LEG 124E
PRELIMINARY REPORT

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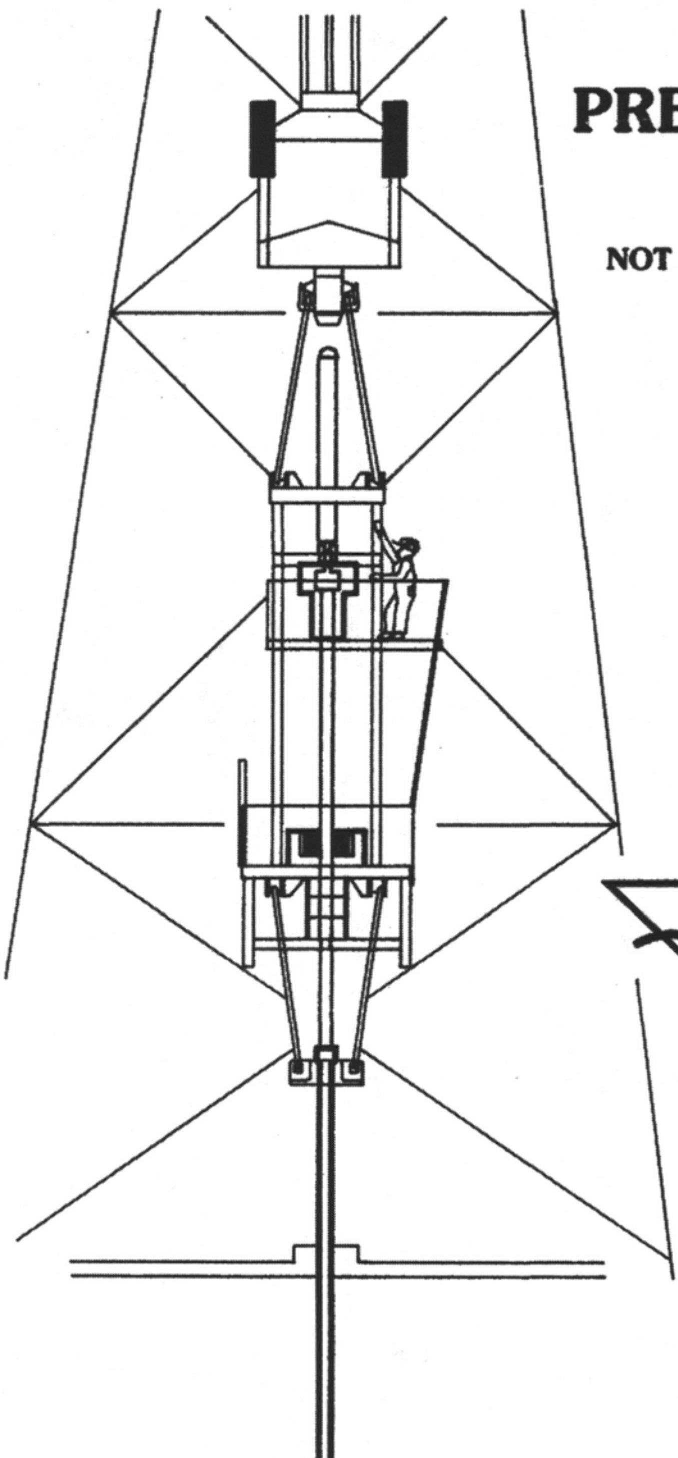

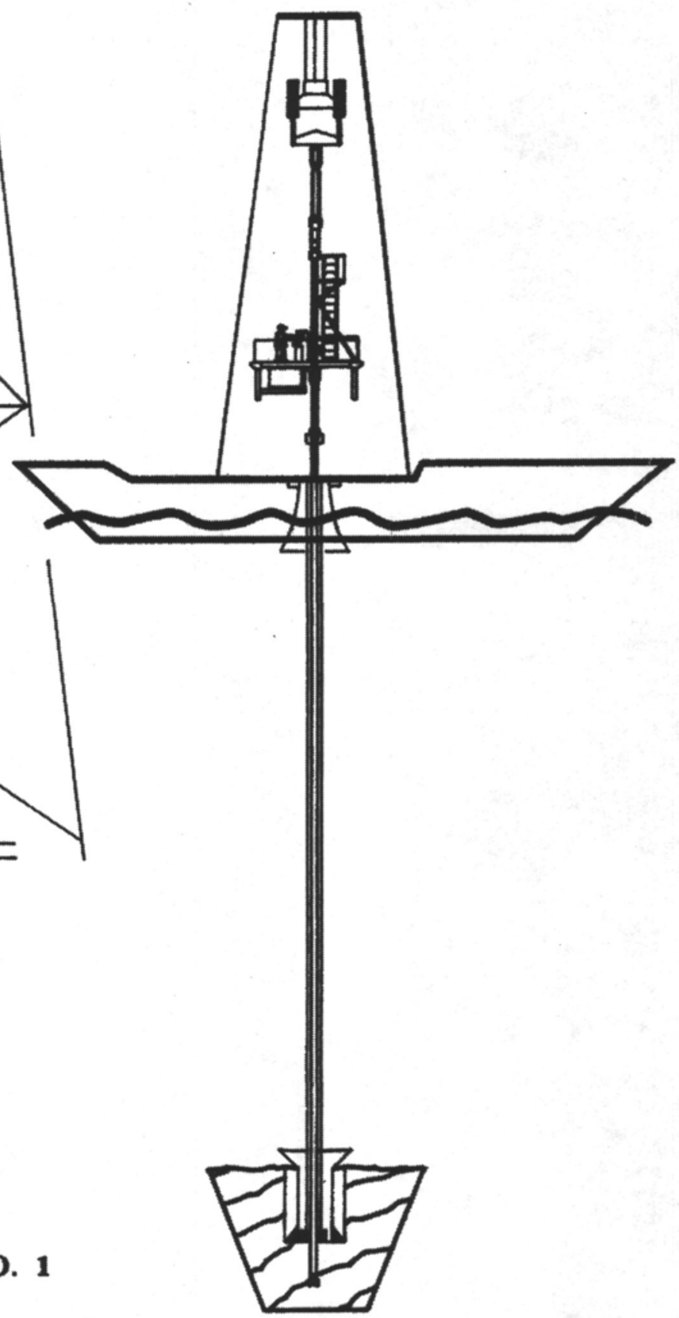

OCEAN DRILLING PROGRAM
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OCEAN DRILLING PROGRAM

LEG 124E PRELIMINARY REPORT

PHILIPPINE SEA

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ENGINEERING AND SCIENTIFIC REPORT

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ENGINEERING AND SCIENTIFIC REPORT

Abstract

This special engineering leg was planned to satisfy the need for improved drilling technology in order to achieve scientific objectives for the Ocean Drilling Program. On Leg 124E, therefore, several developmental tools and operational techniques were tested at sea, including the diamond coring system (DCS), the modified navidrill core barrel (NCB) system, phase 1 of the pressure core sampler (PCS), the redesigned extended core barrel (XCB), coring techniques in deep-water chert sequences, and logging technology developed at Lamont-Doherty Geological Observatory.

Results of the leg were mixed. Although the DCS did not penetrate basement rock, one of the primary objectives, it did perform reasonably well in coring overlying sediments. The XCB worked well and proved to be decidedly better than the previous model. The NCB system performed better than the XCB in the chert sequences, despite some failures unrelated to drilling. Unfortunately, the hole that was drilled to accommodate logging tests at the location of DSDP Site 453 (ODP Site 776) was lost, permitting only minimal testing of some of the hardware and software.

Other tools performed well, including the latching system for the Japanese "ONDO" temperature-measurement system, the PCS, and the pore water sampler "colleted" delivery system.

Science objectives were of secondary importance on this leg. The shipboard science party described and documented the relatively small number of cores that were recovered. Curatorial personnel took extensive samples from these cores for use in a geriatric-core study. The study will systematically monitor changes in faunal assemblages, chemistry, and physical properties over time.

One of the most important benefits of Leg 124E was the chance to observe tests of these drilling systems and techniques in what were mostly adverse conditions of high winds and seas. This made it possible to determine what and how improvements to those systems can be made to bring about more effective implementation on future ODP legs.

Introduction

The engineering and technology requirements of the JOIDES science community have been growing over the past several years. The complexity of tasks facing the ODP Engineering and Drilling Operations group is greater than ever. To achieve the desired result - the accomplishment of heretofore unattainable goals - requires a high level of cooperation between ODP and JOIDES. Key factors in the cooperative effort are improved communications between development engineers and JOIDES panels, more advanced planning (3- to 4-yr plans) including better definition of technical requirements and science goals, more thorough shore- and sea-based test programs, and, finally, adequate funding levels for critical development projects and equipment.

To conduct the necessary sea-based tests, the concept of dedicated engineering legs has been discussed for several years within the Ocean Drilling Program. The opportunity to utilize JOIDES Resolution for testing developmental tools and evaluating new operational techniques, independent of science objectives, is indeed timely. Such things as vessel motion (operational handling and deployment considerations), marine corrosive atmosphere (rust and corrosion effects on mechanical actuation and hydraulic sealing), and ambient downhole conditions of temperature and pressure can rarely be modeled effectively in a shore-based test. Proper testing at sea is critical to development of any efficient and reliable operational system.

Leg 124E, the first ODP cruise dedicated to engineering, has been an important step in improving ODP system sea-trials testing. It is hoped that the concept of dedicated ship time for engineering testing will continue as a pivotal element in future planning and will help ensure successful hardware development. As such, the complex scientific requirements of the future can be confidently planned for and accomplished.

Engineering Objectives

Major engineering objectives of Leg 124E included the following:

1. Shallow-water concept evaluation of the new diamond coring system (DCS).
2. Continued operational evaluation of the developmental navidrill core barrel (NCB) system.
3. Prototype testing of the pressure core sampler (PCS), phase 1.
4. Performance testing of the newly redesigned extended core barrel (XCB).
5. Performance evaluation of ODP coring systems in deep-water chert sequences.
6. Testing and evaluation of Lamont/BRG logging technology.

7. Evaluation of deep-water operating capabilities of JOIDES Resolution.

Scientific Objectives

Although scientific objectives of Leg 124E were secondary to engineering objectives, some of them were related and included the following:

1. Describing and curating cores recovered, especially the nature of the rock, degree of drilling disturbance, and physical and magnetic properties.
2. Running a comprehensive logging program planned at the ENG-2 site (now Site 776), designed to augment previous results at DSDP Site 453, where core recovery averaged 39%.
3. Dedicating a number of the cores collected in the course of the engineering tests to a geriatric-core study. The study will systematically monitor changes in faunal assemblages, chemistry, and physical properties over an indefinite period of time, which began with initial core recovery aboard ship. Repeated subsampling and measuring the dedicated cores is scheduled after they have been stored in the ODP repository. An understanding of the scientific importance of the changes that occur in these cores during storage is vital to core analysis in general.

Principal Results of Site Drilling and Engineering

In the following pages, an account is given on a site-by-site basis of the drilling and engineering activities, as well as the scientific results, that took place on Leg 124E (see Figure 1). The Operations Report that follows this report complements and expands the site reports.

Site 772

Site 772 (proposed site ENG-1A; 16°39'N, 119°42'E; 1540 m water depth) was selected as an alternative to the Luzon Strait site (proposed site ENG-1) while en route to the latter. It was an attempt to find a suitable lithology for a DCS test in a more sheltered (sea state and current) environment than that anticipated at ENG-1. Site requirements included shallow water (1000-1600 m), limited sediment cover (100-200 m), and relatively shallow basement rock. Hole 772A was drilled to a total depth of 361 mbsf (1901 mbsl).

