NOAA Aquaculture Plan Forsees Increased World Seafood Demand, Possible Shortage

Although worldwide output from aquaculture has about doubled in the last 5 years to some 6 million metric tons, a shortage in the global supply of seafood can be expected in 10 years, according to a report just published by the National Oceanic and Atmospheric Administration, a Commerce Department agency.

Edited by John B. Glude, NOAA Aquaculture Program Coordinator, the plan describes the increasing world demand for seafoods, notwithstanding current landings exceeding 64 million metric tons, and an estimated maximum harvest of 100-150 million metric tons.

Roughly 10 percent of world fisheries production comes from aquaculture. In the United States, public aquaculture of salmon and private culture of oysters, catfish, trout, shrimp, clams, and other species yield about 65,000 metric tons, about 3 percent of landings, or 2 percent consumption of fishery products.

The potential is good for increasing fisheries production in the United States, the report states, by expanding public hatcheries, and by encouraging private farming of fish and shellfish. However, a national policy is needed to recognize that the development of aquaculture is in the national interest, and to call for the protection of coastal and estuarine environments so that aquatic foods can be produced in these areas.

The plan includes state-of-the-art summaries of the culture of high priority species, such as salmon, marine shrimp, freshwater prawn, American lobster, oysters, and marine plants; medium priority species including clams, catfish, abalone, scallop, and yellow perch; and low priority species, such as mussels, crab, and various marine fishes. Most of the expanded program would be conducted by joint efforts with individuals, firms, educational institutions, or State agencies.

Copies of the NOAA Aquaculture Plan, published as a NOAA Special Report, May 1977, are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

Fishery Product Consumption Rose in 1976

Led by a 10 percent increase in fresh and frozen fish consumption, per capita consumption of fishery products increased to 12.9 pounds in 1976, from 12.2 the previous year, according to the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS), a Commerce Department agency. Rising individual income and increased sales in the food service sector during 1976 were prime factors in the 6 percent overall improvement in the finfish market, notwithstanding price hikes during the year.

Expanded fishery zones declared by the major fishing nations may tighten the supplies of groundfish blocks and fillets. Moreover, strong competition overseas for groundfish products may draw imports away from the United States, NMFS said. Pollock block imports from the Republic of Korea could also decrease because of restrictions by the United States and by the Soviet Union on fishing within their 200-mile zones.

Tight supplies of finfish in relation to the anticipated quantity demanded will likely cause prices to rise. However, price increases could be limited by buyer resistance and by competition from relatively lower priced meat and poultry products.

Larger supplies, along with increased consumption, characterized the market for finfish products. Cod fillet sales posted a 34 percent gain above a year ago, while sticks and portions increased 14 percent. Production of sticks and portions rose 3 percent and 15 percent, respectively, prompting imports of blocks to increase 21 percent, a record level.

Fillet supplies increased slightly, led by a 30 percent gain in cod imports and 20 percent gains in both flounder and haddock imports. Increased supplies of salmon were the result of a 64 percent increase in domestic production. Species that experienced lower supplies during 1976 included ocean perch, turbot, and halibut.

Although the total per capita consumption for canned fish was unchanged, salmon and sardine sales were above 1975 levels, while consumption of canned tuna declined slightly.

Cod, Haddock, Yellowtail Flounder Rules Released

Final regulations governing the catch of cod, haddock, and yellowtail flounder by domestic fishermen have been published by the National Marine Fisheries Service. They do not apply to foreign fishermen who are forbidden to retain any of the three species they might catch.

These are the first set of final regulations to be published by the Service implementing a fishery management plan developed by one of the eight Regional Fishery Management Councils. The "Atlantic Groundfish Plan" was developed by the New England Council. The regulations replace emergency regulations implemented last March by Secretary of Commerce Juanita M. Kreps, which expired 12 June.

Under the final regulations now effective, the quota of 10,000 metric tons of yellowtail flounder that may be caught east of 69 degrees west longitude are allocated on a quarterly basis as follows: 1 January through 31 March, 1,500 mt; 1 April through 30 June, 2,500 mt; 1 July through 30 September, 3,500 mt; 1 October through 31

December, 2,500 mt. An additional 4,000 mt may be taken west of 69 degrees as a bycatch when other species are caught.

