CRUISE REPORT

SHIP UTILIZATION DATA

UNOLS
Rev. 4/83

SHIP NAME R/V ROBERT CONRAD	OPERATING INST. L-DGO
CRUISE (LEG) NO. 2610	DATES 27 Aug - 26 Sept 1985

AREA OF OPERATIONS: Hawaii - Guam

DAYS AT SEA 31 | DAYS IN PORT 3.5

PORT CALLS:

PLACE	DATES
Honolulu, Hawaii	21-27 Aug 85
Apra Harbor, Guam	~~26-28~~ 27-29 Sep 85

PARTICIPATING PERSONNEL

CODE	NAME	TITLE	AFFILIATION
1.			
2.	SEE ATTACHED		
3.			
4.			

Use Reverse If Additional Space Required.

WAS RESEARCH CONDUCTED IN FOREIGN WATERS? yes COUNTRY: Japan

PRIMARY PROJECTS (those which govern the principal operations, area and movements of the ship)

PROJECT TITLE AND PRINCIPAL INVESTIGATOR	SPONSORING ACTIVITY	GRANT OR CONTRACT NUMBER	PARTICIPATING PERSONNEL (AS CODED ABOVE)
Trans-Pacific Cable Route Surveys for AT&T Communications, Inc. Alexander Shor	AT&T Communications, Inc.	ATT 003217	1, 3-13, 15-18
DISCIPLINE Geology/Geophysics			

ANCILLARY PROJECTS (which are accomplished on a not-to-interfere basis and contribute to the overall effectiveness of the cruise)

PROJECT TITLE AND PRINCIPAL INVESTIGATOR	SPONSORING ACTIVITY	GRANT OR CONTRACT NUMBER	PARTICIPATING PERSONNEL (AS CODED ABOVE)
Seamounts in the Western Pacific: an integrated geological and geophysical study A.B. Watts & Hubert Staudigel	ONR	N00014-84-C-0132	2, 14-18

SIGNATURE *Alexander Shor* DATE 12/11/85
CHIEF SCIENTIST

TOTAL SCIENTISTS 2 TOTAL TECHNICIANS 12
TOTAL GRAD STUDENTS 1 TOTAL STUDENTS/OBSERVERS 3

ATTACH PAGE SIZE CRUISE TRACK

COST ALLOCATION DATA

DAYS CHARGED	AGENCY OR ACTIVITY CHARGED	GRANT OR CONTRACT NO.
5.5	ONR	TO-0132 WSS-5-60819
29.0	AT&T Communications, Inc.	CU00321701 6-51032

SIGNATURE *John L. Dolley* DATE 11 Dec 85
Institution Official

Participating Personnel, Cruise RC2610 (Robert Conrad)

SCIENTISTS			
1.	Alexander Shor	Assoc. Res. Sci.	L-DGO
2.	Hubertus Staudigel	Adj.Assoc.Res.Sci.	L-DGO/SIO
PROJECT ENGINEERS/TECHNICIANS/PROGRAMMERS			
3.	Dale Chayes	Staff Associate	L-DGO
4.	Peter Lemmond	Seabeam Technician	URI
5.	Eric Halter	Senior Res. Asst.	L-DGO
6.	Paul Manning	Res. Asst.	L-DGO
7.	Kristin Jackson	Casual Employee	L-DGO
8.	Susan Blaurock	Casual Employee	L-DGO
9.	Randy Edwards	Seabeam Technician	URI
10.	William Robinson	Programmer	L-DGO
OBSERVERS			
11.	Carl Svendsen	Senior Engineer	AT&T
12.	Taksuo Hosoya	Engineer	KDD
13.	Takashi Mizuguchi	Engineer	KDD
GRADUATE STUDENTS			
14.	Walter Smith	Grad. Res. Asst.	L-DGO
SHIPBOARD TECHNICAL STAFF			
15.	Joseph Stennet	Science Officer	L-DGO
16.	Frank Robinson	Dredging technician	L-DGO
17.	Martin Iltzsche	Seismic technician	L-DGO
18.	Kurt Feigl	Navigation technician	L-DGO

