File RD-27, Task II

19 May 1953

[redacted] R&D/EP

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Report of Trip [redacted]

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1. On 7 May 1953 [redacted] and the writer met with representatives of [redacted] to discuss the progress of the transistor development program. Representing [redacted]

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The morning session was devoted chiefly to discussion, first of administrative problems, then technical problems.

2. A problem causing considerable inconvenience to the group working on the transistor development was the classification of the bi-monthly reports. At present the reports are prepared on an unclassified basis and, after reproduction, are classified and forwarded to the Agency. After the reports are classified, because of security restrictions, the reports are no longer available to those working on transistor development. [redacted] has written the contracting officer requesting that the reports be allowed to remain unclassified. We advised them that we would give them a prompt reply as soon as the letter reached our group.

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3. The matter of funds was discussed briefly. From the figures available [redacted] their expenditures appeared to agree fairly closely with the pro-rated funds allotted the project.

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4. A general discussion of transistors relative to availability and reliability followed. We were informed that [redacted] had announced four types of transistors as being in production. These types, together with their developmental designations are as follows:

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Production Type	Developmental Type	Description
2N32	TA-165	Point contact - Pulse and switching applications
2N33	TA-172	Point contact - RF use - Oscillator applications in 50 mc. region. Unstable as amplifier
2N34	TA-153	PNP junction - Low power audio frequency
2N35	TA-154	NPN junction - Low power audio frequency

The [redacted] engineers do not believe that the characteristics of transistors are sufficiently controllable for production. Management, however, forced them to go into production. Production tolerances have not yet been established.

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5. A very discouraging problem at the moment is the very short shelf life (on the order of 1000 hours) of transistors (the reason Zenith quit manufacturing transistor hearing aids). The exact reason for the deterioration is not yet known to the engineers [redacted] although they believe that humidity is probably 50X1
a major cause.

6. [redacted] 50X1 stated that they now had a breadboard model of a transistor receiver and supplied us with the attached schematic. This receiver, at the moment, is capable of supplying 5 mw. into a 4000 ohm load with a sensitivity of approximately 100 microvolts (noise figures have not yet been determined since the receiver was just completed on the day of our visit). A considerable improvement in sensitivity should be possible since the sensitivity at the I.F. input is 160 microvolts and an overall gain of 12 to 14 is expected in the R.F. and mixer stages. As you will note from the schematic, the receiver has no AGC. Present investigations show that an additional transistor may be required for each stage to which AGC is to be applied. These additional transistors, however, will require a negligible amount of power to perform their function. (An AGC circuit using no additional transistors was added to the receiver in the afternoon. This was applied to the first IF stage only and caused quite noticeable detuning.) The TA-153 transistors employed in the receiver were selected for good RF response and amplification. The general run of this type (production type 2N34) will not function properly at RF frequencies. The TA-157 (an RF equivalent of the TA-153) is expected to operate quite satisfactorily at these frequencies and production of this type of transistor is expected possibly within 6 months.

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7. [redacted] questioned the [redacted] engineers as to whether they felt that it 50X1
was now feasible to consider constructing a transistor transmitter and receiver to cover the range of 2-8 mcs. They stated that the transmitter portion was still not feasible, but that the receiver (7" x 3½" x ¼"), with a sensitivity of 15 microvolts and an output of 5 mw. into a 4000 ohm load, should be readily obtainable by the time high frequency, production-type transistors are available (estimated at 6 months). [redacted] that we would advise them as to 50X1
whether we would be interested in the development of a transistor receiver. [redacted] 50X1
indicated an interest in undertaking the development but did not commit themselves to the project.

8. The [redacted] engineers indicated a definite preference for junction type 50X1
transistors and plan to use them wherever possible. They are convinced that the tetrode type transistor is the solution to RF operation (junction type with two base connections).

9. The afternoon session was spent in the laboratory. We were shown the newly constructed receiver and test equipment used for the project. The receiver was of breadboard construction and naturally included no attempted miniaturization. The current drain of the receiver was measured and found to be 16 ma. at 22.5 volts for the 8 transistors. The engineers believe that this figure could be reduced by 40% by using the proper battery voltages for each stage instead of the voltage dropping resistors employed in the breadboard receiver.

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10. We were shown some miniature components for use with transistor circuits. Among these were composition resistors manufactured by [redacted] approximately 3/8 inches long and about 1/16 inches in diameter and capacitors approximately 3/16 inches in diameter and 3/8 inches long having capacitances as high as 10 mfd. at 25 volts. We were also shown mercury batteries manufactured by [redacted] 50X1 50X1

11. Following the demonstrations in the transistor laboratory, we were given a brief tour of the laboratory.

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Attachment:
Schematic

cc: OC-E
Monthly Report
Chrono
Dev/EP

R&D/EP/JCB/mlk 19 May 1953