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*2-101 J. L.*

RESEARCH ORDER #1

11 May 1955

PHASE 2a - PROGRESS REPORT #4

This report covers the period from 15 February 1955 to 1 April 1955.

OBJECTIVE:

To construct two complete sets of equipment (4 units) to serve as design approval models, based upon the results of the work accomplished in Phase I.

DISCUSSION:

The first unit of the design approval models was essentially completed 1 March 1955. Individually the various parts of the system functioned well and according to expectations; however, several features of the mechanical system were not completely satisfactory.

In view of the above situation, and after discussions between customer personnel and the contractors, it was decided to modify immediately the mechanical design to bring about improvements in the final design approval models.

The following units were considered satisfactory:

1. Optical system
2. Electronics system (transmitter-receiver)
3. Electronics power supply
4. Battery charger-regulator, and
5. Nite viewer.

Construction was completed on the above units for the four models during the month of March.

Major mechanical changes were incorporated in the four models as follows:

1. The clamps for fastening the front and rear covers to the frame were too light. Larger clamps were purchased for the four design approval models.

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2. The unit when mounted on its tripod platform had a tendency to fall forward when released from its locked position. The end plates were redesigned to move the center of gravity of the unit directly under the supports.
3. In the first unit it was possible for locking nuts to be completely removed with the chance of the operator losing them. Locking arrangements were redesigned so that locknuts are not removable in the final models.
4. The scanning yoke was found to be too light for the weight of the unit. This yoke was strengthened by increasing material thickness in the final models.
5. A taper pin and chain arrangement was used at the top of the tripod legs. This arrangement was changed to a ball and socket joint, in the final models to improve ease of assembly and strengthen the assembly.
6. It was possible to force the legs into position the wrong way in the tripod platform of the first model. This problem was overcome by making it possible to mount the legs either way.
7. In the first model numerous holes were drilled in the plastic window for mounting purposes. The mounting method has been changed so that no holes in the plastic window now exist. A metal frame fastened to the cover by means of screws holds the plastic window securely in place.

The above changes required modification in design drawings and specifications. Upon completion of design changes, the parts for the four remaining models were fabricated in our model shop.

Four models were constructed, optically aligned and collimated at a distance of one mile. All four were field tested over a range of 4.5 miles, the maximum range available to us for this purpose.

#### RESULTS OF TEST:

Tests were conducted both in daytime and at night at 4.5 miles. Weather was clear; transmission was estimated to be 0.6/sea mile or less.

#### Comments on Test

1. Intelligibility - The units performed excellently from this standpoint. Words were crisp, and individual voices instantly distinguishable. Voice conversation was considered superior

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to ordinary good telephone conversation, and several conversations were carried on between various members of the group present. The excellent intelligibility seems to confirm our original choice of the audio frequency pass band and the rising response within that band. This system response was obtained by proper choice and design of the individual characteristics of the microphone, modulator, transmitter-receiver amplifiers, and the headset.

2. At no time during operation was it required to operate with the receiver gain control set more than half way toward maximum gain. System noise was low, and optical interference caused no difficulties in carrying on normal conversations.
3. Modulation was easily controlled by adjusting the gain. This made it easy when the operator wished to speak in a low voice. By watching the neon lamp, and adjusting the system so that the lamp glowed from 10 to 20% of the time, maximum signal was achieved without distortion.
4. During night operation at the range given above, it was easy for the listening operator to signal for a break-in to speak. The speaking operator watched through his viewer. When the light went on from the listening station, it indicated that this operator wished to take over and transmit. This procedure while practicable at night was not too comfortable. During the daytime at a long range it was not usable.

Various opinions were expressed by members of the group after extensive use of the equipment during both daytime and nighttime operation. Following are three major conclusions reached by the group.

1. During daytime operation good landmarks are essential for a satisfactory find operation in a minimum length of time. Over a range used, 4.5 miles, the viewer was useful in daytime, not because one could see the other light thru it but because of familiar background. The viewer should therefore be useful in daytime operation, where the operator has some knowledge of the background surroundings of the receiver location.
2. The viewer is a necessity for night operation, and in fact enables an operator to establish a find in relative short time.
3. The automatic scan mechanism is not essential, in fact the personnel present at the test felt that it should not be a part of final equipment.

Following completion of the field tests the four units were packed for shipment and turned over to a representative of the customer.

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**PROGRAM FOR NEXT INTERVAL:**

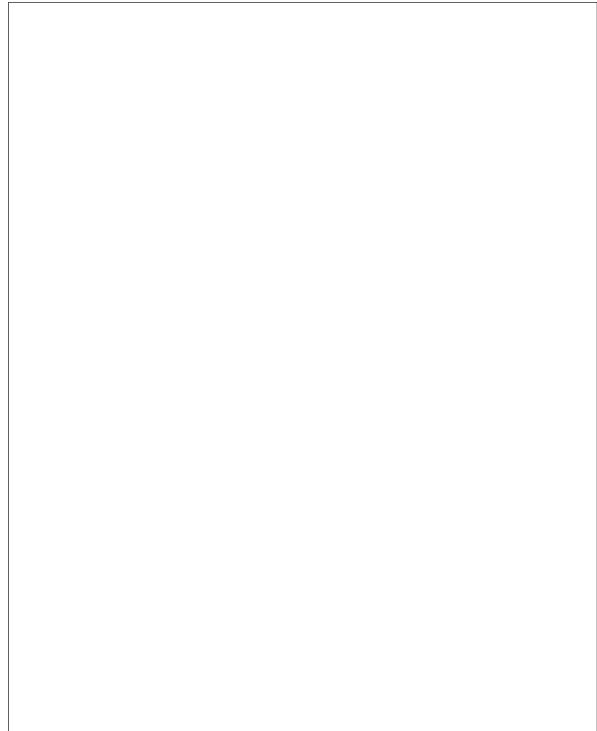
Upon evaluation and field testing by customer personnel, the equipment will be returned to us for the following work.

1. Environmental tests (originally scheduled for completion 7 May 1955).
2. Modification in design based on results of environmental tests and customer's experience with the units. (Scheduled for completion 21 May 1955.)
3. Construction of one unit incorporating any changes brought about by modification in design. (Scheduled for completion 1 June 1955.)

It is expected that this unit will serve as the first of twenty (20) production units.

Report prepared by:

Report approved by:



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