

Concepts and Background for a
UNOLS-SPONSORED STUDY
entitled
RESEARCH SUBMERSIBLE FACILITY REQUIREMENTS
for
SHORT AND LONG TERM NEEDS WITHIN THE
U. S. SCIENTIFIC AND TECHNICAL COMMUNITY

(Approved as a UNOLS Sponsored Study by UNOLS Advisory Council
 on January 25, 1979)

BACKGROUND

The UNOLS ALVIN Review Committee (ARC) in concert with representatives of the U. S. Navy (the Office of Naval Research), the National Science Foundation (Office of Oceanographic Facilities and Support) and the National Oceanic and Atmospheric Administration (Manned Undersea Science and Technology Office) agreed to the need for an independent study to assess the short and long term needs for a University National Oceanographic Laboratory System (UNOLS) sponsored manned submersible science program. The ARC of UNOLS prepared and approved a work statement, included below, on August 7, 1977.

WORK STATEMENT

Regarding Suitability of UNOLS Submarine
 Science Facilities for the Short and Long Term
 (August 7, 1977)

The purpose in undertaking this study is to assess the current and project requirements for UNOLS submersible science facilities; to review the alternatives to meet these needs; and to recommend specific systems both in the short and long term, along with priorities and associated costs.

Specifically, to establish priorities and costs with regard to:

1. Identification of short term* needs and directions for UNOLS submersible science and engineering.
 - a) What is the useful expectancy of the present facilities meeting UNOLS' needs (ALVIN and present LULU)
 - b) What options exist for improvement within the short term
2. Identification of long term* needs and directions
 - a) What are the specific capabilities the scientific community will be looking for
 - b) What options exist for meeting these needs

*Short term refers to utilization of (or updating) existing facilities. Long term refers to replacement and/or procurement of new facilities. This study should identify the associated time-frames.

The recommendations by the ARC to have NOAA/MUS&T coordinate the program in cooperation with NSF and ONR has not been possible. This proposal, therefore, has been developed as an alternative, retaining the August 7, 1977 charge for the study.

THE PROPOSAL

It is proposed that UNOLS, through the ALVIN Review Committee, and with the support of three federal agencies (NSF, NOAA & ONR) currently supporting the on-going ALVIN Program, sponsor a study to assess the manned research submersible facilities requirements for short and long term needs within the U. S. scientific and technical research community. It is proposed that the study be conceived as a UNOLS sponsored study, funded by and coordinated with the interests of the three federal agencies currently funding the ALVIN operations programs. The charge to the study group (to be defined in more detail later in this document) shall be based on that originally developed by the ARC in August 1977. (See the WORK STATEMENT on pages 1 and 2). The submersible requirements, referred to in the WORK STATEMENT, shall be based upon well defined research needs in the U. S. scientific and technical community.

THE OBJECTIVES OF THE STUDY

The objective of this study is to develop a comprehensive facilities plan which identifies and satisfies UNOLS submersible science requirements from the present through the year 1990. The plan shall consider LULU/ALVIN modifications, leasing of submersible systems, or capital expenditures for reactivation of existing facilities and/or construction of new or additional systems, as well as plans for maintenance and operations.

The plan will involve (1) assessing the needs for and a review and analysis of projected ocean science and technology research programs, and hence to define current and future UNOLS submersible facility requirements, (2) the definition of alternative operational systems (submersible, support ship and handling equipment) capable of satisfying the requirements identified in (1), and (3) completion of detailed cost-effectiveness analyses resulting in recommended operational systems. The facilities plan shall include an implementation program which describes required actions, associated schedules, and estimated funding requirements. Arrangements for operational and scientific program management shall be reviewed and recommendations made.

THE SCOPE OF THE STUDY

The study shall identify and define UNOLS submersible science capability facility requirements through the 1980's and, if possible, beyond into the 1990's. It is assumed that the facilities for which a need is defined shall be National Oceanographic Facilities available for use by qualified scientists from any institution (academic, government and other appropriate institutions) through an allocation procedure of a UNOLS Review Committee. In addition to determining the needs of the academic ocean science and technical community for research facilities (such as those within NSF), the survey effort shall include civilian government agencies (e.g. NOAA, DOE, EPA, USGS, DOT, BLM) and the U. S. Navy unclassified programs through the Office of Naval Research (Code 480).

The assessment of existing operational systems and their components shall include a determination of the general specifications and status of current and recently active U. S. submersible and foreign civilian submersible systems which represent advanced developments in the design of submersibles,

support vessels, and handling equipment. The study emphasis shall be on conventional manned submersibles.