Cruise Report:

Seamounts in the Western Pacific

H. Staudigel, W. Smith and A.B. Watts

Staudigel and Smith completed an integrated geophysical and petrological shipboard investigation of seamounts in the western Pacific which was funded by the Office of Naval Research. During Cruise RC 26-10, of the R/V Conrad, a combined cruise including this research and a cable survey for AT&T, we carried out eight rock dredges, Seabeam bathymetry, and gravity and magnetics surveys. The shipboard work included real time Eotvos correction of the gravity data for optimizing the layout of the gravity lines, and macroscopic and microspcopic evaluation of the dredged materials for ch..sing samples for the shorebased investigations. As listed in the bride log, we spent a total of 5 days, 12 hrs, and 03 mins, as follows:

1. 01 Sept/1426-1908 hrs, Necker Ridge, one dredge.
2. 16 Sept/1200-1525 hrs, Jaybee Smt., one dredge.
3. 17 Sept/0755 to 19 Sept/0906 hrs, "On-ridge" Smt., Seabeam and gravity surveying and 2 dredges.
4. 19 Sept/1448 to 22 Sept/1733 hrs, Hemler Smt. ("Off-Ridge" target, Seabeam and gravity surveying and 4 dredges.

1. Navigation

Our navigation was based on three types of data, recorded once per minute; dead reckoning, Loran - C ranges, both available throughout the cruise and GPS positioning, when available. Dead reckoned positions were obtained from the Magnavox Transit Satellite Dead Reckoning System which includes Furuno doppler log data in reckoning between transit satellite positions. The satellite fixes were logged digitally and manually, the latter providing the only navigation during data logger failures. One such event occurred during a gravity line in the Hemler survey and lasted for about 15 minutes. Seabeam and gravity systems, however, are handled by independant computers which performed flawlessly during all our operations.

Loran - C signal strengths from Iwo Jima and Marcus Island, the master and the first slave of the 9970 Northwest Pacific chain, were strong enough to supply reliable ranging information during both surveys at the on ridge target and Hemler. Real time plots of ranges and signal-to-noise ratios aided in correcting Loran jumps. A complication arose because of relatively high drift of the Rubidium vapor frequency standard, up to 3 microseconds per day (3 times higher than specification). The resulting drift in ranges was manually corrected every few hours as accurate GPS fixes were available. The logged Loran ranges require considerable post-processing to recover good position data.

The GPS system was able to supply position data of Loran-C quality precision during portions of periods of 3-satellite or 4-satellite constellations. However, even during such periods which occurred only a few hours each day, unfavorable constellation geometry often made these fixes unreliable. A common problem during the target surveys was that two satellites lay at nearly the same azimuth, while the third would be almost 180 degrees from the pair. This occurred during each of the first two 3-satellite constellations each day. We found that GPS can supply positions with only two satellites, if it has been previously been navigating well with three; however, it was necessary to anticipate the loss of the third satellite and force the receiver onto an external clock while the three satellite system is still in good order. The clock signal is used in lieu of the third satellite to compute the measure of frequency offset of the reference oscillator. This frequency bias depends also on geometry of the constellation and is used in the position calculation. However, the error in position fixes grows with time, during periods of such clock-locked two satellite operations.

2. Gravity

Gravity surveys were laid out to complement existing data and to constrain the gravity field in two dimensions ~~(Figure 1).~~ During all gravity lines, we requested the bridge to avoid small course adjustments which may give us more flexibility in the post - processing Eotvos correction computation. At the On-ridge target, Vema cruise 3312 had provided several crossings through the flexural moat area, but the exact position of the gravity low remained ambiguous. Our survey was laid out to traverse these areas slightly offset from the Vema tracks. Eight crossings were achieved through a four-pointed star pattern. A similar track strategy was applied to Hemler seamount. The attempt to map out the gravity anomaly in two dimensions is of particular importance to Hemler, because of its elongate nature and the possible interference with gravity fields of the neighboring volcanos.

