INTERNATIONAL PHASE OF OCEAN DRILLING (IPOD)
DEEP SEA DRILLING PROJECT
DEVELOPMENT ENGINEERING
TECHNICAL NOTE NO. 6

OPERATIONAL TECHNICAL ACHIEVEMENTS

SCRIPPS INSTITUTION OF OCEANOGRAPHY
UNIVERSITY OF CALIFORNIA AT SAN DIEGO
CONTRACT NSF C-482
PRIME CONTRACTOR: THE REGENTS, UNIVERSITY OF CALIFORNIA

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Prepared for the
NATIONAL SCIENCE FOUNDATION
National Ocean Sediment Coring Program
Under Contract C-482

by the

UNIVERSITY OF CALIFORNIA
Scripps Institution of Oceanography
Prime Contractor for the Project

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THE GLOMAR CHALLENGER

The GLOMAR CHALLENGER was designed by Global Marine Inc. specifically for the earth science "Deep Sea Drilling Project." The ship was built in the Levingston Shipyards in 1966 to specifications developed by the Joint Oceanographic Institutions for Deep Earth Sampling and the National Science Foundation. The ship embarked on the first expedition (Leg 1) on August 11, 1968.

The GLOMAR CHALLENGER was the first dynamically positioned drill ship to operate in the deep oceans. Four (4) electrically powered thrusters (two in the bow and two in the stern) were used in combination with the ship's main propulsion to maintain station while drilling. A computer system was utilized to control the thruster and main propulsion output. The computer received a signal from sea floor beacons as to what repositioning of the ship was required.

Since the first expedition many new scientific tasks were assigned to the ship which were not originally anticipated. The majority were accomplished successfully and some were accomplished at the maximum capability of the CHALLENGER. Over the years the ship, the systems and components were redesigned or modified as required to accomplish the ever growing number of scientific experiments and tasks.

CONTENTS

TECHNICAL ACHIEVEMENTS

DRILLING AND CORING STATISTICS

LEG	DATE	NO. SITES	NO. HOLES	CORED	RECOVERY	%	DRILLED	PENETRATION	NO. CORES ATTEMPTED	NO. CORES W/RECOVERY
1	8-11-68/9-23-68	7	11	430	181	42	2750	3180	56	52
2	9-23-68/11-25-68	5	12	603	217	36	2423	3026	77	55
3	11-25-68/1-24-69	10	17	836	773	92	1454	2290	108	103
4	1-24-69/3-24-69	9	16	986	393	40	3113	4099	120	105
--	3-24-69/4-6-69	TRANSIT: BALBOA, PANAMA TO SAN DIEGO, CALIFORNIA								
5	4-6-69/6-5-69	12	14	1027	870	85	886	1913	131	126
6	6-5-69/8-5-69	17	35	1046	689	66	2757	3803	134	124
7	8-5-69/10-2-69	7	15	1174	948	81	3266	4440	145	143
8	10-2-69/12-2-69	8	15	1470	1225	83	1856	3326	184	177
9	12-2-69/1-27-70	9	17	1693	1539	91	1804	3497	202	200
--	1-27-70/2-13-70	TRANSIT: BALBOA, PANAMA TO GALVESTON, TEXAS & SHIPYARD PERIOD								
10	2-13-70/4-5-70	13	14	1154	736	64	5022	6176	162	148
11A	4-5-70/5-11-70	7	9	832	370	44	2682	3514	95	93
11B	5-11-70/6-1-70	4	6	493	263	53	2152	2645	58	56
11C	6-1-70/6-16-70	2	2	RE-ENTRY TRIALS - NO CORING				--	-	-
12	6-16-70/8-11-70	9	13	1449	838	58	4454	5903	174	166
13	8-11-70/10-6-70	15	28	1424	640	45	4853	6277	201	183
14	10-6-70/12-1-70	10	17	751	407	54	4242	4993	98	93
15	12-1-70/2-2-71	10	16	2331	1233	53	2079	4410	264	254
16	2-2-71/3-30-71	9	12	1761	1260	72	752	2513	207	201
17	3-30-71/5-25-71	8	10	2371	904	38	879	3250	248	196
18	5-25-71/7-19-71	11	15	2483	1215	49	1683	4166	280	273
19	7-19-71/9-13-71	11	16	2186	1062	49	7783	9969	256	238

NOTE: CORING RESULTS IN METERS

DRILLING AND CORING STATISTICS
(Continued)

