

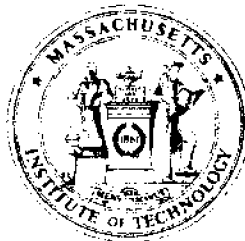


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**Directory of M.I.T. Research Projects  
Related to  
Marine Resources, Ocean Utilization  
and Coastal Zone Development**

Compiled by  
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and  
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Massachusetts Institute of Technology  
Cambridge, Massachusetts 02139

Report No. MITSG 72-10  
May 15, 1972

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## INTRODUCTION

There are many and varied research efforts throughout M.I.T. that are related to the general categories of Marine Resources, Ocean Utilization, and Coastal Zone Development. As such, all are of wide interest to the National Sea Grant Program although less than 15% of this marine-related research is Sea Grant sponsored. At present, broad dissemination of research results is given to the Sea Grant-sponsored projects, but the balance of the related efforts may or may not receive equal coverage.

In keeping with the Institute mandate that M.I.T.'s Sea Grant Project Office serve as a focal point for all Sea Grant-related efforts at M.I.T., this Directory of Related Research Projects has been developed. The objectives for the directory are to create a general awareness of and to provide identification of and ready reference to the many marine-related research projects at M.I.T.

This directory has been made possible by the cooperation, support, and contribution of the Industrial Liaison Office and is largely a specialized extraction and adaptation from their Directory of Current Research.\* This Sea Grant-related research directory will be maintained current by the M.I.T. Marine Resources Reference Center and will be reissued semi-annually or annually as changes demand. Additional information on specific research topics can be obtained from the Marine Resources Reference Center or from the principal investigator listed for each project.

The Sea Grant Project Office will welcome any suggestions for improvement of the directory format and data content, as well as the identification of any other Marine Resources, Ocean Utilization and Coastal Zone Development research efforts that may have been inadvertently omitted from this directory. Pre-addressed tear-out sheets, the last two pages of this directory, are included to facilitate (1) general comment and (2) data submission for projects to be included.

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Alfred A.H. Keil  
Director  
M.I.T. Sea Grant Program

Cambridge, Massachusetts  
May 1972

\* Distribution of the Directory of Current Research is  
limited to participating members of the Industrial Liaison  
Program.

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72001	Computational Fluid Dynamics	Dr. D.A. Oliver	Aero and Astro		Methods of using computers in fluid dynamics experiments as numerical and non-numerical computational aids. Emphasis is on interactive capabilities utilizing displays of flow fields and illustrations from internal and external aerodynamics including two- and three-dimensional transonic flow through turbo-machine cascades.
72002	Nonlinear Structural Problems	Dr. T.H. Pian	Aero and Astro	Tong Luk	Techniques for studying various types of structural nonlinearities. Both static and dynamic problems are included. The research presently is focused on the development of finite element methods for determining stress intensity factors in fracture mechanics.
72003	Analysis of Laminated Shells	Dr. T.H. Pian	Aero and Astro	Tong Whitmer	Finite element analysis techniques for static thermal stress and dynamic load response analyses of laminated thick shells. Present phase is limited to linear static and vibration analyses.

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72004	Mechanics of Fibrous Composite Materials	Dr. T.H. Pian	Aero and Astro	Griffiths	Development of methods for analysis and design of laminated fibrous composite structures.
72005	Mechanical Behavior of Composite Materials	Dr. J.W. Mar Dr. T.H. Pian	Aero and Astro	Orringer Shepherd	The mechanical behavior of heterogeneous, bonded mixtures of ductile and brittle metals and other materials. Research presently is focused on compressive failure modes in models of ductile and brittle fiber composites. The possibility of using laser techniques for measurement of small deformations is being investigated.
72006	Man-Vehicle Control Simulation	Dr. L.R. Young	Aero and Astro	-----	Laboratory studies of human operator response in vehicle control. A two-axis flight simulator and a hybrid computer are used to simulate situations including helicopter hovering, booster rocket control, aircraft blind landings and automobile driving. These studies are performed in conjunction with more basic research on biological subsystems and human operator models. Of particular interest is the biological control system which enables humans to maintain themselves or a vehicle in a desired orientation in space or with respect to an apparent gravity vector.

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72007	Life Support Systems	Dr. L.R. Young	Aero and Astro	-----	Studies directed to the problem of providing suitable artificial environments for space flight and other ventures by man into hostile surroundings. The man-environment system is treated as an advanced engineering problem with areas of closed ecological systems, atmospheric mixtures and personnel propulsion units coming under study.
72008	Liquefied Natural Gas Interactions With Water	Dr. R.C. Reid	Chemical Engineering	-----	Under certain conditions, liquefied natural gas (LNG) spilled on water leads to explosions. Since LNG is now being shipped by tankers in large quantities, research is being conducted to enable the mechanism of such explosions to be delineated and to search for possible countermeasures.
72009	Fuel Cells	Dr. H.P. Meissner	Chemical Engineering	-----	Investigation of the theoretical and engineering factors affecting fuel cell performance.



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72010	Mass Spectrometry of Organic Compounds	Dr. K. Biemann	Dept. of Chemistry	-----	Correlation of the mass spectra with the structure of organic compounds. Particular investigative emphasis is being placed on the determination of the structure of natural products. Applications to biomedical (primary structure of polypeptides and proteins, identification of drugs and their metabolites in body fluids) and environmental (rare and specific water pollutants) problems are emphasized.
72011	Environmental Trace Analysis		Dept. of Chemistry		Development of new methods for the measurement of very low levels of metals and other constituents in natural water systems. The extension of this technique to the determination.
72012	Trace Metals in Sea Water	Dr. D. Hume	Dept. of Chemistry	Gilbert	Development of high-sensitivity electrochemical methods for the quantitative measurement of trace metal concentrations in the ocean and elucidation of the chemical nature of the species involved.

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72013	Law and the Social Control of Science and Technology	Dr. N.S. Baram	Civil Engineering	Ducsik	Many problems facing society today have been brought about by scientific and technologic developments. There is a need for interdisciplinary programs of education which will provide graduate student with an understanding of the role of the legal system and other value based social institutions which function as partial controls on science and technology. Such education is especially important at a school of technology, and must become an intergral part of the education of future professionals in science and engineering.
72014	International Environmental Control	Dr. M.S. Baram	Civil Engineering	Mauch	The International Environmental Control Program (IECP) has been developed by an interdisciplinary research team at M.I.T. representing the disciplines of law, management systems, public health, political science, and systems analysis. IECP has been designed to confront urgent environmental problems of an international nature, and to develop pragmatic methods for the management of such problems through international cooperation. These methods will be developed to serve as guidelines for the fragmented national and international political processes which are beginning to take place, to ensure coherent and effective management of the international environment

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72015	Waves and Wave-Induced Process in the Near Shore Zone	Dr. C.C. Mei	Civil Engineering	Liu Carter	Investigation of mass transport in a long wave tank, effects of finite width on the three-dimensional structure of mass transport, secondary boundary layers in a wave system near a sea wall, coastal currents induced by variable radeotopm stresses, long-shore and rip currents with changing topography.
72016	Water quality Model for a Network of Estuarine Channels	Dr. A. Ippen	Civil Engineering	Harleman Dailey	An estuary consisting of channels and junctions is modeled mathematically by a network of one-dimensional channels. A finite element model is used for solution of the equations of motion and mass transfer with tidal advection and dispersion included for each branch of the network. These equations are solved to provide time-dependent concentration distributions for non-conservative water quality parameters.
72017	A One-Dimensional Model for Salinity Intrusion in Estuaries	Dr. A. Ippen	Civil Engineering	Harleman Thatcher	Finite difference model to predict time-dependent longitudinal salinity distributions in an estuary. The model couples the continuity and momentum equations for the tidal motion with the mass transport equation for salinity. The model incorporates the time-dependent boundary conditions of tidal range at the ocean end and variable fresh water inflows.

