

ROUTING AND RECORD SHEET

INSTRUCTIONS: Officer designations should be used in the "TO" column. Under each comment a line should be drawn across sheet and each comment numbered to correspond with the number in the "TO" column. Each officer should initial (check mark insufficient) before further routing. This Routing and Record Sheet should be returned to Registry.

FROM: R&D-EP	TELEPHONE	NO. DATE 15 September 1955
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TO	ROOM NO.	DATE		OFFICER'S INITIALS	TELEPHONE	COMMENTS
		REC'D	FWD'D			
1. R&D Lab			9-20	MHT		Excellent info on field problems with equip!! MHT
2.			9/21	CR.		
3.			9/21	84		
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NEXT REVIEW DATE: _____

AUTH: HR 70-2

DATE: 1 DEC 1980

REVIEWER: 064540

13 September 1975

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Trip Report 11 July to 1 September 1955, WMECA and Return

1. The following report concerns the writer's activities involving [redacted] maintenance and air-readiness problems at WMECA. This report is essentially the same as that submitted to Chief, WMECA, for transmittal to Headquarters as attachment to WMECA 55-831. Referenced attachments, photos, and pen recordings will accompany the WMECA report.

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2. The writer arrived as scheduled on Tuesday night, 12 July, and was met at the airport by the Deputy Chief, WMECA. (Courier privileges were not tested.)

3. After a brief tour of the areas concerned and a conference with Chief, WMECA, the writer joined [redacted] and assisted in the development of a suitable mobile service unit aimed specifically at [redacted] maintenance problems. As mentioned in the WMECA June Monthly Report, the unit consists of a 6 x 6, 2½ ton military truck upon which has been mounted a NO-27 radio station hut, to which power is furnished by components mounted in a ½ ton trailer. (See attached photos.) AC power supply consists of a Fairbanks Morse 5.75 KVA diesel generator set up for 60 cycle operation. The DC supply consists of storage batteries and three powercon converters capable of driving the [redacted] equipment. There is also available, one DC converter, capable of supplying sufficient power for illumination purposes in event of a serious generator breakdown. Due to the lack of space in the hut, limited shop facilities were selected and installed. The attached inventory covers equipment and facilities installed.

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4. The entire unit was moved from [redacted] on 27 July. Prior to moving the unit, some test equipment was lashed to the top of the bench and the chairs were lashed to the bulkheads. Parachute webbing, buckles, and snaps were used to an advantage in tying down the equipment.

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5. During the period 27-30 July, efforts were made to collect and temporarily install a [redacted] mock-up in the hut. One set of the equipment removed from the [redacted] Iraned to the EI is now being used. All spare components available in the area were collected and placed in the hut for checking, repair, and re-storage.

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6. On 30 July the unit was moved to [redacted] following transfer of the aircraft to the same location. The period 30 July - 9 August was one of a continual operational alert. Attempts were made to place the equipment in the best possible operating condition under the alert. The checking process included antenna continuity checks, crystal checks, removal of the preamplifiers, junction boxes, and receivers for bench checking, and cable continuity checks throughout the aircraft. The [redacted] equipment was also removed for bench checking. All tubes were tested; preamplifier tubes were specially checked for microphonics. All tests and checks were conducted under some degree of stress and were based upon operational expediency. To facilitate visual monitoring during alignment and operation, one mirror change was made in the equipment. The neon channel indicators were brought out to the front panel directly adjacent to the corresponding input cables. At a later date, the threshold controls will also be made available on the front panel for screw-driver adjustment only. After the equipment was completely checked and returned to the aircraft, test recordings were made with the aircraft turning up. The [redacted] equipment appeared to be operating fairly satisfactorily. The [redacted] equipment was noisy due to microphonics in the preamplifiers, caused by poor shock mounts. The shock mounts were chipping out, allowing metal to touch metal. The coding signal level in the [redacted] equipment was too low in amplitude. (See recordings.)

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7. During the equipment and system checking, the following discrepancies were noted and corrective action taken:

- a. Three antennas were found to have intermittent continuity to ground. The Notification had been made, but the antenna had not been assembled tight enough afterwards.
- b. Three antennas had to be replaced; one due to stripped threads between the filter section and face plate, one due to corrosion, and one due to damaged receptacle fitting.
- c. Nine crystals were found to work unsatisfactorily, three of which gave no results at all.
- d. Twelve crystal holders were defective. The scotch tape insulation had become defective in several cases. The brass pressure spring had become loose from its lead solder mount in six cases. Electrolytic was apparent between the brass fitting and the silver plated shell in several cases.
- e. One cable connector was broken at the crystal holder.

