28 August 1940 NRL Report No. B-1647

NAVY DEPARTMENT

Report of Test

on

Resonated Horn - Type H-3
Manufactured by Bendix Aviation Corporation
Marine Division, Brooklyn, New York

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

FR-1647

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Authorization: BuShips ltr. S65-5(SS) of 31 July 1940.

Date of Test: August, 1940.

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Distribution: BuShips (5)

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Appendices

AUTHORIZATION FOR TEST

1. This test was authorized by reference (a), and other references pertinent to this problem are listed as reference (b), (c), (d) and (e).

References: (a) BuShips Ltr. S65-5(SS) of 31 July 1940.

(b) Specifications 17S11c of 1 May 1940.

(c) Bendix Drwg. CAL-3235- BuEng. File No. SS194-S65-417- Alt. 0 (Twin Horn).

(d) Bendix Drwg. CAL-5673 (Bells, High Intensity).

OBJECT OF TEST

2. The object of this test was to determine the extent of compliance of the low pitch unit of the sample twin horn, reference (c), with the specifications, reference (b), as a type H-3 horn and its suitability for Naval use.

ABSTRACT OF TEST

3. The sample unit, following its removal from a twin unit, reference (c), was placed in a Bendix bell case, reference (d), and set up at this Laboratory in suitable test circuits where its performance was carefully observed for compliance with the specifications as a Navy type H-3 resonated horn. The test was concluded with an inspection to ascertain compliance with the specifications in the matter of design, quality of workmanship, and materials, and any defects resulting from the tests.

Conclusions

(a) The results of this test indicate that, were the sample unit installed in a more suitable case, it would fully comply with the specifications as a type H-3 horn.

Recommendations

(a) In view of the satisfactory test results obtained this type of horn is recommended for approval subject to satisfactory check tests of a finished sample.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample low pitch unit was removed from a "Twin Horn," reference (c), manufactured by Bendix Aviation Corporation, Marine Division, and then tested as a Navy type H-3 horn.

5. For test purposes, it was installed in a Bendix bell case, reference (d), using 1/4 inch brass spacers between the case and cover to provide sufficient clearance between the unit and the bottom of the case.

6. The horn is designed for operation from a supply of 115 volts direct potential. The mechanism is mounted on a steel chassis. The disphragm is clamped between this chassis and an aluminum alloy case cover with six (6) No. 10-24 fillister head steel screws threaded into steel inserts.

7. The trumpet is spiral in form, of die cast alloy, and is made in two sections, one having a flange. A flat rubber gasket is clamped between this flange and the case cover by four external fillister head steel machine screws and two internal steel machine screws. The other section of the trumpet is secured to this section with nine (9) oval-head steel screws, zinc plated.

8. The magnetic circuit is made up of a laminated core, "W" shaped, on which rests a single form wound coil. The armature is mounted on a supporting steel spring and linked to the formed steel diaphragm by means of a bolt.

9. The tungsten contacts are shunted with a 50 ohm resistor connected in series with a 0.25 Mfd. condenser to reduce arcing.

10. Further details are shown by photographs, Plates 2 and 3, and drawing, reference (c).

METHOD OF TEST

11. The sample was first tested to determine its electrical characteristics. Following an acoustical analysis, it was subjected to tests in the following order:

(a) Inclination in all planes while supplied with rated voltage $\pm$ 10%.
(b) Endurance test of 1500 cycles of "one minute on" and "one minute off", the first 750 cycles at 60°C. and the second at 0°C. ambient temperatures. During this test, the temperature rise was determined by the resistance method.

(c) Shock test of 20 shocks of 250 foot pounds each as specified in paragraph F-2g and the vibration test as specified in paragraph F-2h.
(d) Sound analysis to determine any change as a result of the endurance, shock, and vibration tests.
(e) Dielectric test of twice the rated voltage plus 1250 volts, 60 cycles, for one minute between the electrical circuit and ground.
(f) Test for insulation resistance by a 500 volt Megger.

