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DIGITAL COMPUTER LABORATORY
Massachusetts Institute of Technology
Cambridge, Massachusetts

DD 254
LRE
5-15-60

SUBJECT: DIGITAL COMPUTERS FOR AIR DEFENSE SYSTEM

To: Project Lincoln Steering Committee

From: Jay W. Forrester and Robert R. Everett

Date: October 5, 1951

On October 2 we were requested by Dr. Loomis to present some estimates regarding time and personnel required for the work leading up to production of digital computers suitable for air defense information centers.

The preparation of the requested estimate had been started several weeks earlier in response to questions from Dr. George Valley.

The material here is a summary of that discussed with the Steering Committee. The estimates are based on the following foundation:

(1) that an improved air defense system using a digital computer information center as recommended in the Charles Report is necessary as soon as practical;

(2) that no existing digital computer is more than a laboratory model with respect to the present problem, and that a design is needed which will improve reliability, reduce maintenance, be tailored to the air defense application, and incorporate the necessary facilities for the required terminal equipment;

(3) that the key personnel and background experience for the estimated design program will come from the MIT Digital Computer Laboratory.

As now foreseen, and subject to revision, the proposed machine will be based on transistors as the active elements in the computing circuits and three-dimensional arrays of magnetic cores for high-speed internal storage. Most other components and techniques

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will be those now in use in electronic devices or which are already proven out in the research and development phase. The machine speed should be as high as can be obtained without delaying the program. Computing capacity, on which the application makes heavy demands, is much less expensive to build or maintain in a single high speed machine than in several of slower speed.

The estimates to follow were made independently by several of our staff qualified to judge the magnitude of the undertaking. The estimates were similar in all important respects.

Figure 1 shows the calendar of activity with the principal work in each time interval designated. Three years from the starting date seems a minimum to achieve operation of a well engineered prototype machine.

Charts in this memorandum begin with an indeterminate starting date, since the time to reach decisions on space and budgets is more difficult to estimate than the technical activities.

The estimated personnel which will be needed is shown in Figure 2. It reaches a peak of somewhat over 100 staff members. The Digital Computer Laboratory can start this group with ten men accustomed to working together and competent to direct the program.

Figure 2 shows 290 staff-man years in the first three-year period. This is arrived at by estimating the actual job. This compares with 370 staff-man years over a period of six years on Whirlwind I, from December 1946 to December 1952, at which time the Cape Cod terminal equipment should have been installed. It is our estimate that a computer suitable for air defense is a job of at least the magnitude of that already accomplished in reaching the present status of digital computers. The estimate may, therefore, be somewhat low considering the comparison with the Whirlwind I figure.

Figure 3 shows the building space which would be needed for the personnel of Figure 2.

Jay W. Forrester

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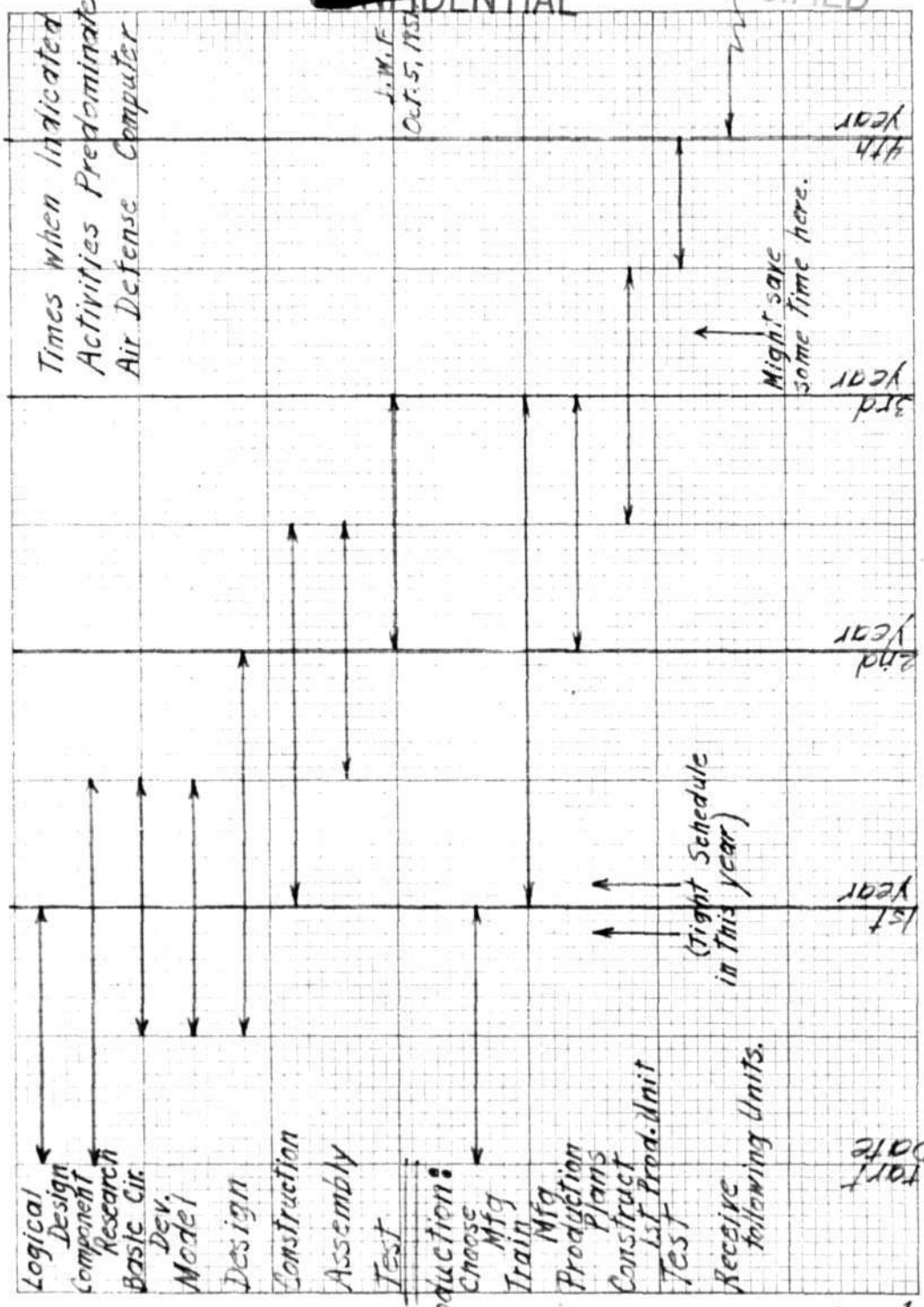

