3/26/83 Early Life History and Host Relationships of the Isopod <i>Anilocra chromis</i>	Ernest H. Williams, Jr.
State University of New York at Stony Brook; Fresno State University	4/4/83—4/16/83 Growth of <i>Caulerpa</i> spp. and Its Relationship to Sediment Habitat	Susan L. Williams
Marymount Palos Verdes College; University of Southern California	4/25/83—5/5/83 Influence of Fish Predators on Activity Patterns of <i>Diadema antillarum</i>	James A. Coyer
California State University at Long Beach	5/30/83—6/11/83 Planktivorous Fish as Nutrient Importers in Tropical Reef Communities	Richard Bray
San Francisco State University; Tiburon Center for Environmental Studies; National Marine Fisheries Service, NOAA	6/20/83—7/2/83 Ecological Function and Fishery Resources of <i>Halophila</i> Beds	Thomas Niesen

Table II-2.—Continued

Participating Institutions	Date of Mission and Purpose	Principal Investigator
University of Virginia	7/14/83—7/21/83 Assessment of Deep <i>Halophila</i> Seagrass Meadow as Fish Habitat and Feeding Ground	Michael Robblee; Carol McIvor
Kuwait Department of Mariculture and Fisheries (Kuwait); Fairleigh Dickinson University	7/8/83—7/21/83 Artificial Reef Utilization by Grouper Fish	Nigel Downing; Camille Al-Zehar
Florida State University; University of Puerto Rico	7/29/83—8/15/83 Role of Herbivorous Fish in Nitrogenous Regeneration on Coral Reefs	Alina Szmant-Froelich
Laboratoire de Biologie et D'Ecologie Marines (France)	9/12/83—9/22/83 Morphological Variation of <i>Caulerpa</i> ; Study of Macrobenthic Species on the Shelf Bottom	Claude Falconetti
Universite de Liege (Belgium)	9/12/83—9/22/83 Sociobiology and Sex Change of Labroid Fishes	Daniel Bay

Like all NOAA undersea research vessels, the HYDROLAB is certified by the American Bureau of Shipping (ABS). All research personnel involved in HYDROLAB projects undergo thorough training and certification programs before participating in NOAA-sponsored missions. The success of NOAA's underwater safety program is attested to by the outstanding record of safety of the HYDROLAB program, which has logged more than 70 undersea research missions without a single serious mishap.

#### NOAA's National Undersea Research Program at the University of Hawaii

The University of Hawaii is the base for NOAA's Hawaiian Undersea Research Program component. The program headquarters is located at the Makai Research Pier at Makapuu Point, on the island of Oahu. The program relies on the two-man research submersible MAKALI'I and the Launch, Recovery, and Transport (LRT) vehicle HIILAWA (see fig. II-6).

Research areas emphasized by the program include:

- Fisheries: ecosystem assessment and dynamics; habitat degradation and enhancement; harvesting impact; animal behavior; and gear development
- Pollution: manner and physical effects of waste disposal; behavioral, biochemical, and physiological responses of marine organisms to pollutants
- Seafloor properties and processes: geological, geochemical, and geophysical aspects, including gra-

dients in the water column near the seafloor, sediment transport, stability, fluxes, and mineral resources

- Ocean technology and services: marine sanctuary monitoring; engineering; equipment testing and recovery; medical and diving physiology; and archaeology

The program peer review panel reviews research proposals submitted on these and other areas of scientific importance and recommends to the program those judged as having the greatest scientific merit, cost-effectiveness, and suitability in relation to NOAA's overall program.

#### Facilities

The principal research vessel used in the Hawaiian program is the one-atmosphere submersible MAKALI'I (fig. II-7). This submersible has a depth capability of 380 meters and an operating speed of from 1 to 3 knots. It has been certified as an A-1 submersible by the ABS, after an extensive period during which it underwent disassembly and refurbishing. The ABS test dive of the newly modified submersible took place July 15, 1981. The MAKALI'I can accommodate a pilot, a scientist/observer, and a 200-pound payload.

The Launch, Recovery, and Transport (LRT) vehicle HIILAWA was designed to transport, launch, and recover the MAKALI'I. SCUBA divers aboard the HIILAWA control the vehicle as it is towed, carrying the MAKALI'I (fig. II-8) to the launch site. Once the