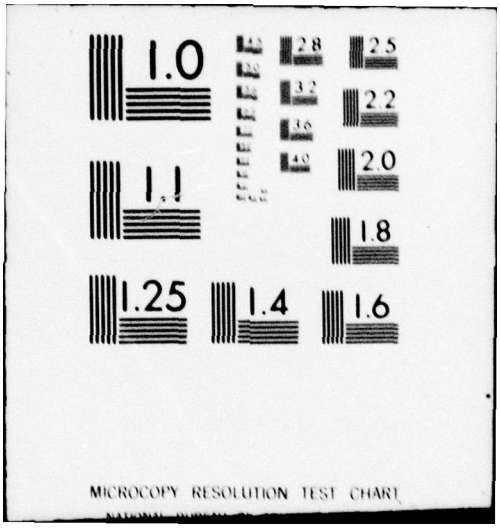
AD-A058 665 HYDROACOUSTICS INC ROCHESTER N Y F/G 9/6
REVIEW OF HLF-3 PERFORMANCE IN PANOIC 77,(U)
OCT 77 D P HOLLINGER, E D MCCLOSKEY N00014-77-C-0269
UNCLASSIFIED HA-132-77 NL

1 OF 1
AD
A058 665

END
DATE
FILMED
11-78
DDC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART

(12) (14) HA-132-77

B.S.

LEVEL II

# (6) REVIEW OF HLF-3 PERFORMANCE IN PANOIC 77

(10) D. P. Hollinger
E. D. McCloskey

(11) 11 Oct 77

(12) 13 P.



Submitted to:

Office of Naval Research
Arlington, Va. 22217

Attention: Dr. Alan O. Sykes, Code 222

As Contract Line Item No. 0002, DD1423 A002,
Under Contract No. (15) N00014-77-C-0269



HYDROACOUSTICS, INC.

321 NORTHLAND AVE. P.O. BOX 3818 ROCHESTER, N.Y. 14610

## 1.0 SUMMARY OF HLF-3 SOURCE PERFORMANCE

For the PANOIC 77 exercise, Hydroacoustics Inc. was contracted to provide the HLF-3 sound source, associated electronic equipment to monitor its performance, and personnel to help in the exercise. The HLF-3 sound source, with tow cable and topside controller-monitor, AC voltmeters, wave analyzer, and Honeywell 5600 instrumentation tape recorder, were shipped to Hawaii. The source was instrumented to telemeter the following parameters to the ship: Sound pressure level, radiator acceleration, depth, water temperature, pitch, roll and body acceleration in two planes. With the help of P.G.I. personnel, the equipment was installed on the USS SAFEGUARD from 29 June 1977 to 10 July 1977.

On 11 - 12 July, a two-day test was conducted off the coast of Oahu. During this time, the source was towed for 18 hours, at a depth of 100 meters, with the standard sequence output. This test tow also served as an acoustic survey for future sites for a bottom installation.

On 15 July, the USS SAFEGUARD departed Pearl Harbor to begin Phase I of PANOIC-77. The ship reached point 1C on 23 July, about 12 hours late due to mechanical difficulties with the ship's steering and engines. At this time, HLF-3 was deployed and operated with the standard sequence. The ship continued on the prescribed track for Phase I until 30 July, when an unsuccessful attempt was made to rendezvous with the SILAS BENT at position 7C. After waiting a couple of hours, we proceeded on to point 11C where we met the SILAS BENT on 31 July. The ship then

continued on the track to the end of Phase I on 4 August. The source was then brought on deck and we proceeded to Midway. At the end of Phase I, the source had operated for 283.1 hours and had been towed about 2300 miles.

On 10 August, the USS SAFEGUARD left Midway on Phase II. On 13 August, the source was deployed for a 35 hour tow at 100 m depth. The source was then brought back aboard and the ship continued to point 27C, where the source was deployed at a depth of 33 meters on 16 August. After about 12 hours of operation during quite heavy seas, the leak detector light came on intermittently. HLF-3 was therefore retrieved and we determined that the leak indication was due to a mechanical short in the sensor. However, when the source was re-deployed it produced no sound and was, therefore, brought back aboard. While repairs were being made on HLF-3, the HX-137 source was prepared and deployed on 19 August. On HLF-3, we found that a drive button had become unseated from a drive piston closing off the hydraulic drive port. This was corrected, along with other minor problems found when the source was opened. By 21 August, HLF-3 was operational again, and we proceeded to run it on deck for a total of 6 hours. On 24 August, the HX-137 was retrieved and the HLF-3 deployed. The source operated normally until 30 August. At this time, it was decided to retrieve the source 20 hours early due to building seas and a worsening weather report. This completed Phase II, with the HLF-3 source operating for 183 hours and covering about 1500 miles.

