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Critique and Proposal for Administration of Agency Automatic Sequenced  
Digital Computer Equipment

I. Present Situation

1. The present situation at AFSA regarding digital computer planning and operation will be better understood in the perspective of three types of influencing factors:

- a. Unification, and the residual influence of the two separate lines of development that had been under way under the previous Army and Navy sponsorship.
- b. Attempts, since unification, to maintain proper balance, between activities in the Offices of R and D and of Operations, during the various phases of computer development and operation.
- c. The rapid expansion of the digital computer industry, and its revolutionary influence on analytic and production activities at this Agency.

2. Without attempting specifically to trace the effects of the fore-mentioned influencing factors, the results will be listed below, with comments where called for:

- a. Division of responsibility for programming. There are now three different groups of people having three different concepts of their interest in preparing computer programs, in divisions 22, 34 and 35. Although valiant attempts at coordination of these activities have been made, the lack of clear-cut direction and assignment of responsibilities has led to confusion and dissatisfaction. For example, in "35" we are late in preparing for operation and maintenance of ATLAS II, due only to lack of personnel. Yet the total of programming personnel in "22", "34" and "35" would probably be adequate for our responsibilities if they were under one direction and if waste due to duplication of training were eliminated. The need for so much coordination on a "horizontal" plane increases paper work, and if indulged as completely as it deserves in the present decentralized treatment, would have us spending more time "coordinating" than getting work done. There is even waste or unbalance in travel allowances, since there have been many instances when attendance has been approved at computer association meetings for people from all three divisions.
- b. Because "22" anticipates the ultimate responsibility for operation of these equipments, a crew of maintenance personnel has been assigned at least a year in advance of anticipated need, to learn enough about ABNER. But at the same time, "35" has the responsibility, as per S.O.P., for "experimental operation", so that "35" also has under training, personnel of supervisory grade to take charge of maintenance until "22" takes official responsibility.

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A similar criticism can be made in the case of ATLAS I. Furthermore, even this official policy is not followed strictly; it is understood that upon delivery and installation of DELLA, "22" maintenance personnel will go to work directly, and "35" people will not even come into the picture.

c. In order for "22" to be abreast of developments in the field and to have some influence on features of Agency machines under construction, they are building up a staff of people, independently of "35" and are kept informed on technical progress in "35" and by contractors. In many cases, decisions to obtain equipment or decisions affecting specific features are made in "35" without full concurrence of "22". The latter resent this on the grounds that they (22) are to be the ultimate users and should have greater voice in such decisions. Actually, it is likely that both "22" and "35" are partly right.

d. From one point of view, the future of Agency computer equipment should be likened to a wartime period in Machine Division history. Operational experience with punched card equipment led to formation of a group within that division who developed equipment or proposed and designed equipment to be constructed outside. During that period a very healthy attitude made possible the construction, as wartime needs developed, of such important devices as the slide-run attachments, brute-force attachments, key-finder, characteristic message locator, and other devices operable in conjunction with standard IBM equipment. The analogy to be drawn is that computer-type equipment is likewise in the early stages of development in which the direction of the principal advances will be determined by people who gain experience in all phases of their operation. The interplay of the various factors influencing changes in equipment design is nowhere more intimate than in the digital computer field. The following are typical questions that immediately involve programmers, cryptanalysts, operators, maintenance men, mathematicians, and design engineers:

- a. Determination of the degree of specialization to build into individual orders;
- b. How reliable are certain newly tried engineering techniques;
- c. What is the proper emphasis to give to built-in checks;
- d. The effect on programming techniques of various new design proposals;
- e. Relative operational dependability of serial-versus parallel-type construction;
- f. To what extent are certain cryptanalytic attacks amenable to digital computer programming techniques, and at what point should specialized equipment be recommended;