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72018	A Two-Dimensional Model for Salinity Distribution in Estuaries	Dr. A. Ippen	Civil Engineering	Harleman Fisher	Analytical methods to describe the two-dimensional salinity distribution in an estuary which is homogeneous laterally, but non-homogeneous vertically. The initial phase is concerned with time-averages of salinity and velocity over a tidal period. The objective is to provide a better understanding of salinity and sediment transport processes in estuaries.
72019	Sediment Suspension in Free Surface Flow	Dr. A. Ippen	Civil Engineering	Taggart Yermoli	Effect of sediment on the properties of a turbulent free surface flow. The non-uniform distribution of sediments of various properties over the depth of the flow is coupled to changes in the state of turbulence, boundary resistance, mean velocity distribution and depth for a given mass rate of flow of the two-phase system.

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72020	Long Island Ground Water System	Dr. D. Harleman	Civil Engineering	Gelhar	Model simulations of water table response and salt water intrusion for alternative methods of ground-water utilization on Long Island. Analytical predictions of salt water intrusion and dispersive mixing between the fresh and salt water have been developed. The motion of contaminants in the aquifers is also being investigated.
72021	Thermal Stratification and Water Quality in Lakes and Reservoirs	Dr. D. Harleman	Civil Engineering	Ryan	Prediction of seasonal variations of vertical temperature distribution, outflow temperature and concentration of water quality parameters for a lake or reservoir. The mathematical models have been developed and verified by comparison measurements of a laboratory reservoir and field measurements for temperature and dissolved oxygen.
72022	Thermal Effects Associated with Nuclear Power Plants	Dr. D. Harleman	Civil Engineering	Ditmars	Thermal pollution associated with the intake and discharge of heated condenser water from nuclear power plants. Methods of preventing recirculation and of inducing mixing of thermal discharges, including surface discharge and submerged multipoint diffusers, are under investigation.

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72023	Real-Time Model For Estuarine Water Quality Prediction	Dr. D. Harleman	Civil Engineering		Numerical solution by finite difference techniques of the longitudinal distribution of water quality parameters in an estuary. The mathematical model includes non-linear effects such as variable area, variable dispersion and the instantaneous tidal velocity.
72024	Water resources Development in Argentina	Dr. F. Perkins Dr. J. Schaake	Civil Engineering		Mathematical models for use in river basin planning in Argentina. A three level hierarchy of models is planned as follows: Level I, Models, for Economic Planning and Objectives; Level II, Screening and Optimization Models; Level III, Models of the Physical System.
72025	Movement and Mixing of Water Injected into Aquifers	Dr. L.W. Gelhar	Civil Engineering		Analytical and experimental study of the replenishment of ground water aquifers by means of recharge wells. The study considers the effect of dispersion (mixing) between injected water and the native water of the aquifers. The influence of density variations is also being studied. Experiments on dispersion in unsaturated flow are also being developed.

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72026	Turbulent Flow Near Rough Permeable Boundaries	Dr. L.W. Gelhar	Civil Engineering	-----	Measurement of mean velocity, shear stress, and turbulent flow near a rough permeable boundary. The experiments are being conducted using air in a closed circular conduit.
72027	Wave Interaction With Coastal Structures	Mr. C. Sollitt	Civil Engineering	-----	Interaction of water waves with coastal structures. The basic problem under consideration is the transmission of ocean waves past breakwaters, both by overtopping and by penetration through a rubble breakwater.
72028	Interaction of water Waves with Structures	Dr. C.C. Mei	Civil Engineering	-----	Interaction of water waves with submerged storage tanks and platforms which have dimensions comparable to, or larger than the design wave length. Cylindrical bodies of elliptical cross section are considered. Calculation of the scattering amplitude wave forces and moments and interaction of water waves with harbors is also investigated. Emphasis is on the effects of non-straight coast line structures.

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72029	Effects of Topography on Random Water Waves	Dr. C.C. Mei	Civil Engineering	-----	Change of wave spectrum due to topography or coastal structures. Waves of both infinitesimal or finite amplitudes are studied. In the first case the diffraction by a three-dimensional obstacle in an open ocean has been treated. The nonlinear case treated is the wave scattering by a shelf which is sufficiently shallow for higher harmonics to be generated. Harmonic generation is of basic importance in wave spectrum changes when waves enter shallow water. Normal and oblique incidences are both being worked out.
72030	Strategies in Water Quality Management	Dr. D.H. Marks	Civil Engineering	-----	Alternatives for water quality management including models for investment in central treatment facilities are investigated.
72031	Screening Models For Water Resource Planning and Investment	Dr. D.H. Marks	Civil Engineering	-----	Mathematical programming models for investment in water resource projects have been developed and are being applied in the context of an arid region river basin in Argentina. Emphasis is centered on building a framework for showing sensitivity to political, institutional and social constraints.



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72032	Reinforced Plastics	Dr. F. McGarry	Civil Engineering	-----	A study of the ways in which the properties of fiberglass resin composites are influenced by resin glass filament characteristics, surface treatments, wear geometry, and cure conditions. Unique methods of resin modification to prevent microcracking have been devised. Emphasis is on application of fracture mechanics concepts to fibrous reinforced composites.
72033	A Problem-Oriented Computer Language for Hydrologic Analysis	Dr. B.M. Harley	Civil Engineering	-----	Development and implementation of a problem-oriented computer language for use in the modeling of river networks. Selection and investigation of strategies for the choice of the "best" parameters for use in the modeling of flood wave dynamics.
72034	Runoff Models for Urban Drainage Control	Dr. J.C. Schaake	Civil Engineering	-----	Mathematical models of the stochastic relationship between rainfall and response characteristics of urban catchments. Preliminary systems analysis models will be constructed to identify the important response characteristics. Synthetic runoff hydrographs will be studied and stochastic relationships determined. Important statistical properties of systems response and the parameters of the rainfall and runoff models will be devised.