The study and resultant facilities plan shall be completed in approximately 12 months.

CONDUCT OF THE STUDY

It is proposed that the study be conducted as a UNOLS sponsored effort, organized by the UNOLS Advisory Council and ARC in behalf of UNOLS, the three Federal agencies, and the U. S. scientific and technical research community. It is proposed that in organizing the study, UNOLS establish three components for the effort.

- 1) A Submersible Science Assessment Panel (Science Panel)
- 2) A Submersible Science Facilities Planning Task Force (Task Force)
- 3) A UNOLS Submersible Study Project Office (Project Office)

The Science Panel's major responsibility will be to assess the role submersible science plays in the larger context of ocean science and technology research and to define the scientific requirements, if any, for UNOLS Submersible Facilities in the short and long term (a more detailed charge follows). The Task Force's major responsibility will be to use the assessments of the Science Panel to develop the mission requirements (if any) for science submersible(s) and develop specific recommendations, if warranted, for UNOLS Submersible Facilities in the short and long term. The Project Office shall provide staff and technical support to the Science Panel and the Task Force, and shall coordinate the study and produce the final report. The Project Office shall also consult with and report to ARC periodically on the progress of the study. From amongst its members, the ARC shall appoint a Steering Committee for the study. It is proposed that the study be jointly funded by NSF, ONR and NOAA (not necessarily on a three equal parts basis, but on a mutually acceptable negotiated percentage basis, with no agency supporting less than 25% of the cost of the study).

THE SUBMERSIBLE SCIENCE ASSESSMENT PANEL

It is proposed that a Submersible Science Assessment Panel (Science Panel)

be appointed by the UNOLS Executive Committee from a list recommended by the UNOLS Advisory Council. In making the appointments, the diverse needs and discipline interests (the sciences and engineering) of the academic and governmental communities shall be represented. The panel shall be composed of:

- Four individuals from the ocean science and technical community, the selection being based on their demonstrated ability to evaluate the broad scope of needs and long term patterns for ocean science and technical research.
- Three individuals with demonstrated research competence in using manned submersibles for science, one of whom has experience in operational characteristics of ALVIN or similar submersibles and their support systems.
- One member of the Task Force, appointed by the Task Force
- A Chairperson shall be appointed from those listed above by the UNOLS Executive Committee.

The Science Panel shall review and analyze the needs for manned submersible systems to support U. S. ocean science and technical programs. The Science Panel membership shall be overlapping with the recently established Ocean Science Board (OSB) Study Committee (The charge to the OSB Study Committee is attached in Appendix I). The OSB Committee has been established to study the ocean science requirements for the performance of complex manipulative and observational manned and related unmanned research tasks in the ocean. Because manned submersible science is an aspect of the OSB study, it is highly desirable that the two national studies be coordinated. While the UNOLS study will produce its own science panel report and have its own membership and chairman, the OSB Committee and UNOLS Science Panel shall have overlapping membership (the amount of overlap to be determined by the UNOLS Executive Committee and the OSB Committee Chairman) and shall, wherever possible have concurrent meetings and use each other's data and assessment resources. It is suggested that the Science Panel include in its methods of assessing needs, reference to recently conducted studies, e.g. the Post-IDOE Studies and background data, the National Science Board 1978 study entitled "Basic Research

in the Mission Agencies" and the NOAA/MUS&T study entitled "Federal Civilian Agency Manned Undersea Program Identification, Description and Facility Requirements" by F. Busby. Further, the Science Panel should use, as extensively as possible, the materials being developed for the OSB study. These needs shall be placed in a larger context with other needs in the U. S. ocean science and technical research community, so that an assessment of the importance of submersible capabilities can be made. If the need for submersible science is demonstrated, then the Panel shall identify and make priority judgments about the ocean science and technical research programs that require submersibles. The Panel shall focus its efforts on manned submersibles, recognizing that unmanned systems may be more appropriate for some needs. The Panel recommendations shall focus on those demonstrated scientific and technical needs that clearly require manned submersible systems. A definition of current and future UNOLS submersible capabilities shall be developed in the context of the need for the submersible to do the research. The Science Panel shall prepare a report within six months of the start of the study, which shall be submitted to the Task Force with copies provided to the OSB Study Committee, the ARC Steering Committee and the UNOLS Executive Committee. The report should be suitable for the Task Force to understand the specific capabilities the scientific community deems essential for a UNOLS Manned Submersible Science Program.

