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Memorandum 6M-3760

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Division 6 - Lincoln Laboratory  
Massachusetts Institute of Technology  
Lexington 73, Massachusetts

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SUBJECT: BIWEEKLY REPORT FOR 15 JULY 1955

To: Jay W. Forrester

From: Division 6 Staff

Approved: *J. C. Proctor*  
John C. Proctor

CONTENTS

- Section I - System Test and Planning
- Section II - AN/FSQ-7
- Section III - Advance Development
- Section IV - Central Services

I - SYSTEM TEST & PLANNING

1.1 Air Defense

1.1.1 Test Program

(H. D. Neumann) (CONFIDENTIAL)

The manned interceptor simulation program is being documented.

(F. Mathiasen) (CONFIDENTIAL)

A background noise simulation program to provide fairly realistic noise patterns for use with the monitoring program has been written. It is, however, general enough so that it may be of use in other tests.

(H. D. Houser) (CONFIDENTIAL)

The sections of the weather clutter and correlation program which track the interceptor when there is Mark X data and which track the target have been coded.

(A. Smalley) (CONFIDENTIAL)

Simulated data input blip scan tapes on B-29 and B-47 aircraft

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have been prepared from figures supplied by Group 22. The figures at 20,000 feet are based on actual flights with the FPS-3 operating on SDV mode 4. Blip scan values at other altitudes, 10, 15, 25 and 30,000 feet are extrapolated from the 20,000-foot figures taking into account the manufacturer's antenna pattern and the  $1.5^\circ$  tilt of the lower beam.

Simulated data input tapes are being prepared for evaluating the interception function in the 1954 Cape Cod System (see 6M-5014).

(J. F. Nolan) (CONFIDENTIAL)

The problem of how to evaluate a tracking program has been considered. Some quantities which appear to have significance in measuring single aircraft tracking performance include:

1. Error in placement of prediction point (Prediction error) on a dynamic scan-by-scan basis.
2. Mean and variance of the prediction error for unaccelerated flight paths.
3. Maximum value of prediction error attained after a maneuver.
4. Length of the time period after a maneuver, during which the prediction error exceeds one standard deviation as determined for unaccelerated flight.

Some difficulties have been met within the general area of noise background simulation. Time considerations tend to discourage the dynamic generation of background noise data when other than the simplest model of the noise is used. For background noise with time and spatial correlation, the preparation will have to be done in advance and the data stored on the drum (MFC) or on magnetic tape (WWI).

(W. A. Keit) (CONFIDENTIAL)

Three tests were conducted at the Direction Center which attempted to alter the Automatic Initiation methods so that tracks with speeds less than 100 knots would not trigger the automatic initiation. The present performance may be summarized as follows:

1. All tracks with speeds of 60 knots or less are dropped during the tentative phase 100% of the time.
2. Tracks with speeds between 70-100 knots are dropped 70% of the time.

(A. Wright) (CONFIDENTIAL)

The SAGE Test Committee has issued the following M-notes during the past biweekly period:

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- 6M-5004-1 Outline of Test Program for Experimental SAGE Subsector
- 6M-5029 Simulated Data Reference Program
- 6M-5031 SAGE Test Committee Meeting No. 4
- 6M-5034 Multiple SDV Prints - Heavy Radar

(W. Vecchia) (UNCLASSIFIED)

Total Assigned Time

Analysis & Program Checking	33H 40M
System Operation	38H 30M
Equipment Checkout	2H 30M
Air Force Training	7H 40M
<b>Total</b>	<b>82H 20M</b>
Time Given Group 6345	3H 30M
Time Given Group 64	12H 35M
<b>Total</b>	<b>16H 05M</b>
Time Lost to Computer (Malfunction)	1H 15M
Time Lost Due to Strike	58H 20M
<b>Total</b>	<b>59H 35M</b>

TOTAL . . . . . 158 H

1.1.2 System Evaluation

(R. W. Sittler) (UNCLASSIFIED)

The number of ghosts expected by triangulation on a hypothetical raid through Subsector I of the SAGE System has been estimated. A raid size of 50 aircraft was assumed in a scattered formation of 50 x 50 miles (alternatively, 100 x 100 miles) flying due west at the latitude of Philadelphia. The heavy radars were used for triangulation. In regions of three radar overlap, about 400 ghosts are expected. In regions of four radar overlap, the number of ghosts ranges from about 50 to 100.

