

1. Introduction

An important new scientific endeavor to improve our basic understanding of the nature and origin of the earth has been under consideration for the past several years. And now the National Science Foundation (NSF) is prepared to begin a \$700 million, 10-year program of marine geologic investigations. This effort, known as the ocean margin drilling (OMD) program, resulted from years of planning and evaluation by government-sponsored committees and represents an innovative approach to mutual efforts by government, universities, and the **industry**. The program is both a continuation of deep ocean drilling under NSF earth sciences and a new thrust to investigate the geology of continental margins and ocean crust where very deep drilling is necessary to penetrate unknown regions. Some of the margin regions, which are the borders between continental shelves and the deep ocean, could contain substantial oil and gas resources, but very little evidence has yet been collected.

Early planning for an ocean margin drilling program began in 1973 and continued with the Conference on the Future of Scientific Ocean Drilling (FUSOD) held in Woods Hole, Massachusetts in 1977. In 1978, an NSF advisory group reviewed the scientific merit of a margin drilling program and in 1979 an NSF "blue ribbon" committee addressed the national interest in such an effort. Recently, an NSF sponsored meeting was held in Houston during the week of March 3, 1980, and included scientists and engineers from academic institutions, petroleum companies, and government agencies. At this meeting, an ocean margin drilling model program plan was developed. That plan, the principal current description of NSF's ocean margin drilling program, is what this report addresses. Engineering considerations and scientific objectives were evaluated in that plan. A model program that

would consist of six years of drilling and four years of pre-drilling preparation was presented. The plan also presented an estimate of program costs* The model drilling program includes 10 sites and **15 holes**. The **deepest** holes in the model program are about **21,000** feet below the sea floor in about 11,000 feet of water. Two sites are in the Pacific, one in Antarctica's Weddell Sea, and the others in the Atlantic and Gulf of Mexico. The scientific objectives stated in the plan are to investigate: (1) passive and active continental margins; (2) the earth's crust beneath the deep ocean and (3) the deep sea sediments which could yield historic environmental information on the earth, especially the opening of the Atlantic Ocean and the Gulf of Mexico.

It is planned that the program will be jointly funded by the Federal government and the petroleum industry, each sharing 50 percent of the costs over the 10 year period. Eight major petroleum companies have expressed interest in participating and they are expected to commit funds for **FY81** following a July 1980 meeting to detail NSF's technology plans. These technology plans include the conversion of the government-owned Glomar Explorer to a deep drilling ship and the development of a riser system* for controlled drilling in up to **13,000** feet water depths and up to 20,000 feet below the sea floor. There are some differences between the water and drilling depth goals stated for the model drilling program and for the technology development but these are not considered significant.

*A riser is a large diameter pipe extending from the **sea floor to the** drilling ship on the surface through which the drill pipe is inserted. The riser acts as a conduit for drilling fluid which is pumped down the pipe and flows back up to the ship between the pipe and riser. The riser is also used to help control pressure in the well and support blowout prevention (see Chapter VI).

This Technical Memorandum reviews the present plans for the Ocean Margin Drilling program and addresses questions on the merits of the program and alternatives to it. It analyzes problems associated with the approach proposed by NSF and suggests possible improvements. It also discusses the institutional capability of the Federal agencies which are to manage this program; the technology development aspects, and the problems and opportunities associated with industry participation.

To prepare this memorandum, OTA assembled a panel of scientists and sought the advice of technology consultants and petroleum company representatives. At a March 1977 panel meeting, presentations on the program were made by the NSF and the Joint Oceanographic Institutions Inc. (JOI), which were followed by a discussion of the program's scientific merit and alternatives. Panel members, OTA staff and consultants prepared the material that was used as the information base for this document. The report was reviewed by science and industry experts listed in the acknowledgements and appropriate comments were incorporated.