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REPORT OF THE COMPTROLLER GENERAL OF THE UNITED STATES



Manned Undersea Science And Technology Needs Focus And Direction

**National Oceanic and Atmospheric Administration
Department of Commerce**

National goals and objectives for U.S. manned undersea research have not been clearly defined. Until this is done it would be difficult to establish a level of funding or new facilities needed to support an expanded Federal manned undersea research program.

The Office of Manned Undersea Science and Technology (National Oceanic and Atmospheric Administration) could be designated to provide leadership and focus to manned undersea activities. If so, it should be responsible for ascertaining the manned undersea needs of various Federal agencies involved in these activities and for proposing development and acquisition of facilities to meet these needs. It should also be a national focal point for manned undersea activities to coordinate and manage the use of manned submersibles and underwater habitats and to provide information to users of its services on current and planned research projects, research results, and technological developments.

PSAD-77-130

JULY 14, 1977

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COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-145099

The Honorable Lowell P. Weicker, Jr.
United States Senate

Dear Senator Weicker:

As requested in your July 7, 1975, letter (see app. I), we studied the problems, present status, and future of manned undersea science and technology. We provided preliminary information to your office in December 1976 and February 1977. After the December meeting we were asked to concentrate on a list of 12 questions provided by your office. (See app. II.)

We obtained much of our information from representatives of the marine science community in the Federal Government, including the Manned Undersea Science and Technology Office of the National Oceanic and Atmospheric Administration, Department of Commerce, the National Science Foundation, and the Navy; universities; private industry; and advisory committees. The responses to the 12 questions are categorized under the following headings:

- Research Areas Where Submersibles Can be Used (question 1).
- Facilities (questions 8 and 9).
- Barriers and Limitations to Expanded Use of Undersea Science and Technology (questions 2, 3, 4, 5, and 12).
- Federal Administration of Manned Undersea Programs (questions 6, 7, 10, and 11).

INTRODUCTION

Manned undersea science and technology can be defined as the use of manned undersea equipment and techniques to conduct ocean research. This includes research with manned submersibles or habitats and by divers. Manned submersibles serve as observation platforms and a means of transporting scientists and their instruments to specific locations in the water. Some submersibles have lockout capabilities which

B-145099

permit a diver to leave the facility to do scientific studies and then reenter while remaining submerged. Habitats are stationary facilities used to house the divers who make studies on or near the ocean bottom.

Manned undersea activity should not be considered an entity in itself, but rather one of many techniques used to study ocean processes and phenomena. It often complements surface-based investigations. Manned submersibles and habitats are usually expensive to operate and should be used only when a high priority need is shown and alternative research tools are not applicable.

The National Oceanic and Atmospheric Administration, the National Science Foundation, and the Navy have undertaken or sponsored manned undersea research. Although the Navy and the National Oceanic and Atmospheric Administration do some of their own research, much of it is done by the academic community. Private industry is also involved in manned undersea research by designing, building, and testing facilities.

Undersea research has suffered from (1) the lack of overall ocean research goals and objectives, (2) a national focus, and (3) sporadic funding. The National Oceanic and Atmospheric Administration attempted to provide a national focus for manned undersea research when it established the Manned Undersea Science and Technology Office in 1971. However, its budget was restricted to level funding of about \$1 million a year and its objectives were narrowed to support only in-house investigations. In another attempt to provide a national focus for manned undersea research, the Congress appropriated an additional \$1.5 million in fiscal year 1977 for the National Oceanic and Atmospheric Administration to support surveys, mission analyses, cost analyses, and design and engineering studies for an underwater ocean laboratory known as Oceanlab. (See pp. 5, 7, and 9.)

RESEARCH AREAS WHERE SUBMERSIBLES CAN BE USED

The tasks, rather than the type of science, determine the suitability of using manned undersea techniques. Submersibles have unique capabilities to perform complex manipulations and precise sampling activities, as well as providing a platform to observe processes in the deep sea. Tasks for which manned undersea facilities offer major advantages include

B-145099

- detailed observations of marine organisms, topographic features, and processes;
- selective sampling of the bottom environment;
- selective positioning, servicing, or recovery of instruments; and
- finding new and unsuspected occurrences that remote instruments were not designed to detect.

