TRANSMITTAL SLIP | DATE

TO: ~~ISD/SB~~

ROOM NO.	BUILDING

REMARKS:

[redacted] 50X1

~~General Counsel~~

HRT-2 File

7.7.4/1

FROM: ~~ISD/SB~~

ROOM NO.	BUILDING	EXTENSION

FORM NO. 041 REPLACES FORM 36-8 ☆GPO : 1957 - O - 439445

SECRET

6 September 1961

MEMORANDUM FOR THE RECORD

SUBJECT: Test of HRT-2 Beacon Transmitter with Various Antenna Systems

DATE : 29 August 1961

1. The HRT-2 [redacted] Beacon will shortly become available in production quantities, pending approval of the final design. As it has been planned to provide the ANA/42 Antenna on a one-for-one basis with the transmitter, it will shortly be necessary to order a quantity of these units from their contractor. This will ensure that units of the complete system become immediately and concurrently available upon completion of the initial beacon transmitter production run. 50X1

2. Possible improvements of the ANA/42 are presently under study and a completely new antenna has been under study at TSD [redacted] It is felt that developments resulting from these studies should influence any future contract involving further ANA/42 production, providing such developments are considered useful. 50X1 50X1

3. The tests herein described were originally proposed as a preliminary evaluation of the "[redacted] Antenna" previously mentioned, but the test objectives were later broadened to include the whole "family" of antennas with which the [redacted] beacon is intended to operate. The following antennas were included in this preliminary investigation: 50X1 50X1

A. ANA/42

B. 16 foot whip

C. [redacted] Experimental Antenna 50X1

D. Quarter Wave Balloon supported antenna

4. It should/

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4. It should be emphasized that, with the exception of the ANA/42, and possibly the [redacted] 16 foot whip, the systems listed above are very early prototypes and the performance characteristics noted in these tests were obtained primarily to indicate to the individuals concerned, the areas and directions for improvement. They should not be construed as an indication of the capabilities expected from a production item. 50X1

5. Participating in the tests, conducted at [redacted] were: 50X1 50X1

[redacted] 50X1

[redacted] 50X1

For TSD/Systems Branch

[redacted] 50X1

For Engineering Branch

[redacted] 50X1

For Audio Operations Branch

[redacted] 50X1

6. TEST PROCEDURE:

The tests were divided into two parts, conducted simultaneously. Part One was concerned with general balloon erection procedures. Part Two consisted of comparative field strength measurements using the HRT-2 in conjunction with various systems in order to obtain rough data on loading characteristics. The antennas were erected in the vicinity of [redacted] in the morning hours of 29 August 1961, with a prevailing wind of 6 to 10 knots (based on 6 knot wind velocity reported at nearby airfield). 50X1

PART ONE:

Test #1: Erection of Quarter Wave Balloon Supported Antenna:

A standard/

PART ONE: - continued

Test #1 - continued

A standard, neoprene meterological balloon was inflated with 10.67 cubic feet of Helium from a 12 pound bottle, and suspended from a stranded, 150 foot phosphor-bronze cable weighing approximately 4.5 ounces. This balloon was sent aloft at approximately 10:45 a.m. and remained up until 2:30 p.m. when it was taken down before the test group left the area. The balloon was affected by low wind levels present and lay over at an angle of about 45° during the entire period.

Test #2: Erection of Quarter Wave Balloon Supported Antenna:

A standard, neoprene meterological balloon was inflated with 17.5 cubic feet of Helium and suspended in the same manner as before. The balloon lay over at approximately the same angle as before. Erected at 11:00 a.m., the balloon remained aloft for the remainder of the test.

Test #3: Erection of Quarter Wave Balloon Supported Antenna:

A standard, neoprene meterological balloon was inflated with 35 pounds of Helium (maximum capacity). While being filled, the first balloon burst at this pressure. A second unit was successfully inflated. This balloon remained at an elevation of about 60° above 60° above horizontal for approximately 1.5 hours after erection when it too burst.

PART TWO:

Test #4: [redacted] Top Loaded Experimental Antenna: 50X1

This antenna was connected through a small impedance matching device to the [redacted] HRT-2 Beacon. Difficulty was experienced in loading the transmitter, and the output meter (on the beacon) read approximately 0.2 of its full scale reading. 50X1

A laboratory/

PART TWO: - continued

Test #4 - continued

A laboratory grade, field strength meter broke down during the test and relative measurements were then made with a home-made device. The antenna produced full-scale readings on this device to a maximum distance of 5 feet in every direction.