We set up a spreadsheet program (Lotus/courtesy A. Shor) to calculate the free air anomaly in near-real time, by manually entering latitude, heading, speed, and raw gravity readings in five minute intervals. In some cases, the desired anomaly could not be easily identified from these calculations, probably due to the relatively long sampling intervals, the differences between the heading and the course made-good, and the fairly small amplitude of the signal.

3. Description of the dredged materials

1. The dredge on Necker Ridge (RD 1) was placed at approximately N22 23' W167 23', the final location pending Shor based reduction of Navigation data. This dredge mainly served for familiarization with the dredging technique aboard the R/V Conrad. We recovered a total of approximately 80 kg of submarine volcanic materials, mostly volcaniclastics. As a result of this test dredge, we changed the dredging technique which was further refined in the dredge on Jaybee seamount. This technique is briefly described in the last section of this report.

2. The Jaybee Smt. dredge (RD 2; N 22 57'/E 153 35') contained approximately 30 kg of volcaniclastic and non-volcanic sediments. Some of the non volcanic material may be altered reef carbonate.

3. Two dredges were carried out on the "On-ridge target", one on the South flank (RD 3; N 21 28'; E 151 47') and one in the North of the seamount (RD 4; N 21 42'/ E 151 42). The dredge from the South flank contained approximately 200 kg of mostly aphyric basalts, some of them with up to 1% of small clinopyroxene phenocrysts. The basalt has a remarkably fresh appearance, probably with less than 30-50% groundmass alteration, we found one sample with small amounts of fresh glass. Approximately 80 kg of clinopyroxene phyric basalts with thick Mn crusts and Mn - nodules were recovered from the North flank.

4. Hemler guyot consists of one north-south elongate summit, and small seamounts to the northeast and west. Detailed bathymetric data were made available to us from C. Smoot, Navoceano, allowing us to reduce our Seabeam

surveying to a minimum.

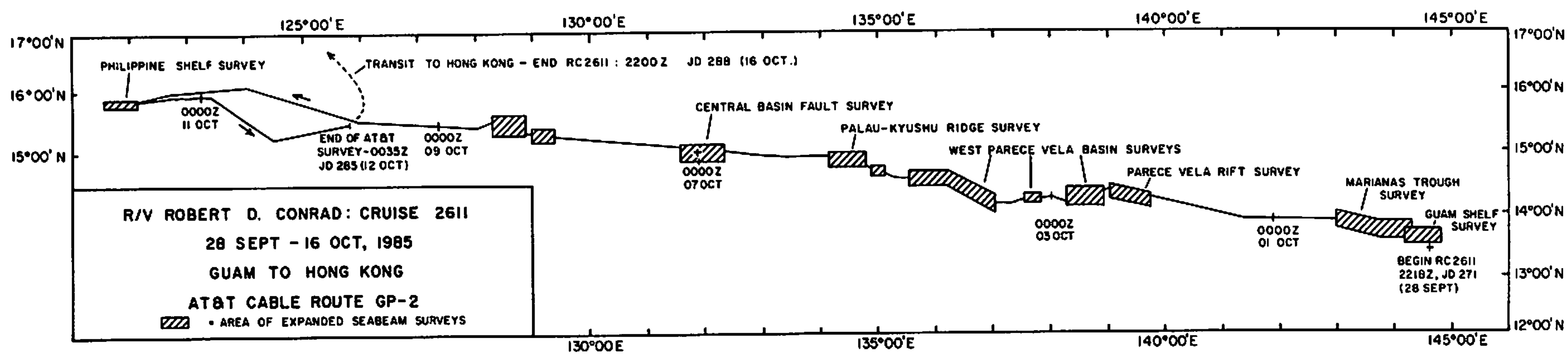
Four dredges were placed in the Hemler group, one on each of the two satellite seamounts in the east (RD 8; N 20 06/ E 151 34') and in the west (RD 6; N 19 53'/E 151 54'), and one on the north of Hemler (RD 7, N 19 33'/E 151 34') and south flank (RD 5, N 19 22'/ E 151 58'), respectively. RD 5 contained approximately 100 kg of rock, mostly aphyric basalts, all covered with Mn-crusts (up to 5cm thick) . Some samples are fairly fresh, with alteration of approximately 40% of the groundmass. This dredge also contained pillow breccias, hyaloclastites, and some Mn-nodules with cores consisting of pillow fragments. RD 6 had to be terminated early because of high winds, reducing the amounts of recovered materials to about 30kg. We recovered two big fragments, both heavily coated with Mn-oxide, containing clinopyroxene basalt and hyaloclastite, respectively. RD 7 contained about 150 kg of basalts with variable amounts of olivine, clinopyroxene and plagioclase phenocrysts. Plagioclase and olivine is completely replaced by secondary phases, clinopyroxene is only partially altered. Most basalts contain up to 5% olivine and clinopyroxene phenocrysts, but we found one picrite with 15% olivine and 10 % clinopyroxene phenocrysts. We also recovered some submarine volcaniclastics and some non-volcanic sediments. RD 8 contained about 250kg of rock material, mostly highly altered picrites with 2-5 cm thick Mn-crusts, including some samples with fresh clinopyroxene.

