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Memorandum 6L-190

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By: R R EVERETT

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Page 1 of 10 PagesDivision 6 - Lincoln Laboratory
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Lexington 73, Massachusetts

SUBJECT: PROPOSED RESPONSIBILITIES FOR TASKS IN MEMORANDUM 6M-3416

Prepared for: Conference at Western Electric, March 17, 1955

From: Jay W. Forrester, Robert R. Everett, C. Robert Wieser

Date: 16 March 1955

I. INTRODUCTION

On March 4 there was a meeting at Lincoln Laboratory for discussion of Memorandum 6M-3416, which outlines the various types of computer programming tasks which we foresee in the SAGE System. If the nature and approximate magnitude of the tasks in that Memorandum are accepted as realistic, the next step is to determine who might properly be responsible for the execution of each task. This memo makes a proposal for responsibilities of the various organizations. This proposal has been discussed by the Lincoln Steering Committee and outlines how Lincoln Laboratory might accomplish the tasks for which it should be responsible.

II. ASSIGNMENT OF RESPONSIBILITY FOR PROGRAMMING ACTIVITIESA. Principles

We suggest that the same principles be followed in assigning responsibility for the computer programming work in the SAGE System as have governed the division of effort in electronic equipment phases.

The guiding rules might be stated as follows:

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II. A Continued

1. Tasks related to research and development, to basic system design, and to demonstration of feasibility would be the full responsibility of Lincoln Laboratory.
2. Tasks corresponding to production engineering and final product design are, in electronic areas, normally carried on by other organizations. Because of the newness of this area and the unavailability of trained men elsewhere, some of this work may need to be shared Lincoln Laboratory.
3. Lincoln Laboratory must make available to others having responsibility for later phases of the effort the necessary background information and training support so that those other organizations can accomplish their tasks.
4. Tasks corresponding to production, installation, checkout, and system test would be carried out for the Air Force by an organization other than the Lincoln Laboratory.
5. Tasks relating to the operation of the system after installation would be the responsibility of the Air Force to be accomplished with their uniformed personnel, by civil service, or by contract.

Figure 1 shows a replot on one page of the separate curves shown in Memorandum 6M-3416.

B. Proposal for Lincoln Responsibilities

Referring to Memorandum 6M-3416, we propose that Lincoln be responsible for the following tasks:

Task A - Initial master computer program preparation for SAGE including the:

1. Master program for Direction Centers
2. Master program for Combat Centers

Task B - Initial Computer Program Checkout at:

1. XD-1
2. Kingston Test Cell
3. Meguire for the Direction Center and Stewart for the Combat Center

Task F - Continuation of computer program research

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II. B Continued

We believe the above tasks fall naturally to the Lincoln Laboratory under the present circumstances even though they include more "final design" obligations than we have been performing in the electronic equipment areas. In electronics, the Laboratory has not customarily done final equipment design without the participation of an outside organization under separate Air Force prime contract. On the other hand, in the computer programming area, the tasks are so interwoven with our responsibilities for systems guidance that no satisfactory dividing line for responsibility seems to exist. Accepting the responsibility for the technical content as well as the doing, still leaves open to Lincoln the possibility of enlisting the assistance of others without our delegating responsibility for the end result.

C. Tasks Proposed for Western Electric

It seems to us that the following tasks of Memorandum 6M-3416 are implicit in the undertaking which Western Electric has already assumed.

Task C - Adaptation of the master programs for all installations after the first. This is a companion task to the design of communications networks, and installation of equipment. On the equipment side, Western Electric is handling the unique details in a particular subsector in accordance with a standard pattern and procedure.

Task D - System tests for installations in the production subsectors. This is a part of the routine installation and system checkout for which Western Electric

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II. C Continued

has accepted responsibility.

Task J - Computer programs for evaluation tests. This is part of the system evaluation tests which Western Electric has agreed to make for the Air Force before turning over each subsector.

Part of Task K - Preparation of special-purpose maintenance programs. That part of this task which does not relate to the FSQ-7 equipment is part of the over-all system test and integration.

D. Tasks Proposed for IBM

Part of Task K - IBM has already accepted responsibility for the part of Task K which relates to the FSQ-7 equipment. Limiting their responsibilities to this area would be compatible with our understanding of the present inter-relationship of organizations in the SAGE System and would also fit the pattern of IBM's relationship to its commercial customers.

