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Plus Ref. (a)



21 January 1959

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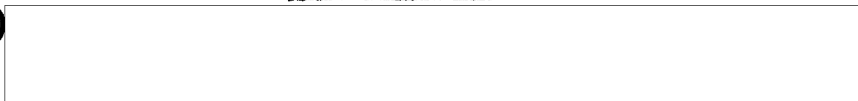
Dear



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**SUBJECT: LRS Evaluation - Quotation**

**Reference: (a)**



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In response to your request of recent date, we are submitting our quotation on the LRS Evaluation. The technical details are described in the attached Reference (a). The cost breakdown is as follows:

Engineering, Direct Labor

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ILE,

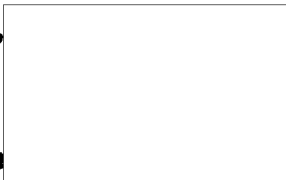


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Material & Other Charges

Sub-Total

G&A,



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Total

Fixe

Total Cost Plus Fee

\$ 17,670

It is certified that the ILE and G&A estimating rates used above have been approved by the respective Resident Department of Defense Auditor.

The work proposed in Reference (a) can be completed in fourteen (14) months from the date of acceptance of contract award. The following reports will be issued in conjunction with this work:

- (1) Final Report covering Test Program - Five (5) months from date of acceptance of contract award.
- (2) Life Test Supplement - Fourteen (14) months from date of acceptance of contract award.

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SUBJECT: LRS Evaluation - Quotation



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This quotation is made subject to your agreement to provide the following Government-furnished equipment:

- (1) Two transmitters
- (2) Seven receivers

Any special terms and conditions relating to work under this quotation and/or with reference to the basic agreement, should be provided in writing.



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Attachments: (3) copies of Réf. (a)

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**LRS EVALUATION**

[Redacted]

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**13 January 1959**

**PREPARED FOR**

[Redacted]

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**By**

[Redacted]

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13 January 1959

**LRS EVALUATION****PURPOSE**

The object of this proposed program is to obtain through test and observation, sufficient data to permit appraisal of performance, suitability and reliability of the LRS-1 system. A secondary objective is the generation of conclusions and recommendations derived from test results, which may improve the usefulness of the equipment. A final report will be issued at the end of the regular test program and a life-test report will be issued at the conclusion of the life-test period.

**DISCUSSION**

The evaluation program will be divided into three general categories: Laboratory Tests, Field Tests and Life Tests. The laboratory tests include all tests and measurements of equipment characteristics which can be compared directly with similar measurements on other apparatus. Laboratory tests should be made under controlled conditions using techniques and instrumentation which may be duplicated at any time. Laboratory test results provide the fundamental data upon which an evaluation can be made. Field tests are composed of measurements made under simulated field conditions to provide some indication of expected performance in actual use. In general, field test results are not duplicable and cannot provide a sound basis for objective evaluation. Field tests and results when specified and interpreted by the user can provide valuable information relating to improved application. Life test results

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provide indications of expected equipment life and deterioration with age. Since in this program it is not possible to test a statistically adequate sampling of equipments and environments, test results cannot be considered conclusive. Throughout the entire test period, the equipment and instruction material will be subject to critical observation and subjective appraisal. Such observations will cover the areas of operation, installation, maintenance, general handling precautions, and improved design.

For the tests enumerated, at least two transmitters and seven receivers will be required. One transmitter and three receivers are required for life tests, as described below, and the remaining transmitter and receivers are the minimum required for laboratory and field tests.

#### TESTS TO BE PERFORMED

While it is beyond the scope of this proposal to describe, in detail, the tests required, the following listing is indicative of the types of tests to be performed. Included are those measurements specifically called for by the user. Standard test conditions applicable to this equipment will be established as soon as possible after receipt of the units.

#### I. LABORATORY TESTS

##### A. Receiver Measurements

Measurements will be made on receivers in the condition received. One receiver will be aligned and partially rechecked. Should a substantial difference be noted, all receivers will be re-aligned and re-tested.

Whenever possible, receiver measurements will be made using a CW signal from a precision signal generator. Where pulsed signals are required, the signal generator output will be suitably modulated.

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Receiver input measurements will be made at the antenna terminals as determined by calibrated signal generator output. Receiver output measurements will be made as DC at the detector output.

1. Frequency and Bandwidth

- a. Measure detector output as a function of input frequency with signals near the limits of dynamic range.
- b. Determine center or peak frequency.
- c. Determine bandwidth between 3 db points.

2. Sensitivity

- a. Measure detector output as a function of input signal from no-signal to a maximum value.

3. Dynamic Range

- a. With a pulsed source, measure lower and upper limits of signal amplitude which cause the relay to actuate consistently.

4. Pulse Length Tolerance

- a. Vary length of operating pulse and determine points at which relay fails to operate consistently.
- b. Repeat test with signal limits near extremes of dynamic range.

5. Contact Resistance

- a. Measure switch contact resistance in terms of voltage and current for several values of current within the specified limits for AC and DC.

6. Power Source Variations

Measure characteristics under standard conditions for variations in power supply voltage from 0 to 7.5 v.

- a. Current - Current drawn by unit.
- b. Bandwidth and Frequency - Measure frequencies producing signals 3 db down at detector. Determine bandwidth and

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center frequency.

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c. Sensitivity - Measure detector output for standard on-frequency inputs. Measure minimum pulsed signal which will produce consistent relay operation.

d. Pulse Width Tolerance - Measure maximum and minimum pulse lengths which will produce consistent relay operation with standard, input signal.