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- f. Three cases were discovered where cross connections existed between crystal holders and preamplifiers, resulting in false channel indications.
- g. Several 88-239 amphenol fittings on the preamplifiers had become damaged and had to be replaced.
- h. One channel of a preamplifier in the [] had no tubes. Empty tube shields were intact. 25X1
- i. One amphenol fitting No. 91MC4F1 used in the power cable to a preamplifier failed at the preamplifier due to 28 volt short to ground. A small screw used in capturing the bakelite insert had penetrated the bakelite to the point of contact with the 28 volt pin receptacle. (This is a design fault. In the meantime, pins No. 1 and 4 should be interchanged on all amphenol receptacles No. 91FC4F and 91FC4M. This will place ground potential near the capture screw.)
- j. Preamplifier shock mounts were overloaded by the weight and influence of the couplings, cable, and cable tie-downs. All shock mounts have been temporarily beefed up with foam rubber.
- k. Several 90 degree angle coax fittings used with 88-239 amphenol fittings on the front of the junction box were found loose and defective. Part of the threaded area of the 88-239 is sacrificed behind the eighth inch chassis panel. All 88-239 fittings on the junction boxes will be mounted on the outside of the panel at a later date.
- l. Ground straps were found to be broken or disconnected from both junction boxes and several preamplifiers. 25X1
- m. Both the [] and the [] recorders in the [] had been adjusted to operate at a speed 16% lower than standard. This resulted in a time consumption for each one hour cartridge of one hour and six minutes. The recorders were re-adjusted to standard. 25X1
- n. Vibration had caused a number of nuts and washers to work completely loose in the junction box and one preamplifier in the [] (During the checking, a small washer gave the equipment a real smoke test by shorting out B plus, causing resistor R-129 to burn out.) 25X1

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- e. A number of microphonic tubes were replaced in the junction boxes and preamplifiers.
- f. The coding oscillator in the [] equipment was operating unsatisfactorily due to the failure of resistor R-423. 25X1
- g. All main voltage levels in the equipments were at lower levels than those specified in the handbook. While operating in the aircraft, the aux power supply in the aircraft had to furnish 30 volts to the dynamotor in order to have delivered to the equipment the required 25, 300, and 150 volts.
- r. The 4 and 6 kc notes were found to be low by approximately 3 to 5 hundred cycles.
- s. Both equipments were found to be operating at considerable decreased sensitivity in an effort to keep the equipment from keying on noise. The ground and airborne tests have been conducted with the sensitivity adjustments at maximum in an effort to search out noise sources in both the equipment and the aircraft. It has been determined that the equipment will key on, and record, the aircraft VHF transmissions and practically all transients caused by impressing a load on the 25 volt aircraft supply. Operating at maximum gain has also helped to determine preventable noise sources such as poor continuity in couplings, poor grounds, and microphonic tubes which had not been discovered during the bench check-out.
- t. Several potentiometers used in the sensitivity controls in the junction boxes were noisy when subjected to vibration and shall have to be replaced. Temporarily, the noise has been restricted by placing pot locks on all sensitivity controls.
- u. The junction box in the [] showed evidence of corrosion caused by a leaky hatch. Front couplings were beginning to corrode rather heavily. It is understood that waterproof covers are available in the area. 25X1

8. Since no flight test operations were possible while the aircraft was [] performance had to be judged solely upon ground run-up checks. These checks were aggravated continuously by an extremely strong local GCI signal at a frequency below 2100 mcs. The signal was so strong, in fact, that it has been suspect in two cases of causing some damage to the crystals. 25X1

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9. On 9 August, after an unproductive alert, the aircraft and maintenance unit was transferred back to [redacted]. A short test was conducted during the aircraft transfer. The attached pen recordings indicate some of the discrepancies encountered. The equipment on the [redacted] appeared to operate satisfactorily except for some intermittent coding. It was difficult to determine how much of the intermittent coding was a result of malfunction in the equipment and how much was the result of coding lock-up due to two strong local signals [redacted]

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10. A superficial analysis of the pen recordings made during the tests indicates that considerable additional work is required toward balancing the coding indicators, time delays, and left-right timing circuits under "in-flight" stabilized power conditions. Since the equipments have proven capable of satisfactory operation while on the battery without the aircraft engines turning up, the noise problem becomes one of screening the "in-flight" aircraft for filterable electrical noise where practicable, while continually striving to reduce equipment microphonic, loose coupling, crystal, and crystal holder noises. Aircraft equipment actuators, local power supplies, and main aircraft voltage regulating equipment will become major check points. The noise search program will be used to an advantage in the training program.