3. Dredging

We used dredge frames purchased from Hawaii Institute of Geophysics, equipped with 1.5m long bag built from chains, linked together with repairlinks. The dredging assembly included dredge weights of approximately 150kg, placed about 3m above the dredge, and pinger, 500m above the dredge.

Standing still, we paid out wire, approximately 3/4 of the water depth. Then we drove the ship "upslope" with respect to the seamount , at approximately 4-5 kts, letting out 2000-3000m wire, at about 5000m/hr. During this time the dredge is moved only slightly over the ground, relative motions between the ship, pinger, and the ground below the pinger can be determined on the PDR record and used to adjust winch or ship speed. After letting out the required amount of wire, we stopped the ship, let the dredge and wire settle until the pinger is approximately 75 m above the ground, and begin to reel in slowly, keeping the pinger at 75-200m above the ground. Typically, this distance was kept at fairly low winch speeds, until the excess length of wire relative to the water depth decreased to about 300m. Once the pinger separated from the ground by more than 200m, it was necessary to accelerate the winch speed, in order to keep the tension high enough for good bites.

The winch aboard the RV Conrad is equipped with an uncalibrated tension gauge, with a scale of 1-20. At a wire length of 5500m, pulling the wire in results in an average minimum tension of 8-10, good bites may go up to 16. Twenty such good bites fill a basket. Bites up to 19 did not harm the dredging assembly.


R/V ROBERT D. CONRAD: CRUISE 2611
28 SEPT - 16 OCT, 1985
GUAM TO HONG KONG
AT&T CABLE ROUTE GP-2
• AREA OF EXPANDED SEABEAM SURVEYS
PHILIPPINE SHELF SURVEY
TRANSIT TO HONG KONG - END RC2611 : 2200Z JD 288 (16 OCT.)
0000Z 11 OCT
END OF AT&T SURVEY-0035Z JD 285 (12 OCT)
0000Z 09 OCT
CENTRAL BASIN FAULT SURVEY
0000Z 07 OCT
PALAU-KYUSHU RIDGE SURVEY
WEST PARECE VELA BASIN SURVEYS
0000Z 03 OCT
PARECE VELA RIFT SURVEY
0000Z 01 OCT
MARIANAS TROUGH SURVEY
GUAM SHELF SURVEY
BEGIN RC2611 2218Z, JD 271 (28 SEPT)
125°00'E
130°00'E
135°00'E
140°00'E
145°00'E
17°00'N
16°00'N
15°00'N
14°00'N
13°00'N
12°00'N