Engineering Results. The DCS was not evaluated at Site 772, since it was determined that basement was not reachable at a shallow enough depth. The total-depth capability of the DCS "test" system for Leg 124E was 2000 m. We wanted to core a minimum of 100 m of crystalline rock with the DCS. This was not possible, since basement had not yet been reached at 1901 mbsl. However, while coring the upper 351 m at the site, three other developmental systems were tested. Phase 1 of the newly completed PCS, the latest version of the XCB, and an expanded version of the pore water sampler "colleted" delivery system were all deployed.

The PCS was used twice, first inside the drill pipe near bottom (as a pressure test), and then a second run in sediment. A maximum hydrostatic pressure of 2200-2300 psi was recovered. Core was recovered on the second run but only at 500 psi retained pressure, well below calculated hydrostatic pressure. The reason for the low pressure was identified and corrected.

The XCB-124E system was deployed 10 times in several test configurations. The system held up well mechanically and was deemed successful from a handling/redressing perspective. Many more deployments in a variety of formations will be required to fully evaluate the system.

A "dummy" pore-water sampler (WSTP) package was deployed on the new "colleted" delivery system. That system decouples the water sampler from pipe motion through a 22-ft-long slip joint (increased from 11 ft in earlier models). The system was used only once and was evaluated primarily for ease of rig-floor handling.

In summary, the DCS testing was deferred to the original ENG-1 site. The limited PCS system tests were successful. Additional testing is essential for a complete evaluation of the system. The few XCB deployments were considered successful from a mechanical-integrity point of view but were deemed inadequate to draw any sweeping conclusions regarding overall system performance. Significantly more XCB testing is required. The mechanical handling and deployment testing of the new "22-ft, extended stroke" WSTP was completed successfully.

<u>Scientific Results</u>. Lithostratigraphic results revealed the expected hemipelagic clayey sediments at this site. Numerous core samples were collected for the geriatric-core study and will prove useful for long-term monitoring plans.

Paleomagnetics results indicated that the upper part of the cored interval is correlative with the Brunhes, and the base of Core 124E-772A-11X probably is slightly older than the Jaramillo.

Physical-property studies showed that the siliciclastic clay in the upper 5 m of the cored section was highly overconsolidated. Sediment in the 5-45-mbsf interval was normally consolidated. Sediment below this level was highly underconsolidated, apparently as a result of the XCB coring process; these cores were all highly disturbed. Four major geotechnical zones were delineated on the basis of physical-property determinations. The boundaries of these zones correlate with major seismic horizons on a high-resolution profile of the site vicinity.

Site 773

Two holes were drilled at Site 773 (proposed site ENG-1; 20°12.3'N, 121°39.2'E; 1604 m water depth). Hole 773A was terminated at a total depth of 137.4 mbsf (1741.4 mbsl). An apparent rubble zone was encountered between 119 and 134 mbsf. Several ledges were identified also in that zone. The formation was composed primarily of interbedded clay and rubble. Gabbro was recovered in the core catcher of the last XCB core, indicating that basement may have been close. Unfortunately, formation instability in the rubble zone made the hole inappropriate for deployment and testing of the DCS.

Engineering Results. The XCB-124E system was deployed twice as spot cores between washed intervals. Again, just as in Hole 772A, no conclusions could be reached concerning overall system performance. There were no mechanical failures.

Hole 773B was drilled to a depth of 98.7 mbsf so as to position the drill pipe above the unstable rubble zone encountered while drilling Hole 773A. Plans were to keep the 5 1/2-in. drill pipe above the unstable rubble zone so that it would not become stuck during subsequent DCS coring operations. Drilling through the rubble and underlying basement would have been a good demonstration of the DCS potential.

The first deployment of the DCS occurred at Hole 773B under less than ideal wind and sea conditions. A thorough evaluation of the DCS took place despite the fact that the ship's heave amplitude and period exceeded the design parameters of the DCS.

Although some aspects of the DCS were not tested, many positive highlights of the system were identified as well as some improvements to be implemented prior to future shipboard testing. Highlights of the DCS testing at Site 773 include the following:

1. Established the feasibility of handling and deploying a slim-hole DCS through ODP 5 1/2-in. drill pipe suspended from a floating vessel.
2. Demonstrated the concept of cutting core with a DCS in 1600 m of water under severe operating conditions.
3. Demonstrated successful secondary "active" heave compensation under environmental conditions exceeding the design parameters of the system.
4. Successfully tested the deployment, operation, and recovery of the DCS tubing string (3 1/2-in. working drill rod), including wedge-thread connections, without adverse effects.

5. Confirmed satisfactory performance of the DCS top drive, power pack, and mud-pump equipment.
6. Confirmed satisfactory performance of the DCS platform, mast, and feed-cylinder hardware.
7. Established the feasibility of spudding a sedimentary hole with an APC/XCB BHA and then deepening the hole to total depth with the DCS.

Necessary changes and improvements to any prototype system are always identified, based on the initial test deployment. That was also true of the DCS development. Based on the Leg 124E sea trials, the following areas were singled out for improvement prior to the next DCS test:

1. All mining-industry wireline tools and coring components need to be strengthened to hold up better when deployed in the more rugged offshore, deep-water environment.
2. The core winch, installed on the platform, and used to recover the DCS core barrels, must be upgraded or replaced with a more standard "oilfield"-type winch equipped with mechanical braking, and level wind systems.
3. Handling/deployment time, although reduced significantly by the end of Leg 124E, must be improved still further. A variety of improvements can be made which will lead to significantly more efficient DCS rig-floor and platform operations.
4. Future deployments must solve the problem of hole instability leading to the sticking of the API 5 1/2-in. drill string. Use of a reentry cone and casing modified for DCS compatibility will aid in solving the problem.

Some aspects of the DCS were not tested on Leg 124E. The ability to penetrate and recover crystalline rock was not demonstrated. An evaluation of the wider kerf diamond core bits (4.0-in. OD by 1.87-in. ID) was not conducted. The dynamic effect of rotating a long tubing string inside API drill pipe, although evaluated at 120 rpm, was not investigated at the higher, 500- to 600-rpm speeds likely to be used in coring crystalline rock.

Finally, the use of rig triplex mud pumps dressed with 5-in. liners was not evaluated for use in the DCS coring operation. In spite of the shortcomings, DCS testing on Leg 124E generated a large amount of data which is essential to the further development of the DCS for ODP operational use.

<u>Scientific Results</u>. The volcaniclastic claystone obtained at the site is characteristic of an island-arc environment. Additional core samples were collected and curated for the geriatric-core study.

Site 774

Two holes were drilled at Site 774 (proposed site ENG-1B; 20°12.3'N, 121°44.08'E; 1098 m water depth) in attempting to find basement and stable hole conditions for testing the DCS. The water depth of 1089 m would have been ideal for DCS testing owing to minimal wireline, drill-pipe, and drill-rod (tubing) round-trip times.

Hole 774A was drilled with an XCB bit and center bit to a total depth of 37.8 mbsf (1132.3 mbsl). The hole was terminated owing to extreme hole instability likely caused by the loose volcaniclastic sand penetrated at the mud line. When an overpull of 160,000 lb was required to free the drill string, the decision was made to terminate the hole.

Hole 774B was also drilled with an XCB bit and cutting shoe to a total depth of 255.9 mbsf (1344.9 mbsl). Basement rock was not reached, and hole stability deteriorated until eventually the drill pipe became irretrievably stuck. After 12 hr, and a maximum overpull of 510,000 lb failed to free the pipe, a drill-string severing charge was deployed and the hole was abandoned. It is suspected that the same accumulation of volcaniclastic sand encountered in Hole 774A was responsible for the sticking of the drill pipe in this hole.

Weather conditions at the site were extremely rough and contributed to the difficulty in maintaining adequate hole stability. No developmental tools were deployed or evaluated at the site.

The main scientific result achieved at the site was a satisfactory water-gun profile obtained during underway-geophysics surveys.

Site 775

Three shallow holes were spudded at Site 775 (proposed site ENG-1C; 19°51'N, 121°42.98'E; 506 m water depth) again in attempting to find suitable conditions to test the DCS. The site was located on a seamount in Luzon Strait. The shallow water depth, as mentioned earlier, made trip times much less costly. Basement was virtually assured, but adequate sediment cover for spudding was questionable.

After an intense search for a sediment pond, using the underwater television system (VIT), Hole 775A was spudded. After 6.0 m of penetration had been made in well-cemented volcaniclastic sand, drilling was halted, and the VIT system was deployed for confirmation of spud-in. The bit had indeed penetrated sub-bottom, and the site appeared drillable. The pipe was pulled clear of the mud line, since drilling could not proceed with the VIT system deployed around the drill string.

Hole 775B was spudded "blind" and was drilled to a total depth of 20.5 mbsf (526.5 mbsl). The hole was abandoned owing to unstable hole conditions (surface volcaniclastic sand) complicated by severe sea conditions.

Hole 775C was successfully spudded and drilled to a total depth of 11.2 mbsf (517.2 mbsl). However, this hole also proved unstable owing to abundant volcaniclastic sand. Extremely bad sea conditions causing large-amplitude, short-period heave conditions, coupled with untenable hole stability, ultimately forced the abandonment of all the holes at this site.

All holes were drilled using an XCB bit with a wash barrel in place. No developmental tools were deployed or evaluated at this site.

Upon completion of Site 775 a transit was made to Luzon Island, where the lee of the island afforded protection for offloading the DCS hardware and personnel. During the offloading process, five stands of 5-in. drill pipe were run, and the latching system for the Japanese "ONDO" temperature-measurement system was tested. That system is scheduled for operational deployment on the Nankai Trough leg. The latch system was deployed seven times without success until enough additional weight (heavy-weight sinker bars) was added to the tool. The latch system was then successfully deployed twice with a total weight of 1073 lb (487 kg) below the tool. Although it was identified that more weight was required for the deployment than estimated, the weight of the ONDO tool itself should be more than enough to allow a successful operational deployment.

Site 776

Site 776 (proposed site ENG-2; 17°54.4'N, 143°40.95'E.; 4713.4 m water depth), in the western part of the Mariana Trough, coincides with the location of DSDP Site 453. Site 453 was cored to a total depth of 455.5 mbsf, with an average core recovery of 39%. The rocks near the bottom of Hole 453 were identified as altered polymict igneous breccias overlying intensely sheared gabbro cataclastites and were not considered to constitute "true" basement (Shipboard Scientific Party, 1981).

Hole 776A was drilled to a total depth of 532.5 mbsf, or an estimated penetration into "basement" rocks of about 100 m. Unfortunately the hole fell in around the drill string and was lost, along with the bottom-hole assembly and part of the drill pipe. Time constraints did not allow drilling a second hole.

Loss of the hole made it impossible to obtain logging data from the two new Schlumberger combination tools - the "quad combo" and the geochemical tool with its high-temperature litho-density module. It was possible to make minimal tests of the qualitative performance of the new hardware and software in the drill pipe after the pipe was severed and pulled above the seafloor. These tests indicated that the new configurations worked successfully without any apparent interference between the nuclear modules. Hole cooling-by-pumping tests were not possible without having a hole in hot rock. The wireline heave-compensator tests were made successfully in the pipe from 90 to 2000 meters below the rig floor (mbrf), and these measurements probably were just about as useful as measurements in an open hole would have been. Data obtained included heave-induced acceleration of the ship measured by an accelerometer in the hull, acceleration of the Schlumberger geochemical tool measured by the GPIT module near the top of the tool, and line tension measured at the logging winch.