E. Unassigned Tasks for Air Force Action

The following tasks seem not to be commitments of any present participants in the program so that the Air Force must arrange to have them done either by uniformed personnel, civil service, or by contract.

Task E - Computer program revision

Task G - Computer program engineers permanently stationed at operating sites

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II. E Continued

Task H - Preparation of computer programs for data reduction
and analysis

Task I - Preparation of synthetic data for training

III. AVAILABILITY OF STAFF MEMBERS FOR LINCOLN TASKS

In Section II, B, it is recommended that Lincoln carry out Tasks A, B and F in Memorandum 6M-3416. Task F begins in 1957 and phases in with the completion of Tasks A and B so that it will be given no further consideration in this memorandum. Tasks A and B, which are large and immediate, present the important problem.

A. Staff Required

Figure 2 shows a replot of Figure A and B in 6M-3416. Figure 2 shows the sum of the two curves in Figure A and B. In making the total, the curve for the Combat Center master program was delayed to start October 1, 1955 instead of July 1, but was made correspondingly higher to include the same number of man months. The shapes of the curves were changed slightly to give a wider flat part to the required manpower versus time curve rather than a peak of short duration. The upper curve of Figure 2 shows the resulting manpower required when a training period is allowed for new staff members prior to their start of productive work.

The lower area under the curve shows the number of experienced staff members required for the preparation of operational and program specifications. Men of this type must have at least a year of experience and must therefore necessarily be drawn from present Lincoln staff. Almost all such persons are now in Group 61. We can assign the required number of experienced persons if we operate under the assumptions which

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III. A. Continued:

are given in a later section. The center section on the curve shows the number of less-experienced persons, which can be made available from present staff, for the preparation of coding specifications. The upper section on the curve shows the number of new staff needed to assist in the program coding and who are not presently expected to be available in Division 6.

In addition to the computer programming engineers shown on Figure 2, we plan to transfer 7 well-qualified staff members from elsewhere in the Division into Group 61 to assist in coordination, liaison, administration, interviewing new staff, handling visitors, etc.

The following table tabulates the information given above and in Figure 2.

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III. A. Continued:Computer Programmers
for SAGE Master Program

| | Operational and Program Specifications | Coding Speci- fications and Coding | Administrative, Liaison, Coordination |
|---|---|--|---|
| Now available in Group 61 | 19 | 10 | |
| Transfer from elsewhere in Division 6 | 3 | | 7 |
| New additions by September 1 | | 30 | |
| | <u>22</u> | <u>40</u> | 7 |
| Total Computer Program Engineers Required for SAGE Master Program | | 62 | |

Figure 3 shows the proposed allocation of Operational and Program Specification writers to the several tasks of preparing the master programs for both the Direction Center and the Combat Center. Included are times for initial checkout, modification, and final checkout at McGuire and Syracuse. A total of 22 such people is assumed throughout the period. New staff capable of writing operational specifications should become available by growth from the coding staff. It is expected that such additional staff will be required for peripheral activities such as test programs and that the total available for master programs can at best remain constant. It should be noted that once the operational and program specifications are written, a large number of senior people are still required for close management of the coding phase.

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III. A. Continued:

Figure 4 shows the proposed time allocation for the coding staff. New staff will be brought in and trained during the spring and summer. (These people may be potential but untrained operational specification writers.) Coding staff now available will be used until fall on utility programs and for study of optimum codes for parts of the SAGE programs that are especially time consuming. The major coding load for the direction center will begin in September. During the check-out phase, fewer coders will be required; those released can begin coding for the combat center.

B. Assumptions Made in Assigning Men to Master Program Preparation

In order to assign the above personnel, some strict limitations are necessary on other activities of Division 6, and Group 61 in particular, until still more staff members, beyond those necessary for the preparation of master programs, can be acquired and trained. The most important of these assumptions are:

1. The Cape Cod Test Program cannot be assigned more key Group 61 personnel. The need in the Test Program is urgent since the test program is limited by the shortage of supervision rather than system or equipment time. This means that the Test Program on the 1954 Cape Cod System in obtaining data on SAGE System performance will proceed at about one half the rate permitted by the physical equipment until some method of additional staffing is arranged. The men needed to accelerate the Cape Cod Test Program are not included in any of the tasks of Memorandum 6M-3416-1
2. Only two top-caliber men have been allocated for the total of any new tasks which may arise with regard to such matters as:

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III. B. 2. Continued:

Antiaircraft

AEW utilization

3. Only one of our better staff members is assigned to counter-countermeasures.
4. The work of Group 61 on equipment specifications in support of Groups 62 and 64 and IEM must be held at the level of two staff members.