LEG	DATE	NO. SITES	NO. HOLES	CORED	RECOVERY	%	DRILLED	PENETRATION	NO. CORES ATTEMPTED	NO. CORES W/RECOVERY
20	9-13-71/11-10-71	9	13	474	161	34	2698	3172	55	46
21	11-10-71/1-11-72	8	14	2574	1387	54	2133	4707	288	258
22	1-11-72/3-6-72	8	11	2543	1380	54	2090	4633	275	271
23	3-6-72/5-1-72	12	17	2594	1427	55	2808	5402	308	306
24	5-1-72/6-26-72	8	11	3194	1994	62	1260	4454	349	337
25	6-26-72/8-22-72	11	13	1394	790	57	2859	4253	171	151
--	8-22-72/9-6-72	SHIPYARD PERIOD: DURBAN, SOUTH AFRICA								
26	9-6-72/10-30-72	9	12	2234	1185	53	1659	3893	246	239
27	10-30-72/12-9-72	5	5	1571	960	61	874	2445	176	173
28	12-9-72/2-27-73	11	16	3014	1405	47	2633	5647	329	293
29	2-27-73/4-18-73	10	16	1909	1182	62	1290	3199	215	206
30	4-18-73/6-13-73	5	9	2332	1164	50	1808	4140	250	249
31	6-13-73/8-4-73	13	17	2612	1234	47	3661	6273	285	266
32	8-4-73/10-10-73	11	13	2211	739	33	1369	3580	241	220
33	10-10-73/12-17-73	5	8	1718	884	51	2748	4466	184	172
34	12-17-73/2-3-74	3	6	385	232	60	321	706	45	45
35	2-3-74/3-30-74	4	4	515	193	37	1697	2212	55	52
36	3-30-74/5-22-74	6	10	1006	579	58	1474	2480	107	102
37	5-22-74/7-29-74	4	9	1777	406	23	1415	3192	156	152
38	7-29-74/9-25-74	17	18	3237	1805	56	2042	5279	354	352
--	9-25-74/10-7-74	SHIPYARD PERIOD: AMSTERDAM								
39	10-7-74/12-17-74	7	11	1535	1057	69	3126	4661	165	159
40	12-17-74/2-15-75	6	7	2339	1502	64	4190	6529	249	248

DRILLING AND CORING STATISTICS
(Continued)

LEG	DATE	NO. SITES	NO. HOLES	CORED	RECOVERY	%	DRILLED	PENETRATION	NO. CORES ATTEMPTED	NO. CORES W/RECOVERY
41	2-15-75/4-10-75	5	7	2786	1673	60	2276	5062	300	295
42A	4-10-75/5-21-75	8	11	1192	670	56	3269	4461	150	144
42B	5-21-75/6-11-75	3	6	2318	1275	55	420	2738	251	242
43	6-11-75/8-12-75	6	6	1769	958	54	1363	3132	189	184
44	8-12-75/9-30-75	5	11	1343	547	41	2024	3367	149	142
--	9-30-75/11-8-75	SHIPYARD & IPOD MOBILIZATION PERIOD: NORFOLK, VA.								
44A	11-8-75/11-27-75	2	4	75	31	41	545	620	8	8
45	11-27-75/1-20-76	2	3	994	328	33	76	1070	112	108
46	1-20-76/3-10-76	0*	2	283	64	23	245	528	35	32
47	3-10-76/5-12-76	2	7	2810	1813	65	2040	4850	301	292
48	5-12-76/7-13-76	8	10	2996	1230	41	996	3992	318	308
49	7-13-76/9-4-76	8	11	1944	881	45	736	2680	207	202
50	9-4-76/11-10-76	2	5	821	358	44	2355	3176	80	78
51A	11-10-76/12-13-76	1	2	430	252	59	113	543	48	44
51B	12-13-76/1-17-77	0*	3	372	209	56	211	583	48	44
52	1-17-77/3-9-77	1	2*	566	335	59	187	753	71	71
53	3-9-77/4-25-77	0*	1	627	406	65	0	627	73	72
54	4-25-77/6-18-77	11	18	847	461	54	435	1282	103	102
--	6-18-77/7-13-77	SHIPYARD PERIOD: TERMINAL ISLAND, CALIFORNIA								
55	7-13-77/9-6-77	4	11	807	405	50	424	1231	104	96
56	9-6-77/10-10-77	4	7	1323	497	38	736	2059	142	135
57	10-10-77/12-4-77	4	10	2524	1424	56	3309	5833	273	262
58	12-4-77/1-30-78	5	9	2972	1592	54	722	3694	324	322

DRILLING AND CORING STATISTICS
(Continued)

LEG	DATE	NO. SITES	NO. HOLES	CORED	RECOVERY	%	DRILLED	PENETRATION	NO. CORES ATTEMPTED	NO. CORES W/RECOVERY
59	1-30-78/3-15-78	5	7	2779	1162	42	428	3227	322	306
60	3-15-78/5-15-78	10	17	2716	833	31	115	2831	293	280
61	5-15-78/7-29-78	1	2	1246	726	58	440	1686	161	156
62	7-29-78/9-6-78	4	5	1976	635	32	39	2015	218	215
--	9-6-78/10-7-78	SHIPYARD PERIOD: TERMINAL ISLAND, CALIFORNIA								
63	10-7-78/11-27-78	7	11	3641	1523	42	272	3913	398	389
64	11-27-78/1-14-79	8	14	2936	1631	56	424	3360	344	322
65	1-14-79/3-13-79	4	15	1323	750	57	680	2003	179	172
66	3-13-79/5-2-79	8	14	3155	1844	58	456	3611	353	351
67	5-2-79/6-27-79	7	15	2316	1182	51	1147	3463	254	243
68	6-27-79/7-19-79	1	1	147	75	51	190	337	20	20
--	7-19-79/8-13-79	TRANSIT: BALBOA, PANAMA TO CURACAO & SHIPYARD PERIOD								
68	8-13-79/9-18-79	2	7	1012	787	78	98	1110	259	245
69	9-18-79/10-29-79	2	7	784	455	58	1061	1851	125	123
70	10-29-79/12-28-79	5*	32	817	478	59	192	1009	151	148
71	12-28-79/2-21-80	4	6	1303	822	63	139	1442	173	163
72	2-21-80/4-8-80	4	12	2163	1544	71	550	2713	308	297
73	4-8-80/6-1-80	6	13	1475	1051	71	583	2058	286	281
74	6-1-80/7-24-80	5	11	2573	1830	71	566	3139	356	249
75	7-24-80/9-6-80	3	8	1931	1445	75	239	2170	342	328
--	9-6-80/10-11-80	TRANSIT: RECIFE, BRAZIL TO NORFOLK, VA. & SHIPYARD PERIOD								
76	10-11-80/12-21-80	2	4	1532	985	64	762	2294	202	199
77	12-21-80/1-30-81	6	8	2179	1077	49	72	2251	238	236