Site 777

Site 777 (proposed site ENG-3; 17°42.2'N, 148°41.8'E; 5810.5 m water depth) coincides with the location of DSDP Site 452. Site 777 was chosen to evaluate the possibilities of achieving scientifically acceptable core recovery in interbedded chert/ softer-sediment lithologies. Five shallow holes were drilled, with sub-bottom penetrations ranging from 39 to ~60 mbsf.

Engineering Results. No soft sediment was recovered in any of the XCB or NCB cores below the first occurrence of chert. The drilling records can be interpreted to suggest that the chert is not uniform but contains clay layers or is at least fractured. In any case, the chert/porcellanite did not present itself as a stable, hard formation to be smoothly cut by the diamond coring shoes of the XCB or NCB tools.

Attempts to core the chert beds with the XCB system were unsuccessful. A few pieces of chert were recovered with partially trimmed surfaces matching the cutting shoe inner diameter, but the trimming operation was never completed because the chert apparently fractured before a full cylinder could be produced and "fed" into the core liner past the core catchers.

The NCB showed more promise than the XCB in coring interbedded chert and clay but will not be worthy of scientific commitment to such interbedded lithology until certain improvements can be made to the overall NCB system. Additional land testing of both XCB and NCB systems is scheduled later in 1989.

A positive aspect of drilling at this site was that five holes were spudded into 38-41 m of pelagic clay and deepened into the chert layers without damage to the BHA. The possibility of such damage was considered a significant potential problem before the site was drilled. The improvements in heave compensation used on JOIDES Resolution, as compared to the bumper subs used on

Glomar Challenger, make the spudding operation relatively routine, albeit slow, with as little as 38 m of extremely soft and unsupportive sediment over the hard chert/porcellanite unit.

Operational Strategies for Obtaining Scientific Objectives. Drilling at Site 777 demonstrated that XCB and NCB techniques as they presently exist are not capable of efficient drilling and recovering core in formations dominated by chert and porcellanite. The XCB cutting shoe is not sufficiently robust to withstand quick abrasion in these formations, and when penetration is achieved, XCB recovery is no better than with standard rotary drilling (RCB). NCB recovery is occasionally more encouraging, but the cores cut at this site, because of their fractured nature, usually jammed in the core catcher after only a small amount of recovery.

No soft sediment was recovered below the uppermost layer of chert/porcellanite in any of the Site 777 holes, although some fine-grained chert material was recovered that had been pulverized by the drilling process. Because of ambiguity in interpreting the drilling records, it is difficult to draw conclusions about the coring systems' capabilities to recover original soft sediment interbedded with cherts. Testing on land is needed to document the recovery capabilities of both of the systems in alternating hard and soft formations under ideal conditions. The Upper Cretaceous chert and chalk sequences of the southern English or French Normandy coasts should be an excellent physical analogue of many deep-sea formations.

Scientific planning based on engineering developments yet to be achieved is a necessary goal for significant technological progress. In the following discussion, however, we shall assume that the scientific objectives in formations containing chert must be attained with proved technology already in hand, and shall develop an operational strategy to gain those objectives.

Site 777 and a comparable site off the Bonin Trench are the two primary locations scheduled for significant ocean crustal penetration and recovery on an upcoming leg dedicated to obtaining geochemical reference sections for the western Pacific subduction-zone systems (currently this leg is scheduled for early 1990). Site 777 is also an excellent physical analogue for the highly rated, but not yet scheduled, old Pacific crust drilling program, dedicated to obtaining the oldest remaining sedimentary and ocean crustal samples of the Pacific Basin. Operations at Site 777 demonstrate that in good weather conditions a pelagic clay overburden of 35-40 m should be sufficient to stabilize a short BHA, although a thicker section would be preferable. They also show that the chert/porcellanite zone will present both recovery and hole-stability problems. The only existing and proved ODP technology that potentially will deal with these stability problems, especially if 100-200 m of basement penetration is required, is to deploy a multiple reentry cone and to case through the unstable interval. This strategy was successful at Site 765 on Leg 123, at which a geochemical reference section hole was drilled and cored 271 m into the Mesozoic basement of the Argo Abyssal Plain.

For the geochemical reference section holes off the Mariana Arc and possibly the Bonin Arc, we recommend a strategy essentially identical to that used at Site 765 on Leg 123. That consists of drilling and coring a "pilot" hole to basement with conventional RCB techniques to test the chert distribution at deeper levels than were reached at Site 777, locate the exact basement depth, and recover as much sedimentary material as possible. Then set a conventional reentry cone, drill to basement with an oversized tri-cone bit, and hang and cement 250-300 m of casing into basement to eliminate instability problems in the sedimentary section. The hole then can be cored to the desired basement depth with RCB techniques that usually provide good basement recovery in Mesozoic basalts.

The Old Pacific sites in the Pigafetta Basin could be attacked with a modification of that strategy, because deep penetration into basement is not as important, and there is a correspondingly greater interest in the Mesozoic sedimentary section. This would involve a shorter casing program to isolate the unstable interval in the upper sediment section, and would leave the lower Mesozoic sediment and basement sections uncased so that coring could proceed with lower pump pressures and increased sediment recovery.

Proposed Site ENG-4

This site at the Mariana Trench (15°N, 147°30'E; 8176 m water depth) was picked to test the deep-water capabilities of the Resolution. Time constraints precluded drilling at this site, although a beacon was dropped and a successful positioning test was conducted from the signals beamed to the surface. Other planned tests that could not be carried out involved the ship's hoisting systems, the TV winch/coaxial cable, and the seven-conductor electric logging line. Because of the limited activities at this site, no Leg 124E site designation was made.

Summary and Conclusions

Many positive results were achieved on this first drilling leg dedicated to testing new tools and technology under operational conditions. The diamond coring system firmly established the feasibilty of handling and deploying a slim-hole diamond coring system through ODP 5 1/2-in. drill pipe suspended from a floating vessel and cutting a core in 1600 m of water under severe operating conditions. Necessary improvements were identified, which could only have shown up on sea trials. These include developing more rugged core-barrel systems and the need to solve the problem of hole instability. The improved XCB system generally worked well and proved to be decidedly better than the previous model. The NCB had two or three failures unrelated to drilling and performed better than the XCB in the chert sequences.

Other tools performed well, including the latching system for the Japanese "ONDO" temperature-measurement system, the PCS, and the pore water sampler "colleted" delivery system.

Finally, one of the most important benefits of the engineering leg was observing first-hand the various coring and drilling systems and how they operated (in what were mostly adverse conditions of high winds and seas), and above all, learning what and how improvements to these systems need to be made to bring about more effective implementation on future ODP legs.

References

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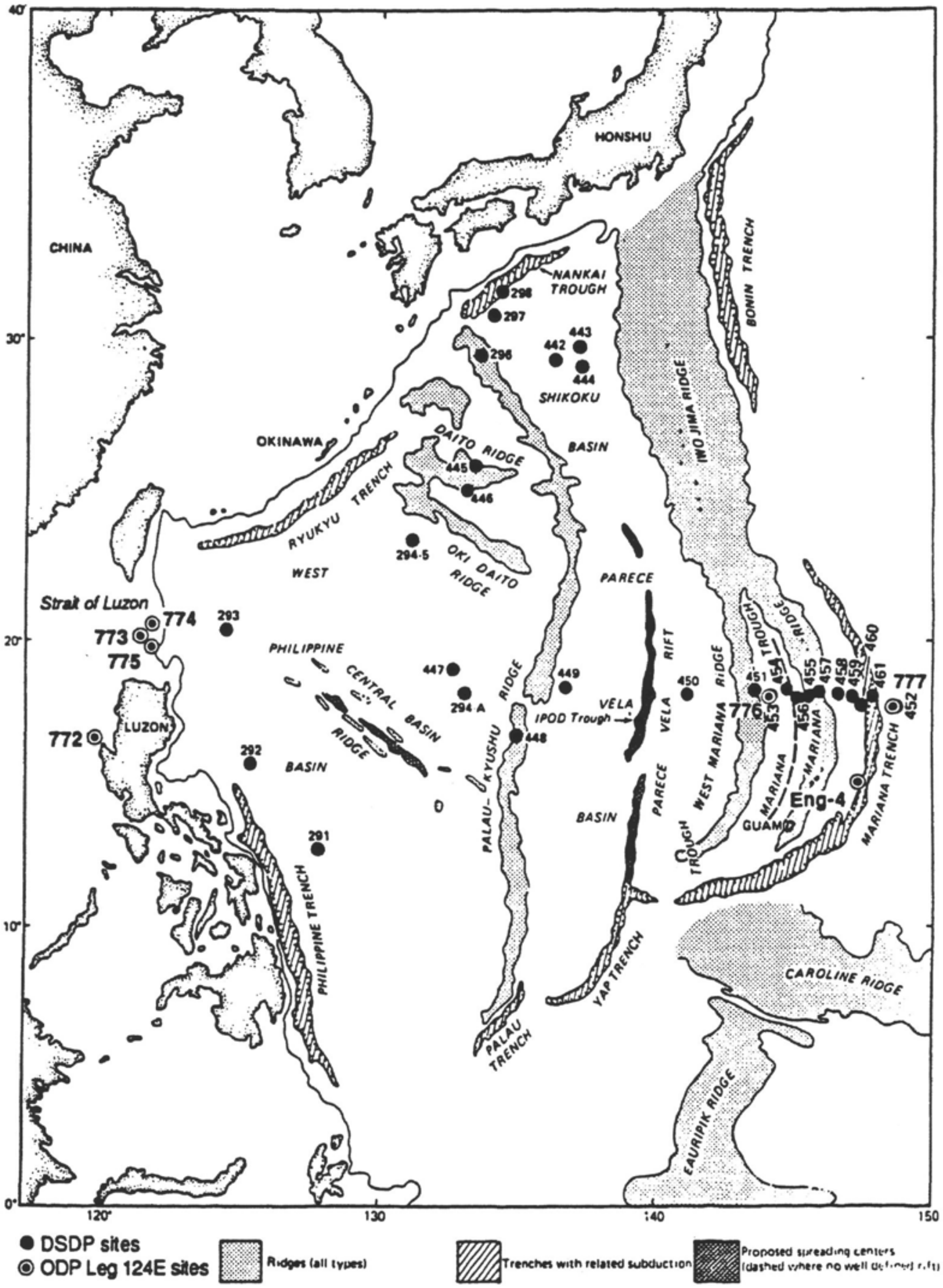

Figure 1. Map of western Pacific region showing DSDP sites and ODP Leg 124E sites. (Adapted from Hussong et al., 1982, Fig. 1).

OPERATIONS REPORT

Port Call, Manila

JOIDES Resolution arrived at the Manila Harbor Pilot Station at 0600 on 4 January 1989, and dropped anchor to await clearance to proceed into South Harbor. After shifting, Resolution passed the first line to pier 13 at 0800 hr on 4 January.

From initial planning, it was anticipated that the Leg 124E port call probably would take all 5 days allotted to it. The major work item in preparation for the leg was installation and checkout of the DCS. Leg 124 had helped with the DCS installation by mounting a 'J' box on the starboard-aft derrick leg from which the electrical umbilical to the DCS platform was draped. Also, the rendezvous boat that came from Singapore and arrived at Resolution on 28 December, during Leg 124, delivered 311,000 gal of fuel as well as barite and bentonite. Loading all those items in Manila would have further complicated the number of activities taking place at the port call. Therefore, the five days of port call activity anticipated were centered around the DCS installation.