C. Sources for New Staff

The preceding sections show a need for 30 new staff between now and September 1 to work on master program preparation. This does not include staff who should be brought in to accelerate the Cape Cod test program, to make preparations for effective testing of the XD-1 System, and for other tasks which might be postponed until staff can be made available. The new staff for the master program preparation should preferably be capable of developing to operational specifications caliber after they have gained experience.

The 30 needed for master program preparation can be made available in one or a combination of the following ways:

1. Hiring new staff members. We believe it is entirely possible to find this number of new staff members to add to the Lincoln Laboratory by September 1, if we undertake to do this very soon.
2. We believe that some of the desired number can probably be found amongst the present Lincoln staff.
3. Assignment of staff from other organizations. If the other organizations take on responsibility for tasks as outlined in Section II, they will need, in 1956 and 1957, a number of experienced persons who could receive their training and experience by assisting Lincoln in

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III. C. Continued:

preparation of the master programs. If the personnel of other organizations do not participate in master program preparation, but come to Lincoln only for training, it will impose an additional unscheduled burden on our staff.

Signed 
Jay W. Forrester

Signed 
Robert R. Everett

Signed 
C. Robert Wieser

JWF:RRE:CRH:jmm/mb

Attached: Drawing B48644-G (Figure 1)
Drawing B48645-G (Figure 2)
Drawing B48646-G (Figure 3)
Drawing B48647-G (Figure 4)

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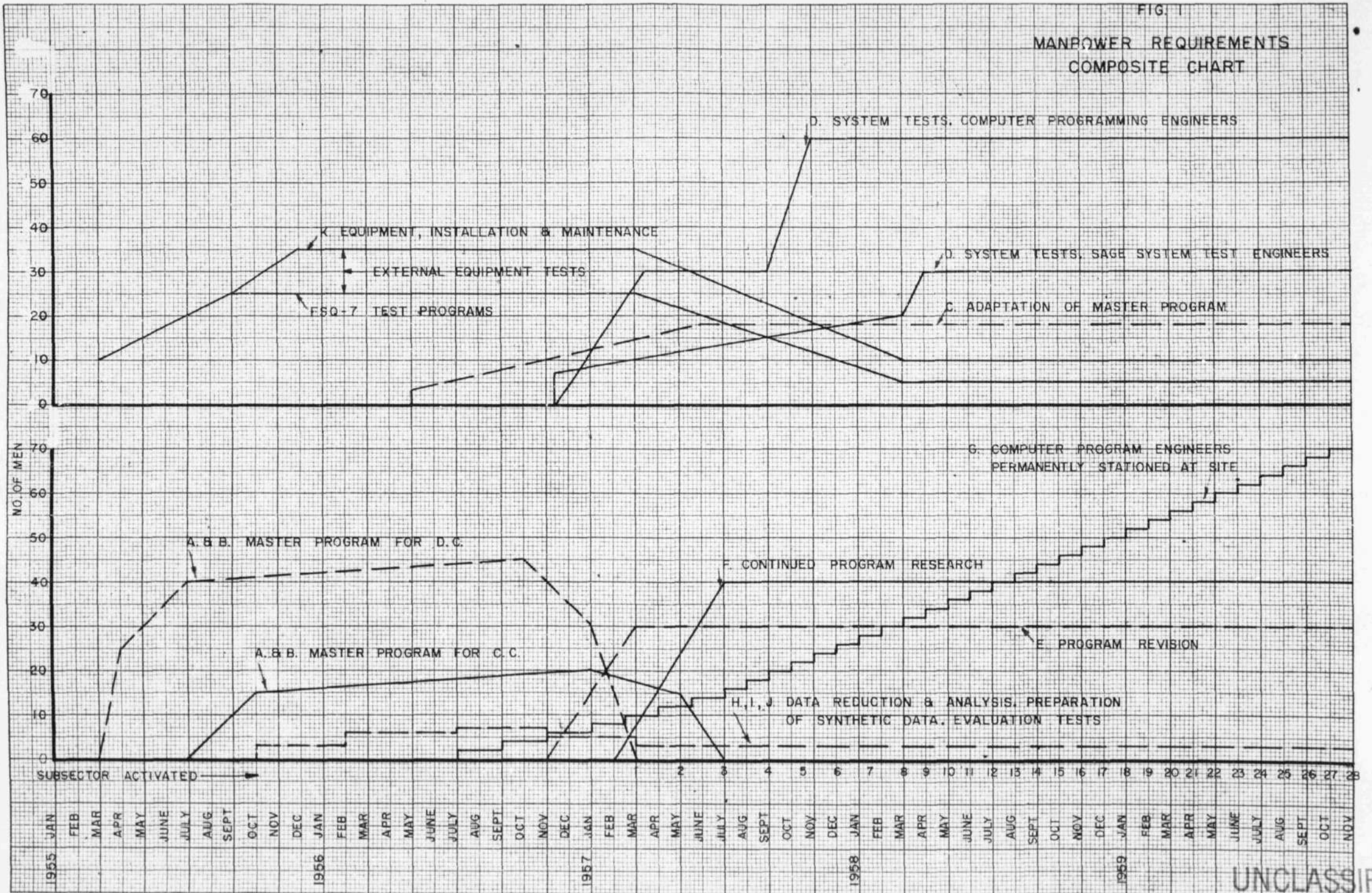
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FIG. 1