1.1.3 Staff Training Activity

(P. R. Bagley) (UNCLASSIFIED)

A full-time course in air defense and air defense programming (Group 61 Indoctrination Course) taught by A. Hill, P. Bagley, and members of the Program Organization Section, is being given 11 July through 29 July. (Memorandum 6M-3737 gives the course outline and schedule of lectures.) The course is primarily for the new RAND and Group 61 staff personnel, but is attended also by new Western Electric personnel.

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The IBM Programmer Training Course, directed by Robert Lowe (rhymes with "how") of IBM, will be held at the Lexington Field Station from 18 July through 16 September. There are at present 41 students enrolled from Lincoln, RAND, Bell Telephone Laboratories, Western Electric and IBM.

A seminar on FSQ-7 programming, and some of the broader aspects of the master program, has been inaugurated. The intent of the seminar is to provide some instruction for those whose work relates to SAGE but who will not be directly concerned with programming. Several lectures will be given on topics of interest to specific groups. The seminar is open to all properly cleared members of the Laboratory. Lectures are held in room A-166 Mondays 12:30 to 2:30. A tentative outline of seminar topics is given below, together with the security clearance required for attendance:

July 11 - Fundamentals of Programming (Unclassified) .  
 July 18 - Outline of Central Computer (Unclassified)  
 July 25 - Programming for FSQ-7, Part I: Control and Arithmetic Processes (Unclassified)  
 Aug. 1 - Programming for FSQ-7, Part II: Simple Programs (Uncl.)  
 Aug. 8 - Programming for FSQ-7, Part III: Input and Checkout Processes (Unclassified)  
 Aug. 15 - FSQ-7 Terminal Equipment (Confidential)  
 Aug. 22 - Air Defense Master Program (Secret)  
 Aug. 29 - FSQ-7 Display System (Confidential)  
 Sept. 6 - (Tuesday) - Training and Battle Simulation (Conf.)

Suggestions for other seminar topics will be welcomed.

The possible need for a 20-hour course in programming for XD-I, which would be primarily for semi-experienced and experienced programmers, is currently under investigation. We are asking section leaders to report those, if any, persons in their sections who will need this training before 1 October 1955, and when.

Another Group 61 Indoctrination Course is planned for September, to be given to Lincoln personnel (and perhaps others) after they have completed the IBM Programmer Training Course. This course will cover Operation Specifications, Master Programs, and Group 61 Organization.

#### 1.1.3 Responsibility for New Staff Personnel

(P. R. Bagley) (UNCLASSIFIED)

I have been assigned responsibility for all new Group 61 staff personnel from the time that they arrive for work until they are ready for assignment to a working section in the group. My duties include responsibility for:

1. Welcoming and introductions

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2. Office layout and assignment
3. Announcement of arrival and location to services needing up-to-date directory information.
4. Briefing and general information on laboratory facilities.
5. Formal training classes.
6. Informal training during periods when classes are not given.
7. Advising on section assignment of each person.

In certain cases I will assume these duties in respect to non-Lincoln staff. I am being assisted in this work by Betty Kollet and Arthur Hill.

#### 1.1.4 Programming Information Service

(P. R. Bagley) (UNCLASSIFIED)

Issued this biweekly period was Memorandum 6M-3733, Documents of Interest to XD-1 Programmers. In preparation is an M-note summarizing all available and up-to-date information on the instruction codes for XD-1, FSQ-7, and FSQ-8. This latter memo will include the instruction codes, actions of each instruction, execution times, instruction word layouts, sense codes, select codes, and operate codes.

#### 1.1.5 Tracking

(R. F. Jenney) (CONFIDENTIAL)

An analytic study to determine the mean length of time a track can be kept in the search area has begun.