## 7. Temperature and Humidity

- a. Vary temperature between 0° and 60°C.
- b. Vary humidity between 0-5% and 95-100%, with low humidity at low temperature and high humidity at high temperatures.
- c. Perform same measurements described under Power source variations and with a battery power supply.
- d. Measure power supply voltage.

## B. Transmitter Measurements

Measurements will be made on one transmitter tuned in accordance with the instruction manual.

Except where necessary, tests will be made with CW operation.

### 1. Frequency

a. Frequency will be measured as tuned per instruction book.

### 2. Power Output

a. Power output will be determined by measuring voltage across the specified dummy load.

### 3. Pulse Width

a. Pulse widths at extremes of pulse width control will be measured with transmitter as received.

b. Pulse widths at extremes of pulse width control with control adjusted in accordance with instruction book.

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## 4. Power Line Variations

Power line effects will be measured over ranges of 0-125v, 0-250 v for the 115 v and 230 v settings, respectively, of the line switch. The compensating control will be set at a fixed, median value. Measurements will be made with the transmitter as tuned at the nominal line voltage.

- a. Frequency - Frequency will be measured.
- b. Power Output - Power output will be measured across a dummy load.
- c. Pulse Width - Pulse widths obtainable at the extreme settings the pulse width control will be measured.
- d. Line Power - Power line current and power will be measured.

## 5. Temperature and Humidity Test

- a. Vary temperature in a range from 0° to 60°C.
- b. Vary humidity in a range from 0-5% to 95-100%, with high humidity at high temperature and low humidity at low temperature.
- c. Perform same measurements listed under Power Line Variations with fixed line voltage.

## II. FIELD TESTS

### A. Receiver

#### 1. Antenna Tests

With a fixed transmitter range and antenna height, the signal received by the receiver will be measured at the detector output for the following antennae.

- a. Tuned half-wave doublet.
- b. 1/4-wave straight wire.
- c. 1/8-wave straight wire.

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d. 1/16-wave straight wire.

## 2. Irregular Operation

a. A random selection of CW, Voice and musical signals will be fed to the input of the pulse discriminator. For each type of signal, the time of occurrence of triggering action will be measured.

b. Observations of irregular triggering during life tests and bench test will provide remaining information in this area.

## 3. Altitude

a. One unit will be subjected to a pressure of 2.5 psi, corresponding to an altitude of 40,000 ft. for one hour. Operation will be checked after return to ambient conditions.

## 4. Temperature

a. One unit will be subjected to a temperature of -65°F for two hours. Operation will be checked after return to ambient conditions.

## 5. Vibration

a. One unit will be subjected to vibration for a maximum of one six-hour period in a manner to be specified, in detail, by the customer. Following vibration the unit will be checked for proper operation.

## 6. Drop

a. One unit will be dropped in a manner to be specified, in detail, by the customer. Upon completion of the drop, the units will be checked for proper operation.

## B. Transmitter

### 1. Antenna Tests

Field intensity will be measured at fixed range and antenna

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height for the following antennae.

- a. Tuned half-wave doublet.
- b. 1/4-wave straight wire.
- c. 1/8-wave straight wire.
- d. 1/16-wave straight wire.

## 2. Altitude

a. One unit will be subjected to a pressure of 2.5 psi. corresponding to an altitude of 40,000 feet, for one hour. Operation will be checked following return to ambient conditions.

## 3. Temperature

a. One unit will be subjected to a temperature  $-65^{\circ}\text{F}$  for a period of 2 hours. Operation will be checked following return to ambient conditions.

## 4. Vibration

a. One unit will be subjected to vibration for a maximum of one six-hour period in a manner to be specified, in detail by the customer. Following vibration the unit will be checked for proper operation.

## 5. Spurious Output

a. Transmitter output will be checked for harmonic content and parasitic oscillations.

## C. SYSTEM OPERATION

Operation of the LRS-1 system will be checked with transmitter and receiver located in two different rooms on the same floor and between rooms five floors apart. Operation will be checked by relay operation and by signal strength at receiver detector output. The following conditions will be checked over each of the two transmission paths.

1. With 1/4 wave antennas on receiver and transmitter.

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2. As above with receiver connected to heating pipes.
3. As above with receiver connected to water pipes.
4. As above with receiver connected to power line.
5. As (1) with transmitter connected to heating pipes.
6. As above with transmitter connected to water pipes.
7. As above with transmitter connected to power line.

### III. LIFE TESTS

#### A. Transmitter

One transmitter will be operated continuously from a nominal 115-volt power line. By means of a time clock, the transmitter will be actuated every five minutes. Tests will be made until a failure occurs or for one year, whichever is shorter. Periodically, check measurements will be made of the following quantities.

1. Frequency
2. Output Power
3. Pulse Width

#### B. Receiver

Three receivers will be operated continuously from battery supplies with one, two, and three batteries paralleled for the three receivers. Batteries will be replaced whenever the relay fails to operate. Relay contacts will be loaded to full rated current at 115 v. Improper triggering of the relays will be recorded. Tests will be continued until failure occurs or for one year, whichever is the shorter. Periodically checks will be made of the following quantities.

1. Battery Voltage
2. Sensitivity
3. Frequency
4. Bandwidth

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**IV. OBSERVATIONS:**

Throughout the test program, device operation will be observed specifically for information regarding the following:

- A. Reliability in use and general structural ruggedness.
- B. Vulnerability to damage due to mishandling or wrong connections.
- C. Detectability as affected by audible noise.
- D. Irregular operation of relays, particularly with respect to actuation rather than failure to actuate.
- E. Apparent adequacy of the instruction book. This assumes availability of a complete final version.
- F. Installation notes which may make for improved field operation.

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