


8-1-1981

Volume 5, Number 8 (August 1981)

The Solar Ocean Energy Liaison

Follow this and additional works at: http://nsuworks.nova.edu/nsudigital_otec-liaison

 Part of the [Energy Policy Commons](#), [Environmental Studies Commons](#), [Natural Resources Management and Policy Commons](#), [Oceanography Commons](#), [Oil, Gas, and Energy Commons](#), [Science and Technology Studies Commons](#), and the [Water Resource Management Commons](#)

NSUWorks Citation

The Solar Ocean Energy Liaison, "Volume 5, Number 8 (August 1981)" (1981). *The OTEC Liaison*. Paper 48.
http://nsuworks.nova.edu/nsudigital_otec-liaison/48

This Newsletter is brought to you for free and open access by the NSU Digital Collections at NSUWorks. It has been accepted for inclusion in The OTEC Liaison by an authorized administrator of NSUWorks. For more information, please contact nsuworks@nova.edu.

Solar OCEAN ENERGY Liaison

INCORPORATING
The OTEC Liaison

VOLUME 5 NUMBER 8
August 1981

OPTIMISM FOR DAM-ATOLL

Thomas P. Higgins says early research and development results "provide optimism for cost competitiveness" for Dam-Atoll, the system to convert ocean-wave energy into electricity. Higgins is manager of Ocean Energy Systems at the Lockheed Missiles and Space Company, Sunnyvale, California. He and Clinton P. Sherburne, manager of the Dam-Atoll program, co-authored a paper which Higgins presented at the Sixth Marine Systems Conference

of the American Institute of Aeronautics and Astronautics.

The authors estimated the capital installed cost of an early-production Dam-Atoll unit at \$8 million to \$12 million. Higgins said that as the cost of fossil fuel soars "it appears quite probable that a group of Dam-Atoll units can provide competitive energy in the latter part of this decade". Earlier, Higgins told scientists meeting in Madras, India that Dam-Atoll could

be competitive in Third World locations with adequate wave-energy resources.

In June 1981 Sherburne told the Eighth Annual Ocean Energy Conference in Washington DC that the cost of electricity from Dam-Atoll could be as low as 7.5 cents per kilowatt-hour, "the same as oil-steam today". While Dam-Atoll production costs would rise only slightly, he said, fossil fuels are expected to continue increasing significantly in price.

Dam-Atoll would consist of a concrete dome 300 feet (100 meters) in diameter, its top just breaking the ocean surface. At its center, curved vanes would guide incoming waves after they refract (band) around the atoll shape of the dome. The vanes would direct the water into a central core 60 feet (20 meters) in diameter so as to create a vortex inside the core, causing hundreds of tons of seawater to swirl downward to turn a turbine. The turbine would drive a generator producing 1 to 2 megawatts of electricity, enough to serve about 500 homes.

A newly-designed dome, shallower and flatter than previous designs, would act as a "surf ramp" to achieve maximum wave-capture efficiency, giving Dam-Atoll an overall efficiency up to 45%. Previous designs envisioned a floating, moored Dam-Atoll which would follow tidal changes. Lockheed's research now indicates that the unit's performance could be improved even further by providing the capability to adjust ("tune") for wave height, maximizing power output. This ability to adjust the depth could also be used to "duck" beneath the surface during severe storms.

Dam-Atoll would operate best off the western side of land masses such as the Pacific Coast of North America, the Arabian Sea off Pakistan and India, or the North Atlantic coast of Scotland. It could supply electrical loads tailored to local needs by selecting the proper number of units required.

Lockheed studies indicate that fabrication of the large dome and subsequent assembly of the system should be done relatively close to the installation site, enhancing the use of skills and labor. "These factors offer great potential for isolated or less-developed areas which need electrical power," Higgins said.