DRILLING AND CORING STATISTICS
(Continued)

LEG	DATE	NO. SITES	NO. HOLES	CORED	RECOVERY	%	DRILLED	PENETRATION	NO. CORES ATTEMPTED	NO. CORES W/RECOVERY
78A	1-30-81/3-12-81	3	6	1106	841	76	1021	2127	118	117
78B	3-12-81/4-15-81	NO CORING. DARAPA ENGINEERING TRIALS								
79	4-15-81/5-30-81	4	9	2156	1089	51	873	3029	247	246
80	5-30-81/7-22-81	4	8	2398	1493	62	1116	3514	306	296
81	7-22-81/9-16-81	4	8	2112	1181	56	410	2522	247	241
82	9-16-81/11-14-81	9	10	1246	757	61	2778	4024	145	145
83	11-14-81/1-5-82	0*	0*	514	108	21	0	514	71	71
84	1-5-82/3-3-82	6	11	1907	1044	55	801	2708	206	200
85	3-3-82/5-2-82	5	17	2351	2073	88	1129	3480	299	297
86	5-2-82/6-20-82	6	11	1110	956	86	308	1418	126	124
87	6-20-82/8-19-82	3	14	2770	1158	42	2561	5331	311	293
88	8-19-82/9-19-82	0*	3	84	34	40	1041	1125	11	9
--	9-19-82/10-11-82	SHIPYARD PERIOD: YOKOHAMA, JAPAN								
89	10-11-82/11-29-82	2*	6	1416	877	62	1591	3007	156	155
90	11-29-82/1-9-83	8	18	4580	3709	81	1468	6048	494	480
91	1-9-83/2-20-83	2	6	237	111	47	189	426	31	30
92	2-20-83/4-27-83	6*	19	383	280	73	209	592	55	51
93	4-27-83/6-17-83	3	7	2434	1679	69	1827	4261	261	253
94	6-17-83/8-17-83	6	22	4007	3362	84	1499	5506	433	425
95	8-17-83/9-26-83	2*	5	1175	966	82	3558	4733	125	125
96	9-26-83/11-8-83	11	20	2586	1665	64	1120	3706	385	372
--	11-8-83/11-20-83	DEMOBILIZATION: MOBILE, ALABAMA								