Manned undersea activity can be used to some extent in many ocean research areas including biology, geology, ecology, and physics. Submersibles are useful for geological and geophysical research in support of conventional techniques, such as dredge and core sampling, towed camera sleds, and sonar readings. For example, conventional techniques can be used for preparing bathymetric maps and identifying features requiring closer study. Then manned submersibles can be used to observe the features and take sample data.

Habitats are most suited to projects requiring long-term monitoring of environmental conditions or organisms in their natural state. Processes which occur rapidly can be studied in their entirety.

Research areas where manned undersea submersibles can be used include:

1. Biology:

- Assessing marine biological resources.
- Studying the life cycles of biological organisms and their relationships to the ocean's physical, chemical, and geological characteristics.

2. Geology:

- Studying geological processes of the ocean bottom.
- Studying environmental effects of marine mining.
- Studying sedimentation processes on the ocean bottom.
- Studying and investigating in detail the continental shelf, slopes, submarine canyons, and cliffs.

B-145099

--Studying depositional and erosional processes.

3. Ecology:

--Inspecting existing waste disposal sites and selecting new ones.

--Subsequent monitoring of disposal sites.

4. Physics:

--Studying radioactivity in the ocean.

FACILITIES

In 1965 there were 19 manned submersibles operational in the United States. In 1975 there were 57 submersibles of which 18 were operational, and 8 habitats which were all inactive. One of the principal submersibles used for research is the deep submergence research vehicle Alvin. It is operated by the Woods Hole Oceanographic Institute under a joint funding agreement with the Navy, the National Science Foundation, and the National Oceanic and Atmospheric Administration.

We asked members of the marine science community how many submersibles and habitats could be used and where they should be located to support a national manned undersea science program. Their opinions varied from three to nine submersibles and from one to three habitats. Opinions also differed as to where these facilities should be located.

Three reports have been issued which attempt to assess facility needs.

--"Manned Underwater Platforms," prepared by the University of New Hampshire in October 1972, showed a need for three manned submersibles and three habitats.

--"Future Facilities Requirements of the University National Oceanography Laboratory System," prepared by the University of Hawaii in October 1974, showed a need for nine manned submersibles and three habitats by 1990.

B-145099

--"Report on UNOLS Long-Range Planning Meeting" dated May 1975, showed a need for two manned submersibles and one habitat by 1990.

A University National Oceanographic Laboratory System supported workshop, held at Stanford University in December 1976 on the long-range use of the Alvin, did not foresee the need for adding another deep submersible until 1985. The workshop participants said that if the Alvin could not fulfill the demand for research time, a proposal should be made to use the Navy's submersible "Sea Cliff" on a part-time basis for West Coast operations.

Operating costs

In most cases, manned submersibles and habitats are expensive to operate and should be used only if a high priority need is shown and other methods are not applicable. The operating costs of submersibles vary according to many factors, including the complexity and size of the facility and the support equipment needed. Therefore, the operating cost of any future submersibles or habitats could not be estimated unless these factors were known.

However, to illustrate the cost of using these types of facilities, the following table on page 6 shows operating data for 11 submersibles which were operational in 1975.

Oceanlab

The National Oceanic and Atmospheric Administration's Manned Undersea Science and Technology Office is planning for the development of a manned undersea facility called Oceanlab. The Congress appropriated \$1.5 million for fiscal year 1977 to be used for surveys, mission analyses, cost analyses, and initiation of design and engineering for a national ocean laboratory. The Manned Undersea Science and Technology Office estimates that the construction cost of Oceanlab, independent of surface support, will be about \$22 million by 1981.