The source was never deployed on Phase III of the operation, due to high seas and medical emergencies of the ship's crew.

## 2.0 REPAIR REPORT

The first indication of a problem with the HLF-3 source occurred when the leak indicator lamp started blinking on and off. After continuing to operate in this manner for about an hour longer, the light came on almost continuously and it was decided to retrieve the source.

With the source on deck, by using an ohmmeter it was determined that the leak sensor was not being shorted by water but by a mechanical short. An oil sample was also taken, confirming that there was no water in the oil. The source was then redeployed, and we attempted to continue operation; however, the source failed to produce any sound. The source was again brought on deck, and the electronics package was removed. Electrical measurements revealed that the problem was in the hydraulics and that a radiator would have to be removed.

When the radiator was removed, we observed that a part of the pump inlet strainer was found to have created the leak detector indication. The motor mounts and inlet strainers also needed replacing. Further tests finally disclosed that the drive buttons had become dislocated from their proper seat in the pistons, forcing the piston up and blocking off the hydraulic drive port. The pistons and buttons were reseated, the motor mounts and inlet strainers replaced, and the source reassembled. After a brief period of operation, the source again stopped operating. This time the fault was traced to a plugged servo valve, probably due to dirt that had entered the system during the previous repair. The servo valve was replaced, and the source was reassembled. At this time a splice in the tow cable was

found to be intermittent, causing a 6-dB drive level shift. This splice was redone and the source operated on deck intermittently, allowing it to cool down between runs, for about six hours of running time without incident. The HLF-3 was later deployed and operated normally for five days. During this time, the hydrophone and temperature probe were shorted out by rain water that had entered the source while repairs were being made. Source Level was confirmed through the radiator acceleration channel.

## 2.1 RECOMMENDATIONS

This exercise revealed a few minor weaknesses that should be rectified before another tow operation. A temporary fix was made in San Francisco to insure that the drive buttons and pistons remained seated. A more permanent solution to this problem should be found. More mechanically rugged inlet strainers should be fitted to the source.

While in San Francisco the rubber motor mounts were replaced by rigid, steel mounts which should remedy that problem. A slightly more elaborate electrical calibration signal should also be implemented to resolve any questions on the FM telemetry channel calibration. Finally, preceding the next tow operation, time should be set aside to refine the tail shape of the tow body to increase the stability of the tow body.

## 3.0 HLF-3 EVENT LOG - PANOIC 1977

### SOUTH SITE EXPERIMENT

| DAY (Julian) | DATE/TIME (Uncorrected GMT) | DESCRIPTION |
|---|---|---|
| 192 | 111830 | Departed pier. |
| 192 | 112330 | Deployed HLF-3. |
| 193 | 120100 | Towing source |
| | 120500 | South Site Experiment |
| | 120930 | North Site Experiment |
| | 121730 | SUS Test |
| 193 | 121800 | Retrieved HLF-3. |
| END SOUTH SITE EXPERIMENT | | HLF-3 operated for 18 hours. |
| PHASE I | | |
| 196 | 160000 | Departed Pearl for Midway. |
| 204 | 230500 | Deployed HLF-3 without Horizontal tail. Towing at -15° on side. |
| | 230700 | Installed Delta-shaped horizontal tail. Still kiting. |
| | 231000 | Commence projector ops. |
| | 231200 | SUS/BB event at 300 ft. |
| 204 | 231250 | Resume std seq. |
| 205 | 240000 | SUS/BB event at 300 ft. |
| | 240050 | Resume std seq. |
| | 241200 | SUS/BB event at 300 ft. |
| | 241250 | Resume std seq. |
| | 242109 | Lost 440 V ac. |
| 205 | 242113 | 440 V ac restored. |

