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**Some Projects Which Need to be Undertaken to Improve COMINT**

After our conversation about possible programs I jotted down these notes on directions which we should investigate, but in which we are now doing little or nothing. Some of the ideas put down here we discussed, and others have come to my attention since then.

1. Recent trends have made the radio spectrum above 20 megacycles more important for COMINT. Not only are the higher frequencies being used more by foreign states, but it has been found that under some conditions the ranges of propagation are much greater than previously thought, making intercept more feasible. For these reasons more intercept of these bands must be made.

Since the receivability of these signals depends critically on location, this operation will be partly, even largely, exploration. This can be done by mobile or semi-mobile teams of 5 men each, 2 scientists and 3 technicians. These teams will vary their techniques to fit the locale and frequency band in which they are working. They will explore only, and do no operational intercept. Operational plans will be based on the findings.

These teams should be in addition to the present plans for developing equipment in these ranges, which of course, will be the main support for the teams.

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2. The interception of telephony and telegraphy from wire lines and cables is far from impossible, even when the interceptor is not able to physically approach the wire. Equipment for this object should be developed, keeping in mind that it may need to be usable [redacted]. The engineering problem is not difficult and could be handled by 5 engineers in a suitable laboratory. Any [redacted]

3. It is my understanding that 80% of the COMINT effort is now expended in intercepting and returning foreign radio traffic, leaving only 20% of the effort for processing at NSA. This indicates that a strenuous attempt should be made to mechanize the collection and return of traffic. In the last eight years, most of R & D's attention has been given to analysis, leaving the collection to lag.

Therefore an experimental intercept station, (perhaps a mock up?), should be devoted to developing stream-lined procedures and equipment for minimizing handling, expediting the return, and improving the reliability of the intercept. The experiments should be carried as far as the initial processing (sorting, logging, etc.). A major requirement is that the procedures developed be compatible with data handling equipment to be developed for NSA.

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This is to be in addition to, and independent of, the presently active program to develop special radio receiving and terminal equipment for intercept purposes.

This proposed program could be carried on by ten experienced people at the intercept station and ten engineers to support it by planning and developing.

4. The mechanization of traffic analysis is lagging far behind that of cryptanalysis. In order to bring this lagging field up to the other, the following program should be followed.

A team of ten research analysts should be formed, to spend one year working on T.A. At the end of the year a group of engineers should be formed to mechanize the procedures produced by the first team. The size of the effort of this group should depend on the results of the team, but it could well be a three million dollar a year program, if in fact T.A. is susceptible to being mechanized to the extent C.A. has been.

5. We know that some of our equipments [redacted] gratuitously. Assuming that foreign equipments do the same, we should make a concerted effort to [redacted]. This can be done in three phases.

a. First design and develop a set of receivers for this special purpose, keeping in mind the possible need to take them surreptitiously into some areas.

b. Send out teams to experiment and survey. This is to be coordinated with [redacted].

c. Send out operational teams to the most productive places. This is probably a [redacted].

This program resembles program 2 above somewhat.

6. The big improvements in computers in the next few years will be in data handling. It looks as though there will be commercially available machines, such as the IBM 702, BISMALC, and RAYCOM, which will be useful. It is also apparent that the specifications set by COMINT needs will not be met by these commercial devices, because the market is not willing to pay for what they consider luxurious capacity.

We need to press for development to meet the FARMER-NOMAD specifications. This will be expensive, but worth it. COMINT needs call for speeds and capacity exceeding the IBM 702 by a factor of 16. The rental on the 702 will be one million dollars a year. This indicates that a ten million dollar program to achieve the goal would be worth it.

7. At the present time a great deal of useless information is intercepted and recorded. It would be possible by relatively simple mechanical techniques to recognize and discard much of this on some circuits. The techniques

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envisioned resemble those now being tried for "flash" transmission, and those being tried for PALLY. A relatively cheap program could experimentally establish the usefulness of the technique. This might be a phase of program 3 above.

8. Of all the techniques useful to COMINT, languages techniques pay off the best, yet we are doing nothing to improve or expand them. I propose that we set up a branch of five people, under Dr. John Watson if he can be had for that purpose, to improve language techniques. This would include statistical study of languages, such as parity bias, and mechanical aids to analysis and translation, but would not include dictionary compiling nor training of linguists. This is a long range program, not intended to furnish immediate results.

The preceding suggestions for projects have been considered only superficially. I do not now believe that any of these deserve more priority than the present program, but further study might well show that some of them are even more important than those now under way. The order in which they are listed does not reflect any priority order. None of them has been discussed with cognizant people. No serious thought has yet been given to the proper people and facilities.

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