As presently conceived, this mobile underwater laboratory will

--operate at depths down to 1,000 feet,

--have lockout capabilities down to 1,000 feet,

BACKGROUND INFORMATION ON MANNED SUBMERSIBLES WHICH
WERE OPERATIONAL IN 1975

<u>Submersible</u>	<u>Operator</u>	<u>Year launched</u>	<u>Estimated daily operating or lease cost</u>	<u>Depth capability</u> (feet)	<u>Pilot/crew</u>
Alvin	Woods Hole Oceanographic Inst.	1964	<u>a</u> /\$7,500	12,000	3
Albatross	Texas A&M University Harbor Branch Foundation	1974	5,200	1,200	2
Johnson Sea Link I	Harbor Branch Foundation	1971	5,095	1,000	4
Johnson Sea Link II	Harbor Branch Foundation	1971	5,095	2,000	4
Albatross Alpha	General Oceanographics	1968	<u>b</u> /1,500	1,000	2
Albatross Beta	General Oceanographics	1970	<u>b</u> /1,700	1,000	2
Albatross Gamma	General Oceanographics	1971	<u>b</u> /1,800	1,000	2
R-1	U.S. Navy	1969	Information unavailable		7
Sea Cliff	U.S. Navy	1968	<u>c</u> /3,250	6,500	3
Albatross	Undersea Graphics	1969	2,250	1,000	2
Albatross	U.S. Navy	1968	<u>c</u> /3,250	6,500	3

/ Based on direct costs for 124 operating days in 1975.
/ Does not include support ship costs.
/ Does not include support ship or personnel costs.

B-145099

- be capable of operating in cold water--temperatures as low as freezing--and under adverse sea state conditions,
- have a surface range of 1,000 nautical miles and a submerged range of 50 to 100 nautical miles,
- have a submerged duration of 30 days,
- be equipped with both life support and laboratory facilities and provide onboard decompression for divers, and
- carry a mini-submersible to enhance rescue capabilities and provide observational capabilities to 1,500 feet.

The Manned Underseas Science and Technology Office has sponsored workshops to allow representatives of the academic, scientific, commercial, industrial, and recreational diving communities to provide mission and design requirements for Oceanlab.

We found that the marine science community generally does not support Oceanlab. Examples of objections to Oceanlab were as follows:

- The National Oceanic and Atmospheric Administration has tried to find programs to fit the facility's capabilities rather than building a structure to meet today's existing needs.
- This all-purpose, complex vehicle may require many repairs, thus reducing the available diving days.
- Funding of Oceanlab may divert funding from other projects.

Oceanlab workshop participants said they had little input in deciding whether or not to build Oceanlab; the decision had already been made. Workshop participants summarized their overall opinion of Oceanlab as follows:

* * * the workshop participants unanimously disapprove of Oceanlab (deep diving lockout vehicle) at this time. We recognize that a limited number of scientists could use the vehicle. It is our opinion that a large Oceanlab vehicle or habitat

B-145099

is not in the best interests of the scientific diving community as a whole. * * * We feel that we can not build a national program of underwater research around a few very expensive, ponderous vessels or habitats. Mobile, practical, rugged and above all readily available equipment and vehicles are necessary to accomplish stated objectives in practical working depths."

BARRIERS AND LIMITATIONS TO EXPANDED USE OF UNDERSEA SCIENCE AND TECHNOLOGY

Certain barriers and practical limitations restrict man working in the sea, whether using manned undersea vehicles or diving equipment. These include cost, training requirements, technological limitations of facilities and equipment, and physiological limits.

Many researchers stated that manned submersibles were not used to a greater extent because of

- high costs,
- sporadic and inadequate funding,
- lack of familiarization with potential contributions, and
- uncertainty as to availability of submersibles.

The technological limitations of manned submersibles also constrain scientists in conducting ocean research. The power source, usually batteries, has limited endurance; and submergence time is dependent upon the energy used for propulsion, external lighting, and equipment requirements. Some larger submersibles have the capacity to remain submerged for 8 to 12 hours with constant use of their propulsion motors or a maximum of 24 hours with minimal use. For example, the Alvin can stay submerged from 6 to 8 hours with constant use of its motors. The Navy is currently seeking to develop an improved power source.