* RETURNED TO SITE AND/OR HOLE AS INDICATED

INTERNATIONAL PHASE OF OCEAN DRILLING

DEEP SEA DRILLING PROJECT

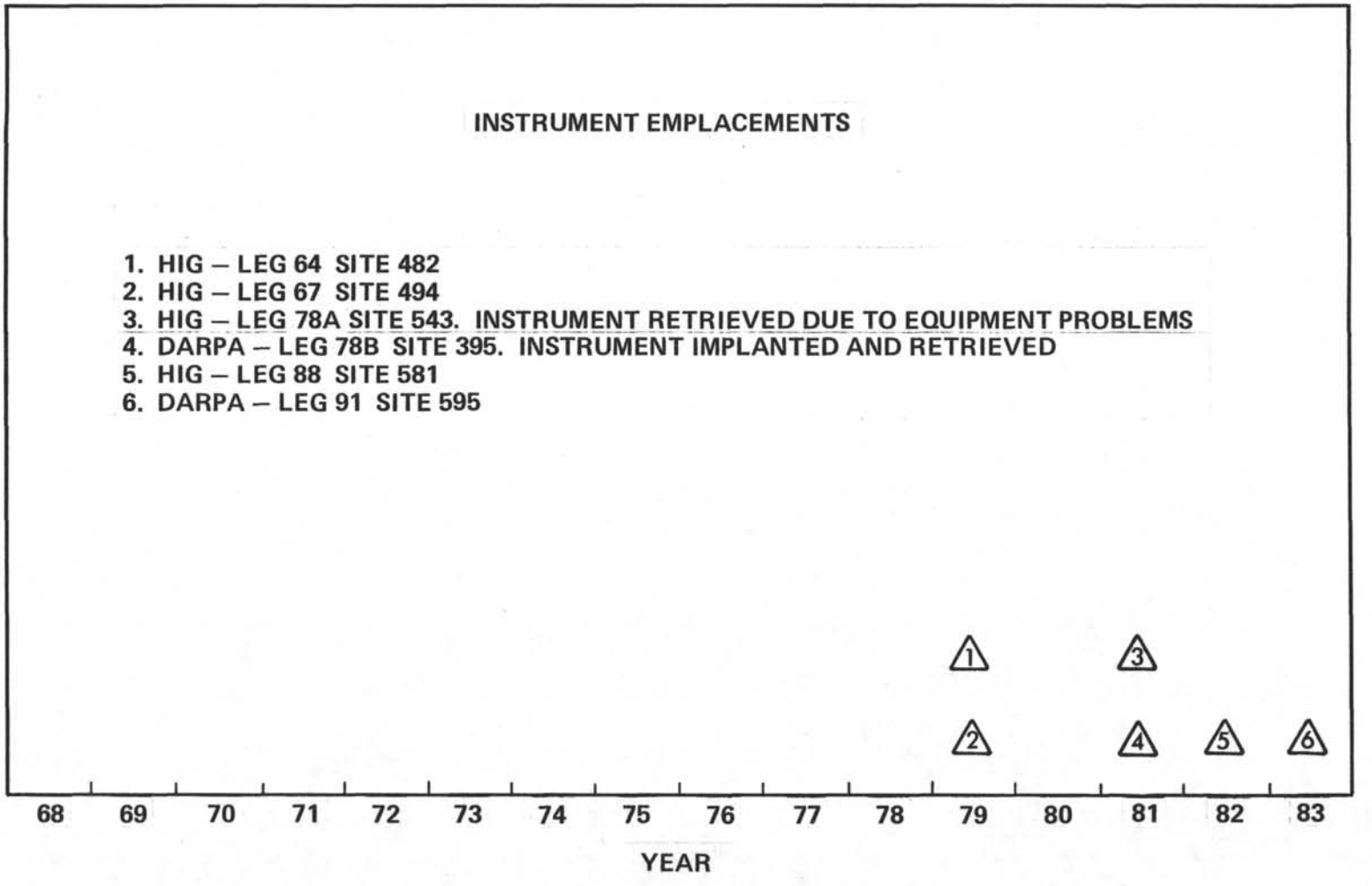
TECHNICAL ACHIEVEMENT AFTER 96 CRUISES

AUGUST 11, 1968 - NOVEMBER 20, 1983

TECHNICAL ACHIEVEMENT	RESULTS/COMMENTS
Total distance penetrated below sea floor:	325,548 Meters
Interval cored:	170,043 Meters
Core recovered and placed in repositories at Columbia University, Lamont Geological Observatory, and Scripps Institution of Oceanography:	97,056 Meters
Overall core recovery:	57%
Number of cores taken:	19,998 Cores Attempted and 19,119 with Core Recovery
Number of sites investigated:	1105 Holes Drilled at 624 Sites
Deepest penetration beneath the ocean floor:	1741 Meters. Leg 47, Site 398
Maximum penetration into basaltic crustal layers in any single hole:	1080 Meters. Leg 83, Hole 504B
Deepest water worked in:	7044 Meters. Leg 60, Hole 461A
Achieved first operational re-entry on December 25, 1970 in 3,062 meters of water:	Leg 15, Site 146
Total distance traveled by D/V GLOMAR CHALLENGER:	375,632 Nautical Miles

INSTRUMENT EMPLACEMENTS

1. HIG – LEG 64 SITE 482
2. HIG – LEG 67 SITE 494
3. HIG – LEG 78A SITE 543. INSTRUMENT RETRIEVED DUE TO EQUIPMENT PROBLEMS
4. DARPA – LEG 78B SITE 395. INSTRUMENT IMPLANTED AND RETRIEVED
5. HIG – LEG 88 SITE 581
6. DARPA – LEG 91 SITE 595



PERFORMANCE AND TIME DISTRIBUTION

Following are performance figures for D/V GLOMAR CHALLENGER from beginning of Leg 1, August 11, 1968 to the end of the drilling contract November 20, 1983.

133,920 hours recorded since DSDP became operational.