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72035	Analysis Models for Solid Waste Management	Dr. D.H. Marks	Civil Engineering	Hudson Fuertes	Analysis models for common processes in the investigation of alternatives for solid waste management including work assignment, districting, routing and scheduling, faculty location and capital budgeting. Emphasis is on models directly implemented by local authorities.
72036	Thermal Generating Facilities	Dr. D.H. Marks	Civil Engineering	Kirshen	Mathematical models for investigation of the location of thermal generating facilities subject to efficiency requirements. These models are used to show the sensitivity of site selection to various parameters including environmental standards and policy constraints.
72037	Transport Planning-Developing Countries	Dr. R.L. De Neufville	Civil Engineering	-----	Support of DOT activities in advising developing countries on transport infrastructure improvement. The research will investigate the particular problems in areas of road transportation, inland waterway transportation, and air transportation.
72038	Ship System Studies	Dr. E.G. Frankel	Commodity Transport Lab	-----	A methodology for the effective establishment of ship system specifications which integrate design, production, and operational parameters.

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72039	Control of Harbor Traffic	Dr. J.W. Devanney, III	Commodity Transport Lab	Norrbin	Development of a model of harbor traffic incorporating the maneuvering characteristics of individual ships and their coupling thru operator decisions and control links.
72040	Coastal Zone Management	Dr. J.W. Devanney, III	Commodity Transport Lab	Blumberg	Research into the application of concept of economic efficiency to the development and control of the coastal zone.
72041	Investment Analyses Under Uncertainty	Dr. J.W. Devanney, III	Commodity Transport Lab	Blumberg	Development of methods for increasing the efficiency of Monte Carlo simulations of potential world bank projects under uncertain conditions.
72042	Ocean Movement of Bulk Commodities	Dr. J.W. Devanney, III	Commodity Transport Lab	Blumberg	The relation between constant value of bulk commodities and ocean transportation costs. Particular reference is placed on the trend of bulk ship charter rates and the effects thereof.
72043	Ocean Resource Exploitation and Sea Transportation	Dr. J.W. Devanney, III	Commodity Transport Lab	Blumberg	An overall model indicating the effects and potential dislocations of ocean transportation system and requirements resulting from major ocean resource exploitations such as petroleum and gas.

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72044	Ocean Transportation Systems Study	Dr. E.G. Frankel	Commodity Transport Lab	-----	A technological evaluation of current and future ocean transportation requirements in terms of ships, port, cargo handling, storage, information, and control technology. Technological voids and applications of novel technology are identified.
72045	Future of Atlantic Ports	Dr. E.G. Frankel	Commodity Transport Lab	-----	A regional, integrated transportation study of foreign trade movement requirements in the period 1970-1990 and the resulting effects on existing ports and port requirements; simulation model of port and multiport operation; port capacity measures.
72046	Ship Systems Model	Dr. E.G. Frankel	Commodity Transport Lab	-----	A methodology for the effective establishment of ship system specifications which integrate design, production, and operational parameters.
72047	Coastal Feeders and Port Model	Dr. E.G. Frankel	Commodity Transport Lab	-----	A general model of the effect of foreign trade freight rates on coastal transport and port development.

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72048	Inertial Sensors	Mr. R.B. Woodbury	Draper Lab	-----	Development of inertial sensors to meet the requirements of high quality control, navigation and guidance systems adaptable to marine, aeronautical and astronautical vehicles of all kinds. This effort includes studies to add to knowledge concerning fundamental principles of inertial sensing, control theory and spatial reference coordinate systems as they apply to vehicle guidance problems. The engineering realization of inertial sensors which advance the state of the art is a prime concern.
72049	Deep Submergence Control and Navigation	Mr. F.E. Houston	Draper Lab	-----	Design of control and navigation systems to optimize the man-machine interface of complex undersea vehicles. This includes computer-augmented and computer-aided mission control onboard surface support ships. External sensors are integrated into overall system operation. Synthesis of designs and design verification is accomplished in a six-degree-of-freedom hybrid-computer simulation.

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72050	Fishery Dynamics Computer Simulation	Mr. E.K. Gardner	Draper Lab	-----	Techniques and appropriate models for forecasting the fisheries market from ocean to consumer as a dynamic process. The simulation is to be used as a resource management tool.
72051	Fisheries Engineering Program	Mr. J.B. Suomala	Draper Lab	-----	A systems evaluation study of emanating or backscatter radiation phenomena from aquatic targets (fish). The applicability of various signal processing techniques will be determined with regard to the quality of information relative to target quantity or density. The study is directed at an improved ability to provide resource assessment of aquatic life.
72052	Mid-Ocean Dynamics Experiment	Mr. J.M. Dahlen	Draper Lab	-----	A collaborative experiment with the International Oceanographic Community in which the Laboratory's role is to design, develop fabricate, and deploy an extensive array of thermal sensors properly instrumented to monitor oceanographic internal tides as they occur at the field site.

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72053	Mathematical Modelling of Air Cushion Vehicles	Dr. D. Cummings	Draper Lab	-----	Classification and analysis of the free surface hydrodynamic and aerodynamic characteristics which determine the motions and control of air cushion vehicles over water. The importance of time history dependent phenomena is stressed.
72054	Hydrodynamic Stability of Deep Ocean Moored Instrument Package	Dr. D. Cummings	Draper Lab	-----	The hydrodynamic characteristics of a large instrument package investigated both theoretically and experimentally. Of major interest is stability during installation and motions while moored.
72055	Oceanic Internal Wave Project	Mr. J.M. Dahlen	Draper Lab	-----	An oceanic microstructure detection array. This array will sense water velocity vectors and temperatures at the four extremities of a large (20m) tetrahedron truss. Initially, evaluation of sensors' performance will be conducted through a buoy experiment and laboratory testing.

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72056	Biomedical Computer	Mr. R.F. Stengel	Draper Lab	-----	A collaborative project with the Clinical Research Center of M.I.T. to facilitate medical diagnosis using an inexpensive dedicated minicomputer at the patient bedside, and employing certain special programming techniques developed on the Appollo program. Initially the diagnosis of cardiovascular disease is to be the prime focus.
72057	Buoy Program-Engineering Support	Mr. R.L. Morey	Draper Lab	-----	Provide engineering support to the Woods Hole Oceanographic Institution effort to develop reliable mooring arrays for oceanographic data acquisition.
72058	Fish Scale Study	Mr. L. Sutro	Draper Lab	-----	A Study to determine and evaluate methods to accomplish automatic examination and analysis of the fish scale as a step towards computer-aided determination of scale structure and age, and of fish growth patterns.
72059	Marine Chemistry and Sedimentary Geochemistry	Dr. R.G. Burns	Earth and Planetary Sciences	-----	Formation of manganese nodules and the marine processes leading to the fractionation of transition elements into nodules. Manganese nodules from deep-sea sediments contain appreciable amounts of cobalt, nickel, and copper. The economic importance of these nodules and their formation is being studied.