The Dam-Atoll program is in the early research and development stages. Lockheed is doing analyses and studies to provide the basis for design and testing of models, and is under contract to the US Department of Energy/Solar Energy Research Institute to

(continued on Page 2)

WHAT IS DAM-ATOLL?

Dam-Atoll is a revolutionary device for conversion of wave energy into useful energy. The dome-shaped structure can be permanently mounted on the seafloor or anchored on site, depending on seafloor conditions. The name Dam-Atoll, a trademark of the Lockheed Missiles and Space Company, is derived from the fact that the plant has the characteristics of both a dam and an atoll. The Dam-Atoll can be used as electricity producer, oil-spill skimmer, or breakwater.

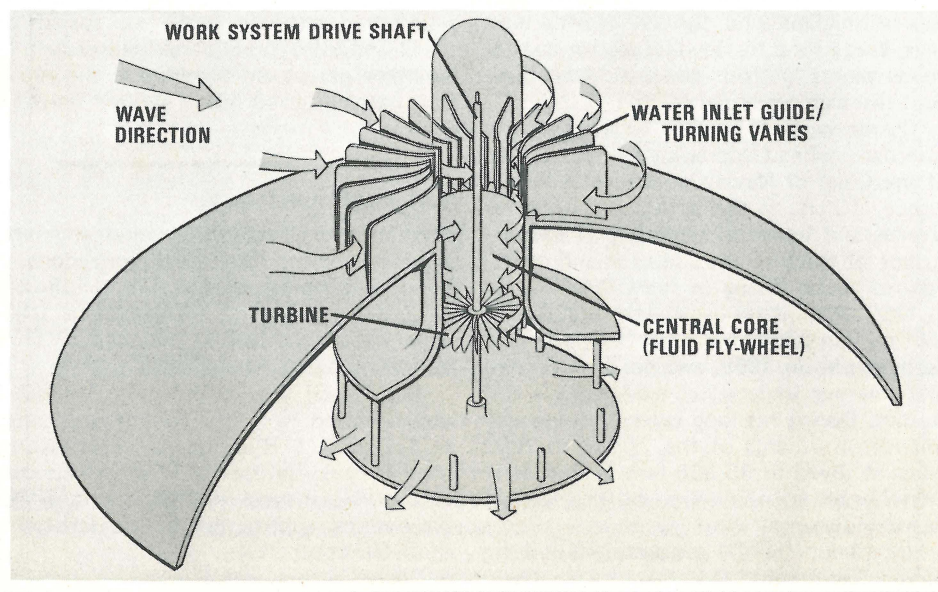
Electricity is produced in the Dam-Atoll by a simple hydraulic turbine rotating under a gravity-induced pressure head. Waves arriving with a frequency of seven to ten seconds are refracted by the shape of the structure. Thus as they reach the center of the dome they enter the water-guide vanes in progressive order. The guide vanes are curved so that the water entering them is caused to spiral downward in the central core. The spiraling, falling water ro-

tates a turbine/generator set, and water is discharged through the base of the structure. An 80-meter-diameter Dam-Atoll could produce one to one-and-a-half megawatts, enough to meet the needs of nearly 500 homes.

By extracting energy from the waves, wave energy is reduced, leaving calm water in the wake of the structure. This fact makes Dam-Atoll a useful mechanism for shoreline protection and for the creation of artificial harbors offshore.

Oil slicks on the water surface from accidental spills or natural seepage could be removed by using Dam-Atoll. As the oil-contaminated surface water enters the plant, the oil could be separated and recovered.

The adjacent photo and others in this issue show the design of this innovative wave-energy-conversion device. Further development of this concept is under way at Lockheed.