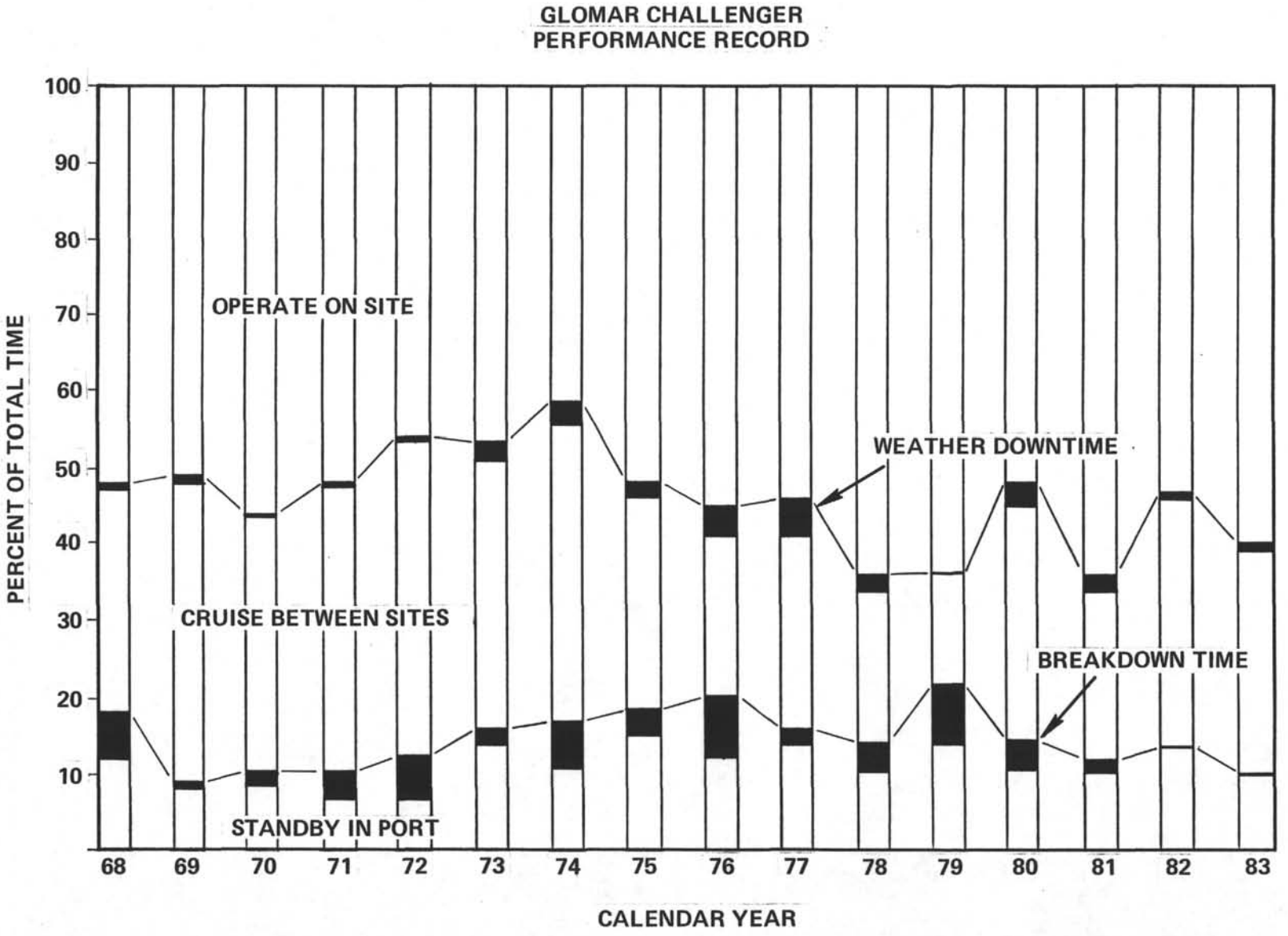
70,099 hours or 52.3% of total time spent on site.

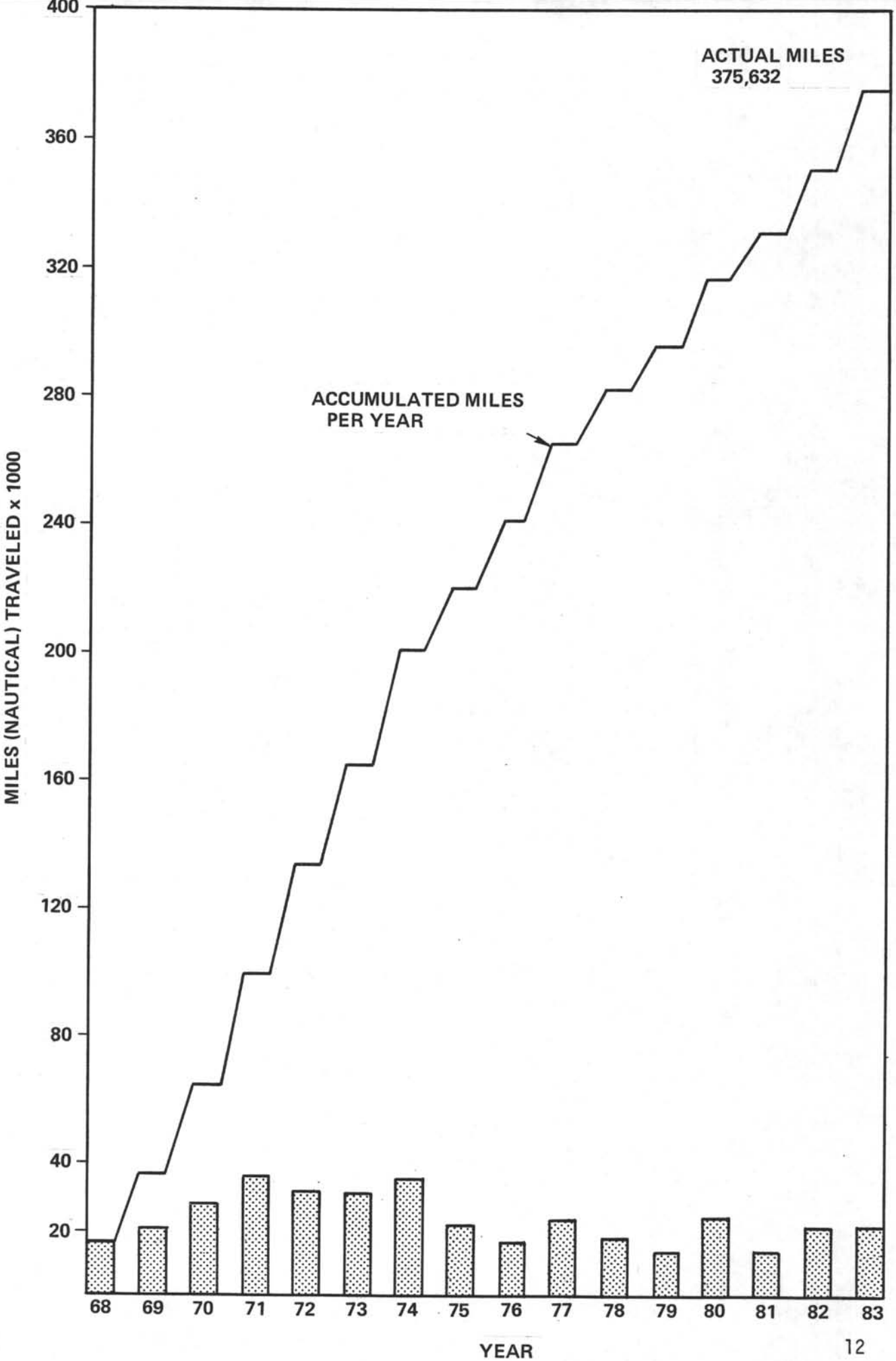
4,010 hours or 3% recorded as total equipment breakdown.