Test #5: ANA/42 Antenna:

This antenna was directly connected to the HRT-2 and, when loaded, drew a current reading of approximately 0.4 of full scale on the HRT-2 Output meter. Rough field strength measurements as previously made, produced full scale readings on the measuring device to a maximum distance of 100 feet in every direction (with the exception of a 30° sector where a wire-mesh fence prevented measurements at distances greater than thirty feet).

Test #6: Balloon Supported Wire Anntenna:

Tests were made using a balloon inflated with 10.67 cubic feet of Helium. Considerable difficulty was experienced in loading the transmitter with this antenna, and no field strength measurements were possible because of the lack of success in obtaining current readings on the transmitter output meter. The antenna was laying over at approximately 45°, and therefore no comparison was deemed possible with the other systems, which were vertical.

Test #7: 16 Foot Whip Antenna:

The transmitter loaded into this antenna with no difficulty, and maximum field strength was indicated to a distance of 20 feet in every direction.

CONCLUSIONS:

CONCLUSIONS:

PART ONE:

The balloon systems currently available are considered unsatisfactory from several standpoints. First, the neoprene balloons are physically weak, deteriorating rapidly in sunlight, particularly when loaded to full capacity. They are very easily punctured, making a clear erection area mandatory.

Secondly, the fully inflated balloon (35 cubic feet of gas), while remaining slightly more erect than balloons inflated with less volume, obviously required a larger and heavier tank to inflate it, and increased drag caused by the larger surface area minimizes the benefits of increased lift. If it were necessary to supply a balloon antenna kit from existing components, the small, 12 pound tank of Helium would probably be the most advisable, in the light of the minimal advantages of increased gas volume when measured against increased tank weight. In any event, at least two tanks would have to be provided, to give insurance of erection. It apparently makes little difference whether Hydrogen or Helium gas is used, since there is only a slight difference in the lift provided.

PART TWO:

[redacted] Top Loaded Experimental Antenna: This antenna was designed with a minimum amount of information available concerning the output impedance of the HRT-2 Beacon Transmitter. In its present state, the antenna impedance is not within the tuning range of the beacon. 50X1

Balloon Supported Wire Antenna: In its present state, the HRT-2 does not have the facility for properly matching the impedance of this device. A physical method of connecting this type of antenna to the HRT-2 should be developed.

ANA/42: The performance of the HRT-2 in conjunction with this antenna is satisfactory from an electricl point of view.

16 Foot/

CONCLUSIONS: - continued

PART TWO - continued

1. 16 Foot Whip: The performance of the HRT-2 in conjunction with this antenna is satisfactory from an electrical point of view.

PROPOSALS:

A. Balloon supported Antennas:

(1) A balloon supported antenna be developed which will vertially support 150 feet of 4.5 ounce wire, with the least inflation volume through the employment of stabilizing devices, and drag-minimizing configurations.

(2) It is recommended that a fabric of polyethylene-mylar nylon/mylar or other materials be investigated for the balloon program in order to provide greater environmental and puncture resistance than neoprene.

(3) It is recommended that TSD [redacted] 50X1
[redacted] fabricate a specimen base designed to physically 50X1
hold the balloon antenna and couple the device electrically to the HRT-2 Beacon.

B. [redacted] Experimental Antenna: This device should be modified 50X1
to more closely match the output impedance of the HRT-2, and if possible, be made broadband enough to operate in the range 1600-1800 kilocycles without further adjustment on the antenna itself. (These steps are currently being undertaken at TSD [redacted] 50X1
and have been given the highest priority). 50X1

C. HRT-2 Beacon Transmitter: It is recommended that the output impedance of this device be broadened to include the Quarter Wave Balloon supported antenna. It is, also, recommended that tests be performed to determine whether damage to the transmitter will result from prolonged operation in the unloaded condition. This matter has already been discussed with the TSD/SB project engineer.

[redacted] 50X1
TSD/AOB

Distribution:
2-TSD/AOB
1 - TSD/EB
[redacted]
1 - TSD/ [redacted] 50X1
1 - TSD