12. The tests were concluded with a careful examination of the sample to determine compliance with the specifications, pertaining to design, quality of workmanship and materials, and any defects resulting from the tests.

13. As the installation of the horn unit in a bell case did not produce a typical splashproof assembly, the salt spray and splash tests were not conducted.

RESULTS OF TEST

14. The test results obtained were as follows:

Requirements	Test Values
Voltage: 115 volts.	115 volts.
Current: Direct.	Direct.
Amperes: Not specified.	0.17 amperes.
Watts: Shall not exceed 40.	19.5 watts.
Pitch of note: Resonated.	Complied. See Plate 1 for acoustical analysis.
Sound pressure output: Shall be not less than 75 decibels, at 18 feet in a soundproof room, under the following conditions:	Complied.
At rated voltage before the endurance test - - - - - - - - - - -	92 db, total noise.
At -10% rated voltage - - - - -	92 db, total noise.
At rated voltage after the endurance test - - - - - - - - - - -	89 db, total noise.

Requirements	Test Values
Inclination: Shall operate in any position while supplied with power within ± 10% of rated voltage.	Complied.
Endurance: Shall operate 1500 cycles of "one minute on" and "one minute off", the first 750 cycles at 60°C. and the second at 0°C. ambient temperatures.	Complied.
Temperature rise: Maximum temperature shall not exceed 115°C. during the endurance test (55°C. rise at 60°C. ambient)	Complied. 33.0°C. at 60°C. ambient.
Shock integrity: Shall withstand 20 shocks of 250 foot pounds each.	Frequency and total noise output were somewhat lower following this test but were still within the requirements. See Plate 1.
Vibration test: Shall be mounted on a standard Navy 3 foot pound vibration machine and subjected to six tests of 30 minutes each at 100, 150, 200, 250, 300, and 350 blows per minute.	Complied.
Dielectric test: Shall withstand twice the rated voltage plus 1250 volts, 60 cycles, for one minute between electrical circuit and ground.	Complied.
Insulation resistance: Shall be not less than 5 megohms at not less than 500 volts, d.c.	Complied. 100+ megohms by 500 volt Megger.
Nameplate: Shall be in accordance with N.D. Specification 42N2.	Copper-nickel alloy nameplate (attached to twin horn case)
Diaphragm: Shall be of nickel-chromium alloy, unless otherwise approved by the Bureau.	*Steel diaphragm used and protected against corrosion with glyptal lacquer.
Protection against corrosion: All aluminum surfaces shall be protected with one coat of zinc chromate paint, or an approved anodic treatment over which 2 coats of approved gray paint shall be applied.	Complied, gray paint over zinc chromate paint used.

Requirements	Test Values
Coil windings: Shall be either single or double silk or cotton covered enameled copper wire.	Complied. Double silk covered enameled copper wire.
Terminal block: Shall be of phenolic material equipped with 9-S-1841-L terminals.	Complied.

*Denotes non-compliance with the specifications.

CONCLUSIONS

15. The results of this test indicate that, were the sample unit installed in a more suitable case, it would fully comply with the specifications as a type H-3 horn.

