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ENGINEERING TESTS OF THE AN/PQS-1 HAND-HELD SONAR.(U)
FEB 61 J H LOGOMASINI
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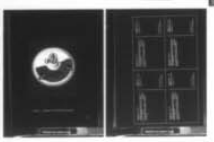

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(10) J. H. Logomasini

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THE PROBLEM

Perform acceptability tests on the preproduction model AN/PQS-1 Detecting-Ranging Set, Sonar, to determine its suitability for naval use.

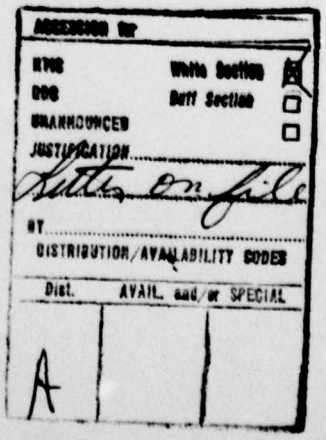
RESULTS

The performance of the AN/PQS-1 Detecting-Ranging Set, Sonar, is satisfactory except for minor mechanical and electrical deficiencies.

ADMINISTRATIVE INFORMATION

This report covers work from 7 October 1960 to 15 December 1960 and was approved for publication 3 February 1961. Work was done by the Engineering and Acoustics Divisions under Problem ST-180, (NEL T2-23), assigned to the Laboratory by Bureau of Ships letter C-9670/13 ser 689A-0208 of 20 July 1960.

The AN/PQS-1 model tested under this problem was built by Dalmo-Victor Company, Belmont, California, under Contract NObsr-81138.



CONTENTS

ILLUSTRATIONS

INTRODUCTION

This report covers a limited engineering evaluation of the Dalmo-Victor preproduction model of the AN/PQS-1 Detecting-Ranging Set, Sonar. Tests were performed to determine the suitability of the equipment for naval service.

This version of the AN/PQS-1 employs both tube and transistor type circuits. It is a preproduction model of the AN/PQS-1(XG-1) developed at NEL under another problem assignment.[1] It was manufactured by Dalmo-Victor Company, Belmont, California, under Contract NObsr-81138.

The equipment specification is MIL-D-22114(SHIPS) which designated the tests to be performed in accordance with specification MIL-E-16400. The tests and the procedures were modified to conform with tests conducted previously on a similar type hand-held sonar.

Preliminary reports of engineering tests were made in NEL letter T2-23 ser 2543-157 of 4 November 1960 and NEL letter T2-23 ser 2622c-0219 of 20 December 1960.

Figure 1 shows the sonar in its carrying case, and figures 2 through 5 are external and internal views of the sonar.

EVALUATION UNDER NORMAL ENVIRONMENTAL CONDITIONS

SURFACE INSPECTION

1. The design of the control knobs should be improved by increasing the hub diameter to provide adequate threads for the two set screws.
2. The present range switch detents are not adequate. More positive detents are needed on the control.
3. Wiring to the transducer and cabling near the center of the electronics disc should be moved slightly to avoide damage to the wiring while opening and closing the housing.

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[1] Navy Electronics Laboratory Report 936 AN/PQS-1(XG-1) Diver-Held Sonar (U) by R. L. Waldie, D. E. Good, and I. C. Simpson, Jr., (CONFIDENTIAL), 10 December 1959

4. Assembly and disassembly of the tube clamps is difficult. By replacing the stand-off spacers under the tube clamps with captive threaded studs, the difficulty could be eliminated.

5. The sharp corners on the tube clamps should be rounded slightly.

6. The slope amplifier components should be fastened more securely.

7. The lead ballast weights tend to loosen under their mounting screws because the lead deforms easily. Substitution of brass ballast for lead is recommended.

8. The housing alignment guide pin should have a longer taper to allow easy assembly of the housing.

9. Metal reinforcing should be placed on the outside eight corners of the wooden carrying case (fig. 1).

10. The inside rubber padding of the wooden carrying case does not adequately support the sonar. Thicker and harder rubber is recommended, especially under the raised edges of the welded grill guards of the sonar.

11. The Hysol epoxy coating (manufactured by Houghton Labs., Olean, N. Y.) applied to the electronics disc did not coat the metallic printed wiring, which would affect its moisture protecting ability.

12. A tool is not provided to tighten the 3-inch-hexagonal securing nut on the sonar housing.

Weights and Dimensions

The weight of the AN/PQS-1 is 22 pounds. The unit has an outside diameter of 12 inches and a depth of 9-5/32 inches.