ODP's project engineer for the DCS arrived in Manila two days prior to the arrival of the ship in order to check the two flats of DCS equipment for damage in transit. The project engineer was unable to check the flats, however, until just after dark on 5 January, when the flats arrived at the pier and installation of the DCS began. The following items relating to the installation of the DCS were accomplished in the order listed:

1. The dolly tracks on which the DCS platform dolly skidded were spotted, leveled with support beneath them, and bolted together.
2. The DCS platform dolly and DCS platform itself were set in place. The DCS mast was then stabbed into the platform, and the entire assembly skidded over to well center and back again to check for possible interferences or skidding problems. A minor fit-up problem was encountered when the unit was over well center. With the Varco top drive in the stowed position, the forward port leg of the DCS platform interfered and the leg had to be field modified and relocated. The remaining installation took only another 2-3 hr.
3. The derrick racking fingers for the 90-ft stands of tubing in the starboard forward corner of the derrick had to be installed at both the 45- and 90-ft levels. This project went smoothly since the original builder of the derrick had also built the racking fingers and therefore had all of the actual dimensions.
4. Next, the Tonto drilling equipment and the Westech equipment were installed on the platform and all hydraulic lines were connected. The safety shock cylinders were installed. The electrical umbilical to get power from the derrick 'J' box to the DCS platform was hung and connected.
5. Eight thousand ft of 3.5-in. tubing was loaded aboard for use as a work string, and make-up/break-in of the tubing was

performed. The tubing was stood back in the forward starboard corner of the derrick prior to departure.

Besides the fit-up and check-out of the DCS, other tests were scheduled for Leg 124E and were prepared for during port call. Plans included tests of (1) the revised XCB, (2) the PCS-phase 1, (3) the new NCB motor for proposed site ENG-3, (4) the colleted delivery system of the pore-water sampler, (5) the first run of the dip-stick for measuring the amount of hole drilled by the NCB, and (6) the ONDO delivery system in preparation for Leg 129.

During the 5 days in Manila, Underseas Drilling, Inc. (UDI) had no repairs, inspections, or other activities that controlled or paced the port call. The only other significant activity was that UDI had local divers check for any entangling rope that may have been left over from the buoy incident of Leg 124.

Tours of JOIDES Resolution were arranged for United States and Philippine government VIPs and also for students of several Philippine universities and secondary schools. Tours took place on 6 and 7 January.

Site 772

The first site drilled on Leg 124E, Site 772, had not been identified in the Engineering Prospectus as having basement underneath shallow sediment cover. A review of the seismic records during the Manila port call by the shipboard scientific party revealed a possible site at the north end of Lingayen Gulf approximately 35 nmi west of San Fernando. This site was characterized by approximately the depth of water that the engineers desired, and we hoped that shallow basement could be found. Since the proposed sites were selected on a minimum of seismic data and no actual core data, we decided to evaluate this alternate site en route to the proposed ENG-1 site. A pilot hole for DCS testing was planned using the XCB system, which would also provide a hole in which an NCB run or a PCS run could be made. Furthermore, if shallow basement were found at the site, the anticipated rendezvous with the supply boat set up for 25 January would be much closer to Manila.

The 80-in.^{3} water guns were deployed at 1630 hr on 9 January (all times given are local). At 2045 hr we began maneuvering in order to locate an exact site for drilling. On 10 January at 0300 hr a detailed survey was initiated, and at 1247 hr a releasable beacon was dropped. Resolution was maneuvered back on site, and thrusters and hydrophones were lowered. By 1945 hr the bit had been made up, and the bottom-hole assembly (BHA) and drill pipe tripped to the seafloor. The top drive was picked up, and a test of the PCS was run inside the drill pipe in order to see if the ball valve actuated properly. That test proved positive.

Medical Evacuation (Medevac)

Lab Officer Dennis Graham was taken to Clark Air Force Base on Luzon by a U.S. Air Force search and rescue helicopter. He had sustained an injury to his right thumb. After treatment in a Manila hospital, Dennis rejoined the Resolution from the Offshore Celtic with the other personnel on 25 January.

Hole 772A

Hole 772A was drilled in 1536.4 m of water, as verified by drill-pipe measurement. The first APC core was shot at 2236 hr, and full stroke was achieved. Four APC cores were on deck by 0025 hr on 11 January with recovery of 104%. A second run with the PCS was successful, followed by a dummy run of the pore-water-sampler collet tool. Hole 772A was then cored with the XCB from 1575.45 to 1632.44 mbsl. The formation was not offering the resistance hoped for; it was drilling at an average of 8-10 min per core. After a stand (about 92 ft) was washed down to 1660.7 mbsl, Core 124E-772A-12X was cut in 23 min with no recovery. Core 124E-772A-13W was washed another 28.2 m, and Core 124E-772A-14X recovered only 0.17 m of a full 9.7-m barrel. A third and final run of the PCS was made with Core 124E-772A-15P, with 1.0 m being cut in 4 min. The PCS run also revealed that phase 1 of the design had no major operating flaws. Beginning with Core 124E-772A-16X, we decided to alternately core, drill a stand, core, and drill a stand. But when Core 124E-772A-18X obtained no recovery at 361.0 mbsf, we decided to pull the drill string and proceed to the original ENG-1 site in Luzon Strait.

The recallable beacon was given the release code numerous times, and the ship was offset to all sides of the beacon. The beacon turned on and off but would not release, even with various command frequencies. After laying down the drill string and pulling thrusters and hydrophones, we were under way to the next site at 1015 hr, 12 January.

Site 773

Seismic gear was not streamed until 0630 hr on 13 January, when both water guns were deployed. Site 773, in Luzon Strait, was crossed at 0815 hr on a west-to-east track, but just after we crossed the site the global positioning system (GPS) was reduced. A north-to-south crossing line was run, and after more survey work was done under better GPS conditions the guns were pulled at 1055 hr. A beacon was dropped at 1145 hr on a final pass at 4 kt over the site. The thrusters and hydrophones were lowered, and the vessel was in a dynamic-positioning mode over the site by 1230 hr. The depth according to the precision depth recorder (PDR) was 1603.4 m, and drill-pipe measurement verified the water depth at 1604 m.

A modified XCB/DCS BHA was made up, which consisted of a special drillable landing sub below the top sub and head sub.

This configuration allowed the XCB to be landed to initiate the hole. Then the hole could be drilled out with the mining drill rod and continued using the DCS out the end of the bit. The bit used for Site 773 was a modified Security XCB bit that had the throat bored out an extra 0.26 in.; the cones were set back in order not to interfere with the tool joints of the drill rod. The outside diameter (OD) of the bit was 11.625 in., 0.187 in. larger than a standard XCB bit. The BHA consisted of three stands of drill collars crossed back to 5.5-in. drill pipe. The entire drill string consisted of 5.5-in. drill pipe in order to give a maximum safety factor in case the drill pipe became stuck. While we hoped that the extra safety factor would never be needed, we knew that while rigging up and running the drill rod and DCS platform the drill string would be left stationary in the borehole for extended periods of time.

Hole 773A

Hole 773A was spudded at 2145 hr on 13 January with an XCB in place. The first two stands were washed in before pulling the barrel. Core 124E-773A-3X was cut from 95.2 to 104.8 mbsf and resulted in 8.91 m of brown sandy clay. This core took only 8 min to cut, indicating that basement was still much farther down. Core 124E-773A-4W consisted of a washed stand to 133.9 mbsf, and another XCB was dropped. Core 124E-773A-5X took 60 min of rotating time to cut 3.5 m, and it was decided that the formation was lithified enough to deploy the DCS.

Prior to running the 3.5-in. tubing through the drill string, a conditioning trip was made to check the hole for bridges. The pipe was pulled up to 30 mbsf, and, upon returning to bottom, 3 m of fill was encountered. Minor bridging that took 10,000 lb of weight was pushed through at 1704 mbsl (100 mbsf) en route to bottom. A second wiper trip up to the 104-mbsf spot was made, and tight spots were worked through at 120 and 125 mbsf. At 1530 hr, 14 January, Hole 773A was abandoned because of hole instability, and the drill string was pulled clear of the seafloor.

Hole 773B

Hole 773B was spudded at 1715 hr with a center bit in place. Three stands were drilled in to 1686.6 mbsl (82.6 mbsf) prior to pulling the center bit. Cores 124E-773B-1X and -2X were cut in 14-15 min each to a depth of 98.7 mbsf, with recoveries of 82% and 86%, respectively. At that point, the depth of the hole was above the zone of instability encountered in Hole 773A. After a 30-bbl sweep of gel, high-viscosity mud was spotted in the annulus, and a wiper trip to 40 mbsf was made. Once the pipe was back on bottom, another 2.75 hr was spent conditioning the hole while the spaceout required for the DCS was checked.

After setting back the top-drive and rigging up scaffolding, a mining bit and outer core barrel were made up. The initial trip in the hole with the 3.5-in. tubing was slow, because each connection between stands had to be made up twice in order to break in the new connections. In port, 70 stands of the tubing had been made up and broken in to save operating time at sea. Also, the tool joints on the first 200 m of tubing had been turned down in order to give a little more clearance through the bit, and those tool joints were gauged during the trip. After two guide dollies for the DCS mast were attached to the derrick guiderail, the DCS platform and mast were skidded to well center, attached to the links, and picked up. The rig's top-drive was then picked up with the second set of links that pinned below the DCS platform so that the drill string could be both rotated and circulated through.

Initial drilling of the top landing shoulder inside the outer core barrel began at 0700 hr on 16 January, and by 0900 hr both inserts had been drilled out and the core barrel retrieved. Following 4 hr of repair on both the hydraulic power unit and the wireline winch, a second core barrel was dropped. The drill string had become stuck during the 40 hr since it had last been moved. A 220,000-lb overpull was required to free the drill string, and the hole was conditioned with 55 bbl of high-viscosity mud. Mud was left inside the pipe and also spotted in the annulus. At 2000 hr the 11.625-in. bit was landed on bottom, and the secondary heave-compensation system on the platform was monitored relative to the heave of the Resolution. The drill string was drilled down 4.4 m after another 1.75 hr of troubleshooting the DCS hydraulic system. From 0400 to 0630 hr the first DCS core was cut from 1702.73 to 1704.33 mbsl (98.73 to 100.33 mbsf) and yielded 47% recovery. A second DCS core was cut to 1705.77 mbsl, but during retrieval of the core the mining overshot parted. A total of 13.5 hr then was spent trying to fish the overshot out of the hole, until at 2230 it was decided to abandon the fishing attempts. The DCS/XCB bit was pulled off bottom, and the 3.5-in. tubing was tripped out of the hole in order to retrieve the core barrel with Core 124E-773B-4M. The trip out of the hole with the drill rod took 4.5 hr after the top drive was set back, the DCS landed and skidded back, and the mast crosshead lowered. During the trip out repairs were made to ODP's slip-type elevators. The second DCS core had advanced 1.4 m and recovered 1.4 m of a volcaniclastic claystone, with the top 20 cm containing igneous rubble that had been washed from above.

After the tubing was tripped out, the top drive was picked up and the hole was advanced 18.67 m in order to get two knobby drilling joints through the guide-horn because the weather was intensifying. The hole was conditioned, and 50 bbl of mud was left in the drill pipe. The 3.5-in. tubing was tripped in the hole in 3.75 hr, and the DCS platform once again picked up. The drill string had once again become stuck, and a maximum of 370,000 lb of overpull was required to free the pipe. A slug of

50 bbl of high-viscosity mud was spotted in both the 5.5-in. drill pipe and the annulus. The drill rod was then landed on bottom and was thought to be up inside the drill pipe. Immediately upon tagging the fill(?), the secondary heave-compensation system began giving trouble, and 5.5 hr was required for repairs. Beginning at 2030 hr, DCS drill rod was washed from 1716.12 to 1718.35 mbsl in 15 hr. At 1130 hr on 20 January, the DCS sand line was run to pull the wash barrel in order to see what had taken 15 hr to ream 2.23 m. Upon recovery of the barrel, the mining overshot rod suffered a tension failure. The decision was made to trip out of the hole with the drill-rod and to look at both the core and the cutting shoe to determine what was happening downhole. Upon recovery of the mining BHA, we discovered that the face of the cutting shoe was completely destroyed and the core barrel had fallen out in the hole, since the core barrel lands and is contained in the bit itself. Since the drill string had to be pulled at least to the mud line to begin a new hole, we decided to move the ship to a new location in search of basement.

