



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

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PROCUREMENT, LOGISTICS,
AND READINESS DIVISION

B-210495

MARCH 4, 1983

The Honorable Don Fuqua
Chairman, Committee on Science
and Technology
House of Representatives



120716

Dear Mr. Chairman:

Subject: National Science Foundation's Expenditures
for Planning the Overhaul and Conversion of
the U.S. Government Ship Glomar Explorer
for Deep Ocean Scientific Drilling Purposes
(GAO/PLRD-83-47)

On November 1, 1982, representatives of your office asked us to determine how much money has been spent in planning the conversion of the Glomar Explorer from a mining ship to a mobile scientific deep ocean drilling platform. We were asked also to give our opinion of the management controls used by the National Science Foundation (NSF) to assure the reasonableness of expenditures. Based on further discussions with your representatives, we were asked to focus on the contract with Lockheed Missiles and Space Company, Inc.

We made our review in accordance with generally accepted government audit standards. At NSF Headquarters, we interviewed officials and reviewed contract files, interagency agreement records, and scientific and technological reports on the ocean drilling program. We did not audit the costs charged to the project, but we did identify the management controls and techniques used by NSF to assure that the project was reasonably conducted. Our work indicates that NSF expenditures have been reasonably controlled.

Since 1975 NSF has awarded \$16,400,394 in appropriated funds and \$5,120,333 in nonappropriated funds to various scientific and contracting organizations for determining the merits of deep ocean scientific drilling and the means to achieve such drilling (see enc. I). Of the total \$21,520,727, all but \$107,000 was used for scientific and engineering studies related to the ship Explorer as the primary candidate for a mobile drilling platform.

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The Explorer conversion project evolved from a contractual study done in 1975 by the Ocean Resources Engineering Company (ORE) which was tasked by NSF to determine the type of platform and equipment required to achieve deep ocean drilling for scientific purposes. ORE noted that a properly equipped large surface ship was the best option. Using ORE's results, a second contract was let with Global Marine Development, Inc., to determine whether the Explorer was a viable candidate for the platform. Global concluded it was.

NSF competitively contracted with Donhaiser Marine, Inc., to evaluate both the ORE and the Global reports for reasonableness. Donhaiser concluded each report was accurate and reasonable.

With these results as a basis, NSF competitively let a contract with Santa Fe Engineering Services Company to develop a conceptual baseline design of how the Explorer could be overhauled and converted to perform deep ocean scientific drilling given the recommended equipment described in the earlier three reports. The Santa Fe contract produced the required concept from which a contract was competed for developing first a preliminary design--a reasonable representation of the rough configuration of the converted Explorer--followed by bid-quality blueprints (known as a contract design) of the method to overhaul and convert the Explorer. Santa Fe's concept design required 2 years to develop at a cost of \$4,384,638 in appropriated funds plus \$846,730 in nonappropriated funds.

Following Santa Fe's work, NSF solicited bids for the Systems Integration Contract for the Ocean Margin Drilling Program, subsequently renamed the Advanced Ocean Drilling program. The contract was for (1) the production of a preliminary design and a contract design, (2) the management of the Explorer's conversion and fabrication, (3) the final acceptance testing and initial operations of the Explorer, and (4) the expected operation and maintenance of the converted Explorer.

In November 1981 Lockheed successfully competed for the contract. The contract has been awarded \$6,983,133, which represents about 32.4 percent of the total Explorer-related funding. Lockheed's contract was initiated with an incremental award of \$1.2 million, which was increased twice during fiscal year 1982: the first was \$2,795,000 and the second was \$1,188,133. Total fiscal year 1982 funding awarded to Lockheed came to \$5,183,133, an amount just short of the \$5.2 million authorized by the National Science Board--NSF's governing body.

Lockheed's planned funding needs for fiscal year 1983 totaled \$4,780,971, which includes a fixed fee of \$391,096. However, the initial fiscal year 1983 award was for \$1.8 million to cover Lockheed performance through January 1983, subsequently extended through March 11, 1983. Expenditures during this period cannot be precisely determined, but may be less than awarded because NSF, for the convenience of the Government, partially terminated the contract effective January 3, 1983, allowing only some tasks to receive wrap-up funding. Complete termination is scheduled for March 11, 1983.

As the systems integration contractor, Lockheed was to provide engineering expertise and services necessary to the design, conversion and fabrication, testing, operation, and support of the drilling vessel and the installed drilling system for the Advanced Ocean Drilling Program. Contract responsibilities were to be met in four phases:

--Phase I-Design. The phase was originally intended as a 1-year activity. Due to funding changes this phase has been divided into Phase IA-Preliminary Design to be achieved in fiscal year 1982 and Phase IB-Contract Design to be achieved during fiscal year 1983.

Preliminary design allows NSF (and its advisory organizations) detailed configurations of the drilling vessel's requirements to meet identified objectives. From these configuration plans, NSF can evaluate the merits of continuing with the Advanced Ocean Drilling Program and its essential equipment--the converted and appropriately equipped Explorer.

