

Declassified in Part - Sanitized Copy Approved for
Release 2014/05/14 :

CIA-RDP78-03153A000700030012-1

ROUTING SLIP

RAK *RAK*

GMB *GMB*

~~MB~~

ME *ME*

~~MB~~

~~MB~~

~~MB~~ *Return*

ILT-7

Declassified in Part - Sanitized Copy Approved for
Release 2014/05/14 :

CIA-RDP78-03153A000700030012-1

SECRET

10 September 1961

MEMORANDUM FOR THE RECORD**SUBJECT : Results of HRT-2 Beacon Tests Conducted 7-8 September 1961**

1. General: A series of air to ground homing tests were accomplished on 7-8 September 1961. These tests were to determine the operational acceptability of the HRT-2 transmitter using both the A-42 and the whip antenna. C-47 #75 and Helio #143D were used as homing aircraft. The C-47 was equipped with an ARN-6 radio compass. The helio with a Lear ADF-12. Both day and night operational tests were accomplished. The weather on both days was unfavorable for higher altitude tests. Ground conductivity in the test area was 2 millimhos, one of the lowest in the United States. Paramecal conducting tests were TSD; TSD; TSD and HPS/ASD.

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2. Observations: Test results are attached. Some general observations were made during testing that should be noted, however:

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a. Utilizing the whip antenna on the transmitter reduces the reception range from 1/3 to 1/3. (NOTE: Two more series of comparison tests should be made with the whip and the A-42 before the whip is eliminated from consideration for operational use.)

b. Signal reception range in the Helio utilizing the Lear ADF-12 receiver was double that of the C-47 utilizing the ARN-6.

c. Using the loop position on the ARN-6 will increase distance of signal reception about 1/3.

d. In the flat terrain at the testing site, reception range was approximately the same in all quadrants.

e. Night operation reduced reception about 50%.

f. A radio compass needle indication is received on the ARN-6 long before a signal is audible. The needle indication and signal audibility are almost simultaneous with the Lear ADF-12.

g. Station passage indication on both receivers was approximately the same. In all cases the needle would begin to fluctuate over the station and 2.5 to 11 seconds later (depending on altitude and type receiver) the needle would stabilize in the 180° position. The Lear ADF-12 took 1/2 to 1 second less to complete the swing in most cases.

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2. Observations: Test results are attached. Some general observations were made during testing that should be noted, however:

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a. Utilizing the whip antenna on the transmitter reduces the reception range from 1/3 to 1/2. (NOTE: Two more series of comparison tests should be made with the whip and the A-42 before the whip is eliminated from consideration for operational use.)

b. Signal reception range in the Helio utilizing the Lear ADF-12 receiver was double that of the C-47 utilizing the ARN-6.

c. Using the loop position on the ARN-6 will increase distance of aural reception about 1/3.

d. In the flat terrain at the testing site, reception range was approximately the same in all quadrants.

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h. Heavy static was noted on the ARN-6 beyond three miles. The Lear ADF-12 filtered out most static at all ranges. Lightning flashes were observed frequently during night tests. Occasional light precipitation was encountered during all tests.

i. Modification to the recording form are required. Forms should include:

- (1) Ground conductivity in area of tests.
- (2) Frequency of broadcast.
- (3) Type transmitter used.
- (4) More space is needed for remarks.

3. Conclusion: Reception range of the HRT-2/ARN-6 is poor, especially at night. In the present configuration (based on these tests), this combination is not acceptable. The Lear ADF-12/ARN-6 comparison tests indicate that the weak part of the system is the receiving equipment.

4. Recommendation: Recommend that the Beacon Panel consider one of the following actions as the next step in the testing program:

- a. Modifications to the ARN-6 be accomplished that will increase reception range to within acceptable standards. (CRRE-AMC 10/11/53 - ENCL)
- b. A new receiver be developed.
- c. A more powerful transmitter be developed.
- d. A new transmitter antenna be developed to increase signal strength, to within acceptable standards.
- e. Investigate the availability of an off-the-shelf receiver that would produce better results.
- f. After correcting presently known deficiencies, repeat testing during more favorable weather conditions.