By this time it was apparent that deployment of the DCS system was a time-consuming operation and the time allotted to DCS drilling was expiring quickly. A site to the north was chosen, in what was hoped to be more protected water in the lee of an island. The bit cleared the rotary table at 0610 hr on 21 January, and Resolution was on her way to the next site.

Site 774

The location chosen for Site 774 lay ~43 nmi north of Site 773 off the southwest tip of Itbayat Island, in order to avoid the rip currents and normal inter-island currents that characterize Luzon Strait. Upon arriving in the vicinity of the site, it quickly became apparent that the currents here were not much less than those we had already experienced. A site was chosen from water-gun profiles, and a releasable beacon was dropped at 1415 hr, 21 January. The corrected PDR water depth was 1093.4 m, and the drill pipe measurement was 1089 m. As the thrusters and hydrophones were lowered, and positioning on the beacon commenced, the weather became rough to the point that both the captain and the ship's electrical supervisor were concerned that operations at this site might be interrupted by positioning alarms.

Hole 774A

The bit was made up and at 1545 hr running the BHA commenced. The currents as indicated on the ship's pit log were so strong that ODP's current meter was rigged and deployed over the starboard side in order to record current measurements vs. depth. A modified XCB/DCS BHA was made up and all 5.5-in. drill string was run. The second bit used on the previous hole was rerun, and at 1940 hr Hole 774A was spudded and drilled to 37.8 mbsf. The hole quickly became unstable, requiring 40,000 lb of overpull at 8 mbsf and 160,000 lb of overpull at 37 mbsf. Three 20-bbl sweeps of high-viscosity mud were pumped, but it soon became clear that a new hole was needed.

Hole 774B

The bit was pulled clear of the seafloor, and the ship was offset 500 m to the northeast on a course of 050°. Hole 774B was spudded at 2245 hr and slowly control-drilled to 255.9 mbsf. The hole was drilled in a total of 289 rotating min with only 10,000 lb of bit weight, so it was evident that basement could be much deeper than was thought. The last joint of pipe that was drilled to the 255.9-mbsf level began to take more weight, so at 0800 hr on 22 January we decided to pull the center bit and drop an XCB in order to determine the lithology.

With the sand line on the way down, the driller suddenly saw a drastic weight loss and quickly had the sand line pulled from the pipe in order to pull some drill pipe in the hope of getting above the suspected trouble zone. The pipe still became stuck. From 0830 until 1300 hr the pipe was worked, and 460,000-510,000 lb of overpull was applied to the drill string without success. Rotation of the pipe was not possible, but circulation was used, without success. At 1300 hr the center bit was retrieved, and at 1415 hr the driller attempted to go to bottom with the pipe. That resulted also in no success, and at the time the pipe was stuck between tool joints, where it was not possible to set the elevators even to break off the top-drive. By 2000 hr the pipe had slowly been inched uphole, and the elevators were set on the stool. The DCS would have been deployed with the pipe in a stuck position, except that the XCB/DCS bit was at that time two stands off bottom. The drill rod, therefore, would not have had any consolidated formation in which to drill, and maybe would not have had any formation at all if the hole had not reconstituted.

The first severing charge was rigged, deployed, and fired, but while the firing panel indicated a positive discharge, the pipe did not come free. At 0145 hr on 23 January, after the second charge had been fired, and while holding 150,000 lb of tension on the pipe, the pipe started to move. The driller quickly pulled five double joints of pipe, with the drag staying between 50,000 and 150,000 lb. After the top-drive was set back, pipe was pulled in stands, and the seafloor was cleared at 0240 hr. The drill pipe was laid down, and thrusters and hydrophones were pulled and secured at 0630 hr. The commandable beacon was recalled and retrieved prior to getting under way.

Site 775

As time had nearly expired for DCS tests, Site 775 was picked strictly on the basis of the bathymetry shown on the ship's chart. An all-encompassing session of ODP engineers estimated the time required to drill a site in about 500 m of water to a basement horizon, to pick up the DCS, and to get five cores in order to prove the capability of the system to drill basement rock in deep water from a floating vessel. A site was chosen on the flank of a seamount 35-40 nmi south of Site 774. The transit time to Site 775 was only 4 hr, and a shallow-water beacon was launched at 1030 hr on 23 January. A localized quick-gridded survey was done with the sonar-dome-mounted transducers to determine the location of the thinnest sediment cover. By the time a suitable site had been located, the first beacon, of only 190 dB, could not be heard with the dynamic-positioning system (DP) in auto-mode. A second retrievable beacon, of 17.5-kHz frequency, was launched at 1256 hr.

Since the bottom profile showed little or no sediment thickness, and the pipe trip was quick, we decided to run the vibration-isolated television frame (VIT) to bottom in order to find a sediment pond in which to spud. The weather worsened the whole time that the pipe trip was being made and the VIT was being run. The DP alarms for caution and cessation of drill-string rotation had to be relaxed from 2% and 4%, respectively, to 4% and 7% because of the rough weather and shallow water. Once the VIT had arrived at the seafloor, a grid was run on DP in a box pattern for 1.25 hr in order to locate a pond of sediment. The view of the seafloor revealed a flat bottom with very little sediment.

Hole 775A

At 2130 hr a small sediment pond was located, and the bit was washed in with 8,000-10,000 lb of bit weight and no rotation, since the camera was still in the water. At 2256 hr, washing was stopped, and the VIT was run back to bottom to observe whether or not any hole had been made. Observation of the seafloor showed that approximately 6 m of penetration had been achieved. The core barrel could not be pulled unless the hole were drilled deeper; also, the VIT had to be retrieved in order to rotate the drill pipe and advance the hole. The drill pipe, therefore, was pulled clear of the seafloor, and the VIT and core barrel were retrieved. Core 124E-775A-1X consisted of 0.31 m of well-cemented sand and highly weathered andesitic basalt rubble.

Hole 775B

Since the site showed that penetration could reasonably be expected, and that perhaps true basement could be reached within several tens of meters, Hole 775B was spudded at 0120 hr on 24 January, and the first 20.5 m was washed in. Two wireline runs were required because of a sheared overshot pin on the first run. In order to pull up to a connection where the pipe could be broken to get the core barrel, only 4.5 m of pipe was left in the hole. The weather had gotten so rough that the pipe was sure to heave out of the hole, so it was pulled clear of the seafloor, and the vessel was offset to spud another hole.

Hole 775C

Hole 775C was spudded at 0555 hr, and 11.2 m was washed in 88 min. Starting a hole in Force 8-9 winds and seas, in an unstable geological setting, proved to be hopeless. The Operations Superintendent decided at 0800 hr to abandon Hole 775C, pull the drill string, and move to a lee where the transfer of personnel and DCS equipment could be made safely to the supply boat from Manila, due to arrive on the following day (25 January). The thrusters and hydrophones were pulled, and the ship was secured for transit at 1145 hr.

Rendezvous

Resolution departed at 1145 hr on 24 January for a lee position near the northwest corner of Luzon, covering the 116 nmi in 10.75 hr to arrive at 2230 hr. The supply boat Offshore Celtic, carrying equipment and personnel, had already arrived at the rendezvous point and lay at anchor. Resolution stayed in a water depth of 200 m in order to carry out several hours of trial deployment of a running tool for the ONDO deep-water seismometer experiment that will be done in the Nankai Trough. For safety of both personnel and the DCS, it was decided not to transfer anything before sunrise. During several runs of the ONDO tool inside 150 m of drill pipe, the tool kept hanging up at the very same spot. The drill pipe was repositioned by pulling a stand, more sinker bars were added, and the tool then easily seemed to ride through the drill pipe as desired. The next trial of that tool needs to be in several hundred meters of drill pipe.

At 0715 hr on 25 January, the personnel transfer from the supply boat to Resolution was accomplished. The equipment transfer began at 0830 hr when the mast of the DCS had been laid out from the drill floor. By 1115 hr, all seven lifts from Resolution had been loaded onto Celtic's deck. The eight offgoing personnel were transferred to Celtic, and at 1120 hr she cast off. At 1215 hr, Resolution was under way for proposed site ENG-2 in the Mariana Trough.

Site 776

One day into the transit to Site 776 the weather into which Resolution was heading began to pick up considerably. Resolution was sailing almost due east on a course of 092°. The wind into which the ship was sailing was out of the east-northeast, and by the evening of 1 February the winds had increased from 12-15 to 35-40 kt, and seas from 7-9 to 12-14 ft, with swells of 18-20 ft. The vessel was taking water over the bow much of the time, and ship motion averaged a 5°-6° roll and a 3°-4° pitch. At times the revolutions of the main shafts had to be decreased by 5-8 rpm because of the pitching motion. The rough weather not only took its toll on the crew, but also severely limited the amount of outside welding and maintenance work that could be done. Maximum wind gusts recorded during the transit were 48 kt, with maximum sustained winds of 39 kt. For the total transit of 1345 nmi, the ship averaged 8.5 kt, but at times the speed was as low as 7.6 kt. The voyage from Site 775 to Site 776 cost Leg 124E 1.8 days of extra time and ranks as one of the roughest transits that Resolution has made during the first 4 years of ODP operations.

Resolution arrived at Site 776 at 0445 hr on 1 February and headed directly for the location of DSDP Site 453 (also proposed site ENG-2). Upon arrival, the GPS was receiving only two satellite transmissions, and so our exact location was doubtful. The 12.0-kHz transducer mounted in the sonar dome was receiving a good record, and the east and west canyon walls of the locality were clearly evident. Site 776 lay on a flat expanse between the canyon walls. Even with fair GPS, it was decided to drop the first beacon and begin to run drill pipe while waiting for better GPS information, since the pipe trip to bottom would be 10 hr. The weather was still rough, and it was not possible to begin to move drill collars onto the casing hatch and measure them in preparation for picking them up to the drill floor. A releasable beacon was dropped at 0850 hr, after the thrusters and hydrophones had been lowered.

Operations at Site 776 were dedicated to running borehole logs and conducting downhole experiments. Five days of logging had been allocated, but that time had to be cut by 1.9 days because of the long transit time and after a reassessment of the actual time that would be required to drill the hole to 605 mbsf. No coring had been planned, as DSDP coring at Site 453 had reached a depth of 455.5 mbsf in igneous breccias with an average recovery of 39%, and, moreover, because of the time constraint.

The BHA was made up to a tri-cone drill bit, and the pipe trip began at 0600 hr. The BHA consisted of fourteen 8.25-in. drill collars and one 7.25-in. drill collar, and also included a bumper sub just under the top stand of drill collars. The total BHA length was 203.08 m, including two stands of 5.5-in. drill pipe. The corrected PDR reading was 4713.4 m. At 1030 hr, GPS coverage was improving, and it was determined that the first beacon was 1.7 nmi from the coordinates of DSDP Site 453. A second releasable beacon was dropped at 1330 hr, and the final position was occupied.