(B. Smulowicz) (UNCLASSIFIED)

The new study of improved weather clutter generation methods is being continued. A possibility is being considered of generating weather clutter characterized by both spatial and time correlation in advance of the actual simulation in order to save computer time. A program has been prepared to demonstrate the feasibility of using simple design criteria to generate realistic clutter.

A preliminary study has begun of various methods to evaluate the quality of tracking.

(A. E. Budd) (UNCLASSIFIED)

The memo describing "Test Specifications for Interception Series 2, 3, and 4" (Draft 6M-5033) has been written

I am now preparing to write a memo on Series 5, 6, and 7.

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1.1.7 Weapons Direction

(J. J. Cahill, Jr.) (CONFIDENTIAL)

Certain changes requested by representatives of the 4620th Air Defense Wing are being incorporated in the latest draft of the operational specification for the interim SAGE AA Direction Section. These include two basic logical changes which are being called to the attention of the Army representatives who had informally approved the previous draft.

Provision for the designation of targets direct to individual AA batteries is being included in a draft of an operational specification for the ultimate SAGE AA direction program.

(E. W. Wolf) (CONFIDENTIAL)

Memorandum 6M-3474, "SAGE System Data Conversion and Transformation," has been issued.

The center of coordinates of the experimental subsector has been tentatively fixed at latitude  $41^{\circ}36'N$  and longitude  $71^{\circ}10'W$ . This is a point near Fall River, Massachusetts.

A new draft of the input Operational Specifications is being prepared.

1.1.9 Studies in Process

<u>Study</u>	<u>By</u>
AN/FSQ-7 Duplex Operation, inactivity and instruction checking (memo)	M. Feldstein, A. Shoolman, P. Vance
Asimuth-only Tracking Study	F. Heart, F. Gucker, D. Latimer
CCS'54, Monitoring II, investigation and checkout	E. Bedrosian
CCS'54 Program Modification and checkout	S. Manber, H. Peterson
CCS'54 Tracking I investigation	E. McEvoy
CCS'54 Tracking program	H. A. Keit
Data Processing Requirements	M. Feldstein, A. Shoolman, P. Vance
Data Reduction Program specifications	F. W. Graham
Display subprogram tasks, manual inputs subprogram task	W. Attridge, L. Collins, W. Harris
Duplex and Standby Studies, revised work schedule	M. Feldstein, A. Shoolman, P. Vance

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Interception Series 5, 6, 7 - Test Specification	A. E. Budd
Interceptor Guidance, factors contributing to error	C. Friedman
Lincoln Compiler, Lincoln Checker, and Utility Control program specifications	S. Knapp, C. Gaudette, R. Gildea, M. Arden
MTC, blip-scan data analysis program, Chi-square values checkout	B. R. Stahl
Program design, subprogram sequence, and in-out control studies	W. Attridge, L. Collins W. Harris
Radar Input Operational specifications	F. Broeks
Random Number Generation - test program checkout	H. D. Newmann
SAGE Identification, Weather Control, and Manual Input Sections, operation specifications	F. Garth, S. Houser
SAGE Height Finding Operation Specifications	H. E. Frachtman
Single Track History Print out Program	D. Latimer
XD-1 inactivity alarm proposal	M. Feldstein, A. Shoelman, P. Vance

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## 1.2 Whirlwind I

### 1.2.2 WWI System Operation

(L. L. Holmes, A. J. Roberts) (UNCLASSIFIED)

Decrease in WWI reliability noted for this period is apparently due to one-shift operation. A marked rise in component failures was noted after each power shutdown. This experience suggests that continuous operation improves computer reliability.

#### WWI Power Supplies

(E. W. Pughe, Jr.) (UNCLASSIFIED)

The motor for the new WWI filament alternator has been connected to the line and run unloaded. The manufacturer has agreed to replace the defective coupling between the motor and generator.

#### Maintenance

(D. A. Morrison) (UNCLASSIFIED)

A simulated radar test program was written and checked out. The Functional Diagram, Marginal Checking Control System - Mod II, WWI has been completed.