The quota for cod caught by recreational fishermen has been deleted from the final regulations because of insufficient catch data to establish a quota. In order to obtain this data, all vessels under 100 tons carrying passengers for hire will have to keep logs and record where the fish are caught, the approximate number and weight of cod and haddock caught daily, and the number of persons fishing.

Fishermen may not keep any haddock less than 16 inches long, except that 10 percent of the weight of the total catch by commercial fishermen may be undersized fish, and recreational fishermen may keep a maximum of two undersized haddock or cod per angler each trip. United States fishing vessels catching any of the species must have proper size identifying markings in a manner described in the regulations. The changes in the final regulations are the result of recommendations of the New England Fishery Management Council following a study of the emergency regulations.

First 1977 Porpoise Mortality Reported

An estimated 4,654 porpoises were killed 14 March through 9 June incidental to yellowfin tuna purse seine fishing in the eastern tropical Pacific Ocean, according to the National Oceanic and Atmospheric Administration's National Marine Fisheries Service. The average number of porpoise killed each time the nets were set was 4.4 per set. An average of 0.39 were killed for each ton of yellowfin tuna caught by the U.S. tuna purse seine fleet.

The total allowable 1977 mortality under present regulations is 59,050. Estimates of porpoise deaths are based on radio reports from NMFS observers assigned to 34 U.S. tuna purse seiners. The Commerce Department agency will make adjustments in later reports for any mortality that may have occurred during 1 January through 13 March 1977, when some porpoise-associated fishing took place under court order.

A general permit for taking marine mammals incidental to yellowfin tuna purse seine fishing operations was issued 15 April by the NMFS to the American Tunaboat Association, San Diego, Calif., on behalf of all U.S. yellowfin tuna fishermen. The allowable mortality of no more than 59,050 porpoises is a 24 percent reduction from the 1976 quota of 78,000.

Since 14 March, yellowfin tuna fishermen have been allowed to fish on porpoise under a court order that permitted them to kill up to 9,972 porpoises until a new permit was issued. However, they were prohibited from taking any whitebelly and eastern spinner porpoise. Under the 1977 permit, they are permitted to kill up to 7,840 whitebelly but the prohibition on eastern spinner remains.

By species and stock, the total allowable 1977 kill and the estimated kill during the period 14 March-9 June are as follows:

Species or stock	1977 total	Est. kill
Spotted dolphin (offshore)	43,090	3,105
Spinner (whitebelly)	7,840	1,178
Common (northern)	400	0
Common (central)	1,600	0
Common (southern)	5,600	280
Striped (northern)	40	0
Striped (northern equatorial)	400	86
Other dolphin (includes bottlenose, rough-toothed, Fraser's, and Risso's dolphins, and short-finned pilot whales)	80	5

A clarification of regulations for tuna fishing on porpoise now permits fishermen to continue a set on porpoise even if eastern spinner, a depleted species, is identified after the set is begun.

Under the Marine Mammal Protection Act of 1972, the fishermen would be subject to penalties as a result of such unintentional taking. Under the clarification, when the tunaboat captain is satisfied that a school does not contain eastern spinner, he may begin his set. Should eastern spinner be sighted later and accidentally encircled or killed in the course of completing the set, this will not be cause for issuance of a notice of violation, provided all other procedures required by regulation have been followed.

Oil Impact on Puget Sound Organisms Eyed

Contracts totaling nearly $150,000 have been awarded by the National Oceanic and Atmospheric Administration (NOAA) to make baseline studies of marine organisms which might be affected by pollution resulting from petroleum transportation and refining activities in the Puget Sound region. The awards went to the University of Washington in Seattle, the University of Alberta in Edmonton, Alberta, Canada, and Western Washington State College at Bellingham from the Commerce Department agency's Environmental Research Laboratories of Boulder, Colo. Huxley College of Environmental Studies at Western Washington State received $43,086, the College of Fisheries' Research Institute at the University of Washington, $54,600, and the Department of Microbiology at the University of Alberta, $49,992.