11. During the period 9-22 August, further checks have been in process at [redacted]. During this period one fully equipped [redacted] visited the airport, staying for about a week. During its stay, two crystals on the [redacted] and one on the [redacted] were discovered shot. The [redacted] is suspect of causing crystal damage; however, since its departure, two additional cases have been observed where extremely strong local signals have been received and recorded by equipment in the maintenance unit. The signals were not present for more than a few minutes in either case, indicating possible pre-flight check on NARS navigational radar. From an area supposedly sparse in signals, it suddenly becomes advisable to take some action to protect the crystals. The advisability of removing the crystals except during operational periods has been entertained, but this process in itself is a damaging one and a deterrent to continual maintenance and flight checks. An alternative is the installation of easily removable metal shields. Prior to taking action to protect the crystals, further checks should be made.

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12. During the period 23-27 August, the maintenance unit was returned [redacted] for necessary truck and trailer maintenance. The oil pump on the Fairbanks-Morse diesel generator had sprung a leak, the fuel tank on the Fairbanks-Morse is inadequate requiring a five gallon supplementary tank, the wiring system on

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the truck was rechecked, and the fourteen converters were rechecked for ground isolation. In the meantime, an inventory has been taken, and a revised spare parts list drawn up. On Saturday, 27 August, the maintenance unit was transferred to [redacted] for equipment check-out during Saturday and Sunday. On 29 August the aircraft and unit were transferred [redacted] for operations. On the days that operations take place, the maintenance unit will be manned until one hour prior to the time the flight leaves. The training officer will brief the flight crews on operation of the [redacted]

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13. At the present time the personnel requirements for maintaining the [redacted] and associated equipment and manning the data reduction center appear satisfactory. [redacted] are assigned with [redacted] having had KI training in the field on equipment maintenance. [redacted] are just beginning their training, while [redacted] is still on [redacted]. [redacted] has demonstrated exceptional aptitude during the writer's stay and has indicated a desire for further training and assignment in [redacted]. [redacted] has been bird-dogging the activity for [redacted] and has indicated a desire for further assignment in the [redacted] as a trouble shooter. [redacted] Chief of Training, has indicated a desire to become more active [redacted] (He is slated for KI in April 1976. The interim could be used to an advantage for prototype evaluation during training of our own personnel.) [redacted] has been extremely helpful and cooperative. (Attempts were made to remove him from the project after establishment of the WNSA maintenance responsibility. [redacted] was successful in stopping any action to remove him. He is now assigned to assist in the project except when actually flying or maintaining communications equipment for which he is responsible.) He has made flight checks on the equipment during periods when the aircraft could not be made available to us, and has been our main contact for getting immediate access to aircraft, having the aircraft turned up when desired, and scavenging parts. [redacted] as Area Engineering Chief, has been briefed on the operation of the [redacted] equipment.

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14. Based upon the writer's observations during the visit to WNSA, the following recommendations are made concerning [redacted] efforts:

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a. The Mobile Maintenance Unit

- (1) As long as the present situation continues whereby aircraft are located at bases lacking in local maintenance facilities, a mobile maintenance unit will be required. The maintenance unit should contain all necessary maintenance and test facilities plus a characteristic group of spares. It should also

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be reasonably comfortable to work in. The present maintenance unit is too small to fulfill all the requirements. It is recommended that a larger maintenance unit be supplied WEMCA for this purpose.

- (2) The power trailer should be equipped with a larger and more stable 28 volt supply capable of furnishing on a simultaneous basis the power requirements of the maintenance unit and the aircraft electrical system. Suitable aircraft type power cords and plugs should be furnished with the power units.

b. The Equipment

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- (1) Maintenance of the should be placed on a continuous basis until the equipment performance is brought to the maximum and all personnel involved in the maintenance are thoroughly trained. This necessarily involves coordination with maintenance personnel in hunting down filterable or preventable aircraft electrical noises.

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- (2) The following minor modifications are considered conducive to good operation and maintenance:

- (a) All neon channel indicator lights should be moved to the front panel on the junction box.
- (b) All threshold controls should be moved to the front panel for screwdriver adjustment only.
- (c) The signal levels seen by the junction box should be the same from all preamplifiers. This can be accomplished by placing screwdriver adjusted controls in the output of each preamplifier. This will compensate for variance in antenna, crystal, and preamplifier performance.
- (d) The preamplifier shock mounts should be replaced with more appropriate mounts. The mounts should be designed and constructed in the ZI and sent to the field as soon as possible.