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72060	Mode	Dr. C.I. Wunsch	Earth and Planetary Sciences	Dahlen Scarlett	Cooperative study of mid-ocean dynamics. The study will serve as a test of current hypotheses about the ocean. The M.I.T. responsibility is for an array of temperature sensors for hydrographic data and internal waves.
72061	Trace Elements in Natural and Experimental Geologic Systems	Dr. F.A. Frey	Earth and Planetary Sciences	Zielinski Skibo Loper	Trace element abundances are determined in a variety of geologic systems. Such data are useful in interpreting the geologic history of rocks. Areas under study are New England, Mid-Atlantic Ridge and ultramafic rock areas throughout the world. Laboratory experiments are done to aid in the understanding of trace element distribution among coexisting phases.
72062	Core Samples from the Joides Program	Dr. F.A. Frey	Earth and Planetary Sciences	Thompson Bryan	Detailed mineralogical and geochemical studies of ocean floor basalts to test various aspects of seafloor spreading and plate tectonics hypotheses.

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72063	Geothermal Investigations in Ocean Regions	Dr. G. Simmons	Earth and Planetary Sciences	-----	Investigations to improve our understanding of the dynamic processes within the earth as reflected in the geothermal flux. It is planned to investigate (a) the significant regional heat-flow variations in the Atlantic, and their possible relationships with geological structure, and (b) the sources of local variability in heat-flow values from the ocean floor, with the aim of improving the interpretation of heat-flow data in some regions.
72064	Numerical Calculation of Tectonic Flow	Dr. D.J. Andrews	Earth and Planetary Sciences	Toksoz	Numerical simulation of sea-floor spreading and upper mantle convection with realistic models for viscosity within the earth. The calculational method is generally applicable to coupled mass and heat flow with inertia neglected.
72065	Measurement of Stress in Place	Dr. K. Aki	Earth and Planetary Sciences	Bouchon	In-place precise measurement of seismic velocity on the surface as well as underground for the purpose of estimating the tectonic stress. The earth-tidal stress is used for calibrating the stress-velocity relation.

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72066	Properties of Mafic Rocks From the Sea Floor	Dr. R. Stesky	Earth and Planetary Sciences	Brace	Room temperature electrical conductivity and seismic velocity of mafic rocks from the ridge in the Indian Ocean measured to aid in the interpretation of conductivity values inferred from magnetotelluric measurements and to aid in correlating existing seismic profiles.
72067	Oceanic Effects of Island and Topography	Dr. C. I. Wunsch	Earth and Planetary Sciences	-----	Strong mixing of temperature and salinity gradients approaching islands. Additional study includes effects of wave trapping around islands, the breaking of internal waves and radiation stress effects of internal waves. A field study of the effects of the Pacific Equatorial Undercurrent on islands is underway.
72068	Sea Level Project	Dr. C. I. Wunsch	Earth and Planetary Sciences	-----	Tide gauge arrays to detect Rossby waves in the ocean and to understand sea level fluctuations. A joint effort with the Environmental Science Services Administration has led to the installation of a tide gauge array in the Caroline and Marshall Islands in the western Pacific Ocean.

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72069	Internal Waves in the Main Thermocline	Dr. C.I. Wunsch	Earth and Planetary Sciences	Dahlen	Field investigation of the properties of open ocean internal waves, with primary emphasis on finding the generation mechanisms and source distributions. The data is used to design a long-term (5 year) antenna for installation in the Sargasso sea.
72070	Continuous Measurements of Oceanographic Chemical Variables	Dr. J.M. Edmond	Earth and Planetary Sciences	-----	Measuring techniques employing electrodes and continuous analyzers to obtain continuous profiles of oxygen, phosphate, silicate, and CO <sub>2</sub> content of the ocean. Immediate application is to the Massachusetts Bay Project.
72071	Controls of the Steady State Composition of Sea Water	Dr. J.M. Edmond	Earth and Planetary Sciences	-----	Role of organisms in concentrating dissolved species into particles which subsequently sink to the sea floor and their role in the distribution of many elements in the sediments and free water columns. A deep sea pump of capacity greater than 10 <sup>5</sup> liters in 10 hours will be built to filter water in situ for examination of the particulate flux. Techniques for the analysis of dissolved trace elements with precision sufficient to establish the vertical and horizontal distribution gradients with high accuracy over the oceans will be developed.

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72072	The River-Ocean Interface	Dr. J.M. Edmond	Earth and Planetary Sciences	Frey	Chemical environment at the river-ocean interface. Many species which are stable in dissolved form in river waters should precipitate into sediments on mixing with the sea and the vigorous biological activity in coastal oceans should facilitate removal of the "nutrient" species both natural and pollution-derived. These processes are being investigated in the estuaries of local rivers.
72073	Sediment Transportation by Turbulent Flows	Dr. J.B. Southard	Earth and Planetary Sciences	-----	Measurement of fluid turbulence in the presence of suspended sediment and the tracing of particle trajectories by special techniques in high-concentration flows to study the interaction between turbulent shear flows and transported sediment particles.
72074	Erosion of Marine Bottom Sediments	Dr. J.B. Southard	Earth and Planetary Sciences	-----	Erosion and deposition of resedimented abyssal marine sediments by flows of sea water in laboratory flumes to determine critical bottom-current velocity for erosion and to study the development of such ocean-bottom features as ripples, dunes, lineations and scour pits around objects.

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72075	Sediment Mechanics	Dr. J.B. Southard	Earth and Planetary Sciences	-----	Theoretical and experimental study of sediment ripples and dunes developed by unidirectional flows of liquid over loose sediment beds. Emphasis is on understanding the development of ripples from flat sediment beds and on the transition from small-scale ripples to large scale dunes.
72076	CO <sub>2</sub> Systems in Sea Water	Dr. J.M. Edmond	Earth and Planetary Sciences	-----	Factors which control the levels of dissolved CO <sub>2</sub> and carbonate in the deep ocean, and their effect on biological activity, and inorganic precipitation. A laboratory project on the kinetics of dissolution of calcium carbonate in water and sea water has been initiated.
72077	International Trade Theory	Dr. J.N. Bhagwati	Economics	-----	Tariffs, exchange control, trade liberalization and related trade theory problems.
72078	Ocean Transport: U.S.-Puerto Rico	Dr. J. Harris	Economics	-----	U.S. maritime laws and their effect on ocean shipping between the U.S. and Puerto Rico. The costs under alternative technologies are considered with special emphasis on the economics of containerization. A revision of existing regulatory procedures is proposed.

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72079	Electrohydrodynamics	Dr. M. Melcher	Electrical Engineering	-----	Interactions between electric fields and dielectric or conducting media to establish fundamental wave and instability phenomena. Related processes useful in space and industry are being developed.
72080	Sonar Device for Mud Penetration	Dr. H. Edgerton	Electrical Engineering	-----	Development of a mud penetrating sonar device in the power range of 1 watt-second per pulse and 15-30 pps. Emphasis is placed on obtaining desired resolution to give sub-bottom details in sediments.
72081	Elapsed-Time Camera	Dr. H. Edgerton	Electrical Engineering	-----	Application of elapsed-time motion picture techniques to underwater photography. A camera employing stroboscopic light pulses at intervals of 1/2 to 120 seconds has been developed.
72082	Electronic Flash Systems	Dr. H. Edgerton	Electrical Engineering	-----	Design, development, and study of electronic flash systems capable of short, controllable flashes and the application of these systems to research and engineering.