The contracts are part of an intensive study of the Strait of Juan de Fuca and northern Puget Sound to determine the probable impact of increasing oil shipment and refining activities there. The study is funded by the U.S. Environmental Protection Agency, and managed by NOAA's Marine Ecosystems Analysis Puget Sound program office.

Western Washington State College will study the types of sea-floor dwelling organisms which inhabit the tidal areas along the west coast of Whidbey Island, Wash., between Deception Pass and Admiralty Head. This information will be added to similar data gathered previously in northern Puget Sound, San Juan Islands, and the Strait of Juan de Fuca. Results of these studies will form a comprehensive picture of sea-floor marine communities in the region.

Scientists at the University of Washington will analyze how oil pollutants may be consumed by marine organisms and transferred to other aquatic populations and to human consumers. The research will concentrate

on four sites where existing oil refineries are located or oil transfer facilities are proposed: Cherry Point near Ferndale; March Point near Anacortes; Burrows Bay; and Port Angeles, Wash.

In a related study, the University of Alberta will research the microbial breakdown of petroleum in the Puget Sound region. Results of the study will provide baseline information on microbial action on crude oil, specifically Prudhoe Bay crude oil from Alaska, in the Strait of Juan de Fuca and northern Puget Sound.

New FCMA Foreign Fishing Fees Proposed

A schedule of fees to be paid by foreign vessels and foreign nations fishing within 200 nautical miles of the U.S. coasts has been proposed for 1978 by the National Oceanic and Atmospheric Administration, a Commerce Department agency. Such fees are required by the Fishery Conservation and Management Act (FCMA) of 1976 that extended U.S. fisheries jurisdiction to the 200 nautical mile limit on 1 March, 1977.

The only change from the 1977 schedule is the use of updated fish prices as the basis for calculating the poundage fee proposed for 1978. In most cases, the proposed poundage fees would be computed on the basis of 1976 average ex-vessel prices contained in "Fisheries of the United States."

The average ex-vessel (dockside) value per metric ton follows for each species: butterfish, $622; Pacific cod, $282; tanner crab, $441; Pacific flounders (except halibut), $387; Pacific hake, $32; red hake, $185; silver hake, $184; Atlantic herring $87; Pacific herring, $344; Atlantic mackerel, $259; Jack mackerel, $110; other Atlantic fin fish, $334; Pacific rockfish, $298; and sablefish, $399.

Prices will be based on foreign countries of the following species not landed in the United States; pelagic armorheads; atka mackerel; other Pacific ground fish; Alaska pollock; and snails (meats).

Prices for Atlantic squid, $414, and for Pacific squid, $55, are based on raw data used to develop the value for squid in "Fisheries of the United States".

More than $10 million dollars have been paid this year to the U.S. General Treasury by foreign nations for fishing within the 200-mile limit off U.S. coasts. Assuming that the projected number of foreign vessels are permitted to fish, and that allocations are eventually realized, revenues from the fees in 1977 are expected to amount to $10.4 million from the poundage fees based on the ex-vessel value of the fish taken, $1.4 million from the vessel permit fees, and $750,000 from observer fees for a total of $12.5 million.

The proposed schedule provides that each foreign fishing vessel will be charged permit fees of $1.00 per gross registered ton; 50 cents per gross registered ton for vessels which only process fish; and $200 per vessel for support vessels which neither catch nor process fish. Moreover, each foreign nation with fishing vessels in the zone will be charged a fee of 3.5 percent of the total ex-vessel value of fish allocated to the nation.

Hearings Consider Joint Ventures Between United States and Foreign Firms

A series of public meetings has been conducted to obtain comments on the possibility of American-caught fish being sold to foreign processing vessels within the 200-mile fishery conservation zone, the National Marine Fisheries Service (NMFS) reports. The Commerce Department agency is concerned that such arrangements might cause overfishing of certain stocks by U.S. fishermen and disrupt the management system provided under the Act.

Several requests have been received by NMFS, a part of the National Oceanic and Atmospheric Administration, to use foreign processing vessels to process fish caught by U.S. fishermen. Some of those foreign processing vessels are owned by joint U.S.-foreign interests. Moreover, some of those vessels hold permits that entitle them to operate in the U.S. fishery conservation zone, and some do not. Other inquiries contemplate U.S. fishermen catching and selling certain species of fish in an amount that could result in the total domestic and foreign catch exceeding the optimum yields established by preliminary management plans.