### 1.2.3 Terminal Equipment

#### CRT Filter Sweep Circuits

(A. V. Shortell, Jr.) (UNCLASSIFIED)

A modification to minimize sweep jitter will be made on the next maintenance drawing.

#### Maintenance Coordination and Records

(C. W. Watt, Jr.) (UNCLASSIFIED)

Memorandum 6M-3747 has been written describing the maintenance coordination and records keeping procedures of the Signal Corps Installation of the 414-A Antiaircraft Fire Control System at Fort Meade. Problems encountered are similar to those expected in the SAGE System.

Memorandum 6M-3746, Standard Operating Procedure for the Cape Cod Maintenance Coordinator, has been drafted and will be distributed for comments.

A meeting was held on 15 July to define the duties and functions of the maintenance and coordination job of the SAGE System. The job will be handled by the Communications and Electronics (C&E) Duty

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(C. W. Watt, Jr.) (UNCLASSIFIED) (Cont.'d)

Officer in the organization of a Direction Center. Duties, space, training, and equipment involved in this job were outlined and generally agreed upon. A detailed study will be made during the next few weeks by the task group assigned at this meeting.

WWI Crosstell Coder

(J. N. Ackley) (UNCLASSIFIED)

A successful closed-loop test was made using MITE 0 to introduce data from the crosstell coder into WWI.

We were unable to use the voice circuit to Lexington to transmit data. Tests with XD-1 and South Truro will have to wait until the data grade circuit is installed 1 August 1955.

(L. D. Healy, C. S. Lin) (UNCLASSIFIED)

The layout of the crosstell input controls has been completed. The control section uses 3 1/2 PIUMP's, construction of which has begun.

(T. J. Sandy) (UNCLASSIFIED)

A program for equipment checking of the semiautomatic height system with WWI has been completed and will be checked out next week.

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2.1 Liaison2.1 Liaison  
2.1.1 System

2.1.1 (B. E. Morriss) (UNCLASSIFIED)

The following points came up at the ADES Progress Meeting, 12 July 1955, in New York:

1. IBM still does not have contractual coverage for the index registers or the Command Post for XD-1. This was presented as the reason why no schedules exist.
2. The XD-1 console delivery schedule was discussed and it was stated that all consoles were scheduled for delivery by the first week of September.
3. Air Training Command has taken responsibility for all SAGE training. At this time they could not say more than that they expected to use XD-1 for initial training in approximately the same way indicated in reports previously prepared by the ADES training group.
4. Burroughs reported a slippage of one month of all FST-2 service test models and the Lincoln model. They were not able to state at this time whether this slippage would also be reflected in the production model. It was suggested that Lincoln reconsider the schedule for FST-2's in the Experimental Subsector, especially for the first service test model now scheduled to go to Texas Tower #2. The reason for this was that the installation at Texas Tower #2 may be expected to take longer than the installation at Montauk. Sending the first test model to TT #2 instead of Montauk will mean that a longer period exists before three models are installed and working, but a shorter period of time before four models are working.

Comment on IBM document, Minimum Equipment List for AN/FSQ-7, dated May 25, 1955, were prepared by the Systems Office and forwarded to CRC. Principal comments were:

1. The information on display consoles does not reflect the latest thinking of Lincoln Laboratory.
2. The spelling out of the arrangement of equipment on consoles in the MEL is expected to place an unnecessary rigidity on this equipment which is not consistent with the flexibility designed into it.

On July 6, 1955, at a meeting with Western Electric and IBM, the following points were raised on compatibility of the console and the building design:

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1. Without changes either in the consoles or in the building, it will not be possible to place all consoles as presently planned. IBM and Hazeltine are now studying this item to determine what compromises can be made in the console design and what these would mean in the way of compromising the floor plan.
2. Measurements taken on XD-1 consoles were presented which lay a basis for questioning the compatibility of the air conditioning and console design in both XD-1 and the production system. This information was not complete enough to allow determination of whether a real problem exists. IBM has been asked to perform the measurements necessary.

A meeting was set up for Wednesday, 20 July 1955, at Lincoln by ADES to discuss changes in console requirements and to see what can be done about resolving the procedure for handling the necessary modifications to console layouts to be compatible with the operational specifications as the operational specifications are prepared.