MANPOWER REQUIREMENTS
COMPOSITE CHART



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KUTZPEL & EBER CO. MADE IN U.S.A.

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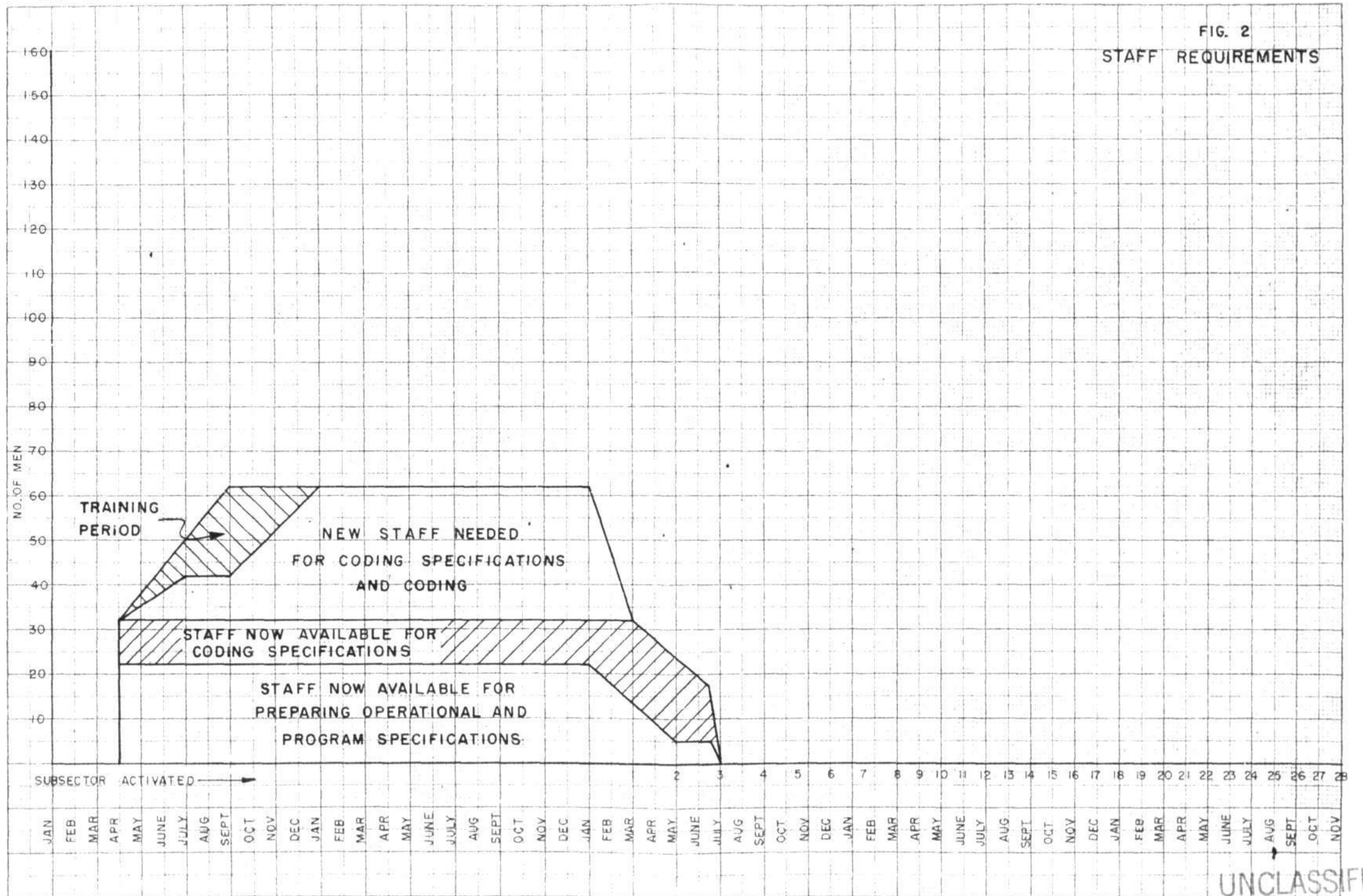
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FIG. 2
STAFF REQUIREMENTS