At present, foreign processing vessels with permits to operate within the zone are not restricted as to whose fish they may process as long as they comply with the provisions of the permits.

"Under the Fishery Conservation and Management Act of 1976, we must first protect the resource, make sure U.S. fishermen and the U.S. fishing industry have the first chance at using the resource, and then make any surplus available to foreign fishermen," said Robert W. Schoning, Director of NMFS.

"We need nationwide input into this important policy decision to be sure that we do not take any premature action that may have to be reversed and in the process hurt the resource and the U.S. fishing industry," said Schoning. "Waiting until the Regional Fishery Management Councils and others have had a chance to study the situation will not cause serious harm to the resources, U.S. industry, or foreign interests."

Discussions at the meetings have centered upon transactions at sea between foreign support vessels and U.S. fishing vessels. Possible courses of action identified by NMFS include such actions as modifying existing preliminary management plans and regulations in 1977; changing the optimum yield statement with or without new biological, social, or economic data; adjusting existing foreign allocations; modifying existing permits and issuing new ones; establishing a long-range policy for United States and foreign joint participation in fishing ventures under both preliminary and fishery management plans; and taking other related steps. The Service intends to publish a rulemaking procedure concerning modification of permits.

NOAA, USGS Publish New Coastal Zone Maps

A series of 11 coastal zone maps of U.S. areas showing both the topography of the land and the bathymetry of the ocean and other water areas will be published jointly in the next 15 months by the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Geological Survey, the two agencies have announced. The series includes maps of the Houston and Bay City (Tex.) quadrangles; the Savannah and Brunswick (Ga.) quadrangles; and the Los Angeles, Monterey, Santa Ana, San Diego, Long Beach, Eureka, and Smith River (Calif.) quadrangles.

Effective administration of a variety of coastal zone activities, including Federal OCS oil and gas leasing and development, near-shore and onshore oil and gas programs administered by states, Federal water pollution activities, and the new Coastal Energy Impact Program require maps that accurately delineate the land and ocean bottom characteristics, according to officials of NOAA's National Ocean Survey. NOAA is a Commerce Department agency.

The multicolor maps, commonly called "topo-bathy maps," are designed for use mainly by coastal zone planners and administrators as well as for conservationists, environmentalists, and others interested in programs, projects, and activities in coastal wetlands, on the Outer Continental Shelf (OCS), and in other coastal areas.

Robert H. Lyddan, chief of the Geological Survey's Topographic Division, USGS National Center, Reston, Va., and R. Adm. Allen L. Powell, director of NOS, Rockville, Md., said the new multipurpose maps represent a marriage of the USGS land topographic information and the NOS bathymetry (topography of the ocean bottom) into a single product, meeting many different needs for a variety of users, where presently several different maps are being used.

The USGS and NOS already have published two 1:250,000 scale (1 inch represents 4 miles) topo-bathy maps in the series, each covering about 8,000 square miles (20,100 square km). The first was an experimental version of part of the coastal zone of North Carolina, published in 1975 and identified as the Beaufort Quadrangle. It has elevation contour line intervals of 25 feet on land, 2 m in water to the 200-m depth, and 10 m in water over 200 m deep.

The second map covers part of the lower New Jersey coast and includes parts of Delaware, Delaware Bay, and the Delaware River as far up as Philadelphia. Identified as the Wilmington (Delaware) Quadrangle, the map was published in two versions: one in the standard format and the other overprinted with the Bureau of Land Management's OCS lease blocks.

More than 100 of the 1:250,000-scale maps would be required to cover the entire coastal zone of the conterminous states and about 85 such maps would be needed for the coasts of Alaska and Hawaii. The two Federal officials said production of larger scale maps at 1:24,000 (1 inch represents 2,000 feet) and 1:100,000 (1 inch represents 1.6 miles) also are underway for areas along the coast of Georgia.

