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AIRBORNE RADIO DIVISION
ENGINEERING ANALYSIS SECTION

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TYPE AND SYSTEMS TESTS OF AN/APS-4A

by

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- Report #R2959 -

[redacted]

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ABSTRACT

1. This final report covers all type tests of the AN/APS-4A. The tests performed on this unit have been limited in scope so as to only analyze the changes which have been made from the AN/APS-4.

2. After compliance with the recommendations of this report the AN/APS-4A will be satisfactory for use in the Naval Service.

RESULTS OF TESTS

3. The range sweeps are quite linear allowing interpolations between range marks to be accurately made.

4. The lengths of the various range sweeps vary by an excessive amount. After adjusting the vertical sweep length control so that the 20 mile range covered all of the available CRT face, measurements of sweep lengths on the other ranges were made. These measurements were converted into percent of available space utilized. The results are shown below.

Range	2	7	20	50	100	180
% used	69.5	83.4	100	77.8	89.0	94.5

The two mile range is seen to be the most objectionable. In fact this range sweep actually covers three miles.

4. In Table I are shown the pulse repitition rate, power output and peak power output. Plate I shows the width of the pulse delivered to the magetron cathode. Measurements of power output were made with the TS-147/UP.

5. The input power required is shown below.

	Volts	Amps.	Watts	Power Factor
AC Line	115	5.83	628	93.7
DC Line	28.0	2.6	72.8	-

6. The bomb unit weighs 123.2 pounds.

7. The noise generated on the AC and DC power input cables is excessive. The values obtained are shown in Table II. These measurements were made with a Ferris model 32B Noisemeter.

8. Noise radiated from the bomb unit is extremely high in the low frequency range. These measurements were made according to paragraph 2.14.5.2. of reference (b) Table 3 shows the results obtained The radiated noise is most intense at the juncture of the two halves of the nacelle clamping rings and along the fiber antenna nacelle.

9. As a remedial measure the inside of the antenna nacelle was covered with copper screening. This screening was extended as far forward as possible without interfering with the antenna radiation. The rear edge of the screening was securely soldered to the nacelle's clamping ring. Subsequent measurements showed that the noise radiation was greatly reduced in the areas surrounded by this shielding. However the noise radiated from the nacelle just beyond the forward edge of the screen was very intense.

10. The entire equipment was satisfactorily operated in ambient temperatures varying from -55°C to + 60°C.

11. At a temperature of -40°C the bomb unit was pressurized to gauge pressure of 5 p.s.i. The ambient pressure was then reduced to simulate 30,000 feet altitude. The system was operated for one hour at this pressure without arcing or other unsatisfactory results.

12. For 44 hours all units of the AN/APS-4A were stored at a temperature of + 85°C and a relative humidity of 95%. After reducing the temperature to + 60°C for one hour the equipment was placed in operation. Although the equipment operated satisfactorily, the following damages were found. The indicator intensity controls could not be rotated. This is due to warping of the bakelite intensity potentiometers, R(1)1. The plastic cover of the wave guide shutter mechanism was also badly warped. In this case the damage did not cause interference to the shutter's operation. Attention is invited to the fact that this condition could prevent the shutter from opening. The paint on the antenna wave guide peeled off.

COMMENTS

13. The variations in range sweep length are not necessary and cause confusion to the operation (See paragraph 4).

14. The conducted noise on both the AC and DC input power lines is excessive. Noise radiation from the bomb unit is very intense. However, due to the physical location of the bomb this high radiation may not be detrimental. (See paragraphs 7 and 8).

15. As a result of high temperature and humidity the following damages were incured. (a) Indicator intensity potentiometers could not be rotated. (b) The plastic cover on the wave guide shutter mechanism was badly distorted. (c) The paint on the antenna wave guide peeled. (See paragraph 12).

RECOMMENDATIONS

16. The tolerances of the range sweep circuit components R(3)1A, 1B, 2, 3, 4, 5, 7, and 11 and their associated condensers C(3)1, 2, 3, 4, 5, and 6 should be reduced. If this is not feasible an alternate solution would be to install separate sweep length control potentiometers. These components could be located on the range unit in the space made available by removal of the alarm circuit.

17. Suitable filters at the radar input should be used to lower the line conducted noise.

18. An investigation of field reports should be made to determine whether the noise radiation from the bomb unit is interfering with other radio devices.

[redacted]

19. If storage of the AN/APS-4A equipment at + 80°C is actually contemplated, the indicator intensity potentiometers R(1)1 should be replaced with a component of non-plastic construction.

20. The plastic cover for the wave guide mechanism should be replaced by a light-weight metallic cover.

21. Use of defective paints or painting methods on the antenna wave guide should be corrected.

22. After compliance with the above recommendations, the AN/APS-4A will be satisfactory for use in the Naval Service.

REFERENCES:

(a) BuShips ltr Sec. 913BH-Ser. 07990 dated 24 August 1945.
(b) BuAer specification EP-389.