There are physical and technological limits which divers face in doing ocean research. The risks and problems of diving increase with depth. To improve the safety, more research is needed on the interrelated effects of pressure, breathing gas mixtures, and time on man's ability to function.

Divers have made routine descents to 600 feet, have worked for 4-hour periods at depths to 1,080 feet in Arctic waters, and have made simulated dry chamber dives to 2,000 feet. Research diving from the surface, however, is usually limited to depths of less than 150 feet. At or beyond 150 feet, a diver breathing compressed air is subjected to a condition known as nitrogen narcosis--the intoxicating effect of breathing nitrogen at higher pressures. Divers are unable to think rationally and their ability to perform simple physical tasks may be impaired. Substituting other inert gases for nitrogen has been recognized as a solution, however, the primary drawback to the use of these gas mixtures has been the high cost of equipment and the lack of training by researchers necessary for its proper use. Other factors which may limit a diver's effectiveness under certain conditions are visibility, water temperature, and fatigue.

FEDERAL ADMINISTRATION OF
MANNED UNDERSEA PROGRAMS

Most marine scientists and researchers we contacted said they believe the Federal Government's management and administration of undersea research has been inadequate in the past. The issues most frequently raised were the lack of

- national ocean research goals and objectives,
- leadership,
- coordination, and
- adequate and continuous funding.

Federal manned undersea research is done primarily by three agencies: the National Oceanic and Atmospheric Administration, the National Science Foundation, and the Navy. These agencies are jointly funding the Alvin's operational expenses which total about \$1 million annually.

The academic community and private industry fulfill important roles in manned undersea science and technology. The academic community carries out manned undersea research under Federal grants and contracts. It also trains students in oceanography, marine science, underwater technology, and scientific diving techniques. Industry has designed, fabricated, and tested most of the manned submersibles built in the United States since 1959. Industry also trains

B-145099

crews to operate submersibles and diving systems, and trains divers to perform various underwater tasks.

In an attempt to establish a national manned undersea program, the National Oceanic and Atmospheric Administration created the Manned Undersea Science and Technology Office in 1971 to develop, promote, and support a national civilian operational capability for man to work under the sea to achieve a better understanding, assessment, and use of the marine environment and its resources. The Office's budget was \$1.4 million in fiscal year 1972, its first year of operation. In fiscal years 1973 and 1974 the Office proposed budget increases of \$15 and \$12 million, respectively, for a national manned undersea program. However, during the budget process for these 2 fiscal years the Office of Management and Budget directed that the objectives be narrowed from a national program to a program supporting only in-house investigations. Consequently, the Manned Undersea Science and Technology's Office budget has been approximately \$1 million a year since fiscal year 1973. This has limited its ability to support enough research to result in national leadership in manned undersea research.

In 1976 the Marine Board of the National Research Council appraised and reported on The Manned Undersea Science and Technology Office program. Its report stated that the principal thrust of the program should be one of coordination and overall management rather than operational control of research, and that the program should

- be national in scope, supporting both civil Federal and non-Federal users;
- provide information and services on a national basis;
- provide for transfer of research results and technology; and
- provide funding grants within specific guidelines, for the development, application, testing, and support of undersea activities.

The Marine Board report recommended "that NOAA [National Oceanic and Atmospheric Administration] revise the MUS&T [Manned Undersea Science and Technology Office] objectives and issue a formal definitive charter for MUS&T" to provide a national focus for civil manned undersea activities.

B-145099

CONCLUSIONS

Manned undersea research presently lacks focus and direction. National goals and objectives have not been clearly defined, and the relative priority of research areas and projects have not been specifically identified or classified. As a result, there is no basis at this time for supporting an expanded manned undersea research program.