Prior to spudding Hole 776A, a detailed drilling plan had been worked out after looking at the drilling results of the Glomar Challenger at Site 453 and the lithology described in the DSDP volume for Leg 60. The results prepared by the DSDP Drilling

Superintendent indicated that the sediment overlying basement would conceivably be drilled as fast as we wanted. Also, the coring results of Hole 453 showed that penetration rates in the basement slowed to an average of 4.5 m/hr through sections of possible talus of igneous rocks, breccias, and deeper metamorphic rocks. The description of basement rock definitely was not very encouraging in terms of both drilling rate and hole stability.

The ODP plan was to control-drill the upper sediment section, making sure to clean the hole of drill cuttings so as not to have them load up in the annulus. The fact that, even after drilling the hole, the drill string would be left stationary for at least 3 days was a major disconcerting factor for the site. The drilling record of Site 453 indicated hole bridging and caving over time. The drilling curve for the sediment was plotted at 50 m/hr for drilling and still being able to clean the hole. The basement part of the curve had a penetration slope of 5 m/hr. Reasons for our optimistic thinking of being able to outdrill the Challenger were (1) not having to core, and (2) the better drilling equipment aboard Resolution - heave compensator, top drive, and mud pumps.

Hole 776A

Hole 776A was spudded at 1850 hr on 1 February, and the hole was drilled to 5011.44 mbsl in the first 6.75 hr for an average rate of penetration (ROP) of 44 m/hr. Ten bbl of high-viscosity mud was pumped on every connection for hole cleaning. At 5011.44 mbsl a short trip was made up to 4863.68 mbsl, with no fill encountered when back on bottom, and a maximum drag in and out of 10,000 lb. Another 6.75 hr was required to drill ahead to 5146.96 mbsl. A hard spot was hit at 5145.5 m (432 mbsf), and it was thought that basement at Site 776 was 23 m higher than at DSDP Site 453. At 5145.5 mbsl, 45 bbl of 80-viscosity sweep mud was circulated. Following another short trip back to 4863.68 mbsl to check for hole swelling, 19 m of fill was found upon returning to bottom. The next 15.5 hr of drilling in apparent basement yielded an average ROP of 4.8 m/hr to a total depth of 5221.48 mbsl. At 0500 hr on 3 February a short trip back to 400 mbsf was made, and a ledge was encountered at 412 mbsf. Upon running back in, tight hole was found from 5183 to 5220 mbsl, just above bottom. The 37-m interval was reamed back through, and two 40-bbl pills of mud were spotted in the hole. Drilling continued to 5224.4 mbsl, and on the next connection another tight spot had to be worked back through from 5218 to 5224.4 mbsl. A total of 8.75 hr was required to drill ahead from 5224.4 to 5245.85 mbsl, an average ROP of 2.45 m/hr. The depth at that point was 532.45 mbsf, with apparent basement penetration at 100.45 mbsf. Since further penetration into basement was going to be extremely slow, the Operations Superintendent decided to terminate drilling and proceed with logging the hole. The LDGO representative agreed that 100.45 m of basement would be the minimum acceptable amount, and that, in the face of the reduced time for logging, drilling should be terminated. Another factor in the decision was that 30 min had been required to get unstuck just above bottom during drilling with the last single joint, which reached 5245.85 mbsl.

Just after displacing the hole with 11.0 ppg mud for logging, the drill pipe became stuck at what was thought to be 5233 mbsl. In addition, at 2200 hr the beacon signal was becoming considerably weaker, and the DP operator advised that another beacon needed to be dropped. The stuck pipe was pulled and worked from 2300 hr on 3 February until 0830 hr on the 4th, with a maximum overpull of 130,000 lb available for use. At 0115 hr the shifting tool was dropped in order to release the bit and see if the pipe was perhaps only stuck at the bit. When excessive backflow of the pipe was observed at the rig floor, it was certain that the bit had been released and the pipe was still stuck. The high risk of drilling through 400+ m of loose and unstable sediments had taken its toll.

The first severing charge was assembled and run in the pipe at 0830 hr, and the charge detonated at 1110 hr. The charge was placed in the second joint of 5.5-in. drill pipe above the 7.25-in. drill collar. The ideal place to have exploded the charge would have been in the bumper sub, but the sub was closed. Tension of 100,000 lb of overpull was held on the pipe while the shot was made, and, while we received positive indication of detonation, the pipe did not come free. While the second severing charge was being rigged up, the drill pipe was worked as the logging line was withdrawn. The spot picked by the Operations Superintendent for shooting the second charge was 17 m higher than the point at which hole problems were experienced while drilling DSDP Hole 453 at 160 mbsf.

The first shot was an 84-pellet shot, which is designed to produce enough energy to sever an 8.25-in. drill collar. The next try, in the 5.0-in. drill pipe, was a 31-pellet charge. With 160,000 lb of tension held on the pipe, the drill pipe came free almost immediately. Conversations with the LDGO representatives about the amount of usable hole left confirmed our decision to pull the pipe clear of the seafloor. The logging experiments had been aimed at the basement objective and, since that was not now possible, the LDGO representatives said that logging through the pipe hanging in the water column was as good as anything the upper hole could provide. The pipe was pulled clear of the mud line at 1930 hr and left hanging 319 m above the seafloor.

The "quad combo" logging tool was run at 2030 hr to 600 mbsl. Because of an apparent malfunction of the sonic module, the tool was brought out of the pipe at 2215 hr. A second run of the same tool was made from 2310 until 0115 hr on 5 February, and the problem was traced to air in the upper 600 m of pipe. The next logging run was with the geochemical tool (also used for wireline heave-compensator tests) and took place from 0330 until 0915 hr.

Medevac

At 0120 hr, one of the UDI roughnecks suffered a severely sprained and dislocated ankle and foot. We were one day at most from pulling pipe and moving to proposed site ENG-3 (equivalent to the location of DSDP Site 452), and it was decided to rig down from logging immediately and evacuate the injured man to the island of Saipan for treatment. The detour to rendezvous with a boat operating out of Saipan was set up through a call to the ship's agent in Guam. The transfer of the injured roughneck was made at 1215 hr on 6 February after a 20-hr transit. Resolution was under way for proposed site ENG-3 (Site 777) at 1218 hr.

Site 777

At 0730 hr on 7 February, Resolution slowed and deployed water guns for surveying in the immediate area of Site 777 in order to see if the present survey could be tied to that done by the Conrad in 1981. A 17.0-kHz releasable beacon was dropped at 1608 hr, and the site occupied by the vessel immediately. The BHA was made up at 1710 hr after the thrusters and hydrophones had been lowered and secured.

A 3.5-kHz deep-source bottom pinger was attached to the VIT camera frame in order to run a bottom survey to see if the layers of chert drilled in Hole 452 could be more accurately imaged and displayed on a flat-bed recorder. The VIT frame was installed on the drill pipe once 4138 m of pipe had been run. The corrected PDR water depth for the site was 5812.4 m, and the drill pipe was run to 5771.71 mbsl, ~1.5 stands of pipe off bottom. The VIT frame was left 1/2 stand above the bit and the survey was begun at 0610 hr on 8 February. After several minutes, the sonar source quit pinging and was pulled to the surface for repair. Upon recovery of the VIT and a check-out of the deep sonar source (DSS), it was discovered that a transistor on one of the electronics boards had failed.

Hole 777A

At 1110 hr, the VIT was out of the water, and the upper guidehorn had been reinstalled. The drill string was spaced out, and all was made ready to shoot the first APC core and establish the mud line depth. Because of a misrun with the GS tool, the pin in the APC failed, allowing the APC to fall. A full barrel was found upon retrieval of core, so the mud line was not determined. Since the thickness of the overlying sediment was not yet known, a switch to the XCB system was made for the second coring run, to be safe. Coring with the XCB continued from 5825.5 to 5864.5 mbsl for Cores 124E-777A-2X through -6X. A 30-bbl high-viscosity mud sweep was pumped, and upon pulling the sixth core we found that 110,000 lb overpull was required to move the drill pipe. Once the pipe was free, the driller immediately pulled pipe. Having had to sever the pipe on two previous occasions had made us all wary.

Hole 777B

After pulling clear of the seafloor and retrieving Core 124E-777A-6X, the ship was offset 25 m to the southwest (away from the beacon), and preparations were made to spud Hole 777B. We decided to take four APC cores, based on the lithology seen in the first four cores of Hole 777A. The first four APC cores of Hole 777B obtained 103.3% recovery, as the hole reached 5848.9 mbsl. The first NCB run was made because the hardness of the formation into which the XCB had drilled in Hole 777A had completely emaciated two diamond-impregnated cutting shoes. The first NCB run (Core 124E-777B-5N) took 3.25 hr to cut, and the hole was advanced 1.3 m before the barrel. No apparent end of stroke was evident from the strip-chart recorder that had monitored pressure vs. time for the entire run. Upon retrieval of the core, it was discovered that the surface-set cutting shoe had been ground down severely, and that not only the bit crown was gone but also 1.5 in. of the body of the cutting shoe. Since there was now junk in Hole 777B, the pipe was pulled clear of the mud line, and the ship once again offset.

Hole 777C

Hole 777C was located 25 m northeast of the beacon. The ship had been operating ~3500 ft away from the beacon in 5810.5 m of water on the edge of the beacon's included cone of good signal. Hole 777C was spudded at 1602 hr on 9 February and washed from the mud line to 5849.28 mbsl. After the center bit was retrieved, a 10-bbl sweep of high-viscosity mud was pumped and the first NCB core was cut. Four hours was required to cut this core, from 5853.87 to 5857.87 mbsl. Upon retrieval of the core barrel and motor it was discovered that a diamond-impregnated cutting shoe had been completely destroyed. By this time it was not clear to the ODP engineers whether there was a problem with the metallurgy of the cutting shoes or if perhaps the NCB was running with too much weight on the bit. The sizes of the jets in the flow divider had been increased prior to the last NCB run, but the engineers were puzzled. The drill pipe was again pulled clear of the mud line and the ship offset again northeast, closer to the beacon. Recovery in Holes 777B and 777C was 0.72 and 0.7 m, respectively, and in both cases the cores were jammed in the barrel. Also, the NCB strip-chart recorder showed no clear indication of when during the run the jamming might have occurred. Since the NCB run in Hole 777C had revealed a 4.0-m stroke, it was decided to make another run with a slightly different impregnated cutting shoe, and also to vary the drilling parameters of the NCB run slightly.

Hole 777D

Hole 777D was washed to a depth of 5861.1 mbsl and the hole swept with 10 bbl of high-viscosity mud. The first NCB run was started at 0430 hr on 10 February, and took 4 hr to drill from 5861.1 to 5862.23 mbsl. The core recovered 0.27 m of porcellanite/chert, and while the core was once again jammed in the core catcher, the cutting shoe had come back worn but in one piece. In an attempt to continue on the learning curves for both the NCB and chert drilling, another NCB run was deployed. Core 124E-777D-3N from 5862.2 to 5866.3 mbsl (51.7-55.8 mbsf) was drilled in only 30 min, and a definite end-of-stroke indication was seen. While there was more encouragement about the way that the NCB had operated, upon breaking out the barrel only 0.37 m of core was recovered from the 4.1-m hole advancement. The formation was definitely getting harder, and the ODP engineers thought that the learning experience was invaluable. Core 124E-777D-4N was dropped down the drill pipe at 1300 hr and again the core took less than 1 hr to achieve full stroke. Upon attempting to retrieve the NCB, the RS overshot sheared. Once out of the hole with the wireline, a set of wireline hydraulic jars was made up and RIH to attempt to jar the core barrel loose. After 2.5 hr of jarring and working the NCB without success, the only thing left to do was to drop the Kinley wireline cutter, retrieve the sand line, and pull out of the hole with the drill pipe to free the NCB. The sand line had been cut and retrieved by 2315 hr on 10 February, and the driller then doubled out of the hole with the top drive until clear of the mud line.