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- (e) All HFG type crystal holders should be replaced by a type designed and built by a concern specializing more in microwave components.
- (f) All 60-239 type coax fittings should be moved to a front mounting position to increase the threaded area for couplings.
- (g) The current handled by the contacts of relay KY-2 should be reduced to the minimum required by placing a resistor in series with the coil of relay KY-1.
- (h) The regulators on the FS-9⁴ dynamos should be adjusted to deliver 300 volts based upon the average voltage level available at the input of the dynamos.
- (i) The attached list of equipment and spares should be furnished as soon as possible.

c. Gas Aircraft

- (1) Noise checks are required on the aircraft electrical system. This is a responsibility of WENCA in coordination with 25X1
- (2) The equipment must be protected from the weather, leaky hatches, etc. If hatches can't be kept in repair, covers should be provided.
- (3) The aircraft should be made available on a progressed basis for maintenance checks and preflight checks. If possible, pre-flight checks should be made one or two days prior to an actual operation.

d. Security

- (1) The physical security of both 25X1
 appears to be somewhat questionable. 25X1
 At civilian personnel are allowed 25X1
 to roam at will. At where a con- 25X1
 siderable amount of construction is underway, the aircraft and truck have been scrutinized from a distance up to 500 feet by the workmen. Telephone lines at have been 25X1
 subject to two accidental breaks during the

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past month, and on two occasions, parties were found waiting on the telephone line to which they stated they were connected by mistake. This is a local problem with little control possible; however, all personnel involved in the operations should be informed of the necessity for continued alertness.

- (3) The security consciousness of [] personnel during the periods at [] appears to be satisfactorily in keeping with the sensitivity of the job at hand.

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e. General Policy

- (1) The personnel involved in [] WNSCA should be read in as thoroughly as possible on the overall objectives, the timing, the training, the prototype equipment available, and the personnel plans of the effort as pertains to WNSCA. Both the effort and the moral of the personnel concerned would benefit from a wider distribution of information apparently available at Headquarters. Equipments, such as the AFR-4, have arrived in the area with no instructions as to its employment.
- (2) The WNSCA area has collection potentials in the four broad categories [] and should be exploited with whatever prototype equipments headquarters can furnish. The prototype equipments should also be available in the area for training purposes in anticipation of future operations.

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15. During the writer's visit, effort has been concentrated upon cleaning up the equipment at the nuts and bolts level. Little time has been available for setting up the [] unit for systems checking. All HF checks on the equipment were made with the flash light size buzzer, the output of which was sufficient to key the equipment at distances up to one hundred feet. The buzzer and hearing aid proved to be ideal for trouble shooting.

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16. The writer welcomed the opportunity to make the subject trip. While the efforts were not intended to serve as a cure-all for all the ills of the [] system, it is felt that if the procedures introduced and the recommendations made are acted upon with the same enthusiasm evident during the period of the visit, the future results obtained should show great improvement. It should be kept in mind that one of the major stumbling blocks effecting the sensitivity and performance of any wide band system is electrical noise from sources external of the equipment itself. The

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noise may be radiated and/or introduced through the supply lines. This has been highly evident in the [redacted] equipment and will continue to be a problem in all other wide band equipments. When and if the HF range of the [redacted] equipment is extended downward, the problem is expected to become more troublesome. The noise problem should be reckoned with more seriously in future equipment planning. All aircraft, boats, and vehicles involved [redacted] should be assumed to be noisy until thoroughly checked.

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17. In the opinion of the writer, the [redacted] has the capabilities of testing an improved version of the [redacted] equipment utilizing a number of the present basic components. Antenna modification kits could be fabricated at Headquarters. Dimensional differences could be kept to a minimum by constructing a new antenna set-up with the same in-board restrictions as those of the present set-up. The out-board set-up could be covered with a suitable radome. The same preamplifier set-up could be used, and all cabling would be the same. The junction box would be modified by bringing out three signal leads and inactivating the identification circuits. Three piece recorders, or a three channel tape recorder, would be required.

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18. On or about 20 September 1955, the [redacted] to California is due to be returned [redacted]. The [redacted] is expected to stop at Andrews Field on the way [redacted]. Here is an opportunity to ship directly [redacted] an urgently required junction box, 28 volt supply, and a number of other items requested [redacted].

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CC-E/R&D-EP/VEB;msb (14 September 1955)

CC: Monthly Report (2)
R&D Subject File
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