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Fig. 1

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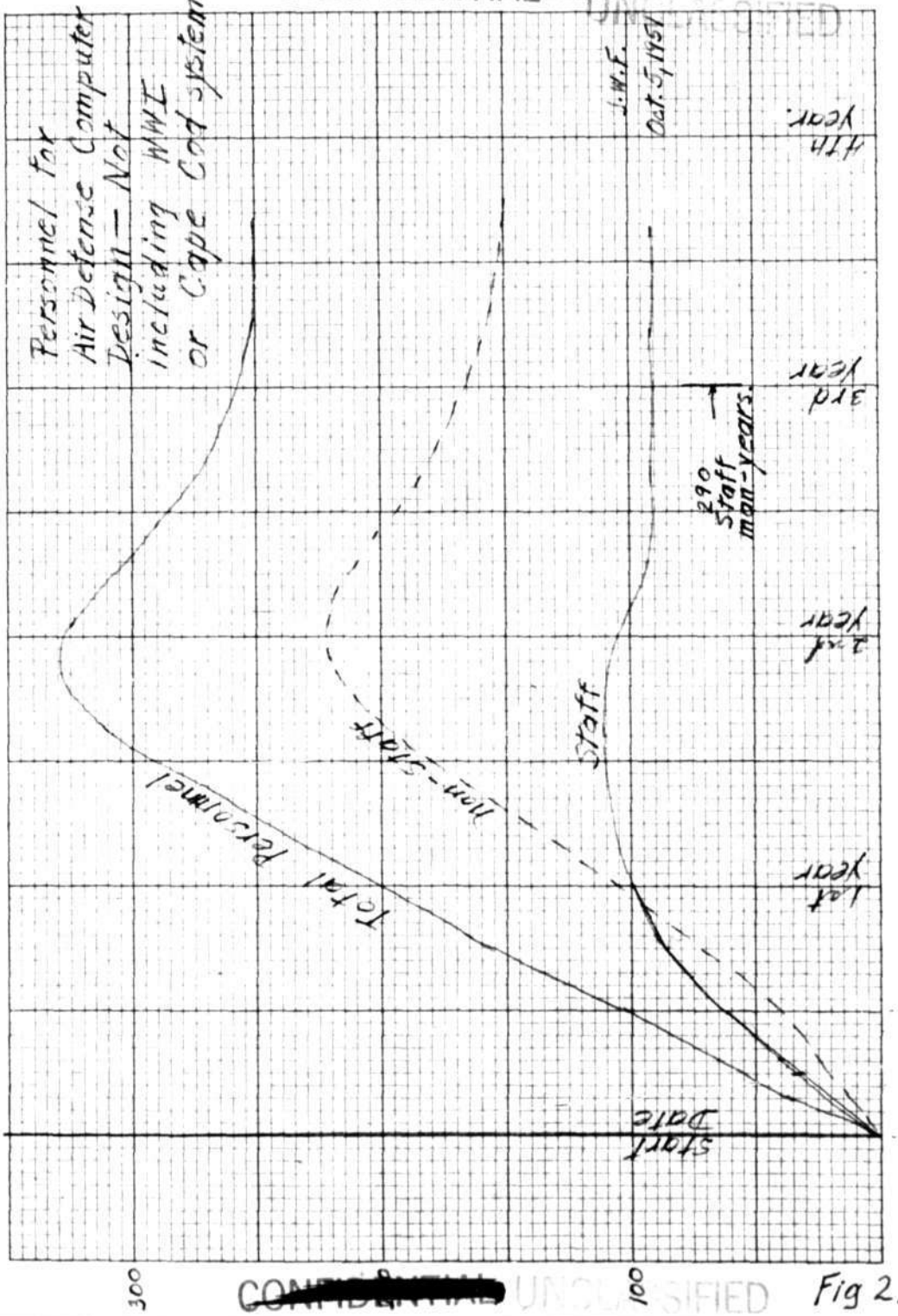