(F. Irish, T. Parkins) (CONFIDENTIAL)

We attended a meeting at ADC Headquarters in Colorado Springs for the purpose of determining the dates on which external circuits are required for equipment testing purposes for Subsectors 7 through 13.

By way of fulfilling our responsibility on the ADES Communications Subcommittee, we prepared a chart which shows the installation dates relative to the activation date for a typical subsector. This chart has been modified several times and during the meeting at ADC, a modification was made which clarified the installation dates for the crosstell lines to adjacent Direction Centers.

It was decided that voice communication to overlap radars in unactivated subsectors would be provided by toll calls because AT&T Co. has advised ADC that it will not provide temporary circuits. This probably means that the telephone company will not provide temporary circuits in those cases where new facilities would have to be constructed.

(C. J. Carter, H. J. Kirshner) (UNCLASSIFIED)

AN/FSQ-7 (XD-1) Communications Installation

A trip was made to North Truro to determine what new construction is required at that site for experimental subsector telephone circuits. It was hoped that the New England Telephone Company would handle all new construction required. It was later learned that because of legal technicalities, only a portion of the work will be done by the

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telephone company and the remainder by a private contractor. We are attempting to locate a contractor for this remaining work.

The New York Telephone Company is proceeding with installation of new cable facilities at Montauk. A contractor who will do certain preparatory work (erecting new poles, placement of conduit, etc.) has been located.

As a result of discussions at Hq. ADC, modifications agreed to by Group 61 have been made to both internal and external telephone circuits and terminations. Experimental Subsector circuits and terminations are being revised to reflect these changes. It is not yet known whether these changes will influence, to any noticeable degree, the completion date for the Experimental Subsector telephone system.

A teletype machine has been procured for practice use with the IBM 049 teletype tape-to-card punch.

#### 2.1.2 Power

##### Power for C.C. and D.C. Site

(J. J. Gano) (UNCLASSIFIED)

The AFIRO has rejected Western Electric's proposal to use nine 800 kw generators at 480 volts for the second combined station on the basis that nine units are too many for one installation. Lincoln agreed to the nine units which had been selected over seven 1250 kw units (as used on the first combined site) because of lower initial cost, increased efficiency, and greater flexibility. Schedule requirements now indicate that the second combined site will be the same as the first.

##### Power Supplies

(J. D. Clarke) (UNCLASSIFIED)

The following power sources have been ordered for the new TX-0 Transistor Computer:

Four series packaged DC power supplies (4 voltages at 1.5 amps) manufactured by Lambda Electronics.

Three thyatron rectifiers (3 voltages at 15 amps) manufactured by Power Equipment Co.

We plan to use our own electronic regulator sections for these supplies.

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Schedule Coordination and Follow-up Activity

(F. F. Manning, J. J. Carson) (UNCLASSIFIED)

A posted Experimental SAGE Subsector schedule was prepared for use of the ADES Project Office in preparing the next ADES Quarterly Report. A report on the present status of Experimental SAGE Subsector activities, together with floor plans showing the location of equipment in Building F were prepared and forwarded to ADES for their use.

J. J. Carson attended the Project High Production Coordination Meeting at Kingston on 8 July 1955. IBM claims that system testing of the AN/FSQ-7 (XD-1) equipment is approximately six weeks behind schedule overall. Further, they stated that the display system testing will be eight weeks behind schedule at its time of completion. A detailed report has been sent to B. E. Morriss.

IBM expects all production machine efforts to be on schedule as of 1 August 1955. The Autofab is being used for full production of printed card circuits.

IBM indicated that the schedules for the two additional index registers for XD-1 will be available for the next Production Coordination Meeting.

Bendix Radio will build the input pattern generator for the AN/FSQ-7. IBM indicated that the teletype monitor may be rented equipment.