LABORATORY OPERATIONAL TESTS

Underwater operation at sea has again demonstrated the necessity for the following items not covered by the equipment specifications:

1. Positive detents on the "range on-off" control assembly.

2. Cushions attached to the headphones to relieve pressure against the head.

3. A simple wrench to fit the 3-inch hexagonal securing nut on the sonar housing.

During sea operations some wires to the molded junction box on the Dalmo-Victor headset were broken.

BUOYANCY AND BALANCE

The Dalmo-Victor AN/PQS-1 sonar was satisfactory in buoyancy and balance tests.

EVALUATION UNDER EXTREME ENVIRONMENTAL CONDITIONS

TEMPERATURE

Nonoperating

The Dalmo-Victor AN/PQS-1 sonar was subjected to (storage) nonoperating temperature test for 24 hours at -62° C and for 4 hours at +75° C. There was no apparent damage to the equipment after completion of the test.

Operating

Electronic monitoring of the equipment during this test revealed the following:

1. Better selection of tubes should be made to prevent microphonics. The 5676 filamentary type triode is not made under sufficient quality control to allow use of the tube without selection.
2. Test point 2 (dc sawtooth) should be on V3 cathode rather than V4 cathode.
3. The transistor audio output stage did not function properly at first during the temperature test. Redesign of this circuit by the manufacturer corrected the defect.
4. The Dalmo-Victor headphone frequency response was unsatisfactory. The frequency response of the receiver was also unsatisfactory. These defects were corrected by the manufacturer before the test was completed.

HYDROSTATIC PRESSURE

The Dalmo-Victor AN/PQS-1 housing was subjected to hydrostatic pressure test by cycling the pressure between 0 psi and 150 psi,

ten times. The housing completed this test successfully. No damage or leakage of water was observed.

VIBRATION

Vibration tests were conducted on the Dalmo-Victor AN/PQS-1 sonar in accordance with MIL-STD-167. There was no damage to the equipment as a result of this test, and no vibration resonances were observed.

SALT SPRAY

The housing was given a salt spray test in accordance with MIL-E-16400. As a result, the enamel housing finish blistered at two nameplate mounting holes, and the background paint of the nameplate flaked away. Otherwise, the housing passed the test satisfactorily.

It is recommended that the nameplate be placed inside the housing behind the reflector. The nameplate could then be secured with resin, thus eliminating the need for tapped mounting holes. As a substitute, the type designation and serial number could be stenciled with small characters on the external surface of the housing for convenient identification.

HUMIDITY

Humidity tests were not conducted in accordance with MIL-E-16400. As mentioned previously, an epoxy coating had been applied to the electronic circuitry for moisture protection. A simplified test in which moisture was condensed on the surface of the electronic circuitry showed that the coating was unsatisfactory. Performance was satisfactory after the electronic circuitry was sprayed at NEL with "INSL-X clear E-16" insulating spray, which is a lignocellulose plastic material that is difficult to ignite and is self-extinguishing.

CONCLUSIONS

1. The equipment is acceptable for naval use except for minor mechanical and electrical deficiencies.

2. This equipment has demonstrated the feasibility of an aluminum cast case for the housing.

3. It is now within the state of the art to produce a transducer capable of passing the temperature requirements of MIL-E-16400.

RECOMMENDATIONS

The housing, although acceptable, is not an ideal design. It is recommended that investigations be made to provide simpler and more positive seals. It is also desirable to have the electronic circuitry in one sealed compartment and the batteries in another.