1,347 hours or 1% downtime due to inoperative weather conditions.

15,108 hours or 11.3% spent in port calls and demobilization.

43,356 hours or 32.4% spent cruising from site to site and into/out of port.


GLOMAR CHALLENGER
PERFORMANCE RECORD
PERCENT OF TOTAL TIME
100
90
80
70
60
50
40
30
20
10
OPERATE ON SITE
WEATHER DOWNTIME
CRUISE BETWEEN SITES
BREAKDOWN TIME
STANDBY IN PORT
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
CALENDAR YEAR


ACTUAL MILES
375,632
ACCUMULATED MILES
PER YEAR
MILES (NAUTICAL) TRAVELED x 1000
400
360
320
280
240
200
160
120
80
40
20
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
YEAR

RE-ENTRY

Engineering trials were conducted on Leg 11C in June, 1970 and the concept of re-entry was proven to be feasible. The first operational re-entry was achieved in December, 1970 on Leg 15 at Site 146.

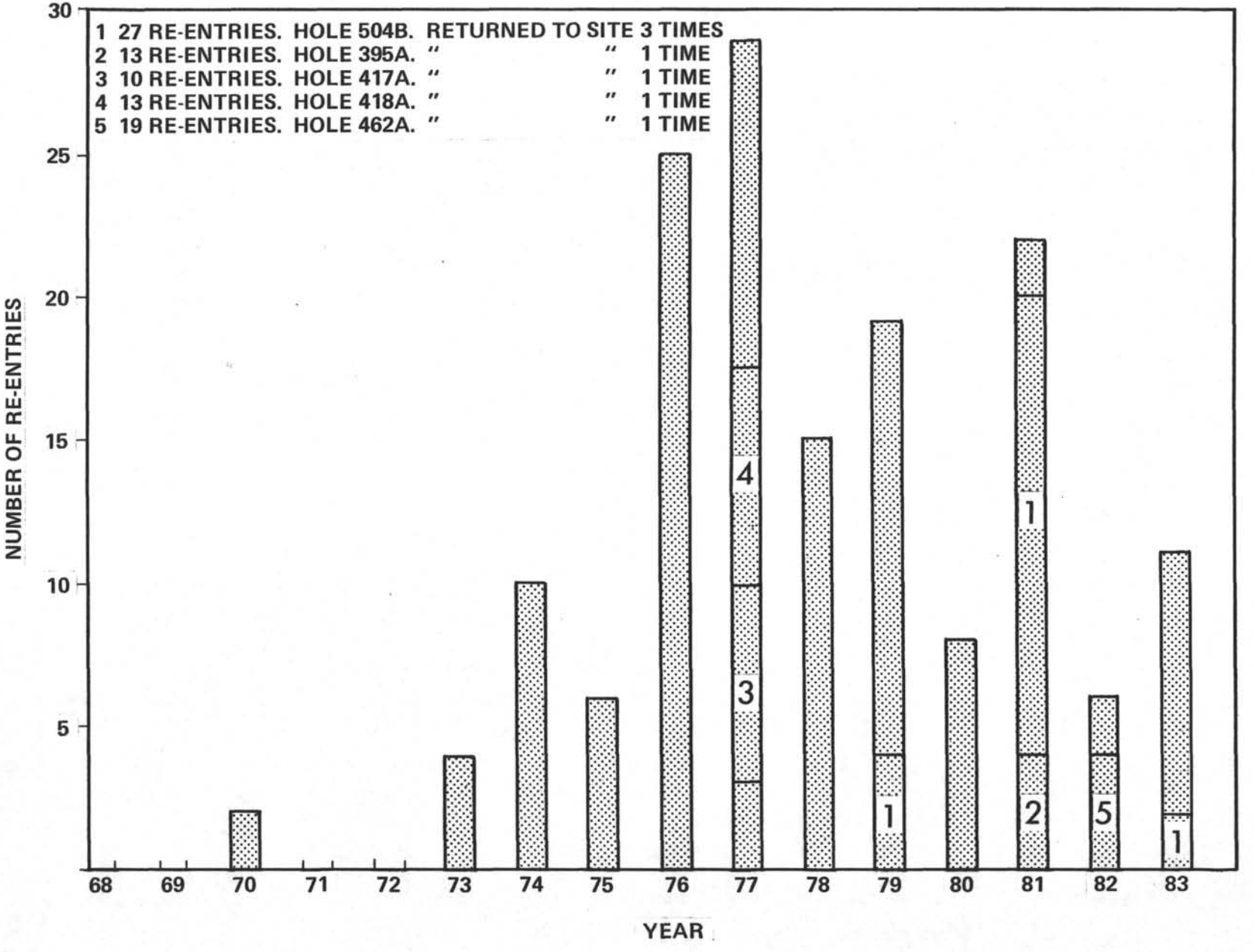
Four (4) re-entries were achieved in 1973 on Legs 30 and 34. The equipment was removed from the ship and major modifications were made by the EDO Western Corporation and Deep Sea Drilling. During Leg 37, ten (10) re-entries were made, nine (9) on Site 332 and one (1) at Site 333.