Solar
OCEAN ENERGY
Liaison

INCORPORATING
The OTEC Liaison

AN INTERNATIONAL NEWSLETTER
ENGAGED AS LIAISON FOR ALL
FORMS OF SOLAR ENERGY FROM
THE SEA, INCLUDING:
OTEC
(OCEAN THERMAL
ENERGY CONVERSION)
WAVE - TIDAL - CURRENT
OFFSHORE WIND - BIOMASS
SALINITY GRADIENTS

VOLUME 5 NUMBER 8
August 1981

EDITOR/PUBLISHER
Richard Arlen Meyer

TYPESETTER
AND COPY EDITOR
Shelly Treshansky

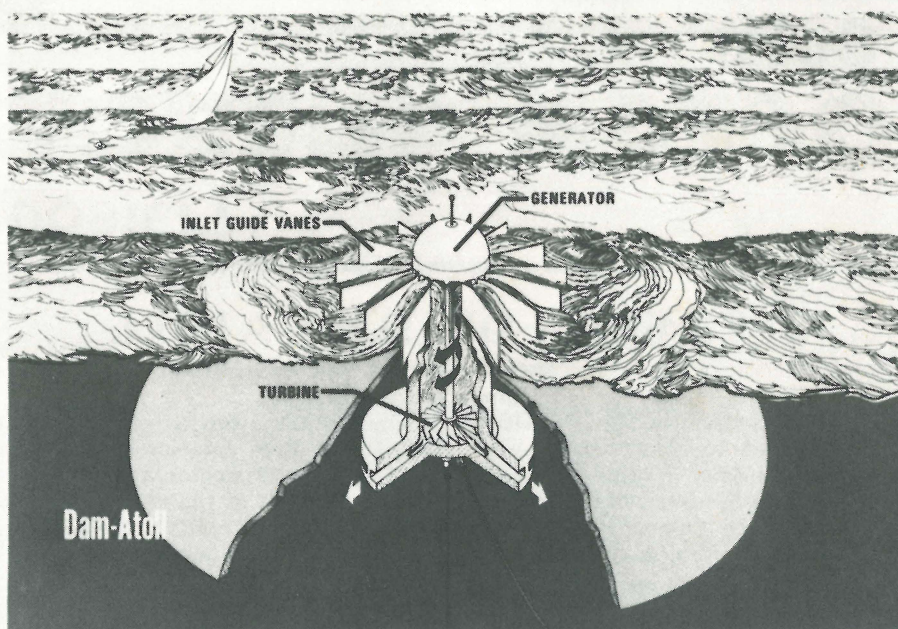
ART DIRECTOR
Pamela Greenfield

SUBSCRIPTION MANAGER
Mildred Ward

RESEARCH
Patricia Belisonzi

OCEAN ENERGY

is published monthly by Popular Products Incorporated at 1303 South Michigan Avenue, Chicago, Illinois 60605, USA. Copyright 1981 by Popular Products Incorporated, Chicago, Illinois. All rights reserved. Contents of this newsletter may not be reproduced in whole or in part without permission. OCEAN ENERGY will not assume any responsibility for any manuscripts or photographic material either left or submitted on speculation. Subscription prices are as listed below: United States and possessions: one year \$150, two years \$250. Foreign: Add \$20 per year for air mail. Single copies: US \$12.50 per copy. Foreign \$13.75 per copy. USSN: 0162-8755



DAM-ATOLL MOORED CONCEPT

**LOCKHEED REORGANIZES
OCEAN SCIENCE LABORATORY**

A prominent American ocean scientist, Dr. Andreas B. Rechnitzer, has been named manager of a reorganized Lockheed Ocean Science Laboratory (LOSL), headquartered in Carlsbad, California. The new organization combines Lockheed Environmental Sciences, also located in Carlsbad, and the ocean-science group previously at Lockheed Ocean Laboratory in San Diego.

"Combining Lockheed's ocean-science activities will result in one group with the fully-developed capability to handle almost any job," said James Wenzel, Lockheed Missiles and Space Company vice-president for Ocean Systems. "We are very fortunate to have a scientist of Dr. Rechnitzer's standing join us as we enhance our ocean-science capabilities."