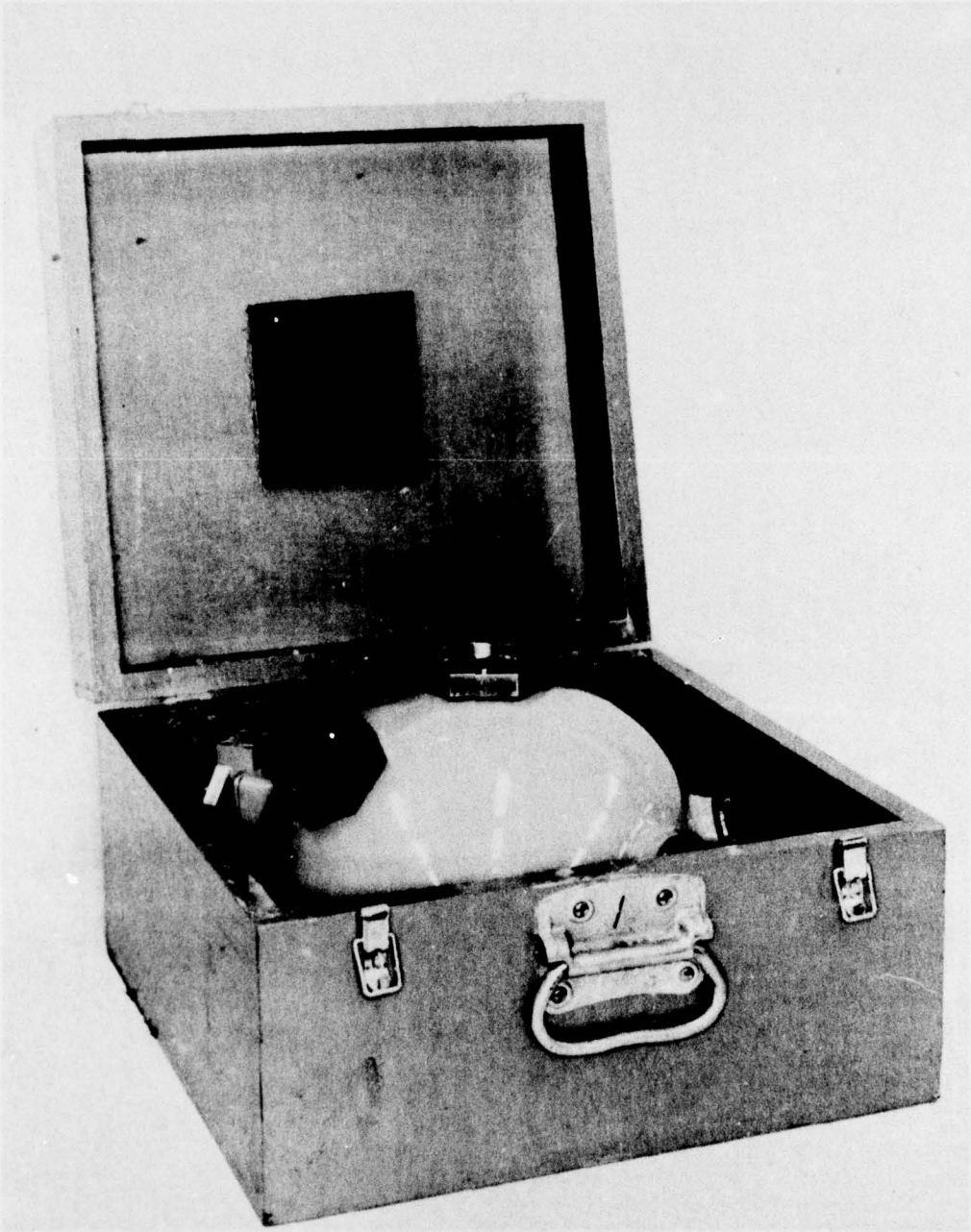

Figure 1. The carrying case.

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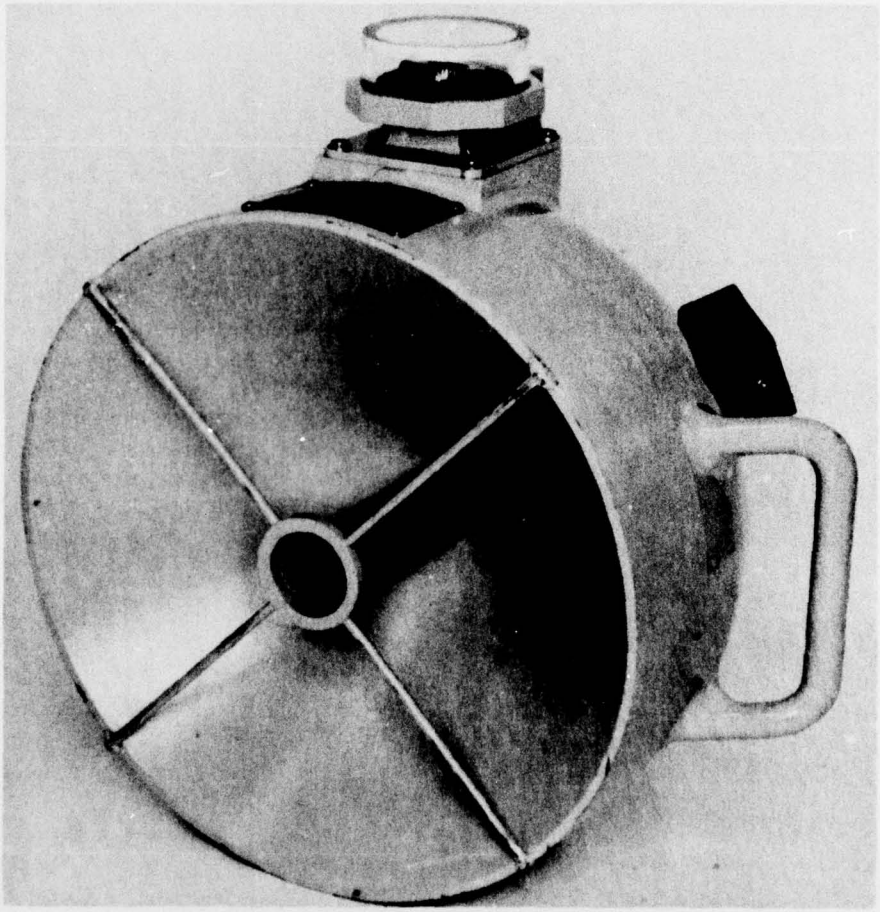