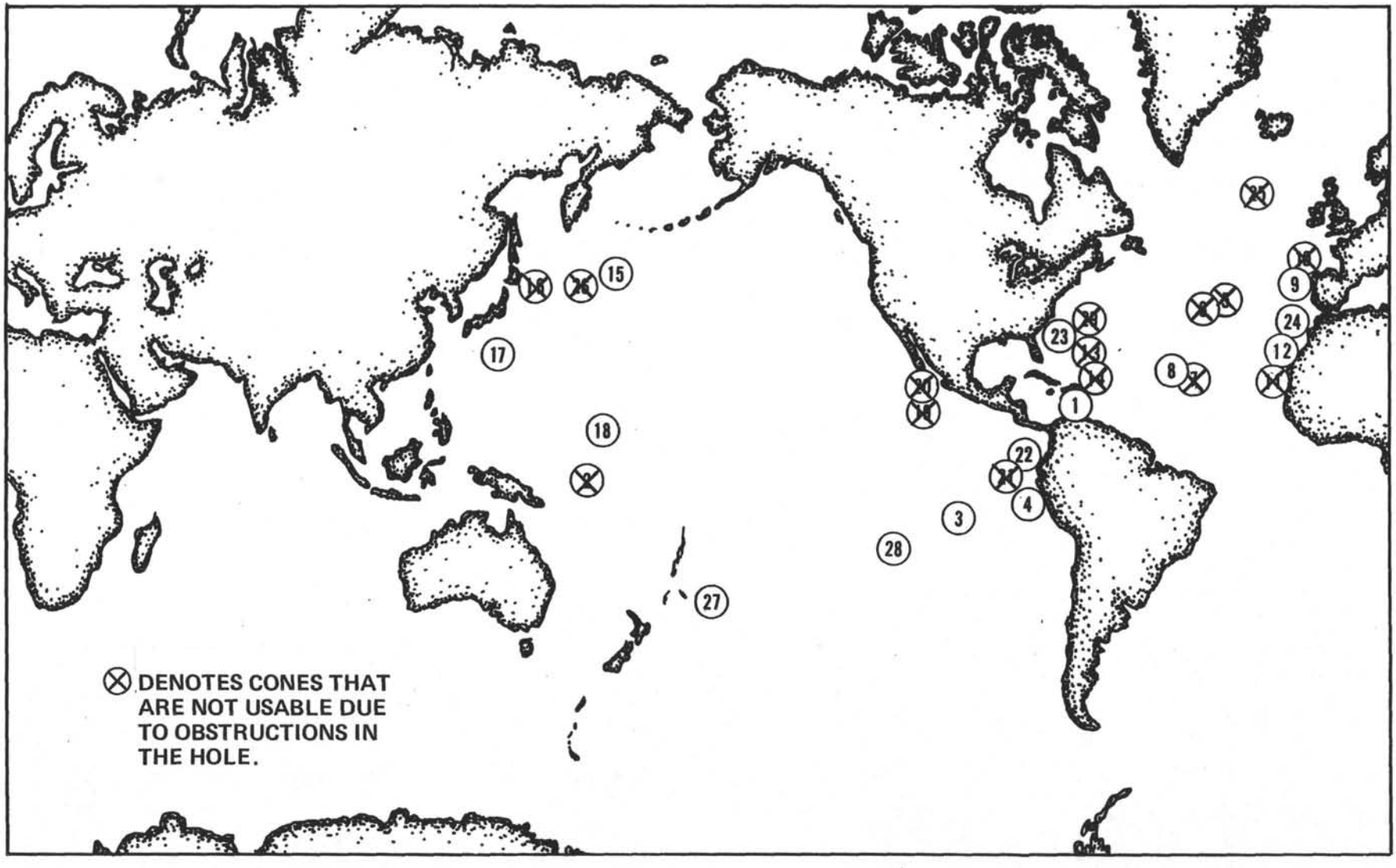
Equipment was again removed and modified/updated for the upcoming DSDP/IPOD Ocean Drilling Phase. Commencing with Leg 45, December, 1975 until November, 1983 a total of 146 re-entries were made at 23 separate sites.