Since the DSS pinger was fixed and another bottom survey with the 3.5-kHz sonar source had been planned, it was decided to run the VIT prior to pulling the drill pipe. Knobby joints were installed in the drill string to cross the guidehorn, and the VIT was installed and run to bottom. The survey was to center on Hole 777D, since at 1210 hr on 11 February a second beacon had been dropped, owing to a total signal loss from the first beacon. A maximum of 12 hr was to be devoted to the pinger survey for insight into the nature of the chert layers. Shortly after reaching the seafloor with the VIT and pinger, the package developed problems and the VIT frame had to be pulled. Later analysis of the problems with the pinger revealed that an "FET" transistor was malfunctioning and could not be repaired. After the VIT frame was pulled and the upper guidehorn and rotary-floor equipment reinstalled, the drill string trip for the NCB was begun. At 1530 hr, the BHA was at the drill floor being broken down and stood back. Slowly and carefully, different sub breaks were made and components of the NCB disassembled until finally at 1800 hr, the connection at the double-window latch sub revealed that the Belleville springs in the NCB had become wedged through the window, not allowing the NCB to come free.

Hole 777E

The five-cone XCB bit had only 4.5 rotating hr on it from the first four XCB/NCB holes, so the same bit was run. All BHA connections were checked and the pipe trip was started at 2000 hr. Hole 777E was spudded at 0840 hr on 12 February and drilled from 5810.5 to 5861.52 mbsl. An XCB coring run was made from 5861.52 to 5870.97 mbsl, and 0.41 m of loose chert hole fill was recovered. The first NCB was dropped at 1245 hr and drilled on for a few minutes before it was discovered that the NCB did not unlatch and drill. At 1515 hr, while pulling the NCB out of the hole, the 3 X 18 sand line parted approximately 1150 m above the rope socket. After we retrieved the sand line at the surface, an in-the-pipe fishing spear was deployed in hopes of snagging the wireline securely enough to pull the wire and NCB out of the hole. For 2 hours the spear was worked trying to snag the wire. By 1730 hr no fishing attempt had been successful, and it was decided to pull the spear out of the hole and add a D/P rabbit on top of it in order to mash down on the top of the wire, creating a snarl to catch the wireline. When the sand line arrived at the surface, it was discovered that the shear pin in the GS overshot had sheared, leaving the spear in the hole. On the first run back in the pipe with the renewed overshot, the spear was engaged, and after half an hour the NCB and wire were caught and slowly started out of the hole. The pulling speed was held to 30 m/min because it was not known how securely the catch was. The spear and NCB arrived at the surface at 2200 hr. The spear was laid down, and the wireline was T-barred out of the hole until enough was on the deck to go over the crown and long-splice onto the forward coring winch drum, to pull the entire NCB out. Since the NCB had not unlatched, the barrel had never drilled and was empty. The hole was washed and reamed from 5839 to 5870.97 mbsl, and at 0330 hr on 13 February Core 124E-777E-2N was dropped. This core was tried twice. The first time the NCB did not unlatch, and the second time only a few chunks of chert were recovered. After reaming 1 m of rathole, Core 124E-777E-3N was attempted, but the motor indicated stall and the NCB was retrieved. The drill string stuck again, and it was decided to abandon further NCB testing at Site 777 in favor of NCB deck testing at proposed site ENG-4.

Hole 777F

In order to confirm the water depth at Site 777, it was decided to shoot one piston core before recovering the drill string. Hole 777F was spudded at 1635 hr on 13 February, and as the wireline was spooled, a line compound was applied to the wire as a preservative. Core 124E-777F-1H was on deck at 1925 hr and recovered 2.46 m of soft brown ooze and mud. The mud line was established at 5817.0 m.

After setting back the top-drive, the pipe trip was begun. The trip out of the hole was interrupted by two minor rig repairs. The vessel was under way at 0630 hr on 14 February.

Transit to Proposed Site ENG-4

At 0915, Resolution reduced speed to investigate a problem with one of the propulsion motors on the starboard shaft. After 1.75 hr of working on the motor coupling, the chief engineer decided to remove the motor from service and to continue with the voyage. Good weather, with little wind and smooth seas, allowed the transit to continue with little reduction in speed. Including the downtime because of the propulsion motor problem, the transit took 18 hr, with an average speed of 11.4 kt.

Proposed Site ENG-4

Approximately 1 hr was involved in surveying along a course of 160° after crossing the proposed ENG-4 location at a speed of 5 kt in order to locate a suitable water depth and bottom profile in which to drop a deep-water beacon. At 5 kt, the bottom signal came in clearly, and at 0130 hr on 15 February the beacon was launched. The ship was stopped immediately and backed to the spot of the drop. We had estimated that the newly designed deep-water beacon could take as much as 2 hr to fall to the seafloor in this part of the Mariana Trench. During that time the thrusters and hydrophones were lowered, and at the same time on the rig floor the ODP engineers set up a test of the NCB's unlatching for drilling a barrel of cement. From 0330 until 0730 hr a positioning test over the beacon was performed by biasing the thrusters against one another. The biasing created artificial noise, since the environment was mild, to simulate noisier conditions that might be expected to prevail. The result of the test was that at 30% of maximum thruster output, the automatic positioning had to be taken over by joystick control and dead reckoning. The ship's position could be maintained in those cases if the vessel were turned into the wind and seas. The power/water ratio for deep water with the 220-dB beacon and 8176.4 m (26,819 ft) was about the same as for the current-style 214-dB beacons that are used for water depths less than 6100 m (20,000 ft). The ship's electrical supervisor also practiced manual control of the DP system in case the Honeywell computer should be lost. The deployed beacon was recallable, but after 1.25 hr of commanding the beacon, it would only turn on and off, and the release mechanism failed to activate.

The test as a whole was considered a success for two reasons: (1) the beacons rated to 6100 m (20,000 ft) that ODP currently uses perform marginally at times in water deeper than 5500 m (18,000 ft) when the weather is rough, and (2) in the future when ODP drills in 7300-8200 m (24,000-27,000 ft) of water, at least one beacon manufacturer will have demonstrated capability in building a true deep-water beacon. One remaining unknown factor is whether the beacon will hold up over a 10- to 12-day hole.

Transit to Guam

JOIDES Resolution was under way from proposed site ENG-4 at 0848 hr on 15 February under full power. The transit to Guam was 190 nmi and was anticipated to take 19 hr. The weather en route to Guam was nearly smooth with virtually no vessel motion, which allowed final clean-up and painting of the ship to proceed rapidly. The agent in Guam had been alerted to the vessel's arrival at the pilot station at 0500 hr on 16 February 1989. The pilot boarded the vessel at 0517 hr, and the first line was passed over to the dock at 0600 hr, ending Leg 124E.

OCEAN DRILLING PROGRAM
OPERATIONS RESUME
LEG 124E

Total Days (4 January - 16 February 1989)	42.92
Total Days in Port	4.92
Total Days Under Way	13.58
Total Days on Site	24.42

Trip Time	5.96
Coring Time	4.56
Drilling Time	3.33
Logging	0.57
Work Stuck Pipe	1.74
Fishing/Circulating/Conditioning	1.69
Rig DCS	3.00
ODP Breakdown	0.57
Downhole & Other (Includes TV/PCS)	3.00

Total Distance Traveled (nautical miles)	2950.0
Average Speed (knots)	9.61
Number of Sites	7
Number of Holes	15
Total Interval Cored (m)	263.80
Total Core Recovery (m)	156.09
Percent Core Recovered	59.17%
Total Interval Drilled (m)	1,410.96
Total Penetration (m)	1,674.76
Maximum Water Depth (m from drilling datum)	5,810.50
Minimum Water Depth (m from drilling datum)	506.00
Maximum Water Depth Dynamically Positioned (m)	8,176.00

OCEAN DRILLING PROGRAM
SITE SUMMARY
LEG 124E

HOLE	LATITUDE	LONGITUDE	WATER DEPTH METERS	NUMBER OF CORES	METERS CORED	METERS RECOVERED	PERCENT RECOVERED	METERS DRILLED	TOTAL PENET	TIME ON HOLE	TIME ON SITE
772A	16-39.00'N	119-42.00'E	1540.00	18	126.70	85.40	67.40%	234.30	361.00	45.7	
		SUBTOTALS		18	126.70	85.40	67.40%	234.30	361.00		45.72
773A	20-12.30'N	121-39.00'E	1604.00	5	13.10	0.00	0.00%	124.30	137.40	29.5	
773B	20-12.30'N	121-39.20'E	1604.00	4	19.10	15.75	82.46%	98.30	117.40	156.8	
		SUBTOTALS		9	32.20	15.75	41.23%	222.60	254.80		186.25
774A	20-35.90'N	121-44.08'E	1094.50	0	0.00	0.00	0.00%	37.80	37.80	7.3	
774B	20-35.90'N	121-44.08'E	1089.00	0	0.00	0.00	0.00%	255.90	255.90	33.0	
		SUBTOTALS		0	0.00	0.00	0.00%	293.70	293.70		40.30
775A	19-51.00'N	121-42.98'E	506.00	1	6.00	0.00	0.00%	0.31	6.31	14.3	
775B	19-51.00'N	121-42.98'E	506.00	1	0.00	0.00	0.00%	20.50	20.50	4.0	
775C	19-51.00'N	121-42.98'E	506.00	1	0.00	0.00	0.00%	20.50	20.50	7.0	
		SUBTOTALS		3	6.00	0.00	0.00%	41.31	47.31		25.25
776A	17-54.40'N	143-40.95'E	4713.00	0	0.00	0.00	0.00%	532.45	532.45	103.2	
		SUBTOTALS		0	0.00	0.00	0.00%	532.45	532.45		103.22
777A	17-42.20'N	148-41.80'E	5810.50	6	48.50	14.69	30.29%	0.00	48.50	31.9	
777B	17-42.20'N	148-41.80'E	5810.50	5	37.20	38.40	103.23%	1.90	39.10	15.7	
777C	17-42.20'N	148-41.80'E	5810.50	1	4.00	0.71	17.75%	43.40	47.40	7.7	
777D	17-42.20'N	148-41.80'E	5810.50	3	9.20	1.14	12.39%	50.60	59.80	40.1	
777E	17-41.80'N	148-41.00'E	5817.00	3	10.50	0.62	5.90%	44.50	55.00	49.1	
777F	17-41.80'N	148-41.00'E	5817.00	1	2.50	2.46	98.40%	0.00	2.50	14.8	
		SUBTOTALS		19	111.90	58.02	44.66%	140.40	252.30		159.35

TECHNICAL SUMMARY

The ODP Technical and Logistics personnel aboard JOIDES Resolution for Leg 124E of the Ocean Drilling Program were:

Senior Laboratory Officer:	Dennis Graham
Laboratory Officer:	Brad Julson
Laboratory Officer:	Bill Mills
Yeoperson:	Dawn Wright
Computer System Manager:	Jack Foster
Computer System Manager:	John Eastlund
Curatorial Representative:	Chris Mato
Curatorial Representative:	Paula Weiss
Electronics Technician:	Jim Briggs
Electronics Technician:	Dwight Mossman
Photographer:	John Beck
Photographer:	Roy Davis
Chemistry Technician:	Kathy Baisley
Chemistry Technician:	Valerie Clark
Marine Technician:	Daniel Bontempo
Marine Technician:	Bettina Domeyer
Marine Technician:	Gus Gustafson
Marine Technician:	Kazushi "Kuro" Kuroki
Marine Technician:	Mark "Trapper" Neschleba

TECHNICAL SUMMARY

The Leg 124E technical staff arrived in Manila, Philippines, on the evening of 2 January 1989. JOIDES Resolution arrived in Manila on the morning of 4 January. Leg 124E was staffed with a normal complement of technicians owing to lab-modification projects, the geriatric-core study, underway-geophysics requirements, and computer and analytical-equipment installations. This 40-day engineering leg provided an excellent opportunity for the technicians to organize lab spaces, make necessary lab modifications, install new equipment, maintain old equipment, and update manuals and data bases. There was a mid-leg rendezvous with Offshore Celtic, a supply boat from Manila, to exchange personnel and offload the diamond coring system. Leg 124E ended in Agana, Guam, on 16 February, 39 days after casting lines in Manila.