[redacted]

TABLE I
POWER OUTPUT

Range	PRF	Power Output	Peak Power Output
Search(2 mile)	1080 cps	22.0 watts	26.4 Kw
Search(100 mile)	630 cps	13.5 watts	26.8 Kw
Beacon	365 cps	24.0 watts	24.3 Kw

TABLE II
Noise Generated on Input Power Lines

Frequency mc	Noise on Lines AC μv	DC μv
0.16	6000	2000
0.24	7000	3000
0.34	5000	8000
0.60	3500	2000
1.0	1500	700
1.4	1200	400
2.0	300	900
2.8	300	70
3.6	150	400
4.0	100	200
7.0	35	70
10	8	20
12	20	2
16	40	5
20	0	0

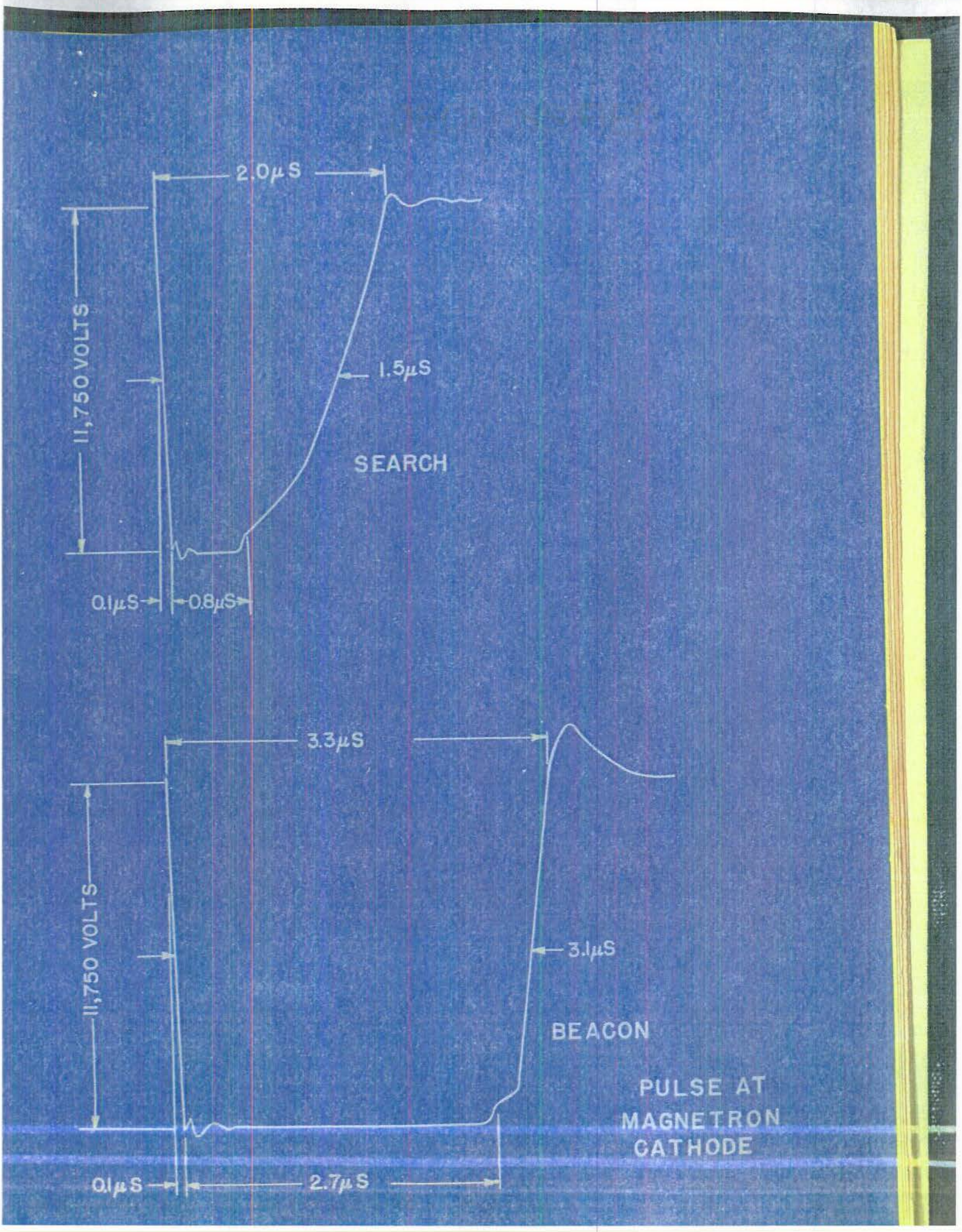
TABLE III

Radiated Noise

Freq. Mc.	Noise v	Freq. Mc.	Noise v
.099	26	6.1	34
.111	13	6.3	29
.130	18	6.7	15
.158	20	6.9	9
.186	22	7.2	5
.202	22	7.5	5
.209	38	7.6	6
.240	49	8.0	12
.289	61	8.4	12
.346	69	8.6	2
.395	73	9.0	5
.397	49	9.2	7
.446	65	9.5	7
.527	85	9.6	6
.638	52	9.8	3
.744	44	10.0	3
.811	22	10.2	4
.841	21	10.4	6
.991	8	10.6	6
1.197	8	10.8	7
1.399	11	11.0	5
1.5	65	11.6	6
1.7	85	11.8	4
1.8	83	12.0	6
2.0	37	12.2	11
2.1	22	12.6	14
2.3	73	12.8	12
2.5	52	13.0	10
2.7	16	13.3	16
3.0	34	13.5	16
3.3	28	13.6	11
3.5	24	13.8	27
3.6	61	14.0	53
3.8	43	14.2	75
3.9	89	14.5	41
4.0	140	14.8	66
4.2	98	15.2	28
4.5	160	15.8	17
4.8	240	16.4	3
4.9	310	16.6	1
5.1	360	16.8	0
5.3	270	17.0	0
5.5	220	18.0	0
5.7	160		
[illegible]	[illegible]		
6.0	58		

Freq. Range 100 Mc to 1000 Mc
Noise negligible.

[redacted]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11,750 VOLTS
1.5μS
SEARCH
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0.8μS
3.3μS
11,750 VOLTS
3.1μS
BEACON
PULSE AT
MAGNETRON
CATHODE
0.1μS
2.7μS

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