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Distribution:

2-TE-OPSWR
2-TSD/AOB
1-AC/DPD
1-DB/DPD
1-MB/DPD
1-COMMO/dpd

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~~SECRET~~AOB TEST EVALUATION REPORT

The tests of the HRT-2 Engineering Prototype were conducted on the 14th and 15th of September 1961 [redacted]. Attending as representatives of TSD/AOB were [redacted] and [redacted] was present for DPD.

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The tests were preceded by a preliminary investigation of the aircraft ADF sensitivity. The aircraft involved was a C-47 equipped with ARN-7 Medium Frequency ADF and a Helio Courier on which a Lear Model 12E system was installed. No check of antenna performance on either craft was possible under the circumstances, so receiver sensitivity was the only parameter tested. A signal of approximately 2.5 microvolts at 1700 kc/s was supplied to the SENSE antenna input of both receivers, and satisfactory indications with similar sensitivities were observed in both cases. The beacon transmitter was set up by the ground party [redacted] at a frequency of 1720 kc/s.

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The prescribed tests were run with results that differed widely between the two aircraft involved (see [redacted] data). With the C-47, stronger signals were received with the ARN-7 ADF in the LOOP rather than the SENSE mode, an unusual condition indicating inefficiency of the SENSE antenna. The Helio Courier, on the other hand, received stable homing signals over approximately twice the range received by the C-47 at distances in excess of the specified requirement in the Test Directive. After the test was concluded, discussions were held with maintenance personnel at Bolling Air Force Base who provided the information that the Air Force has modified all C-47's to use a "Blade" type SENSE antenna rather than the more efficient "long-wire" previously employed. In order to more conclusively determine the capabilities of the HRT-2 Beacon with the ARN-7/C-47 combination, it is recommended that further tests be made. Any tests of this nature must involve the same aircraft receiver and a long-wire SENSE antenna. The results from the present test are, therefore, not considered conclusive.

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The ground party found certain points where they felt improvement could be made to ease installation and simplify operation of the Beacon Transmitter and ANA/42 antenna. These were as follows:

1. **Captive Screws and Washers:** All screws and washers on removable portions of the transmitter case should be of the "Captive" type to prevent the loss of such parts and the defective waterproofing which would result.

2. **Antenna Connections:** Color coded, insulated sleeving should be used to cover the braided cables which are provided on the base of the ANA/42 antenna to prevent them from accidentally shorting. Matching, color coded terminals should be provided on the transmitter.

3. **Ground Rod and Cable:** The ground rod buckles too easily when driven into the ground and should be reinforced. The ground cable should be easily detachable from the ground rod, or attached by some means other than a soldered connection which pulled loose from the ground rod when an attempt was made to remove it from the earth. An agent ground party would not be able to re-connect the cable and rod in the field under the present circumstances.

4. **Pilot Light:** At night there is no way of reading the meter face for tuning purposes. It is recommended that the small light adjacent to the meter be directed at the meter face.

5. **Battery:** The battery case should have the correct insertion position marked on the case in some manner. Perhaps a red dot on the transmitter case to line up with a red dot on the battery would be helpful. This measure is recommended because the battery plug in the transmitter cannot be twisted to fit the battery regardless of position.

6. **Antenna Lug (ANA/42):** The band change lug on top of the ANA/42 loading coil should be of the sliding type. The present band-change lug is difficult to move, and may not make positive contact unless care is taken.

7. **Meter Reading:** It is recommended that an arrow pointing in the appropriate direction be stenciled or otherwise marked on the transmitter case directly above the tuning meter so that anyone tuning the device will know that he is adjusting for a maximum indication.

8. **Rf Energy Present on Transmitter Case:** While using the ANA/42 antenna with the HRT-2, it was noted that the output meter reading increased slightly when the ground lead was touched to the case, indicating a slight difference of rf potential. Are these two points supposed to be at the same potential? When using the 16' whip, the case was quite "hot" for rf. Is it possible to improve the loading of the whip to minimize this condition?

9. **Meter Reading Change:** In the first few minutes after inserting a fresh battery into the HRT-2, a slight decrease (about 15%) was detected in the reading of the output power meter. Since mercury batteries are noted for their constant voltage output despite rather heavy loading, is there some explanation for this condition?

10. Indication that this unit putting out only 4 watts into 50 ohm load.
11. Self locking screws on plate & battery washers.
12. Power^{light} is taking 15V = 1 watt 10ma,
and life - 3000 hr. life approx -
13. Diode for protection -