Port-Call Activities

The Leg 124E technicians came to the ship by bus at 0900, 4 January. Information exchange with the Leg 124 technicians began immediately since a bus was scheduled to take the Leg 124 technicians to the Manila Hotel at 1300 hr. The Leg 124 Lab Officer and Storekeeper were held over an extra day to help coordinate shipments and discuss upcoming lab modifications. Since port-call pacing items were in the 124E air freight, the oncoming freight was loaded on the ship before the Leg 124 freight was offloaded. The off-going surface freight was left aboard because of difficulties with the freight forwarders in Manila. The Leg 124 surface freight was to be shipped from Guam. There were no cores shipped from this port call. A Digital Equipment Corporation service representative repaired a disk controller in the computer lab. No other service reps were required. JOIDES Resolution sailed at 0600 on 9 January.

Fo'c'sle Deck Modifications

A major complaint of the scientific community has been the crowded conditions in the paleo prep and microscope labs. To gain needed space, the scanning electron microscope (SEM) was removed from the SEM lab at the end of Leg 123. The wall that separated the SEM lab and microscope lab was removed and the semi-wall between the paleo prep lab and microscope lab was moved aft 6 ft. This modification doubled the usable space in both the paleo prep and microscope labs. All the original lab furniture, fume hood, and heat hood were replaced with new lab furnishings.

Paleo Prep Lab

Two chemical fume hoods were installed on the forward bulkhead of the lab. A safety shower and eyewash station are located by the fume hoods. The starboard side of the lab has two large stainless steel sinks and a long chemical-resistant epoxy counter top. The port side of the lab has one large sink and epoxy counter space. The faucets in the lab have all been converted from drill water to potable water. There are two chemical cabinets, one for acids and one for corrosives. Temperature regulation on the fo'c'sle deck has been a problem since the ship began scientific drilling. A fan coil unit was installed on the overhead in the forward starboard corner of the paleo prep lab. Now the chemistry, X-ray, and paleo prep labs each have fan coil units and the temperature can be controlled to any desired level. Fan motors and an exhaust stack for the fume hoods were located on the roof of the core lab at the forward starboard corner. This is a better location for venting chemical fumes than the former location on top of the downhole measurements lab, which is close to personnel working on the rig floor.

Microscope Lab

The microscope lab was converted into one large room with a 2-in. maple counter top surrounding the entire lab. The lab accommodates seven research microscopes, two photomicroscopes, and three computer work stations. Seven scientists should now be able to work in this lab at the same time. Microscope parts are kept in a floor-to-ceiling cabinet that has sliding glass doors.

Chemistry Lab

A Varian atomic absorption spectrometer (SpectraAA20) will make possible pore water analysis of Mg, Ca, Na, Sr, K, and other elements as lamps are obtained. A draft users' guide was written this leg and will be updated as experience is gained with the instrument.

A Coulometrics total carbon analyzer was replaced by a Carlo Erba NA 1500 carbon, nitrogen, sulfur analyzer (CNS). The Coulometrics unit will remain on board as a backup for carbon analysis. A users' guide was written for the CNS. Samples were analyzed in support of the geriatric-core study.

Revision 5 of the Lab Automation System (LAS) was installed on the Hewlett-Packard (HP) 1000 computer. LAS controls three gas chromatographs and an ion chromatograph in the lab. The new version has a simplified user interface that can be tailored to specific user commands. It also accepts macro-chaining of frequently used commands. Automatic plotting is a feature of the new version.

The HP-150 microcomputers were upgraded with 20-megabyte hard disk drives. The HP-150s can now be used for WordPerfect, Advancelink, Kermit, and Windows.

Interstitial pore water, organic carbon, and inorganic carbon samples were analyzed for the geriatric-core study. Water samples were analyzed for pH, alkalinity, salinity, calcium, magnesium, chlorinity, sulfate, and silica at 24-hr, 48-hr, 1-week, and 1-month periods. Subsequent analyses will be performed at ODP as described below in the Curatorial Report.

To accommodate the installation of an Atomic Absorption Spectrometer (AA), a small chemical fume hood was removed from the forward starboard corner of the chemistry lab. The fume hood had been used previously for hydrofluoric acid treatment of palynology samples. Palynology work will now be done in the paleo prep lab. The heat hood of the AA was connected to existing stainless steel exhaust ducting. Acetylene gas is piped in from a gas bottle cage located outside on the core lab roof. An acetylene gas leak detector is mounted under the AA, and if a leak is detected a solenoid valve at the acetylene bottle turns off gas flow and sounds an alarm in the lab and on the bridge.

Computer Lab Report

The Vax 11/750 computer system was upgraded to a Local Area Vax Cluster system using ethernet, two Microvax 3500s, a Write Once Read Many (WORM) optical disk, and eight terminal servers. This upgrade will increase the system response time, expand disk capacity, increase the number of serial ports, and provide a more efficient means of archival data storage. Also installed were two Macintosh IIs with color monitors, two Macintosh SEs, and an Apple laser printer. All the Apple equipment was donated by the Apple Computer Corporation. The Macintoshes are connected to the Vax mainframe.

Although the scientific computer support was not as demanding as on an ordinary leg, the engineering staff had similar requirements. A PC microcomputer was located in the derrick on the diamond coring system platform. Another PC was put in the downhole measurements lab for sonic measurements and a third PC was used in the underway geophysics lab for logging the 3.5-kHz near-bottom echo sounder. These were special requirements of the engineering effort. The ethernet cable in the downhole measurements lab was extended to the Schlumberger logging cab and the underway geophysics lab. This ethernet connection will facilitate lab software upgrades.

X-ray Lab

X-Ray Fluorescence - A backlog of 30 samples from Legs 119 and 120 were analyzed. New standards were received from USGS and Geostandards. Pellets of these standards were pressed and published values of trace and minor elements entered into the lab-standards notebook.

X-Ray Diffraction - Twenty samples were analyzed in support of the geriatric-core study.

Routine maintenance of both the XRF and XRD was performed during this leg.

Curatorial Report

Two curatorial representatives sailed on this leg to provide 24-hr curatorial support to the geriatric-core study. Conceived by the curatorial staff in 1986, the geriatric-core study is designed to define the nature and extent of changes in faunal assemblages, chemistry, and physical properties in ODP cores with time. Leg 119 obtained a set of cores dedicated to this study and Leg 124E obtained three sets of cores for this study. Samples were taken for paleontology, physical properties, organic and inorganic carbon, XRD and XRF analysis, and paleomagnetism. Whole-round samples were taken for consolidation testing, interstitial water analysis, and organic geochemistry. Shipboard sampling and analyses were done immediately after the core was split and at intervals of 24 hr, 1 week, and 1 month. Three-month, six-month, and yearly samplings will be accomplished at ODP. A geriatric-core study "cookbook" was written for curatorial use on the ship and at the repositories. Likewise, the curatorial "cookbook" was updated and edited.

Magnetics Lab

A new Schonstedt GSD-1 AF demagnetizer and a Molspin spinner magnetometer were received at the beginning of the leg. The old AF demagnetizer was returned to ODP for repair and will be returned to the ship. The Molspin magnetometer is a spare for the unit in use. All CT*OS word-processing documents in the paleomagnetics lab's Vax account were converted to WordPerfect documents as part of a systemwide conversion to WordPerfect. Instrument calibration factors and accuracy declination measurements were checked during this leg on the cryogenic magnetometer. The cryogenic software, SuperCube, was modified on this leg to allow measurement of seven samples at a time. Approximately 200 measurements were taken with the cryogenic magnetometer.

Physical Properties Lab

A Multi-Sensor Track (MST) for whole-round core-section logging was set up in the physical properties area of the core lab. The MST can accommodate eight sensors but at present there are three sensors installed. The sensors include a gamma-ray source and detector for density and porosity measurements, a *P*-wave transducer pair for compressional-wave velocity measurements, and a magnetic susceptibility loop for magnetism measurements. All three measurements or a subset of the three can be taken with a single pass of the core section on the track. The data collected are stored on a floppy disk and a hard disk, and are transferred to a Vax directory where the data can be accessed for Picsure plots. The track is controlled by a PC microcomputer which in turn commands a digital dc stepping motor that is coupled to a nonmagnetic aramid fiber chain and fiberglass core boat. Each sensor is controlled by its own microcomputer. The computers are networked in such a way that the sensor computers "know" the exact location of the core boat during the scan sequence. The MST will replace the vertical GRAPE/*P*-wave apparatus and the manual magnetic susceptibility track.

Physical properties measurements were conducted on the geriatric cores and regular cores. The thermal conductivity probe thermistors were calibrated.

Photography Lab

Two photographers provided 24-hr video and still photography support for the engineering tests and experiments. The black-and-white print processor and color-film processor were given a major maintenance overhaul. Core and data photography were minimal.

Underway Geophysics Lab

A total of 2847 nmi of bathymetric data and 2518 nmi of magnetics data were collected. Seismic surveys were more extensive this leg since pre-leg surveys were not available for all the sites selected. Three hundred twenty-four nmi of seismic reflection data was obtained. Use of a deep-sound-source 3.5-kHz pinger was attempted at Site 777 to obtain high-resolution profiles of shallow chert layers. The experimental pinger malfunctioned and spares were not available to effect its repair.

The Underway Watchstander's Guide was revised and is available for Leg 125 watchstanders. This guide will serve to standardize data collection from leg to leg.

Downhole Tools Report

The in-situ water sampler and heat-flow probe were reconditioned for use on Leg 125. A new collet delivery system that allows for a 15-ft compensating stroke of the in-situ water/heat-flow tools was available for testing this leg but hole conditions were unfavorable for this test.

Safety Report

A SEDCO safety trainer sailed on the second half of Leg 124E. A CPR/first-aid course and a firefighting course were available to all shipboard personnel.

A videotape explaining safe AA techniques is available. All personnel are required to view this video before operating the AA instrument. Another video on chemistry lab safety was added to the safety video library on this leg.

The downhole measurements lab was reorganized to accommodate extra personnel using this space. The in-situ water samplers and probe assemblies were stowed in an overhead rack. Unfortunately, short tools were placed on top of long tools and the short tools could not be seen. It was decided during the first pre-site meeting to run the in-situ water tool. An accident occurred when two technicians lowered a water sampler causing the smaller probe assemblies to cascade from the rack. One technician smashed his thumb beween two falling tools. The injury necessitated a medical evacuation by helicopter to the Clark Air Force Base hospital in the Philippines. Heavy tools will no longer be stowed in overhead racks.

A team of technicians reorganized the casing hold area. Many legs' accumulation of wood, metal, and plastic scraps were removed from the area for disposal.

New Carpets

The carpets in the science lounge, library, and yeoperson's office were replaced with new blue carpet.

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