| DAY (Julian) | DATE/TIME (Uncorrected GMT) | DESCRIPTION |
|---|---|---|
| 206 | 250000 | SUS/BB event at 300 ft. |
| | 250050 | Resume std seq. |
| | 250131 | Commence multi-depth experiment. |
| | 25023133 | BB at 150 m. |
| | 25025130 | End BB at 150 m. |
| | 25031130 | BB at 50 m. |
| | 25033130 | End BB at 50 m. |
| | 250350 | Brought HLF-3 to surface for inspection, straightened tag lines. |
| | 25035130 | BB at 100 m, no kiting. |
| | 25041130 | End BB at 100 m. |
| | 25050130 | End multi-depth; resume std seq. |
| | 251200 | SUS/BB event at 300 ft. |
| | 251250 | Resume std seq. |
| | 252130 | Commence multi-depth experiment. |
| | 252230 | BB at 150 m. |
| | 252250 | End BB at 150 m. |
| | 252310 | BB at 50 m. |
| | 252330 | End BB at 50 m. |
| 206 | 252350 | BB at 100 m. |
| 207 | 260010 | End BB at 100 m. |
| | 260100 | End multi-depth; resume std seq. |
| | 261200 | SUS/BB at 300 ft. |
| 207 | 261250 | Resume std seq. |
| 208 | 270000 | SUS/BB at 300 ft. |
| 208 | 270050 | Resume std seq. |

| DAY (Julian) | DATE/TIME (Uncorrected GMT) | DESCRIPTION |
|---|---|---|
| 208 | 271200 | SUS/BB at 300 ft. |
| | 271250 | Resume std seq. |
| | 271700 | Commence multi-depth experiment. |
| | 271800 | BB at 150 m. |
| | 271820 | End BB at 150 m. |
| | 27184050 | BB at 50 m. |
| | 271900 | End BB at 50 m. |
| | 271920 | BB at 100 m. |
| | 271940 | End BB at 100 m. |
| | 272030 | Resume std seq. |
| 208 | 272035 | Position 2C. |
| 209 | 280000 | SUS/BB at 60 ft. |
| | 280050 | Resume std seq. |
| | 281200 | SUS/BB at 60 ft. |
| 209 | 281250 | Resume std seq. |
| 210 | 291200 | SUS/BB at 60 ft. |
| 210 | 291250 | Resume std seq. |
| 211 | 300000 | SUS/BB at 60 ft. |
| | 300050 | Resume std seq. |
| | 301200 | SUS/BB at 60 ft. |
| | 301250 | Resume std seq. |
| 211 | 302308 | Turned source off. Retrieved HLF-3 for inspection. Source okay. Aborted rendezvous with Silas Bent. |
| 212 | 310000 | SUS event only. |
| 212 | 310024 | End SUS event. |

| DAY (Julian) | DATE/TIME (Uncorrected GMT) | DESCRIPTION |
|---|---|---|
| 212 | 31002408 | End SUS event. |
| | 310203 | Turned source on. |
| | 311200 | SUS/BB at 60 ft. |
| | 311250 | Resume std seq. |
| | 311541 | Position 11C. |
| | 311600 | Commence multi-depth experiment. |
| | 311700 | BB at 150 m. |
| | 311720 | End BB at 150 m. |
| | 311740 | BB at 50 m. |
| | 311800 | End BB at 50 m. |
| | 311820 | BB at 100 m. |
| | 311840 | End BB at 100 m. |
| 212 | 311930 | Resume std seq. |
| 213 | 010000 | SUS/BB at 60 ft. |
| | 010050 | Resume std seq. |
| | 01033730 | Lost 440 V ac. |
| | 01080230 | 440 V ac on. |
| | 011200 | SUS/BB at 60 ft. |
| | 011250 | Resume std seq. |
| | 011418 | Commence multi-depth experiment. |
| | 011518 | BB at 150 m. |
| | 011538 | End BB at 150 m.<br>Rendezvous with Silas Bent |
| | 011558 | Resume std seq. |
| | 01155915 | End std seq; BB at 50 m. |
| 213 | 011618 | End BB at 50 m. |