If the Manned Undersea Science and Technology Office is restructured, it should be designated to provide leadership and focus to manned undersea activities as recommended by the Marine Board. It should also be responsible for ascertaining the manned undersea needs of the various Federal agencies involved in these activities and proposing, where justified, the development and acquisition of facilities to meet these needs. It should be a national focal point for manned undersea activities to coordinate and manage the use of manned submersibles and habitats, and to provide information to the user community on current and planned research projects, research results, and technological developments.

Until the overall goals and objectives for manned undersea research are identified, it would be difficult to establish the level of funding or new facilities needed to support the program.

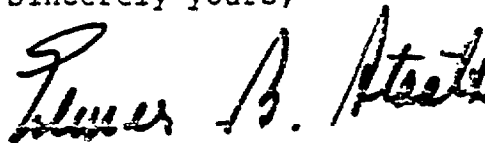
AGENCY COMMENTS

As requested by your office, we did not obtain official Department of Commerce comments. We discussed the report with Manned Undersea Science and Technology Office officials whose comments are shown in appendix III. They agree with our position regarding the need for plans and programs, and support our basic premise that such efforts are necessary for any program activity. They noted, however, that the National Oceanic and Atmospheric Administration, through its Manned Undersea Science and Technology Office, has developed over the last several years, comprehensive and substantial regional manned undersea research programs on a continuing basis. We found, however, that because of budget

B-145099

restrictions the Manned Undersea Science and Technology Office efforts have been directed at supporting only in-house investigations and do not provide a national focal point for these activities.

Sincerely yours,

A handwritten signature in cursive script, reading "Luther B. Steele". The signature is written in dark ink and is positioned below the typed name.

Comptroller General
of the United States

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United States Senate

COMMITTEE ON
 GOVERNMENT OPERATIONS
 WASHINGTON, D.C. 20516

July 7, 1976

Mr. Elmer B. Staats
 Comptroller General
 General Accounting Office
 Room 7000
 441 G Street, N.W.
 Washington, D.C. 20540

Dear Mr. Staats:

During the past year, I have become interested in this Nation's capabilities to conduct undersea science and technology programs. In researching these issues, I soon learned that techniques to work and live in the oceans have progressed very slowly except where related to offshore oil exploration and recovery.

Undersea science was started in earnest some 25 years ago when marine-biologists made short and shallow forays into the sea using simple diving gear. Since then and especially within the past 15 years some techniques have been developed to allow man to work more effectively in the sea. Research submersibles, manned habitats, improved diving equipment and tables have added new dimensions in underwater science. During the 60's, a submersible reached the deepest parts of the ocean and divers were making deeper forays for longer working times. Man, at this point, was truly on the verge of making great strides under the oceans, promising to give marine research powerful new tools for study.

By the end of the 60's, however, interest in undersea exploration and research began to wane. Increased costs, nationwide economic problems and poor planning most likely contributed to the diminishing interest. Large, high-budget, one-time underwater programs with no follow-up were equally responsible for the demise of underwater research.

Another reason, in my opinion, for the decreased interest in undersea programs and perhaps most importantly is the failure of the U.S. government to fund these programs at a level that could produce reasonable advances in techniques and science. The result has been a scattering of poorly funded and administered programs incapable of completing meaningful results.

The U.S. government's total budget for undersea exploration and research

APPENDIX I

APPENDIX I

page two
Mr. Elmer Staats
July 7, 1976

has been level funded for the past five years at about 1 million dollars, even though the overall federal budget for the oceans has increased considerably over the same period. This low level of funding was too small to support a national undersea program of any significance. Presently, there are no manned habitats operating on a full-time program and only a few research submersibles are left from the more than thirty built in the mid 60's.

Obviously, there are reasons for this decrease and ultimate end to underwater science. I am anxious to address these reasons to determine if underwater science should continue and if so, at what level of activity and funding and where it would fit in an overall national ocean program.

I, therefore, request a study by GAO on the problems of undersea science and technology in the past, what it has achieved or not achieved and where it may go from here. I will be happy to assign Bob Wicklund, of my staff, to assist you in any way during your study.