Rechnitzer will be in charge of a team of more than 50 ocean scientists, engineers, and technicians who conduct marine surveys, study local marine biology for coastal power plants, perform bioassays, and conduct research on ocean mining.

Currently, Rechnitzer is assistant for the International and Interagency Affairs Office of the Chief of Naval Operations in Washington DC. He is the author of numerous articles and technical papers, and was co-author of the first book of rules and methods for scuba diving in the US, published in 1950. Rechnitzer became the first American civilian pilot of the US Navy's *Trieste* bathyscaphe in 1959, and has participated in numerous underwater explorations and studies. During his long career, he was also scientist-in-charge of the *Trieste* in 1960 when it dived to 35,800 feet in the Marianas Trench - believed to be the world's deepest dive.

In announcing the appointment and the reorganization of LOSL, Wenzel also said

that the Corrosion Protection Systems personnel, previously part of Lockheed Environmental Sciences, have been transferred to Lockheed Offshore Systems and Services at the Company's Ocean Systems Organization in Sunnyvale. However Wenzel said ocean mining, a tow tank for hydrodynamic testing, and the Lockheed submersible *Deep Quest* will continue to operate at Lockheed-San Diego's Harbor Island facilities.

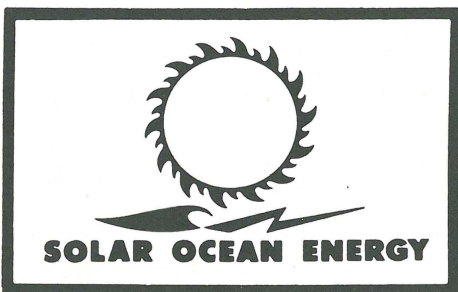
A current example of Lockheed Environmental Sciences work is a \$1.3 million bioassay of Pyramid Lake, Nevada to determine the effect of dissolved solids on the marine environment. This investigation is being performed under a 27-month contract from the US Bureau of Indian Affairs. Previously, Environmental Sciences performed marine environmental studies at the San Onofre and Diablo Canyon (California) nuclear power plants.

Corrosion Protection Services provides a patented cathodic protection system to guard underwater marine structures such as pipelines, petroleum-production platforms, and transportation tubes against galvanic corrosion.

(continued from Page 1)

conduct two 12-month phases of engineering development. The initial phase, consisting of engineering studies, will be followed by construction and testing of a 1/50-scale model six feet in diameter, if DOE budgeting for 1982 permits.

Dam-Atoll was conceived, developed, and patented by Leslie S. Wirt, a scientist at Lockheed's Rye Canyon Laboratories near Saugus, California. Proof-of-concept data were gathered in 1979 from a 1/100-scale model, and results of these data led to the DOE contract.



SUBSCRIBER POLL SHOWS MOST PREFER CURRENT FORMAT

In mid-June OE mailed a questionnaire to all subscribers, the first since this publication's inception in 1977, stressing that OE wants to provide its subscribers with what *you* want. The results showed that a majority of readers were happy with OE *as is*. However several areas of interest will receive greater emphasis: international news, Congressional activities, and technical reports. Those areas which will receive slightly less emphasis are regulations and licensing procedures, legal issues, and patents. However the latter areas will become more important in the near future as OTEC leaves the research-and-development phase and begins to move into commercialization.

Nearly 80 subscribers took the time to respond. A breakdown of their preferences appears in the adjoining table.