Copies of the Beaufort and Wilmington maps may be purchased, prepaid, for $2 each, from the Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202, with checks or money orders payable to the U.S. Geological Survey; or from the National Ocean Survey, Distribution Division C44, 6501 Lafayette Avenue, Riverdale, MD 20840, with checks or money orders payable to NOS, Department of Commerce. The Beaufort map is identified as Map NI 18-4 and the standard format Wilmington map is identified as Map NJ 18-2. The Wilmington map overprinted with the BLM lease blocks, identified as Map NJ 18-2 OCS, is available only from the NOS.

OCEANLAB FACILITY PROPOSALS SOUGHT

The National Oceanic and Atmospheric Administration (NOAA) requested proposals earlier this year for a contract to conduct studies leading to development of "Oceanlab," planned to be the world's most advanced mobile underwater laboratory.

Oceanlab will be a national facility for underwater science and engineering, supporting research on living and nonliving resources, on the development of offshore energy sources, and on obtaining information for marine environmental and resource management. Providing knowledge to help develop and verify safety standards and requirements for undersea operations and diver safety and effectiveness will also be an important part of Oceanlab's mission.

The proposed system would include two components: 1) a mobile undersea facility to operate as a manned engineering and science laboratory, capable of working at depths to either 300 or 1,000 feet (91.5 or 305 meters). The depth capability selected will depend upon relative costs and other trade-offs; and 2) a lockout minisub that can extend the research depth to 2,000 feet (609.5 m), with diver lockout to 1,500 feet (457 m). Mission performance requirements, system configuration, and technical specifications and designs developed under the contract will contribute to the development of construction proposals.

The successful bidder will not be prohibited from providing or constructing any of the systems or major components, or from acting as subcontractor or consultant to the supplier, NOAA officials said.

The concept for Oceanlab was drawn up within the Commerce Department agency's Office of Ocean Engineering by its Manned Underseas Science and Technology office. It followed extensive consultations with government, academic, and industrial research organizations, commercial firms with underwater expertise, and the recreational diving community. No new hardware developmental work will be under-

taken, as the technology already exists for construction of undersea craft with comparable depth capabilities.

In concept—final design details may vary considerably—Oceanlab will be about 125 feet (38 m) in length, with about a 20-foot (6-m) beam, and 450-600 tons displacement. In addition to a small crew it will have a scientific diver capacity of about nine, some of whom can be maintained at one atmosphere (surface pressure). The others can be pressurized to depth for out-of-laboratory research excursions.

Oceanlab's range will be approximately 1,000 nautical miles (1,853 km) on the surface, and 50 to 100 nautical miles (92.5 to 185 km) submerged, with a total 30-day duration. All operations will be independent of surface support.

The companion "lockout-minisub" will be carried piggy-back, and will operate with the larger vehicle. It is conceived at present as a vehicle of about 35 feet (10.7 m) in length, with capacity for about six persons; two vehicle operators at one atmosphere, and up to four divers who can operate from a pressurized compartment. It will have a submerged range of 20 to 30 nautical miles (37 to 55.5 km) and a top speed of about 3 knots.

Fishermen's Protective Act Vessel Fees Listed

The National Marine Fisheries Service has announced fees to be paid by U.S. fishing vessel owners to protect them against losses if their vessels are seized by foreign countries. The rates are in effect 1 July through 30 September 1977, according to the Commerce Department agency.

Under the Fishermen's Protective Act, NMFS uses the fees to help pay costs to owners whose vessels are sized under jurisdictional claims not recognized by the United States. When a vessel is seized the owners are paid for confiscation of fish, vessel, or gear; any damage incurred to the vessel; other costs such as fuel, food, and port fees while they are seized; and up to 50 percent of lost fishing time.

The rate schedule calls for a flat fee of $60 on each vessel, plus an added fee of 45 cents per ton on vessels of less than 500 gross tons, and 62½ cents per ton on vessels of more than 500 gross tons.

Although the rates are the same as last year's, the skippers will be charged only one-third as much because the fee period is only one-third as long, ending with the expiration of the Act on 30 September. Following this period, if no seizures occur, the fees will be refunded, provided the Fishermen's Protective Act is not extended. If the Act is extended, the money will be applied against fees for the following year, ending 30 September 1978.