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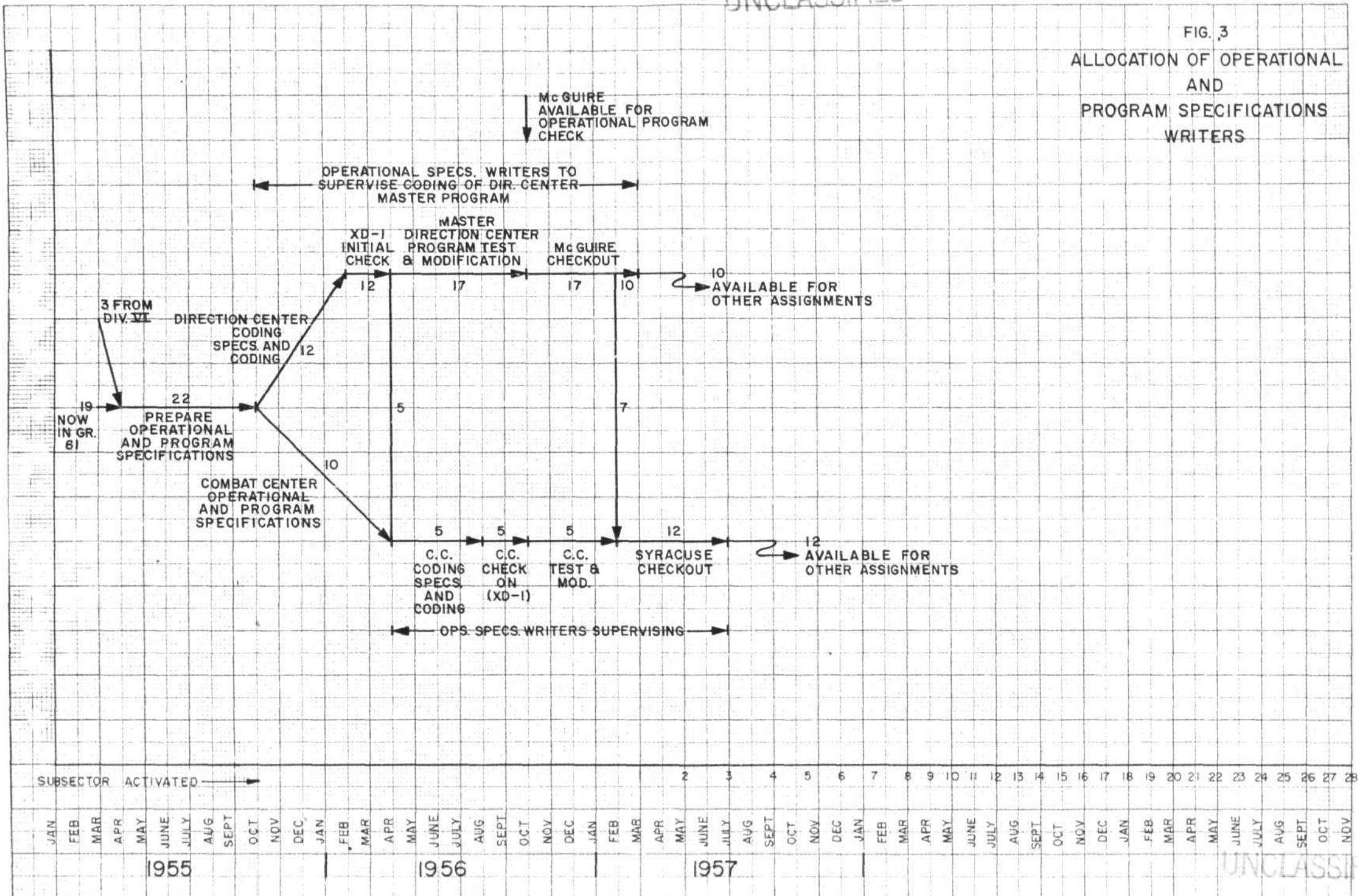
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FIG. 3
ALLOCATION OF OPERATIONAL
AND
PROGRAM SPECIFICATIONS
WRITERS