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72083	Rotating Machines With Superconducting Field Windings	Dr. G.L. Wilson	Electric Power Systems Lab	Smith Thuller Kirtley Klein	Superconducting field windings in generators and synchronous condensers in electric power systems. Such machines are projected to be more compact, less costly and have better electrical characteristics than conventional machines. A 2 MVA scale model is being built.
72084	Nonlinear Waves	Dr. D. Benney	Mechanical Engineering	-----	Singular perturbation problems related to continuum mechanics. Non-linear waves and oscillations, the interactions of random waves and their stability.
72085	Problems in Thin Elastic Shells	Dr. F.Y. Wan	Mechanical Engineering	Seaman	Laterally loaded shells of revolution and helicoidal shells. Fundamental problems of pre-twisted plates. Computational use of extended static-geometric duality. Variational principle for shallow shells. Reduction of shell equations. Effect of transverse shear deformation. Staggered mesh finite difference scheme.
72086	Oil Pollution in Harbors and Bays	Dr. D. Hoult	Mechanical Engineering	-----	Oil pollution problems as they occur in harbors, bays and estuaries.



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72087	Oil in the Arctic	Dr. D. Hoult	Mechanical Engineering	-----	The spreading of oil spilled over or under arctic ice, associated with operations on the North Slope, appears to require a new technology for oil containment and removal.
72088	Fluid-Solid Interaction	Dr. P. Leehey	Mechanical Engineering	Davies	Description and measurement of turbulent boundary layer flow including flow over rough boundaries and excitation of structures by turbulent flow. The random vibration of coupled modal systems including the application of statistical energy analysis is also considered.
72089	Thermal Convection	Dr. L. Howard	Mechanical Engineering	-----	Theoretical studies of free thermal convection, with emphasis on the turbulent case.
72090	Studies in Large Strain Plasticity	Dr. A. Needleman	Mechanical Engineering	-----	Large strain elastic-plastic problems relevant to the theory of ductile fracture. A numerical method has been developed to study bifurcations that result in a localization of plastic flow, such as necking in tension. Also an attempt is being made to analyze the role of void coalescence in initiating fracture.

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72091	Fluid Dynamics	Dr. H. Greenspan	Mechanical Engineering	-----	Motion of fluids and gas in rotating coordinate systems with emphasis on problems in oceanography and meteorology. Special attention is being directed to the formulation of mathematical descriptions of stratified, viscous, rotating fluids.
72092	Rotating Fluids	Dr. L. Howard	Mechanical Engineering	-----	Time dependent rotating fluid motions. The results of this theoretical study are applied to geophysical phenomena.
72093	Pressure Drop and Void in Inclined Pipes	Dr. P. Griffith	Mechanical Engineering	-----	Development of a correlation for sloped oil well pressure drop.
72094	Oil and Its Spread at Sea	Dr. D. Hoult	Mechanical Engineering	-----	The spread of oil on the surface of the ocean. Techniques to control the spread include a bubble curtain.
72095	Thermal Effluent in Aquaculture Systems	Dr. J. Fay	Mechanical Engineering	-----	The use of air screens to regulate the mixing of hot water discharges from power plants.
72096	LNG Cooled Power Transmission Line	Dr. E. Cravalho	Mechanical Engineering	Singh	Total energy systems transmitting LNG (liquid natural gas) and electric power. The transmitting LNG cryogenically cools the electric power cable as well as serving as an energy source.

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72097	Crack Propagation Corrosive Environments	Dr. H. Uhlig	Meteorology	-----	The mechanism of crack initiation and crack growth under conditions of cyclic stress, as affected by corrosive environments.
72098	Stress Corrosion Cracking	Dr. H. Uhlig	Meteorology	-----	A study of the mechanism of stress corrosion cracking in mild and stainless steels.
72099	Corrosion Fatigue	Dr. R. Pelloux	Meteorology	-----	The influence of a corrosive environment (sea water, high humidity) on the rate of fatigue crack propagation in high strength aluminum and titanium alloys. The main variables are microstructure (aging times) of the alloys, cyclic rate, level of stress intensity factor and temperature. The corrosion fatigue susceptibility of the alloys is compared to their stress corrosion susceptibility. The corrosion fatigue crack propagation rates of 7075 aluminum alloys were shown to be dependent upon the stress wave shape as well as upon the frequency. The mechanisms of formation of brittle fatigue striations were evaluated as a function of the amplitude of the stress intensity factor.

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72100	Fundamental Welding Research	Dr. T.B. King	Meteorology	Rosof Batra	The influence of factors such as metal temperature, metal flow rate, metal surface tension and substrate surface roughness on the spreading of molten metal over cold substrates.
72101	Mechanisms of Fatigue Crack Propagation in Steels	Dr. R. Pelloux	Meteorology	Bathias	Fatigue crack growth rates of austenitic and ferritic steels as a function of their yield strength and ductility. Measurements of fatigue plastic zone sizes are made by microhardness indentations. The plastic zone sizes are related to the slip character of the alloys: wavy slip in ferritic steels and planar slip in austenitic steels.
72102	Dynamics of Tropical Circulations	Dr. F. Sanders	Meteorology	-----	The dynamics of circulation systems in low latitudes. This includes particularly those processes determining the tracks of tropical cyclones and those determining the character and behavior of circulations of lesser intensity as disclosed by data obtained during the Barbados Oceanographic and Meteorological Experiment (BOMEX).

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72103	Geophysical Fluid Dynamics	Dr. R.C. Beardsley	Meteorology	-----	Theoretical and experimental research in geophysical fluid dynamics. Current areas of interest are the "spin-up" of a stratified fluid, laminar convection, internal waves, laboratory and numerical models of the wind-driven ocean circulation and vortex motion in a rotating fluid.
72104	Dynamic Meteorology and Oceanography	Dr. J.C. Charney	Meteorology	-----	Study of the general circulation of the atmosphere and oceans: frontogenesis, tropical and extra-tropical cyclogenesis, formation of the Intertropical Convergence Zone, planetary wave propagation, dynamics of the Equatorial Undercurrent, stability of atmospheric and oceanic motions dynamic coupling of atmosphere and oceans.
72105	Geostrophic Turbulence	Dr. J.C. Charney	Meteorology	-----	Theory of atmospheric and oceanic spectra at scales intermediate between the excitation scales and the non-geostrophic scales.

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72106	Sea Environment in Massachusetts Bay and Adjacent Waters	Dr. E. Mollo-Christensen	Meteorology	-----	Development of methods for observation and interpretation of the dynamics of transport of properties and exchange mechanisms between water masses in a coastal area. The study of large-scale and micro-scale transport and dynamics are closely tied to interpretation methods.
72107	Air-Sea Interaction	Dr. E. Mollo-Christensen	Meteorology	Beards	Observation of the dynamics of formation and destruction of the seasonal thermocline as an air-sea interaction phenomenon. The formation of bottom water in Massachusetts Bay by cooling and evaporation is used to study momentum and heat flux in the air-sea boundary layer.
72108	Dynamics of Air-Sea Interaction	Dr. E. Mollo-Christensen	Meteorology	-----	The dynamics and statistics of intermittent events of flux and turbulence production pertinent to the dynamics of air-sea interaction. Laboratory observations of naturally and artificially triggered events of turbulent production and flux are used to correlate field observations from telemetering spar buoys.