Since the beginning of the program, approximately $1.5 million in fees have been collected and an additional $2.5 million have been appropriated. Approximately $3 million have been paid in claims resulting from seizures by Peru, Ecuador, and Panama of U.S. vessels off their coasts.

BLUEFIN TUNA RULES OKAYED

Regulations to help conserve the supply of Atlantic bluefin tuna—a favorite of both commercial and recreational fishermen—were adopted in June by the National Marine Fisheries Service. They took effect immediately, the Commerce Department agency announced. The regulations apply to catches off the east coast of the United States during 1977, and change some of the rules that were in effect last year.

Under the new regulations all recreational and commercial fishermen who fish for bluefin weighing more than 300 pounds must obtain a certificate from the NMFS Regional Director in Gloucester, Mass. In addition, purse seine fishermen catching bluefin weighing from 14 to 115 pounds must also obtain such a certificate. Purse seine fishermen could not catch bluefin weighing more than 300 pounds until September 1. NMFS is part of the National Oceanic and Atmospheric Administration.

For tuna weighing between 115 and 300 pounds, a special 25-ton quota has been established to obtain scientific data and for tagging purposes. Tuna weighing more than 300 pounds cannot be caught and released unless they have been tagged with NMFS tags.

Vessel certificates issued for 1977 will be valid until returned to the Regional Director or until the vessel leaves the fishery. If ownership of the vessel changes, the new owner must obtain a new certificate for that vessel.

Additional detailed regulations apply only to purse seiners and restrict their net size to 4.5 inches in the main body or 8 inches in the selvedge; they may not have a thread count of less than 24 anywhere in the net; and nets cannot exceed 2,700 feet overall. Purse seine vessels and gear must be inspected by an NMFS agent prior to fishing at the beginning of the season, and purse seine fishermen must make daily reports of their catches to NMFS.

The regulations were issued under the authority of the Atlantic Tunas Convention Act of 1975, which ratified U.S. participation in the International Commission for Conservation of Atlantic Tunas. The Commission is responsible for the study of the populations of tunas and tuna-like fishes in the Atlantic Ocean, and recommends conservation proposals for joint action by member governments to maintain stocks at high levels. Member countries of the Commission are Brazil, Canada, Cuba, France, Ghana, Ivory Coast, Japan, Korea, Morocco, Portugal, Senegal, South Africa, Spain, and the United States.

Copies of the complete 1977 regulations may be obtained from the Director, National Marine Fisheries Service, NOAA, Washington, DC 20235, or the Director, Northeast Region, NMFS, NOAA, 14 Elm Street, Gloucester, MA 01930.

Marine Species Checked for Anti-Cancer Drugs

A team of scientists at the University of Oklahoma—almost 500 miles from the nearest salt water—is collecting marine animals from as far away as the Caribbean and Bermuda to determine if

they contain substances that could prove helpful in the fight against cancer and heart disease.

The project, which received a $100,000 Sea Grant from the National Oceanic and Atmospheric Administration last summer, has been supported by the Commerce Department agency since 1971. During that time, the Oklahoma researchers have extracted more than 200 chemical compounds which have shown promise in experiments with laboratory animals either as anticancer agents or as substances that are active on the central nervous system or the heart and circulatory system.

Professors L.S. Ciereszko, F.J. Schmitz, and P.N. Kaul and their students skin dive to collect their specimens from tropical coral reefs of the Bahamas, Jamaica, Florida, and Bermuda. The Oklahoma team first derives crude extracts from the specimens. After any positive action of the extracts has been confirmed, they are subjected to chemical study to isolate the pure compounds that have potential usefulness as drugs. The structure of these compounds is then determined.

Larger quantities of the compounds are then obtained—by harvesting the animals they came from or by synthesizing them in the laboratory—and referred to interested pharmaceutical companies for preclinical and clinical studies required before a new drug can be introduced.

Marine organisms of the greatest interest to the Oklahoma scientists include corals, sea whips, sea fans, anemones, and other animals low on the evolutionary ladder. The group is also studying certain sponges because their extracts lower blood pressure and improve the tone of the heart muscle. Natural and synthetic chemical compounds with these properties are potentially useful in treating hypertension and heart disease.