WE WOULD PREFER IN FUTURE ISSUES OF OCEAN ENERGY:

MORE EMPHASIS	LESS EMPHASIS	AS IS	
31	3	43	INTERNATIONAL NEWS
36	6	34	CONGRESSIONAL ACTIVITIES
34	5	36	TECHNICAL REPORTS
22	18	37	CONTRACT AWARDS & PROCUREMENT OPPORTUNITIES
19	11	42	INTERVIEWS (GOVERNMENT AND/OR INDUSTRY)
13	25	35	REGULATIONS & LICENSING PROCEDURES
26	7	40	PHOTOS, DIGRAMS, GRAPHS, ETC.
22	7	47	MORE FREQUENT CALENDARS OF MEETINGS, ETC.
27	6	42	DATA SOURCES
19	21	34	LEGAL ISSUES AND PATENTS
33%	15%	51%	

PUBLICATIONS AVAILABLE

Proceedings of the International Solar Energy Congress, 1979, New Delhi, India, edited by F. De Winter, includes Ocean Thermal Gradient Systems.

Proceedings of the Joint Conference of the American Section, International Solar Energy Society and Solar Energy Society of Canada, Incorporated, Winnipeg, Canada, edited by K. W. Boer. Volume 5 covers solar thermal and ocean thermal energy.

Both of the above are available from Pergamon Press, Fairview Park, Elmsford, New York 10523.

US GOVERNMENT PROCUREMENT INVITATIONS AND CONTRACT AWARDS

Listed below are procurement invitations and contract awards related to OTEC in particular and ocean resources in general culled from the Commerce Business Daily. This is not to be construed, however, as a complete list.

Jul 1: Radioelement Studies in the Ocean: Contract DE-AC-02-81-EV-10694 .A001, for \$33,750, awarded to Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543. US Department of Energy, 9800 South Cass Avenue, Argonne, Illinois 60439.

Jul 2: Parametric Performance Studies of Fluidized Bed Heat Exchanger: Negotiations are being conducted on a sole-source basis with the United Technologies Research Center of East Hartford, Connecticut for the above-named project. US Department of Energy, Pittsburgh Energy Technology Center, PO Box 10940, Pittsburgh, Pennsylvania 15236.

(continued on Page 4)

	Equipment	100kW test plant	2,500kW commercial plant (assumption)	Remark
Fron Turbine	Type	Axial Flow Compact Type	Axial Flow Compact Type	
	Rated capacity	100kW	2,500kW	
	Working Medium	Fron R-22	Fron R-22	
	Vaporized Fron R-22 Pressure	10.2kg/cm ² abs	10.3kg/cm ² abs	
	Vaporized Fron R-22 Temperature	23.5°C	20.0°C	
	Vaporized Fron R-22 Flow	83ton/h	1,810ton/h	
	Revolution	1,500rpm	3,000rpm	
Generator	Type	Air Cooled Horizontal Rotating Field Type	Air Cooled Horizontal Rotating Field Type	
	Output	100kW	2,500kW	
	Voltage	440V	6,600V	
	Hertz	50Hz	50Hz	
	Revolution	1,500rpm	3,000rpm	
Evaporator	Type	Horizontal Tube Type	Horizontal Tube Type	
	No. of Set	1	6	
	Warm Water Flow	1,975ton/h	@4,020ton/h	Warm Water 25°C
Condenser	Type	Vertical Tube Type	Vertical Tube Type	
	No. of Set	1	6	
	Cold Water Flow	1,926ton/h	@4,870ton/h	Cold Water 4.3°C
Warm Sea Water Pump	Type	Vertical Slant Type	Vertical Slant Type	
	No. of Set	1	2	
	Pump Up Flow	32m ³ /min.	@250m ³ /min.	
Cold sea Water Pump	Type	Vertical Slant Type	Vertical Slant Type	
	No. of Set	1	2	
	Pump Up Flow	31m ³ /min.	@240m ³ /min.	
Fron Pump	Type	Horizontal Multi-Spiral Type	Horizontal Multi-Spiral Type	
	No. of Set	1	3	
	Pump Up Flow	1.1m ³ /min.	@13m ³ /min.	
Load Handling		5kW bulb x 20	Sent to power system	
Intake Pipe		PEφ700 x 1	*PEφ2,500 x 2	

The table above is a comparison of OTEC equipment specifications for a 100-kilowatt test plant and a 2500-kilowatt commercial plant, reproduced from a brochure published by the Tokyo Electric Power Services Company (TEPSCO).