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72109	Equatorial Undercurrent in the Indian Ocean	Dr. H.M. Stommel	Meteorology	-----	Monitoring of the equatorial undercurrent in the Indian Ocean. One goal is to detect the onset and decay of the current in response to the monsoons. The Somali Current has been observed to reverse before the onset of the southwest monsoon over the ocean interior. This result is at variance with the best theory available, which predicts that the current reversal should lag the monsoon onset by about one month. The undercurrent measurements may supply information bearing on the dynamics of the general circulation.

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72110	Ocean Bottom Pressure Fluctuations	Dr. H.M. Stommel	Meteorology	-----	Ocean bottom pressure fluctuations as an aid to understanding ocean dynamics. Measuring ocean bottom pressure in the open sea is necessary in the study of world tides since coastal geometry has a strong influence on shore-based tide gauges. The large amount of data on tides available from these near shore stations make the investigation of the exact relationship between deep sea tides and coastal tides very important. In addition to producing important tidal data, simultaneous recordings of ocean bottom pressure at two different points can also yield useful information on the variations of mass transport across the line joining the two points.

72111	Research in Oceanic Physics	Dr. H. Stommel	Meteorology	-----	A project consisting of seven parts: (a) a field study to measure and map what appear to be large submarine clouds in the winter-time western Mediterranean; (b) an attempt, in cooperation with the University of Kiel, to measure the vertical velocity in an upwelling area off the Northwest coast of Africa (in operation CINECA); (c) measurement of currents around an oceanic island (Ascension Island) that are produced by retification of periodic currents; (d) support of theoretical studies in oceanic
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72111 Cont.					physics; (e) conclusion of attempts to directly measure the detailed shear in microstructure; (f) conclusion of attempts to deter salt fingers underneath the main thermocline and (g) the conclusion of previous studies of the Somali Current.
72112	Administration of Mode-I	Dr. H.M. Stonmel	Meteorology	-----	The first Mid-Ocean-Dynamical-Experiment (MODE-I) is a cooperative scientific investigation of low frequency, medium scale motions in the sea. MODE-I is a joint experimental-theoretical project, involving scientists from fifteen universities and oceanographic institutions. The major field experiment will be performed for four months in early 1973 in a two-degree square located in the southwest quadrant of the Sargasso Sea. Measurements will be made from an array of moored buoys, bottom-mounted and free-floating devices, and ship and airborne instruments, with the central effort directed towards the resolution of the velocity and density fields on the time scale of days to months and a space scale of 10 to 200 kilometers.

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72113	Role of Carrier State in Transmission of Salmonella Infection	Dr. D. Rubinstein	Nutrition and Food Science	Musher	An attempt to assess the role of the carrier state (convalescent and chronic) in the transmission of salmonellosis in Massachusetts. In all cases of salmonella infection where food is the source of infection, the role of the carrier will be assessed, with particular reference to salmonella serological type as well as mode of transmission.
72114	Flavor in Fish Protein Concentrate	Dr. E. Wick	Nutrition and Food Science	-----	Chemistry of flavor in fish protein concentrate, of its flavor precursors, and of conditions for, and mechanisms of, its development.
72115	Liquid Chromatography in Biochemical Analysis	Dr. J.K. Palmer	Nutrition and Food Science	-----	Newer techniques of high-speed, high-resolution liquid chromatography applied to determination of organic acids, sugars or other organic constituents in foods, waste streams, rivers, etc.
72116	Optimum Amino Acid Nutrition	Dr. N. Scrimshaw	Nutrition and Food Science	Young Murray Bilmazes Allen	A determination of the proportion of total nitrogen required as essential amino acid nitrogen with different diets, age groups, and pathological states using whole egg, milk, meat or fish protein.

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72117	Solubilization of Fish Protein Concentrate	Dr. S.R. Tannenbaum	Nutrition and Food Science	Wang Archer	Development of technologically feasible methods for producing soluble protein products from FPC is being accomplished via partial digestion with proteolytic enzymes in a novel system using a selective membrane to simultaneously recover product and recycle the enzyme.
72118	Protein Concentrate Made From Squid	Dr. S.A. Goldblith	Nutrition and Food Science	-----	Work designed to develop a utilizable, stable protein concentrate from squid. Attempts are being made to develop a product with functional properties as well as to study the nutritional value of the products developed.
72119	Preparation of Canned and Dried Squid Products	Dr. S.A. Boldblith	Nutrition and Food Science	-----	Studies leading to the development of dried and thermally processed squid products.
72120	Effect of an FDC Diet	Dr. S.A. Miller	Nutrition and Food Science	-----	The effects of the fluoride concentration of fish protein concentrate on dental caries reduction. A preliminary experiment with animals showed that supplementing an otherwise cariogenic diet with fish protein concentrate would decrease experimental caries by about 60 %.

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72121	Utilization of Squid for Processed Food Products	Dr. S.A. Miller	Nutrition and Food Science	-----	Research to develop a number of canned, dried or frozen products, utilizing squid as the principal ingredient, has been initiated. The objective of this research is to develop products which will provide for a greater utilization of protein foods from the oceans.
72122	Plasma Membranes of Echinoderm and Mammalian Cells	Dr. J.B. Stanbury	Nutrition and Food Science	-----	Isolation of plasma membranes from static and rapidly dividing cells. Microcavitation with nitrogen is used to remove the membranes from thyroid and sea urchin cells. The purity of the preparation is tested in terms of enzymatic activity. Proteins from these membranes are separated on polyacrylamide gels.
72123	Waterborne & Intermodal Transportation Information Systems (TIS)	Dr. A.D. Carmichael	Ocean Engineering	-----	A waterborne and intermodal transportation information and library system including user requirements, data collection, storage, retrieval, and aggregation. The system forms part of an overall transportation information system to be installed in the Department of Transportation.

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72124	Oil Pollution Control	Dr. J. Milgram	Ocean Engineering	-----	The behavior of oil slick containment and collection devices in the presence of winds, currents, and waves. More effective methods of control are being developed.
72125	Oil Pollution Control	Dr. J. Milgram	Ocean Engineering	-----	The containment and collection of oil on the sea are considered. Special attention is given to the forces and motions of floating barriers.
72126	Hydrogen-Oxygen Steam Power-System for Deep Submersibles	Dr. A.D. Carmichael	Ocean Engineering	-----	An open steam cycle utilizing liquid oxygen and liquid hydrogen as the oxidant and fuel in a power system for a deep submersible. The proposed working fluid is a mixture of the steam produced by combustion plus a proportion of the condensed steam returned to cool the combustion products.
72127	Power Tools for Divers	Dr. A.D. Carmichael	Ocean Engineering	-----	A system involving sea water hydraulics to provide power for tools for underwater work. a 1/2 ky power tool is being developed.