The following questions are offered here as a preliminary guide to the information I am seeking on the issue of undersea science and technology:

- (1) Does the U.S. need a manned undersea science and technology program?
- (2) Does manned undersea science and technology fit within the overall goals of the nation's research needs?
- (3) Are the nation's needs great enough to warrant an acceleration in manned undersea programs.
- (4) If so then to what extent should such a program be carried out?
- (5) Has past work in manned undersea programs been cohesive to the nation's overall ocean programs?
- (6) What types of science are best suited to be conducted by manned undersea programs?
- (7) What are present practical limitations on man working in the sea (depth, time, temperature, gases, etc.)?
- (8) What are the reasons for these limitations?
- (9) What information needs to be know to extend his limitations?

APPENDIX I

APPENDIX I

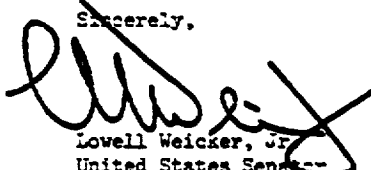
page three
Mr. Elmer Staats
July 7, 1976

- (10) How do these limitations affect the capabilities of undersea techniques to become viable tools of science?
- (11) What role should the academic community play in a national underwater program?
- (12) What role should industry play in a national underwater program?
- (13) Has the federal government's treatment and administration of underwater research been adequate in the past?
- (14) Why has federal funding of underwater research programs been so low in the past?
- (15) Why has the scientific community been generally unenthusiastic about underwater science?
- (16) What have been the outstanding problems with underwater programs in the past?
- (17) What should be the facility priorities of a national underwater program (habitats, submersibles, decompression chambers, etc.)?
- (18) What type of habitat system would be most effective (i.e. large central fixed, mobile, highly mobile such as submarine-habitat, regional semi-mobile, etc.)?
- (19) Is the present supply of submersibles adequate to support a national program?
- (20) How many submersibles are necessary to a national program?
- (21) What should be the capabilities of the submersibles?

Thank you for your consideration of this request.

Best regards,

Sincerely,



Lowell Weicker, Jr.
United States Senator

EW/RS/bn

COPY

Questions to be Addressed by G.A.O. on
Manned Undersea Science

Definition: Undersea Science - the utilization of manned
undersea equipment and tech-
niques to conduct underwater
science

1. What types of science are best suited to be conducted by manned undersea programs?
2. What are the present practical limitations on man working in the sea (depth, time, temperature, gases, etc.)?
3. What are the reasons for these limitations?
4. What information needs to be known to extend these limits?
5. How do these limitations affect the capabilities of undersea techniques to become viable tools of science?
6. How do industry and the academic community contribute to national efforts in undersea science?
7. Assuming that the MUS&T Office will be restructured, what function should it perform in order to best serve NOAA and the marine scientific community?
8. How many habitats and submersibles could be supported by the scientific community on a regional basis, assuming that cost was not a factor?
9. What would be the average cost of operation of these submersibles and habitats?
10. Why has the MUS&T Office been level funded for the past several years?
11. Has the federal government's treatment and administration of underwater research been adequate in the past?
12. Why has the scientific community been generally unenthusiastic about underwater science?

Note: Furnished by Senator Weicker's office.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Rockville, Maryland 20852

May 2, 1977

Mr. Raymond A. Hautala
Assistant Director, PSAD/ST
General Accounting Office
Room 6905
441 G Street, NW
Washington, D.C. 20548

Dear Mr. Hautala:

I appreciate very much the opportunity which my Manned Undersea Science and Technology (MUS&T) staff and I had last week to review with you the GAO draft discussion paper on manned undersea research prepared in response to the August 1976 request from Senator Weicker. Your invitation to provide you with a summary of some of the points which we addressed during our discussions is also appreciated. While this letter does not represent an officially staffed response from NOAA, you may, of course, use such portions as you wish as representing the conversations which we had.