| DAY (Julian) | DATE/TIME (Uncorrected GMT) | DESCRIPTION |
|---|---|---|
| 213 | 011638 | BB at 100 m. |
| | 011658 | End BB at 100 m. |
| 213 | 011746 | Resume std seq. |
| 214 | 020000 | SUS/BB at 60 ft. |
| | 020050 | Resume std seq. |
| | 021200 | SUS/BB at 60 ft. |
| 214 | 021250 | Start mixed seq. |
| 215 | 030000 | SUS/BB at 60 ft. |
| | 030050 | Resume mixed seq. |
| | 030225 | Turn north. |
| | 030330 | Turn east. |
| | 030435 | Turn south. |
| | 030530 | Turn east. |
| | 031200 | SUS/BB at 60 ft. |
| 215 | 031250 | Resume std seq. |
| 216 | 040000 | SUS/BB at 60 ft. |
| | 040050 | Resume std seq. |
| | 041200 | SUS/BB at 60 ft. |
| | 041250 | Resume std seq. |
| 216 | 041550 | Turn source off. |
| END PHASE I | HLF-3 towed 2300 nmi with 283.1 operating hours. | |
| PHASE II | | |
| 225 | 131705 | Start std seq; position 22C. |
| 227 | 150424 | End of leg; retrieve HLF-3; position 23C. |

| DAY (Julian) | DATE/TIME (Uncorrected GMT) | DESCRIPTION |
|---|---|---|
| 228 | 162103 | Position 27C. |
| 228 | 16211820 | Start std seq. at 30 meters. |
| 229 | 170703 | Shut source down to check leak detector. |
| | 17071225 | Resume std seq. |
| 229 | 170844 | Retrieved source. |
| 230 | 180610 | Initiate HY137 transmission. |
| 237 | 250250 | Deploy HLF-3; start mixed seq. |
| | 251846 | Turn north; position 39C. |
| | 251946 | Turn east; position 40C. |
| | 252046 | Turn south; position 41C. |
| 237 | 252146 | Turn east; position 42C. |
| 238 | 260029 | Hydrophone out. |
| | 26025810 | End mixed seq. |
| | 26031930 | Resume std seq. |
| | 260700 | SUS/BB alert. |
| | 260800 | SUS/BB event at 60 ft and 300 ft. |
| | 260850 | Resume std seq. |
| | 26094930 | Turn north; position 43C. |
| | 261050 | Turn east; position 44C. |
| | 26114930 | Turn south; position 45C. |
| | 261249 | Turn east; position 46C. |
| | 262000 | SUS/BB alert. |
| | 262100 | SUS/BB at 60 ft and 300 ft. |
| | 262150 | Resume std seq. |
| 238 | 262249 | Turn north; position 47C. |

| DAY (Julian) | DATE/TIME (Uncorrected GMT) | DESCRIPTION |
|---|---|---|
| 238 | 262349 | Turn east; position 48C. |
| 239 | 270049 | Turn south; position 49C. |
| | 270149 | Turn east; position 50C. |
| | 272055 | Turn north; position 51C. |
| | 272200 | Turn east; position 52C. |
| | 272300 | Turn south; position 53C. |
| 239 | 272356 | Turn east; position 54C. |
| 240 | 280200 | SUS/BB alert. |
| | 280300 | SUS/BB event at 60 ft and 300 ft. |
| | 280350 | Resume std seq. |
| | 281500 | SUS/BB alert. |
| | 281600 | SUS/BB event at 60 ft and 300 ft. |
| 240 | 281650 | Resume std seq. |
| 241 | 290200 | SUS/BB alert. |
| | 290300 | SUS event at 60 ft and 300 ft. |
| | 290350 | Resume std seq. |
| | 290555 | Turn north; position 59C. |
| 241 | 291707 | Turn at position 60C. |
| 242 | 300100 | SUS/BB alert. |
| | 300145 | Turn at position 61C. |
| | 300200 | SUS/BB event at 60 ft and 300 ft. |
| | 300250 | Resume std seq. |
| | 30130014 | SUS/BB alert. |
| | 301400 | SUS/BB event at 60 ft and 300 ft. |
| 242 | 301450 | Resume std seq. |

| DAY (Julian) | DATE/TIME (Uncorrected GMT) | DESCRIPTION |
|---|---|---|
| 242 | 301550 | Recover HLF-3. |

END PHASE II HLF-3 towed 1500 nmi with 183.4 operating hours.

PHASE III Cancelled

PANOIC 1977

HLF-3 Summary: 3800 nmi
484.5 operating hours