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72128	Ocean-Borne Commerce and the Future of the Interoceanic Canal	Dr. N. Padelford	Ocean Engineering	-----	Trends in ocean-borne international commerce and in world shipping and their relationship to the future of the Panama Canal. Consideration will be given to the alternatives of a sea level canal. The problems of arranging suitable treaty provisions for a new Isthmian canal, and the limits of the existing Panama Canal.
72129	Future of Atlantic Ports	Dr. E.G. Frankel	Ocean Engineering	-----	A regional, integrated transportation study of foreign trade movement requirements in the period 1970-1990 and the resulting effects on existing ports and port requirements. Simulation models of ports and multipoint operations and port capacity measures are included in the study.
72130	Evaluation and Utilization of Marine Resources	Dr. A.H. Keil	Ocean Engineering	Lahman	Quantitative methodologies for evaluating and extracting mineral and hydrocarbon resources from the sea.
72131	Statistics of Ocean Ambient Noise	Dr. I. Dyer	Ocean Engineering	-----	The noise of distant ships (and that of other sources) propagates to a remote location through variable paths in the ocean. These variable paths cause fluctuations the ensemble of noise arrivals and statistical models thereof, are being studied to better understand sonar design, evaluation, and operation.

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72132	Student Summer Lab	Dr. D. Cummings	Ocean Engineering	-----	Design of equipment for use at sea. Emphasis is on precise location, mooring systems, underwater work, search, salvage. Students are involved in the design, construction, and use of electronic, acoustical, mechanical and optical equipment for these tasks.
72133	Hydrodynamic Investigation of Flapped Rudders	Dr. P. Mandel Dr. J. Kerwin	Ocean Engineering	-----	A series of rudders embodying variations of flap-chord ratio and balance area. Lift, drag, chordwise and spanwise center fo pressure are determined on the whole rudder and/or the flap separately. Extensions include test of rudders behind a propeller operating in uniform flow and in simulated ship wakes. Tests are underway in the M.I.T. Water Tunnel.
72134	Catamaran Hydrodynamics	Dr. P. Mandel Dr. A. Mansour	Ocean Engineering	-----	Research on catamarans has been pursued in the first two of the following three areas with the third proposed to start in '71-'72: 1) smooth water resistance of catamaran hulls including wave making interference effect of demi-hulls; 2) determination of stress distributions and maximum stresses in catamaran cross structure under assumed loadings; 3) determination of hydrodynamic sea loads on catamaran structure assuming five degree of freedom motion (surge omitted).

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72135	Design of Sonar Search Drone	Dr. D. Cummings	Ocean Engineering	Bertrand	Hydrodynamic modeling of a remote-controlled submersible to search for lost objects with sonar. Emphasis is on yaw-free control in a side current with low-aspect ratio fins.
72136	Application of Shallow-Water Wave Theory to Floating Bodies	Dr. J.N. Newman	Ocean Engineering	Oakley	Hydrodynamic forces on a two-dimensional body in shallow water, near the critical Froude number. Applications to motions and scattering from a circular ice island in shallow water, planning boat forces near the critical Froude number and on two-dimensional bodies in shallow water.
72137	Ship Waves in Homogeneous and Stratified Fluids	Dr. J. N. Newman	Ocean Engineering	-----	Theoretical and experimental study of wave systems which are generated by ships and other moving bodies. Full-scale aerial photographs are being made and analyzed. The results are compared to theoretical calculations that pay particular attention to effects of non-linearity.
72138	Water Jet Propulsion	Dr. A.D. Carmichael	Ocean Engineering	-----	Advanced water jet systems. A computer program will be developed to optimize water jets for the propulsion of high speed ships and boats.



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72139	Non-Axissymmetrical Shrouded Propellers	Dr. J.E. Kerwin	Ocean Engineering	-----	Investigation of a steering device consisting of a propeller shroud with a fixed forward portion and moveable aft portion which can be rotated about the propeller axis.
72140	Propeller Design	Dr. J.E. Kerwin	Ocean Engineering	-----	Application of a deformed-wake model of a propeller to problems of design, prediction of field point velocities and tunnel wall corrections.
72141	Dynamic Measurements in Water Tunnels	Dr. J.E. Kerwin	Ocean Engineering	-----	Development of instrumentation and data analysis techniques for dynamic measurements in water tunnels. Specifically under study are fluctuating propeller forces and associated pressures on adjacent boundaries. Tests are carried out in the M.I.T. Marine Hydrodynamics Laboratory.
72142	Structural-Acoustic Interaction in Water	Dr. P. Leehey	Ocean Engineering	Davies	The effects of fluid back reaction on a vibrating structure radiating sound into the fluid. When the fluid is water, the back reactions are strong and question is raised as to the applicability of statistical energy analysis to the problem. Theoretical analyses of strongly coupled systems are supplemented by experiments involving random excitation of thin membranes with random mass loading.

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72143	Acoustic Radiation From Panels Excited by Turbulent Pressure	Dr. P. Leehey	Ocean Engineering	Davies Burton	Thin membranes mounted flush with the wall of a low noise-low turbulence wind tunnel are excited by turbulent boundary layer pressures. Velocity response cross-correlations of membrane response are made and compared to theoretical estimates. Also a cavity is formed behind the membrane and the sound field in the cavity is measure. Wall pressure-velocity cross-correlations are measured for turbulent boundary layers over rough surfaces in the presence of mean pressure gradients.
72144	Prediction of Seakeeping Qualities for Ships	Dr. C. Chrysostomidis	Ocean Engineering	Milgram	A six degree of freedom model for the prediction of seakeeping qualities of ships. In addition, a model incorporating non-linear considerations for anti-rolling devices is being investigated. Computer aided evaluation of seakeeping performance for ship design purposes will be included.
72145	Design of Outboard Propellers	Dr. D. Cummings	Ocean Engineering	-----	Lifting surface theory applied to the design of commercial outboard propellers for improvement of efficiency and cavitation characteristics.

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72146	Propeller Inverse Problem	Dr. D. Cummings Dr. J.E. Kerwin	Ocean Engineering	-----	A mathematical and numerical model for predicting the performance of propellers at off design conditions.
72147	Hull-Control Surface Interactions Submersibles	Dr. D. Cummings Dr. J.N. Newman	Ocean Engineering	Luckhard	Derivation of a hydrodynamic theory and experimental work on the forces exerted on a submerged vehicle by activation of fins, rudders, and fairwaters. The geometry of trailing vortex sheets is of major importance.
72148	Maintaining Ship Speed At Sea	Dr. M.A. Abkowitz	Ocean Engineering	-----	Research on increasing ship speeds in head seas by improving their seakeeping qualities. Techniques are being developed for the comparative evaluation of ship performance using data from theoretical methods and model tests. Computer aided prediction of seakeeping performance for ship design is included.
72149	Sailing Yacht Research	Dr. J. Milgram	Ocean Engineering	-----	Research on yacht hulls and sails directed toward performance prediction. The facilities of the Marine Hydrodynamics Laboratory are used in this work. Digital computers are used for analytical studies of sails.