EDO Western is to be commended for their effort and interest during re-entry operations. Without this, the re-entry success would have been impossible to achieve. DSDP personnel should be proud to have been part of this program. The record and achievements speak for themselves.

SUMMARY OF RE-ENTRY

LEG	SITE	(METERS) WATER DEPTH	NUMBER OF RE-ENTRIES
15	146	3939 m	2
30	288A	3030 m	2
34	319A	4296 m	1
34	320B	4487 m	1
37	332B	1841 m	9
37	333	1682 m	1
45/78B	395A	4485 m	13
46	396B	4465 m	7
47	398D	3900 m	2
48	400A	4399 m	1
50	415A	2817 m	3
50	416A	4203 m	9
51B/52	417D	5489 m	10
52/53	418A	5519 m	13
55	433C	1874 m	3
57	438B	1575 m	1
58	442B	4645 m	2
61/89	462A	5186 m	19
65	482D	3012 m	1
65	483B	3084 m	7
69	504A	3468 m	2
69/70/83/92	504B	3474 m	27
76	534A	4976 m	8
79	547B	3952 m	3
81	553	2339 m	2
88	581B	5478 m	2
91	595B	5629 m	3
92	597C	4157 m	2
93	603B	4644 m	4
			160 Total Re-entries


1 27 RE-ENTRIES. HOLE 504B. RETURNED TO SITE 3 TIMES
2 13 RE-ENTRIES. HOLE 395A. " " 1 TIME
3 10 RE-ENTRIES. HOLE 417A. " " 1 TIME
4 13 RE-ENTRIES. HOLE 418A. " " 1 TIME
5 19 RE-ENTRIES. HOLE 462A. " " 1 TIME
NUMBER OF RE-ENTRIES
30
25
20
15
10
5
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
YEAR
4
3
1
1
2
5
1



RE-ENTRY CONE DEPLOYMENT MAP

OPERATIONAL RECORDS/"TRIVIA" ACHIEVEMENTS

DSDP OPERATIONAL RECORDS
NOVEMBER 20, 1983
THROUGH LEG 96

		LEG	SITE	HOLE
Longest GMI Leg	71.7 days	74		
Longest Science Staff Leg	83.3 days	39		
Shortest Leg	34.1 days	56		
Longest Distance Traveled	9895.0 n.m.	39		
Shortest Distance Traveled	813.7 n.m.	93		
Greatest Average Speed	10.7 kt	3		
Highest Percentage of Site Time	80.0%	57		
Most Site Time On One Leg	51.8 days	61		
Most Time On Site	83.0 days	69/70/83	504	504, 504A, B
Most Time On One Hole	73.0 days	69/70/83	504	504B
Most Sites Investigated	17	6/38 Tie		
Most Holes Drilled	36	6		
Most Holes On One Site	10	70	506/507	
Shallowest Water Operations Attempted	197.0 m	18	176	
Shallowest Water Operations Successful	505.0 m	28	273	
Deepest Water Operations	7044.0 m	60	461	461A
Longest Drill String	7059.5 m	60	461	461/461A
Deepest Penetration, Multiple Bit	1740.0 m	47	398	398D

DSDP OPERATIONAL RECORDS

NOVEMBER 20, 1983

THROUGH LEG 96

(Continued)

		LEG	SITE	HOLE
Deepest Penetration, Single Bit	1545.7 m	95	603	603F
Greatest Total Penetration, One Leg	9969.0 m	19		
Deepest Penetration Reaching Igneous Basement	1666.5 m	76	534	534A
Deepest Multiple Bit Ingneous Rock Penetration	1076.0 m	69/70/83	504	504B
Deepest Single Bit Igneous Rock Penetration	623.0 m	59	488	488A
Deepest Piston Cored Penetration	315.6 m	90	599	599A
Most Cores Attempted, One Leg	494	90		
Most Cores Attempted, One Site	202	69/70/83	504	504, 504A, B, C
Most Cores Attempted, One Hole	141	69/70/83	504	504B
Greatest Cored Interval, One Leg	4579.6	90		
Greatest Cored Interval, One Site	2074.0 m	69/70/83	504	504, 504A, B, C
Greatest Cored Interval, One Hole	1350.0 m	69/70/83	504	504B
Most Core Recovered, One Leg	3708.9 m	90		
Most Core Recovered, One Site	1055.1 m	93/95	603	
Most Core Recovered, One Hole	936.6 m	47	398	398D
Highest Percentage Core Recovered	92.0%	3		
Greatest Penetration By One Bit (Multiple Holes)	2237.0 m	19	186/189	
Longest Rotating Bit Life	155.8 hrs	70		
Most Bits Used, One Leg	15	6		
Most Holes Logged, One Leg	7	96		

DSDP OPERATIONAL RECORDS

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THROUGH LEG 96

(Continued)

		LEG	SITE	HOLE
Most Logs Run, One Leg	28	64		
Longest Continuous Open-Hole Log Interval	1073.9 m	83	504	504B
First Successful Logging		4		
First Re-entry		11C		
First Operational Re-entry		15		
Most Re-entries, One Leg	16	83	504	504B
Most Re-entries, One Hole	27	69/70/83/92	504	504B
Deepest Water Re-entry	5630.0 m	91	595	595B
Fastest Re-entry Scan Time	2.0 min.	83	504	504B