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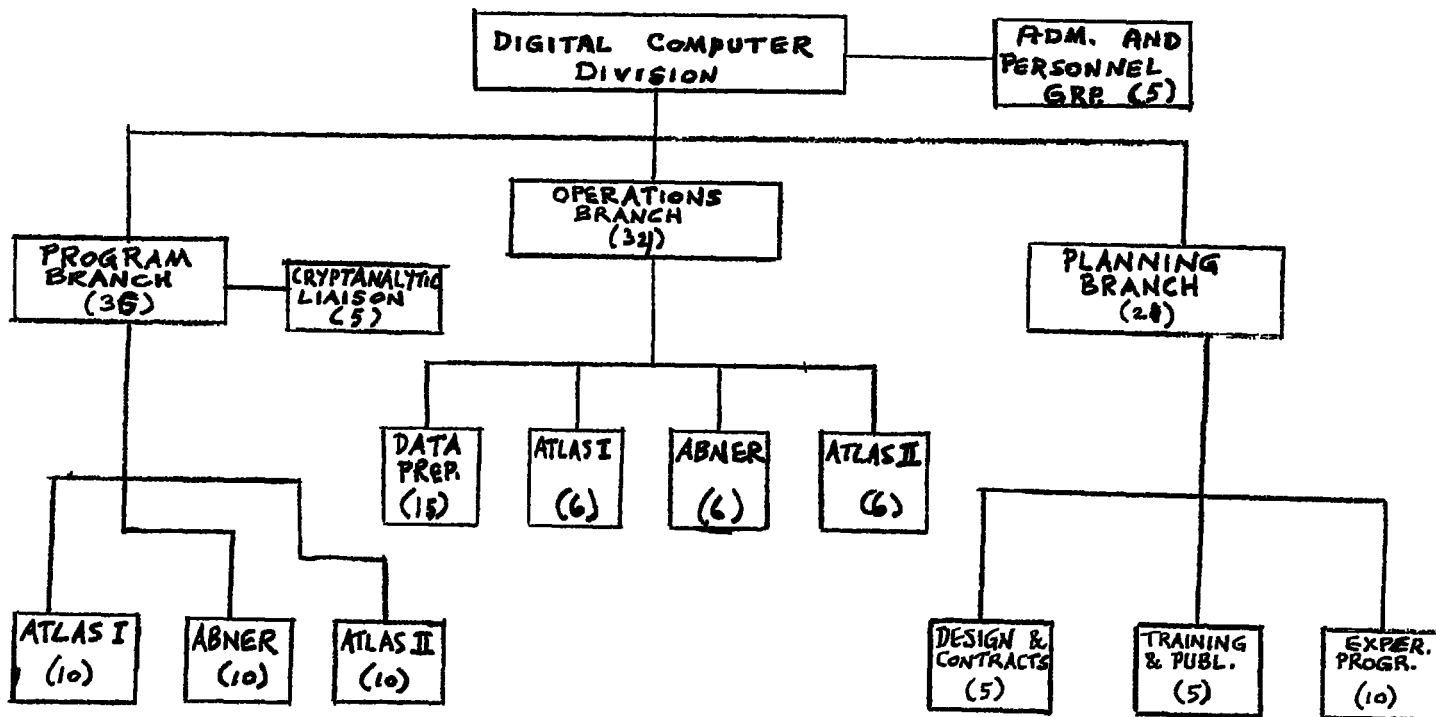
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Yet under the present setup, every such question should properly be considered by personnel in at least two, and sometimes four divisions, and overlaps "offices". The amount of coordinating is too great, and it is unsatisfactory since no authority is present to enforce a decision. One serious result of this has been that decisions on technical matters are too often made by administrative supervisors at an echelon too high for good technical continuity. The chains of command in the various administrative groups having day-to-day interest in the computer field do not actually come together except at the level of Director of the Agency.

## II. Proposed Solution

1. It is proposed that a new division be created within the Office of Operations, called Digital Computer Division. It would have responsibility for all activities in the field of general purpose automatic sequenced equipment, with exception of that research and development work necessary to keep abreast or ahead of outside engineering accomplishments and techniques having possible applications in this field. The latter activity should be retained by the appropriate branch in 35.

2. The following is a proposed Table of Organization for a Digital Computer Division:

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3. There are several comments that can be made on the effect of a centralized setup for all digital computers.

a. The feasibility of the digital computer as an operating equipment and its versatility for use in cryptanalysis has been established. Programming of analytic jobs for digital computers is a unique specialty not required in any other machine types, but still, among various digital computers, similar in philosophy. It would not be an exaggeration to state that application of digital computer techniques for cryptanalytic purposes is effecting the greatest revolution in cryptanalytic machine aids since establishment of the first punched card installation in this activity.

b. At present there are about 50 people at the Agency engaged in different phases of this activity, not including those in 352; these latter would be among those likely to remain in 35 under the proposed setup. Since delivery of ATLAS I Serial 2, ATLAS II Serial 1, ABNER Serial 2, IBM's EDPM will take place within 12 to 18 months, the computer installation at the Agency will become quite formidable, and in fact eventually, with delivery of NOMAD, will undoubtedly be the largest in the world. The scope of these machines is so great that an estimate of the Agency's capital investment in equipment by the time NOMAD is completed, might exceed ten million dollars.

c. The foregoing T.O. represents a tentative framework that could be implemented at once; gradual expansion to the strength indicated should take place over the period of the next year, at which time the total division size would be in the neighborhood of 100 people. With greater concentration on preparations for NOMAD, at that time further increases might be anticipated. Only the early creation of a centralized organization will make it possible for an intelligent administration to keep this extremely important activity from becoming more and more a helter-skelter of competing groups.

d. It is visualized that the group "Cryptanalytic Liaison" would be the link with operational sections having greatest need for machine help. It is likely that this group would either be in close touch with a similar group in the present "22" division, or that they would be physically grouped together, so that potential machine jobs could be discussed and assigned the proper treatment with a minimum of confusion. Similarly, it is anticipated that there would be a certain amount of liaison between "352" and the proposed "Planning Branch".

e. It should be emphasized that the strengths shown on the proposed T.O., and in fact the actual groups themselves, are only tentative. It is visualized and is fully expected that there will be shifts of people according to shifts in emphasis dictated by changing conditions. This fluidity will be an important advantage of centralization; even now, in our early stage of experience with these machines, the lack of authority to shift people to compensate for changes in work load has resulted in unbalanced assignments and duplication of effort.

26 September 1952