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72150	Structural Design of Surface Ships	Dr. J.H. Evans	Ocean Engineering	-----	Applied mechanics methods developed for a rational, consistent and orderly approach to the design synthesis of the primary structures of surface ships from loadings to detail design. Design optimization considerations and methods are included.
72151	The Analysis of Ocean Structures By the Finite Element Method	Dr. A. Mansour	Ocean Engineering	-----	Three dimensional stress analysis of complex ship and ocean structures is performed using the finite element method. Provision is made for the various types of structural members such as plates, bars and deep girders. Effects of boundary and loading conditions are considered.
72152	Effect of Axial Displacements At Boundaries of Beams & Plates	Dr. N. Jones	Ocean Engineering	-----	An examination of the influence of boundary displacements on the load carrying capacity of beams and plates loaded statically. The structures are assumed to be made from a rigid plastic material and the influence of finite deflections is retained.
72153	Structural Behavior of Pipe Bends	Dr. N. Jones	Ocean Engineering	-----	Investigation of elastic and inelastic behavior of piping geometry. The problem is approached by theoretical and experimental considerations of two normally intersecting cylindrical shells acted on by various external loads.

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72154	Damage to Dynamically Loaded Structures	Dr. N. Jones	Ocean Engineering	Summers	Experimental and theoretical response of structures (beams, plates, shell intersections) when subjected to dynamic loads. Intensity of loading considered is sufficient to produce large permanent buckling deformation.
72155	Stresses Around Elliptical Holes in Flat Plates	Dr. N. Jones	Ocean Engineering	-----	Theoretical elastic stress distribution in thin flat plates of finite width which contain an elliptical hole. Influence of adjacent neighboring elliptical holes on stress patterns and effect of various uniaxial and biaxial loads are being considered.
72156	Creep of Structures with Finite Deflections	Dr. N. Jones	Ocean Engineering	-----	Experimental and theoretical investigation into behavior of a circular plate to develop methods suitable for studying creep in more complex structures. Special consideration is given to geometry changes which might occur during deformation.
72157	Static and Dynamic Behavior of Rectangular Plates	Dr. N. Jones	Ocean Engineering	Pengos	Simple, rigid, plastic methods to predict the behavior of rectangular plates subjected to various external loads. In particular the bases (a) uniform static pressure and (b) dynamic pressures due to slamming of a ship are being considered in detail.

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72158	Probability of Failure Under Extreme Bending Moment Values	Dr. A. Mansour	Ocean Engineering	Boufounos	Methods for predicting the probability of failure of ships under extreme values of bending moment. The bending moment amplitude is considered to follow Weibull distribution, therefore, the results could be used for short term as well as long term analysis. Order statistics are used to estimate the extreme values. Charts showing the probability of failure are presented.
72159	Effect of Residual Stresses and Warpage	Dr. K. Masubuchi	Ocean Engineering	-----	Residual stresses and distortion in welded aluminum structures and their effects on service performance.
72160	Marine Applied Mechanics	Dr. A. Mansour	Ocean Engineering	-----	Statistical approach for predicting sea loads used in conjunction with finite element methods to analyze complex marine structures. Both methods offer realistic procedures for estimating the random loads and the corresponding random structural response.
72161	Post-Buckling Behavior of Stiffened Plates	Dr. A. Mansour	Ocean Engineering	-----	Behavior of stiffened plates, idealized by equivalent orthotropic plates, in the post buckling range. Deflections, effective breadth, critical loads, bending stresses, and membrane stresses are plotted versus non-dimensional parameters that specify the elastic characteristics of the plate and its loading condition.

<u>SG Number</u>	<u>Title</u>	<u>Principal Person</u>	<u>Department</u>	<u>Others Involved</u>	<u>Brief Description</u>
72162	Thermal Stresses and Metal Movement During Welding	Dr. K. Masubuchi	Ocean Engineering	-----	Mathematical analyses of thermal and metal movement during welding. Emphasis of the analyses will be placed on gas-tungsten arc (GTA) welding of plates in aluminum alloys, especially types 2014 and 2219. These are used for fabrication of Saturn V structures including fuel tanks. The study also includes tantalum and columbium sheets to be used for the space shuttle.
72163	Integration of Nasa Sponsored Studies on Aluminum Welding	Dr. K. Masubuchi	Ocean Engineering	-----	Integration of results obtained from studies sponsored by the G.C. Marshall Space Flight Center, NASA. These studies, aimed at solving various problems related to welding of aluminum for space vehicles, were conducted at various types of institutions.
72164	Crack Propagation in Welds	Dr. A. Mansour	Ocean Engineering	Yurioka Brown	Analysis of residual stresses and distortion in weldments, and study of crack growth in weldments in high-strength materials.
72165	Underwater Thermit Welding	Dr. K. Mansubuchi	Ocean Engineering	-----	Advance technology of underwater welding and cutting of metals is being considered. The current study includes (1) mechanism of metal transfer in an underwater welding arc, and (2) heat flow during underwater welding.

<u>SG Number</u>	<u>Title</u>	<u>Principal Person</u>	<u>Department</u>	<u>Others Involved</u>	<u>Brief Description</u>
72167	Technological Development and International institutions	Dr. E.B. Skolnikoff	Political Science	-----	An examination of the way in which scientific and technological developments over the next ten to twenty years will generate new requirements for international institutions and an exploration of how these requirements may be met in the light of experience to date.
72168	Public Policy for Seas	Dr. N. Padelford	Political Science	-----	Public policy and the use of the seas in light of new developments in science and technology. Principal emphasis is on United States' interests and policy.
72169	Fiber Connections Within the Shark Olfactory System	Dr. L. Heimer	Psychology	Morey	Analysis of the morphology of the olfactory pathways in the shark using silver impregnation and electron microscopy.



TO: Executive Officer  
M.I.T. Sea Grant Project Office  
Room 3-282

SUBJECT: Comments and Recommendations on Directory of M.I.T.  
Research Projects Related to Marine Resources,  
Ocean Utilization and Coastal Zone Development.

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Name (Please Print)

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Address

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Telephone

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Signature

FOIb

FOIb

From:

TO: Executive Officer  
M.I.T. Sea Grant Project Office  
Room 3-282  
Massachusetts Institute of Technology  
Cambridge, Massachusetts 02139

TO: Executive Officer, M.I.T. Sea Grant Project Office  
Room 3-282

SUBJECT: Research Project for Directory of Work Related to  
Marine Resources, Ocean Utilization and Coastal  
Zone Development

The below described project of current research at M.I.T.  
is recommended for inclusion in the next issue of the Directory:

Project Title: \_\_\_\_\_

Sponsor: \_\_\_\_\_

Principal Person (Faculty Supervisor): \_\_\_\_\_

Department: \_\_\_\_\_

Others Involved (Faculty and Key Staff): \_\_\_\_\_

Scheduled Completion Date: \_\_\_\_\_

Brief Description (Abstract Statement):

Research Area(s): \_\_\_\_\_

Remarks:

Date: \_\_\_\_\_ Signed: \_\_\_\_\_

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From:

TO: Executive Officer  
M.I.T. Sea Grant Project Office  
Room 3-282  
Massachusetts Institute of Technology  
Cambridge, Massachusetts 02139