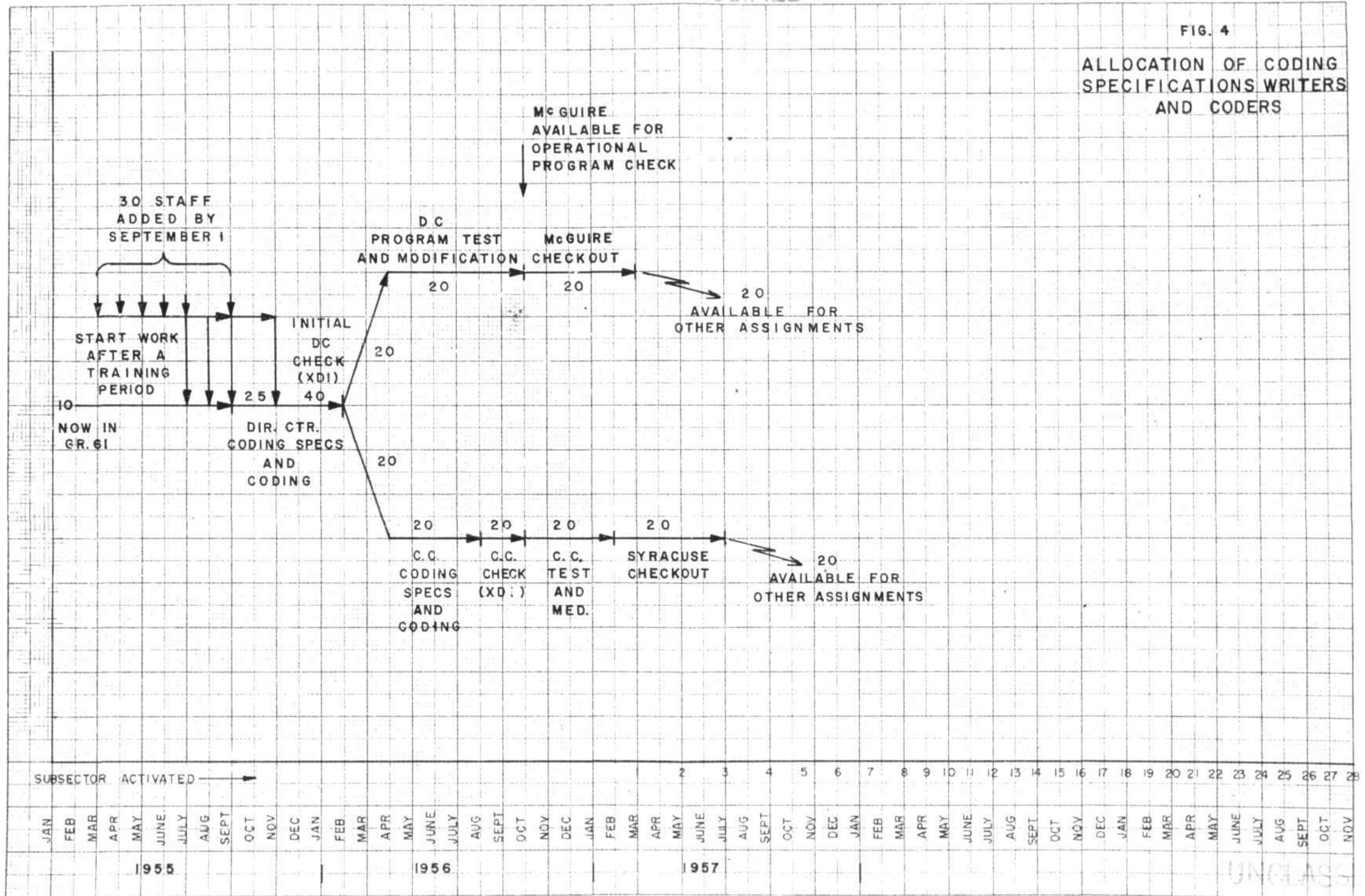


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FIG. 4

ALLOCATION OF CODING SPECIFICATIONS WRITERS AND CODERS



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