BEND
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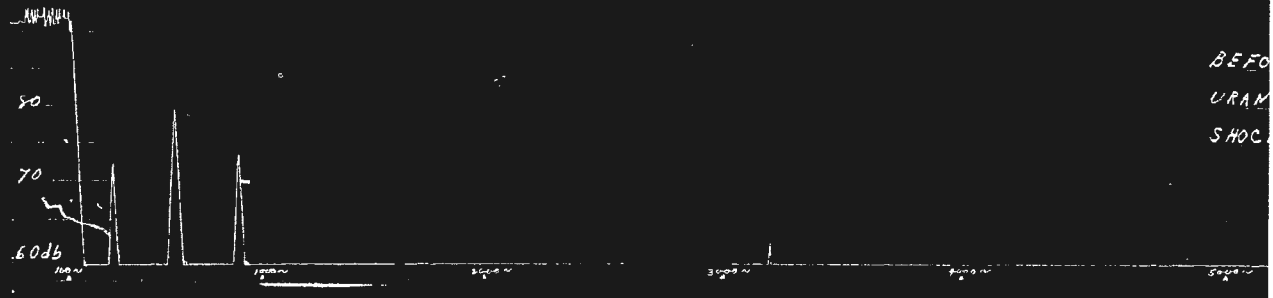
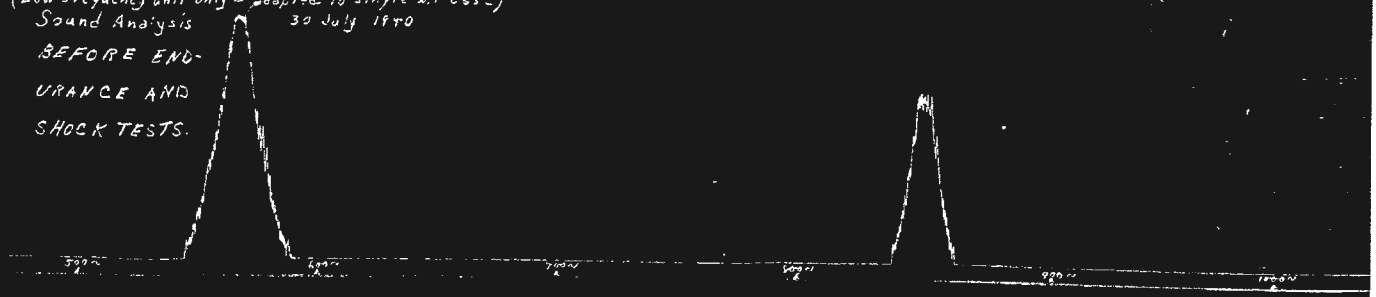


BEFO
URAN
SHOC

BENDIX AVIATION CORPORATION
MARINE DIVISION
TWIN HORN DWG. CAL 3235
115 Volt, D.C. HORN
(Low Frequency unit only - adapted to single unit case)
Sound Analysis 30 July 1970
BEFORE ENDURANCE AND SHOCK TESTS.