THE SUBMERSIBLE SCIENCE FACILITY PLANNING TASK FORCE

The members of the Submersible Science Facility Planning Task Force (including its chairperson) shall be recommended for appointment by the ALVIN Review Committee (with appropriate consultation with representatives of each funding agency). The UNOLS Executive Committee shall make the final appointments. The Task Force shall be composed of:

- Three individuals with operational and/or research experience with research and civilian submersibles (representing academic, government and industrial experience)
- Three individuals with design and/or construction experience with research submersibles

- One individual with research experience with submersibles who is also a member of the Science Panel
- Three individuals, one each appointed by the three funding agencies (NOAA, ONR & NSF)
- The chairperson shall be selected from those listed above.

The submersible capabilities requirements in support of ongoing and projected marine science programs shall be determined by the Science Panel and forwarded to the Task Force. Missions and mission requirements shall be defined for each program, and analyses shall be made to determine compatible geographic and functional requirements, with the goal of developing a cost-effective submersible capability which meets U. S. science and technology needs and is balanced with other oceanographic needs and requirements.

The projected mission requirements shall be compared to the current capabilities of the LULU/ALVIN system and other systems presently available to determine those requirements which remain unsatisfied. The study should recognize as a practical matter, the national investment in the LULU/ALVIN system. The impact of short term LULU/ALVIN improvements and long term UNOLS submersible and support system acquisitions shall be analyzed to determine optional modes of overall mission requirement satisfaction. Optional system conceptual designs will be developed in conjunction with cost-effectiveness analyses to determine the minimum components of a UNOLS submersible capability.

The UNOLS submersible science facilities planning effort, in addition to presenting program requirements, existing facility capabilities or modifications, required short term LULU/ALVIN improvements, and proposed new facility acquisitions, will include a master schedule indicating projected lead times for design, construction and testing of new facilities or modification of existing facilities. Also discussed will be recommended plans for funding, scientific program development, and operational management of candidate UNOLS submersible operational systems.

THE UNOLS SUBMERSIBLE STUDY PROJECT OFFICE

The study shall be supported by a Submersible Study Project Office, appropriately staffed to support all aspects of the study and to prepare all interim and final reports for both the Science Panel and the Task Force. The Project Office shall be headed by a Project Coordinator who shall provide technical staff support to the Science Panel and the Task Force. The Project Office shall be responsible to ARC, through the Steering Committee, and will periodically report to that Committee. It is proposed that the Project Office be the fiscal agent for the study, supporting the expenses of the Science Panel, Task Force, and the Project Office. Further, the Project Office shall be located and be administratively a part of a UNOLS member or associate member institution. The Project Office should be located at an institution with appropriate experience to conduct the study. This is a UNOLS sponsored study, performed on behalf of UNOLS by an institution recommended by the UNOLS Advisory Council and approved by the UNOLS Executive Committee on behalf of UNOLS. The UNOLS Executive Committee shall review all proposals submitted to it by UNOLS members or associate member institutions, and then forward its recommendation for one or more of the proposals to NSF, who shall act as the contracting agency, on behalf of all three (ONR, NSF & NOAA) funding agencies. The study should be completed in no more than 12 months.

The report shall be as specific in details as possible and shall be prepared in a fashion suitable for the ARC and UNOLS to make specific recommendations for meeting the scientific and technical needs for submersible science facilities. The final report shall be prepared by the Project Office and approved by the Task Force, prior to being submitted to UNOLS. The final report shall be submitted to the Executive Committee of UNOLS in a final draft prior to publication. The UNOLS Executive Committee shall approve the report for publication as a UNOLS study. The Project Office shall produce 300 copies of the final report.

February 8, 1979

PROPOSED NOAA OCEANLAB PROJECT ASSISTANCE
Draft 11.15.78

An OSB Study of the Ocean Science Requirements for the Performance
of Complex Manipulative and Observational Manned and Related Unmanned
Research Tasks in the Ocean

Background

The National Oceanic and Atmospheric Administration has initiated a program called Oceanlab to enhance manned undersea capabilities in support of ocean research. The program has included studies of research which could benefit from this enhancement and of a possible major new vehicle -- a large diver support/mobile undersea laboratory -- which would provide the principle focus for the programs in the future. The desirability of this approach has been received by NOAA and the program has been redirected to better assess the most effective technology required to support manned undersea research activities. NOAA has asked the OSB to assist them in this effort.

Study Goals

The unique aspect of manned undersea activity (including divers), in support of ocean research, is the ability to carry out complex observational and manipulative tasks. Delineation of research topics whose successful prosecution would include a requirement for performance of such tasks would be the first step in this review. The second step would focus on possible technical needs to improve and support U.S. capabilities to carry out such tasks using man directly in the seas and extensions of his capabilities through use of submersibles and remotely controlled devices.