Figure 2. External front view of the sonar.

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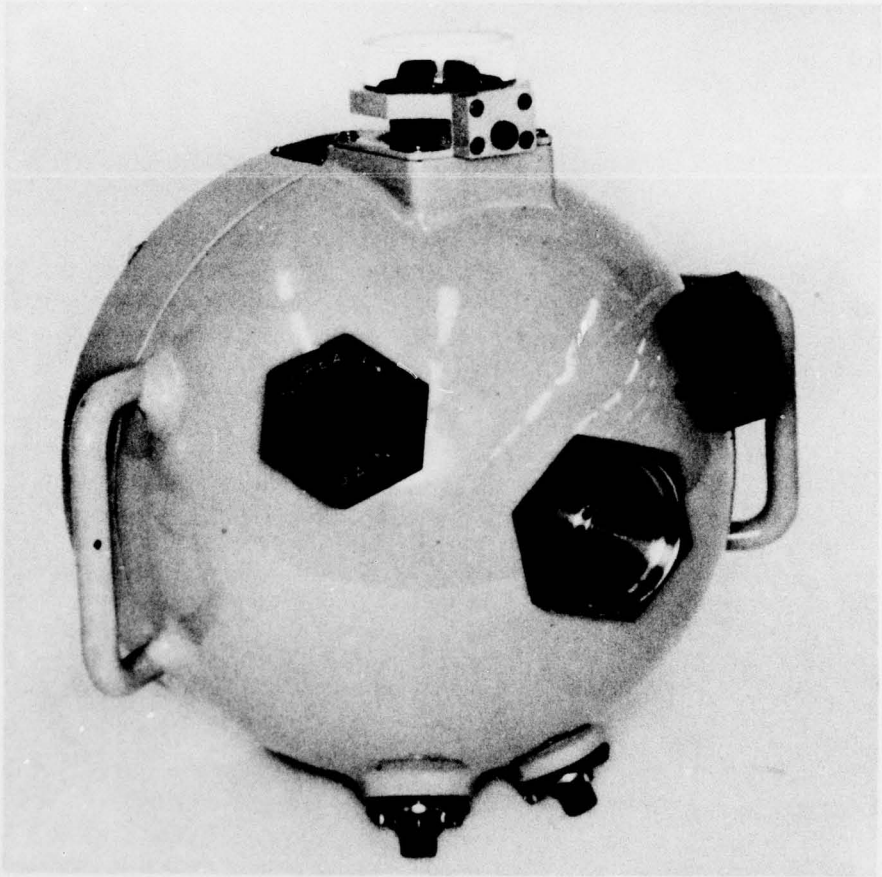

Figure 3. External rear view of the sonar.