Fig 2.

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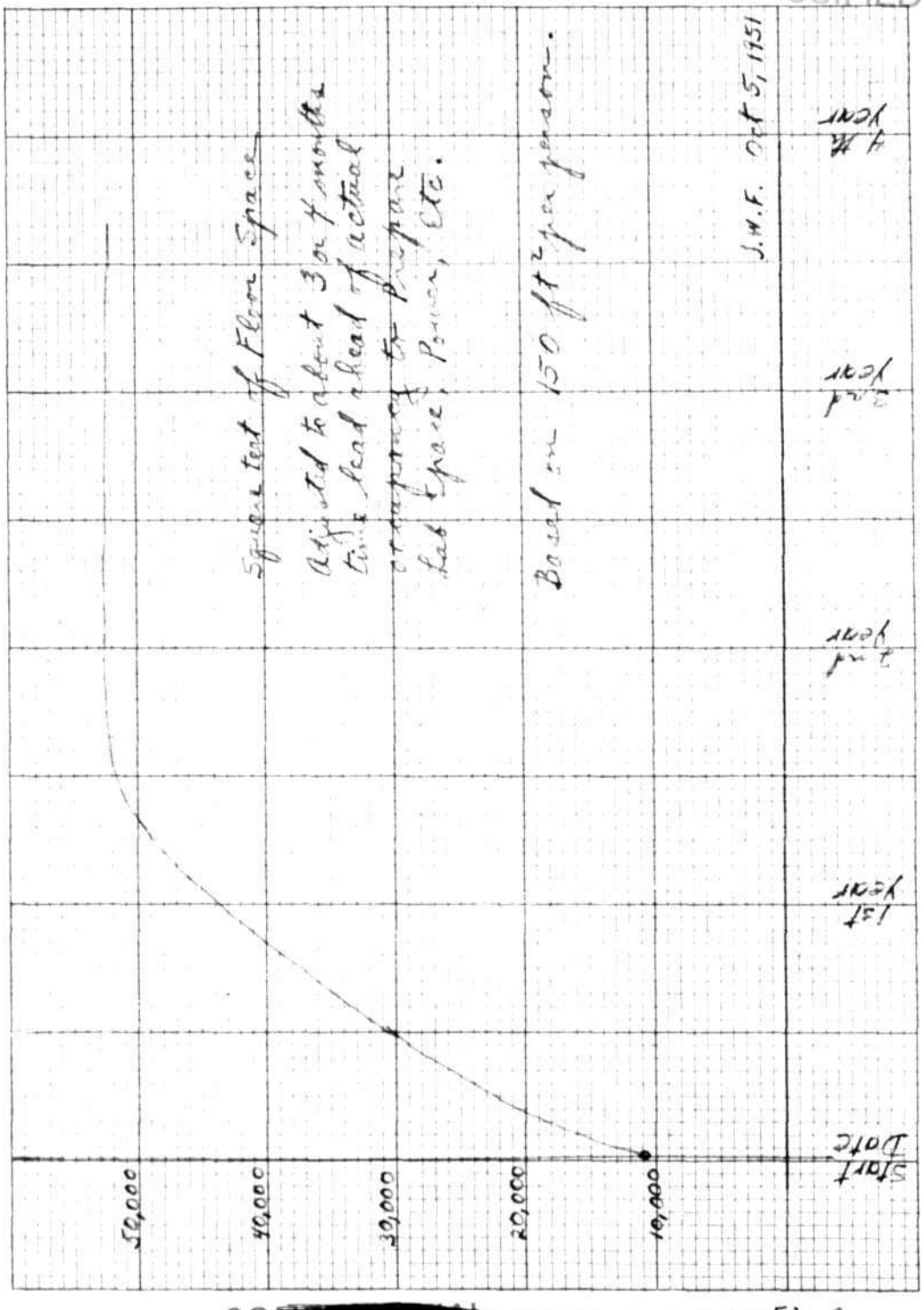

Fig 3.

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