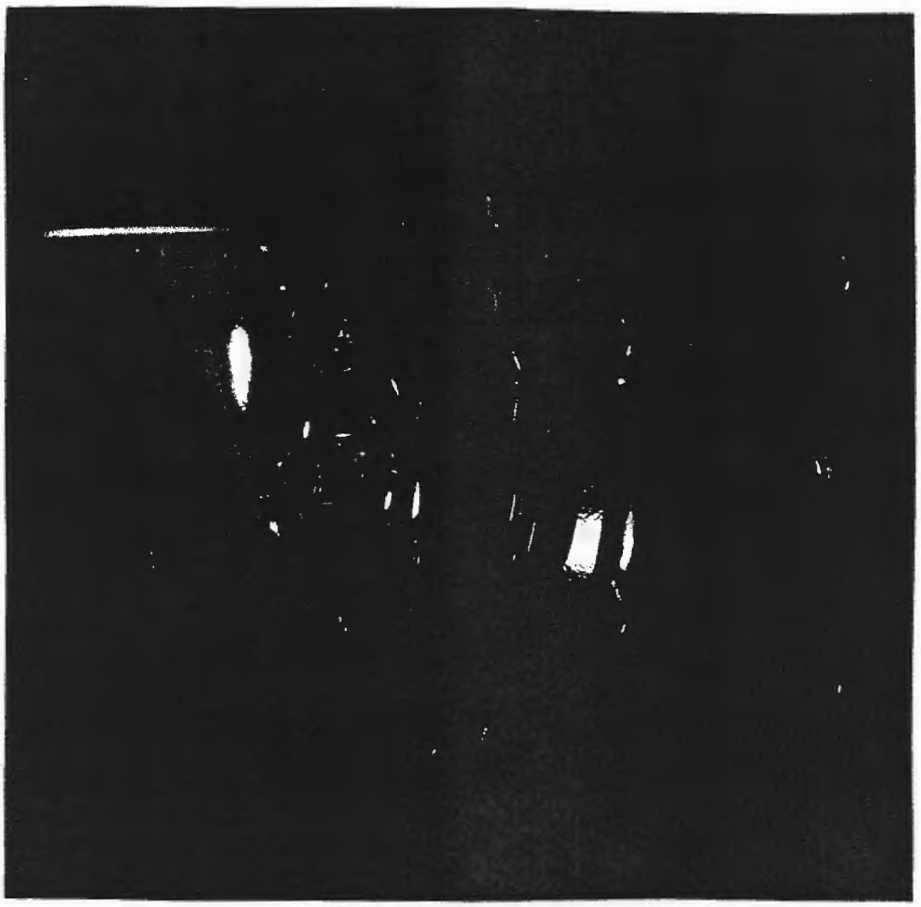


BEFORE ENDURANCE AND SHOCK TESTS.

AFTER THE ENDURANCE AND SHOCK TESTS

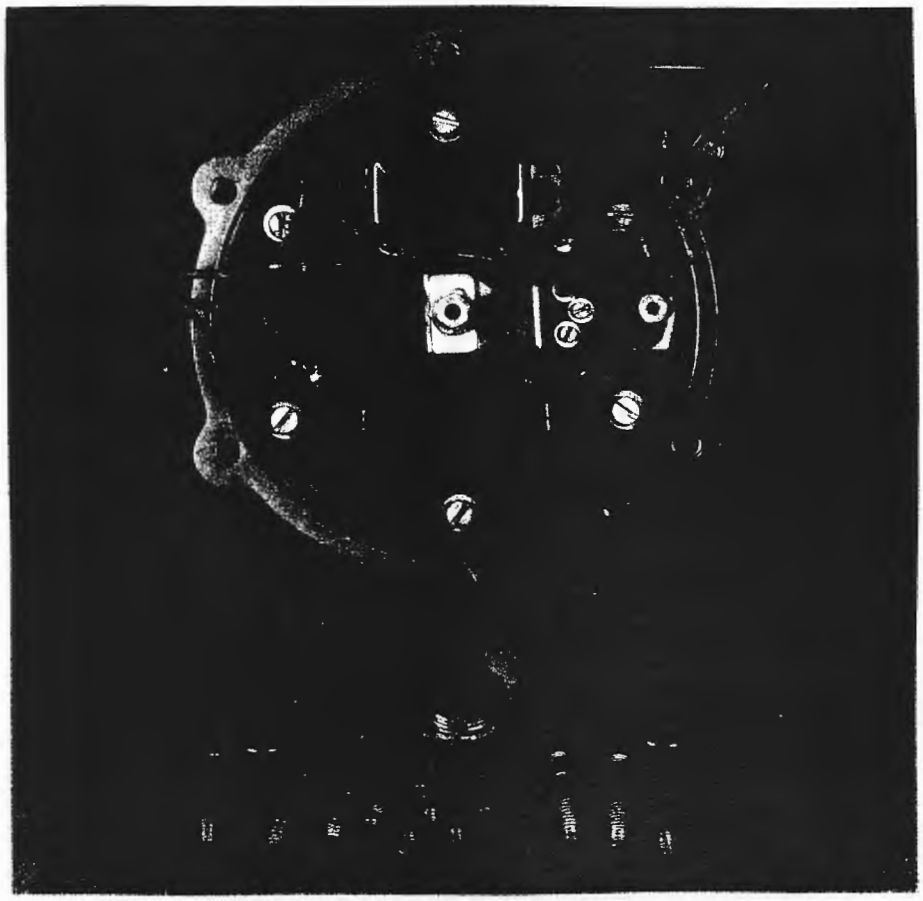
AFTE THE ENDURANCE AND SHOCK TESTS

PLATE I



Type H-3 Resonated Horn
Mounted in Bendix Standard Bell Case

PLATE 2



Type H-3 Resonated Horn
Removed from Bendix Standard Bell Case

PLATE 3