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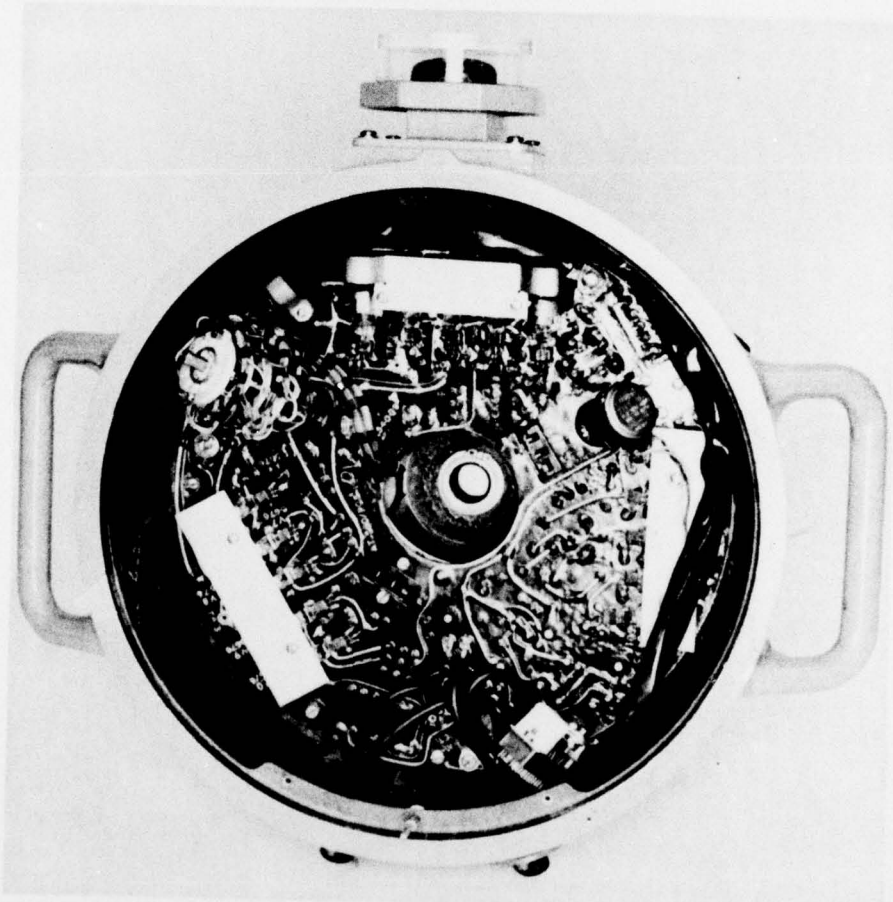

Figure 4. Internal view showing the electronics disc.

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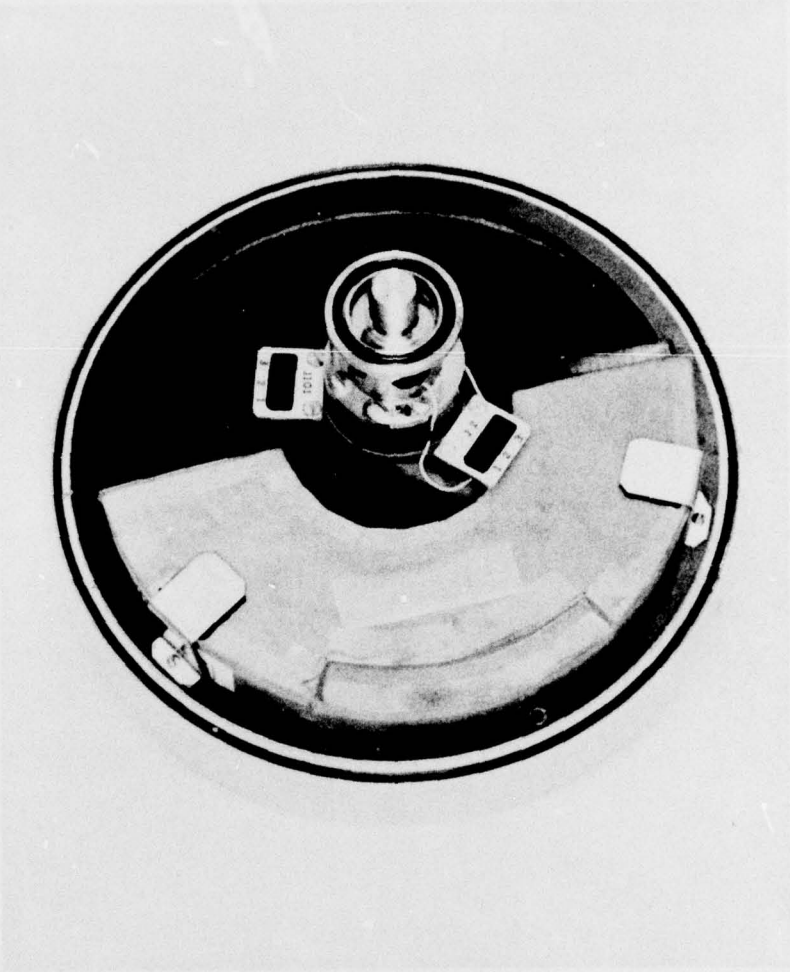

Figure 5. Internal view showing the battery.

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1. Model AN/PQS-1 - Test results
2. Underwater object locators

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ST-180 (NEL T2-23)

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