Preliminary design has been virtually completed and NSF has partially funded contract design. To be completed in fiscal year 1983, the contract design requires Lockheed to have detailed plans ready so that upon NSF approval competitive shipyard selection can be achieved for the conversion and fabrication of Explorer and its drilling system. The contract's termination affects the completion of this and the remaining three phases.

--Phase II-Conversion and Fabrication. This phase was planned for the period October 1983 to June 1985. As the systems integration contractor, Lockheed was to manage and implement all efforts required to convert the ship and fabricate the drilling systems.

--Phase III-Final Acceptance Testing and Initial Operations. This phase was expected to begin in July 1985 and end in June 1986. The contractor was to oversee problems or deficiencies.

--Phase IV-Operations and Maintenance. This phase was to begin in July 1986. It was to require the systems integration contractor to support ship operations which were to be conducted in close liaison with the science contractor (presently the Joint Oceanographic Institutions, Inc.).

Using science and engineering consulting contracts and interagency agreements, NSF has assured itself that the continued need for deep ocean drilling exists and that the Explorer is the most viable option for achieving the scientific objectives. Further, NSF has repeatedly verified the costs of its contract awards as well as the conversion cost estimates provided by contractors charged with developing such estimates.

NSF surveillance of Lockheed's actual and planned expenditures and cost projections for the contract phases demonstrates the diligence NSF has applied to contracts during the Explorer program. The Lockheed proposal and the proposals of competitors were critically reviewed by a large panel of external scientific, engineering, and management experts as well as experts from within NSF. Contract invoices and progress reports have been reviewed for reasonableness and compliance by NSF's staff within the Office of Scientific Ocean Drilling. Contract deliverables--interim or final products--receive both internal review and, as necessary, expert external review through pre-awarded consulting contracts and interagency agreements. NSF, from time to time, has asked the scientific community, engineering professionals, and management consultants to evaluate various components and deliverables of Lockheed's contract. NSF appears to have done a reasonable job of protecting its investments in Explorer-related activities.

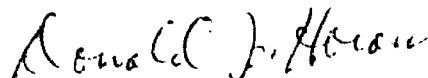
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As your office directed, we did not obtain official agency comments on the content of this report. However, throughout the course of our work, agency officials were continuously informed of our observations.

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We are sending copies of this report to the Directors of the National Science Foundation, the Office of Management and Budget, and the Office of Science and Technology Policy, and to the Chairmen of appropriate congressional committees. Copies will also be made available to other interested parties upon request.

Sincerely yours,



Donald J. Horan
Director

Enclosure

Summary
Schedule of Contracting, Agreement, and
Funding History for
Explorer-related Activities

Contractor (P=Prime S=Subcontract)	Purpose	Amount awarded		Total	Period
		Appropriated Funds	Non- appropriated Funds		
Scripps Institution of Oceanography (P)	Other NSF contracts				
-Ocean Resources Engineering, Inc. (S)	Determine platform	\$ 107,000	\$ -	\$ 107,000	Report 9/75
-Global Marine Development, Inc. (S)	Explorer Feasibility	73,075	-	73,075	Report 2/77
Donhaiser Marine, Inc. (P)	Assess above 2 studies	492,000	-	492,000	5/78 - 10/79
Sante Fe Engineering Services (P)	Systems support contractor for conceptual design	4,384,638	846,730	5,231,368	9/79 - 9/81
-SEAFLO Systems, Inc. (S)	-Sea floor technology				
-EATON Industries of Houston, Inc. (S)	-Well planning/ engineering				
-Doty Associates, Inc. (S)	-Management support				
Joint Oceanographic Institutions, Inc. (P)	Science advice/regional data	3,194,559	3,058,703	6,253,263	5/80 - 9/83
EATON Industries of Houston, Inc. (P)	Well/drilling technology	75,000	889,900	964,900	a/ 7/81 - 12/82
-SEAFLO Systems, Inc. (S)	-Sea floor technology				
Doty Associates, Inc. (P)	Management support	202,989	160,000	362,989	a/11/81 - 12/82
Lockheed Missiles and Space Co., Inc. (P)	Systems integration contractor for design, conversion, testing, and operation	6,983,133	-	6,983,133	11/81 - 3/83
-SECO, Inc. (S)	-Offshore drilling/ engineering				
-Western Gear Corp. (S)	-Drilling technology				
-Earl & Wright (S)	-Architecture/engineering				
-Honeywell, Inc. (2d tier S)	-Control systems				
Total		15,512,394	4,955,333	20,467,728	
<u>Interagency agreements</u>					
Maritime Administration	Review conversion estimates and provide boat and escort service	47,000	-	47,000	7/80 - 9/83
National Academy of Sciences	Science advice/ocean drilling	681,000	25,000	706,000	a/ 6/78 - 12/82
Naval Sea Systems Command	Technical support for conversion	160,000	140,000	300,000	5/80 - 9/86
-J.J. McMullen, Inc. (S)	-Architectural expertise				
Total		888,000	165,000	1,053,000	
Total of NSF Awards		\$16,400,394	\$5,120,333	\$21,520,727	

a/These periods are being reconsidered by NSF consequent to the complete termination on March 11 1983, of the Lockheed contract.