Although the search for these drugs from the sea starts with animals found in nature, it is unlikely that they will be the ultimate source of any useful drugs that may be discovered. According to the University of Oklahoma scientists, after the structures of the compounds are known, it will generally be cheaper to produce commercial quantities in the laboratory by synthesizing the drugs than by obtaining them from natural marine resources.

Introduction of a new drug into clinical use normally requires 7 to 10 years after its initial discovery. In the case of natural drugs, the preclinical development alone—detection, isolation, identification, evaluation, and toxicological studies—may require 5-10 years.

Marine, Atmospheric Institute Initiated

A cooperative institute linking the University of Miami and the Environmental Research Laboratories of the National Oceanic and Atmospheric Administration (NOAA) has been established within the oceanographic complex on Virginia Key in Miami, Fla. Henry King Stanford, President of the University of Miami, made the announcement with Robert M. White, NOAA Administrator, in early summer.

The Cooperative Institute for Marine and Atmospheric Studies, called CIMAS, is intended to serve as a focal point for concentrated research on specific scientific problems of the ocean and atmosphere by specialists from the parent organizations. From time to time, scientists from elsewhere in Florida, the nation, or the world will be named visiting fellows at CIMAS to augment the expertise of the Miami oceanographic laboratories.

As a first assignment, CIMAS will consider oceanic influences on the earth's climate over periods of seasons, years, and decades. Such climatic fluctuations are not well understood by scientists, but can have significant economic and political consequences.

The founding fellows of CIMAS will be Eric B. Kraus and Claes G. Rooth of the University of Miami's Rosenstiel School of Marine and Atmospheric Science, and Ants Leetmaa of the Commerce Department agency's Atlantic Oceanographic and Meteorological Laboratories.

Kraus will serve as director of the fledgling organizations. A noted specialist in air-sea interaction, he was director of the NATO Advanced Study Institute on Modelling and Prediction of the Upper Layers of the Ocean, and has been chairman of the Rosenstiel School's division of atmospheric science for many years. Rooth, who has been chairman of the School's division of physical oceanography, has worked in recent years on the rate at which the oceans transport heat to high latitudes, and the dynamics of this climatically important process. Leetmaa, a physical oceanographer, has had an active part in POLYMODE, an international experiment to study mesoscale ocean variability.

Environmental Satellites Launched for NOAA Studies

A new environmental monitoring satellite, positioned to keep watch over the eastern half of the United States and the Atlantic Ocean, was launched 15 June, in time for this year's hurricane season. The satellite, GOES-2, is the latest in a series of Geostationary Operational Environmental Satellites to be operated by the National Oceanic and Atmospheric Administraion (NOAA). It was placed into an earth synchronous orbit at an altitude of about 22,300 miles (35,800 km) with a velocity which will keep it in position over the equator above South America.

From that position, instruments aboard the satellite will let it "see" the development of hurricanes in the tropical Atlantic or Caribbean, and follow any storm's movement. The satellite routinely transmits imagery back to earth every half hour, day and night; more frequently when necessary. GOES-2 is expected to replace an earlier spacecraft of the same series in maintaining the east coast and Gulf watch. Another satellite of the series is positioned above the equator over the Pacific Ocean, watching the western half of the United States and the Pacific as far west as Hawaii.

Originally conceived as weather satellites, the geostationary spacecraft do provide a host of data of importance

to weather forecasters. They use both visual and infrared imagery for severe storm evaluation and to analyze cloud cover, winds, ocean currents, fog distribution, storm circulation, snow melt, and other environmental phenomena.

But other instruments on board enable the satellite to receive and transmit to earth information from data collection platforms on land and in the oceans; such information as water levels in rivers and reservoirs, ocean wave heights, rain and snowfall measurements, and the like. Additionally, from digital data provided by the satellite, scientists are able to determine wind speeds and directions and cloud heights. Instruments also monitor solar "storms" by measuring X-rays and high energy particles emitted by the sun.

Since May 1974, when the first spacecraft of the series was launched, the use of data has rapidly expanded until today the information is used by such divergent interests as marine shipping companies, forestry officials, and commercial fishermen.