(continued from Page 3)

Jul 8: Solar Production of Industrial Steam Operations and Performance Evaluation: Contract DE-AC-03-78-CS-32199, for \$203,130, awarded to Foster Wheeler Development Corporation, 12 Peach Tree Hill Road, Livingston, New Jersey 07039. US Department of Energy, San Francisco Operations Office, 1333 Broadway, Oakland, California 94612.

Jul 8: South Atlantic Outer Continental Shelf Physical Oceanography Year 4 Program: Contract AA-851-CT1-25, for an estimated cost plus fixed fee of \$525,829, has been awarded to Science Applications Incorporated, 1200 Prospect Street, La Jolla, California 92038. US Department of the Interior, Bureau of Land Management, 18th and C Streets Northwest, Washington DC 20240.

Jul 13: Analyze Issues and Problems Associated with the Integration of New Energy Technologies: Responses will be inviting proposals to prepare critical-issue survey papers addressing important issues and problems associated with integrating new energy technologies into the nation's electrical systems. These issues cover the range of electric-utility-system planning, system operations, and institutional concerns associated with the introduction of energy technologies whose spatial and temporal characteristics are fundamentally different from those of today's technologies and which will alter the planning of electric generation, transmission, and distribution systems of the future. The information developed in these papers will be used in the planning of a major research and development program focused on the successful accomplishment of technology integration. It is anticipated that awards will be in the range of one to two person months and require four months for technical performance. As many as 20 fixed-price contracts are anticipated. Union Carbide Corporation, Nuclear Division, Attention A. F. Johnson, PO Box M, Oak Ridge, Tennessee 37830, (615) 576-1406.

Jul 14: Development of an Air-Deployed Oceanographic Mooring (ADOM) Compatible Hydrophone/Cable Assembly for Gathering Acoustic Data: Negotiations are being conducted with EG&G Washington Analytical Services Center Incorporated, 2150 Fields Road, Rockville, Maryland 20850. Office of Naval Research, 800 North Quincy Street, Arlington, Virginia 22217.

Jul 14: Evaluating Approaches to Collecting Geophysical Data on the Ocean Bottom: Negotiations are being conducted with Planning Systems Incorporated, 7900 Westpark Drive, McLean, Virginia 22102. Office of Naval Research, 800 North Quincy Street, Arlington, Virginia 22217.

Jul 14: Explore Issues Involved with Increasing the Efficiency of Industrial Energy Use, and Predict Effects of Possible Legislative Actions on Industrial Energy Use and Industrial Productivity: Contract 133-4140.0, for \$50,164, awarded to Car-

negie-Mellon University, Carnegie-Mellon Institute. Office of Technology Assessment, United States Congress, Washington DC 20510.

Jul 15: Investigation into Zirconium, Titanium, and Their Alloys with Molybdenum Pressurized to 100 Kilobars at Room Temperature to Study the Omega Phase Transition: Metastable Omega Phase crystal structure will be studied by transition electron microscopy. Communications will be conducted only with Man Labs Incorporated, since it is a continuation of work previously performed by a principal investigator. Solicitation DAAA22-81-R-0124. Purchasing and Contracting Division, Watervliet Arsenal, Watervliet, New York 12189, (518) 266-5147.

Jul 17: Operation of an Inquiry and Referral Service Through the National Solar Information Center: Contract DE-AC-0281-CS71106.A000, \$620,000, awarded to the Franklin Institute of the State of Pennsylvania, Philadelphia, Pennsylvania 19103. US Department of Energy, Chicago Operations and Regional Office, 9800 South Cass Avenue, Argonne, Illinois 60439.