As we indicated, there are a few clarifications we would like to offer with respect to parts of the report, particularly areas relating to the relative costs of submersibles. For this purpose, I have attached hereto a marked up copy of your draft report with these suggestions.

Although the report addresses manned undersea activities generally, I believe that those areas addressing or alluding to Oceanlab require comment since your views on this facility appear to be representative of your assessment of our program. For example, on both pages 3 and 10, it is stated or implied that the MUS&T office proposed Oceanlab in order to provide a national focus for undersea research. I think you would agree that an advanced technology development represented by Oceanlab would, indeed, provide a national focus for undersea activity and would also serve to increase the undersea research capability of the United States. I must point out, however, that the conceptual and other documents for Oceanlab, as well as for the undersea activities that would be conducted coincident to it, were prepared by NOAA in response to specific request by Senator Weicker and by Congressman Alexander. You know, I am certain, that the spark was generated when NOAA had to utilize the German underwater laboratory "Helgoland," highlighting the fact that the United States lacked the necessary advanced technology facility for conducting the planned effort in the rather severe ocean environment of the northern U.S. latitudes.



With respect to the comments in the draft regarding plans and programs, I support your basic premise and note that such efforts are, indeed, necessary for any program activity whether it be oceans or otherwise. I must note, however, that NOAA, through its MUS&T office, has over the last several years developed comprehensive and substantial manned undersea research and regional programs on a continuing basis. These programs have incorporated the use of all available underwater facilities and have fostered the full utilization of small habitats. It has been our aim, through NOAA's use of these facilities as well as by encouragement of interagency and other coordinated use, to progress toward the increased capabilities which would be needed as U.S. ocean interests moved into northern latitudes. As you know, we do remain of the opinion that, with the increasing U.S. interests with respect to understanding and utilizing the oceans - particularly in turbid, cold, and polluted waters, we must reduce reliance on surface support and insure that the U.S. has the year-round capabilities for all-weather manned undersea activities in the 1980's and beyond.

It would not be wrong to state that without the programs which NOAA has been able to mount in the diving areas, the civilian marine community would not be as capable as it is today in mounting science programs requiring safe saturation diving. Continuing activities in support of science programs which require diving and of programs to improve diver capabilities and safety are an integral part of the total program of which the development of the Oceanlab mobile underwater laboratory is a part. The Oceanlab facility and the diver support programs for the manned undersea support work integral to it, represent a unique opportunity to provide a national focus and stimulus to ocean science and engineering through manned undersea activities.

As indicated earlier, I agree with you on the need for plans to set out overall programs and management systems for the operation and use of the facility. Programs addressing current national interests and concerns have been compiled over the past year as the rationale for an advanced technology facility has been refined. Analyses of scientific field programs conducted during the last few years have also been helpful in this regard. Increasing U.S. involvement in the ocean in the next 5 years will bring us to new requirements which we cannot see very clearly now. Even so, a new technology facility such as the mobile underwater habitat will be a valuable addition to national ocean capabilities on the basis of our current assessment of needs. At the same time, however, it would be useful to reexamine national program interests, not only within NOAA but within the entire Federal structure and in the academic and industrial communities also, to set forth a reasonable program projection in anticipation of

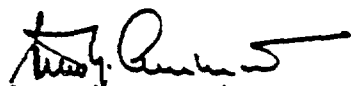
APPENDIX III

APPENDIX III

an Oceanlab facility. I believe that the development of such a plan should be coincident with the construction of the facility, recognizing that the construction process leading to operational utilization may take up to 5 years or so.

As you know, the new technology facility would be used in a cooperative manner, not only by NOAA, but also by all interested Federal agencies, the academic community and private and industrial organizations. It would be centrally managed by NOAA and would serve admirably as a unique and advanced center for supporting and focusing attention on manned undersea research in all ocean issues of national interest.

Sincerely,



Steven N. Anastasion
Director, Office of Ocean Engineering

Enclosure