Infrared radiometers provide Atlantic Coast and Gulf of Mexico shipping with precise information on the locations of the Gulf Stream and the Gulf Loop Current, enabling ships to utilize or avoid the current in those waters. Gulf fishermen also use the information to find productive fishing grounds.

Both the Coast Guard and Civil Air Patrol use geostationary satellite data in their search and rescue efforts, and current research projects indicate imagery and digital data provided by the spacecraft may be of use to agricultural interests by showing freeze lines, soil moisture content, and the like.

The GOES-2 satellite will be used as part of a planned international research project expected to improve forecast accuracy, increase the length of time over which forecasts can be made, and improve the understanding of the physical processes that affect climate and climatic change.

Known as the first Global Experiment of GARP (Global Atmospheric Research Program), the effort eventually will include similar spacecraft from Europe, Japan, and the Soviet Union.

Manufactured by Ford Aerospace and Communications Corporation, as were the first three spacecraft in the series, GOES-2 is expected to replace GOES-1 as the eastern satellite for NOAA at about 75° west longitude. The earlier spacecraft will be moved to about 105°W on stand-by basis, according to present plans.

Although weighing 1,385 pounds at launch, the GOES-2 satellite was reduced in weight to 647 pounds in orbit, after the fuel in its apogee boost motor—which positions the spacecraft into final orbit—was expended. It is drum-shaped, about 75 inches (190 cm) in diameter, and 11 feet (3.4 m) long.

The satellite's orbit and altitude are matched with the earth's rotation so the spacecraft is placed into what appears to be a stable position above the same spot on earth.

MISSIONS AND SUBSYSTEMS

The GOES-2 satellite carried five basic subsystems aloft to accomplish a variety of missions, including:

1) Providing near-continual, high-resolution visual and infrared imaging over large areas of North and South America and surrounding oceans at least every 30 minutes;

2) Collecting environmental data from up to 10,000 remote observing platforms on land, in the ocean, and in the air;

3) Measuring energetic solar particle flux, X-rays, and the strength of the earth's magnetic field; and,

4) Broadcasting centrally prepared weather and satellite information.

The spacecraft on-board subsystems include:

1) Visible and Infrared Spin Scan Radiometer (VISSR) providing visible and infrared imagery;

2) Space Environment Monitor (SEM) subsystem, including a magnetometer, a solar X-ray telescope, and an energetic particle monitor, all for solar observations;

3) Data Collection System (DCS) providing communications relay between data collection platforms and the Command and Data Acquisition (CDA) Station at Wallops, Va.;

4) Wideband Communication subsystem for transmission of wideband video data, "stretched" VISSR data, and weather facsimile data; and,

5) Telemetry, Tracking, and Command subsystem for commanding the spacecraft and transmitting SEM data.

DELTA LAUNCH VEHICLE

The 116-foot, three-stage Delta launch vehicle used by NASA to launch GOES-2 is built by the McDonnell Douglas Corporation and launched by a combined NASA-McDonnell Douglas team. There have been more NASA Delta launches than all other vehicles in its class combined, and the GOES-2 launch will be the 131st using the Delta vehicle.

The first stage produces 205,000 pounds thrust at sea level. Nine solid propellant boosters, each producing 52,000 pounds, are attached to the base of the first stage. Six fire at lift-off, and the final three ignite when the first six burn out. Delta-131 will weigh about 293,000 pounds (132,900 kg) at liftoff. Separation of the first stage comes about 4 minutes into the flight.

The second stage, providing 9,800 pounds thrust in a vacuum, will be fired first immediately after the first stage separation, burning for about 5 minutes, and again about 12 minutes after liftoff for about 10 seconds. About 1 minute later, the second stage will separate, followed by ignition of the third stage of the vehicle which utilizes a solid propellant motor producing about 14,000 pounds thrust. It separates from the spacecraft about 25 minutes into flight, when the satellite is almost 6,000 miles (9,654 km) downrange and moving at about 22,000 miles (35,398 km) per hour, at an altitude of about 135 miles (217 km).

This velocity places the spacecraft in a transfer orbit from which it is positioned into a circular orbit at about 22,300 miles (35,800 km) altitude above the Equator by a motor aboard the spacecraft, with a final velocity of about 6,876 miles (11,066 km) an hour.