Jul 17: Continued Ocean Studies on the Formation and Circulation of the World's Ocean-Water Masses: Contract N-00014-80-C-0440, June 16th (no RFP), for \$406,620, awarded to the Regents of the University of California, Code A-010, University of California, San Diego, La Jolla, California 92093. Office of Naval Research, 800 North Quincy Street, Arlington, Virginia 22217.

Jul 20: Research Entitled "Flux of Energy and Essential Elements Through the Pelagic Portion of the Continental Shelf Ecosystem": Modification to existing contract DE-AS-09-76-EV-00639, for \$97,455, awarded June 25th, 1981 to the University of Georgia Research Foundation Incorporated. US Department of Energy, Savannah River Operations Office, PO Box A, Aiken, South Carolina 29801.

Jul 20: Marine Architect and Engineering: Contract N00600-81-D-9162, May 5th, 1981, \$2,104,205, awarded to Igor Bazovsky and Associates Incorporated, 7255 Owensmouth, Suite 4, Canoga Park, California 91303. Naval Regional Contracting Office, Washington Navy Yard, Building 200, Washington DC 20374.

Jul 29: Data Collection, Exercise Analysis and Reconstruction, and Report Preparation for Two Sea Venture Exercises: Negotiations are being conducted with TRW, 7600 Colshire Drive, McLean, Virginia 22102. Office of Naval Research, 800 North Quincy Street, Arlington, Virginia 22217.

Jul 29: Nearshore Transport Processes Affecting the Dilution and Fate of Energy-Related Contaminants: Contract DE-AS-0980-EV-10331, modification to existing contract in the amount of \$78,339, awarded to Skidaway Institute of Oceanography, Savannah, Georgia 31406. US Department

of Energy, Savannah River Operations Office, PO Box A, Aiken, South Carolina 29801.

Jul 30: Ocean Environmental Studies Consisting of Analysis (1) of Data from Aerial Surveys, (2) of Sounds of Marine Mammals, (3) of Antifouling Coatings and Related Materials, and (4) Evaluation of a New Biochemical Indicator System: Negotiations are being conducted with Computer Sciences Corporation, 4045 Hancock Street, San Diego, California 92110, for RFP N66001-81-D-0529. Commander, Naval Ocean Systems Center, San Diego, California 92152, Attention W. P. Walton, Code 4222, (714) 225-2334.

Jul 31: Development of an Erosion-Resistant, Anti-Fouling Metallized Propeller Coating Applied With Thermal Spray Techniques: In accordance with the specifications, RFP N00024-81-R-5365 will be issued to Flame Spray Incorporated, 4674 Alvarado Canyon Road, San Diego, California 92120. Commander, Naval Sea System Command, Washington DC 20362.

Jul 31: Engineering Design and Development of Subsystems for the Ocean Surveillance Information System: Contract N00039-79-C-0444-P00014, June 18th, 1981, \$114,887, awarded to CTEC Incorporated, Falls Church, Virginia 22043. Naval Electronic Systems Command, Washington DC 20360.

Jul 31: Continuation of the Rapid Optical Ocean Surveillance Testbed: Contract N00039-81-C-0297, June 24th, 1981, \$673,651, awarded to Ampex Corporation, Redwood City, California 94063. Naval Electronic Systems Command, Washington DC 20360.

Aug 6: Determine the Effects of Surface Residual Stresses on the Growth of Microcracks in Titanium Weldments: Negotiations are to be conducted with Southwest Research Institute, 8500 Culebra Road, PO Box 28510, San Antonio, Texas 78284. Office of Naval Research, 800 North Quincy Street, Arlington, Virginia 22217.

Aug 6: Evaluation of the US Policy Alternatives Concerning the Law of the Sea Convention: Negotiations are being conducted with Dickstein, Shapiro, and Morin, Washington DC. Department of State, Contracts Branch, PO Box 9244, Rosslyn Station, Arlington, Virginia 22209, Attention Mr. James K. Kimmel, (703) 235-1773.