2.1.3 Specifications and Building

(H. F. Mercer, H. Wainwright) (UNCLASSIFIED)

I. Building Construction

- Interior - Remaining work on IBM contracts should be finished during week of 18 July.
- Exterior - (all under AF contract) Concrete finishing just about complete, installation of transite for sealing inter-connecting pipe chase and installation of steel work, ladder at Building D access way, and railing at all exterior stairs remain to be completed.

II. Cabling

Efforts are being made to expedite delivery of remaining cables prior to IBM's vacation. Display system cables, some temporary, have been installed so that the first group of display consoles are in operation.

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### III. Equipment Cooling

Except for minor modifications, system is complete and the IBM acceptance procedure is being prepared. A new discharge duct for the dehumidification system is being installed to (1) eliminate intake of Hygrol discharge vapor to MG sets and power room and (2) eliminate possible damage to paint finish of cars parking near building.

### IV. Equipment Layout

Command Post - drawings and specifications have been sent to prospective bidders. Bids are to be returned by 27 July. Contracts for the work will be let as soon as possible thereafter. Hopefully, construction should be completed by the end of September; lighting changes and painting will require additional time - two to three weeks.

### V. Lighting

With the exception of fluorescent fixtures and plastic filters, all other materials have been ordered. The filters will probably be ordered today or early next week. Samples of the fluorescent fixtures and price and delivery quotes for same are due by noon on Monday, 18 July. Evaluation will be completed as quickly as possible and orders placed. We hope to ask for bids on this installation by the end of the week of 18 July.

### Technical Information Releases

(E. D. Lundberg, J. J. Carson, R. R. Sherey, J. A. Russell)  
(UNCLASSIFIED)

The following material has been released as engineering data for AN/FSQ-7 and SAGE System:

<u>TIR</u>	<u>M-Note</u>	<u>Subject</u>
1-78	Supplements	Equipment, Supplements to AN/FSQ-7 specifications
1-79	6M-2769, Supp. 1	Radar Data Capacity of AN/FSQ-7
1-80	6M-3683	Study of a Modified Combat Center for Use as a Permanent Rand and Air Training Command Facility
1-81	Group Report 22-5	Survey Information Required for SAGE Radar Sites

(E. L. Smiley, W. H. Ayer) (UNCLASSIFIED)

Meetings of the D.C. Building study group were held at Western Electric-ADES on July 5, 12, and 13. The organizations repre-

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mented at these meetings were: WE-ADES, IBM, Burns and Roe, and Lincoln.

The general outline of the study areas was expanded to include a brief history of the problems, the present shortcomings, and avenues of investigations. WE-ADES will present this document to Lincoln with a request that we perform the study of specific problem areas.

The detailed production console design by Hazeltine has brought to light a console placement problem. At a meeting on 6 July, several solutions were discussed and it was demonstrated that all but nine consoles could be installed as presently planned if certain compromises were made by Hazeltine. It appeared that these nine consoles would have to be moved slightly if they are not to interfere with the building structure. IBM and Hazeltine are still studying this item in an attempt to improve the situation.

## 2.2 Systems Office

AN/FSQ-8

(A. D. Hughes) (UNCLASSIFIED)

An equipment list for AN/FSQ-8, comparable to IM 102-2 for AN/FSQ-7, has been compiled. It is a tentative list and will not be published in the near future. However, it represents the latest estimates of all equipment and gives the major differences between AN/FSQ-7 and AN/FSQ-8 equipment in number.

Equipment specifications for AN/FSQ 8 are now being written as exceptions to AN/FSQ-7 equipment.

### 2.2.1 Systems (general)

(J. Giordano) (UNCLASSIFIED)

C.E.R. status report #7 has been delayed. A more detailed presentation is being considered.

An investigation on how to duplicate existing .0065 IBM cards on .009 IBM cards is being carried on with Group 61.

## 2.3 Production

### Test Planning and Coordination

(H. Rundquist, R. Mayer, A. Werlin) (CONFIDENTIAL)

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Program Services Committee

Preliminary rough Operational Specifications have been prepared for the test programs to be used in testing gap filler equipment in SAGE subsectors. These specifications are by no means final, but are to be used as a framework in developing adequate Operational Specifications for this test.

Semiautomatic height-finder tests with WWI had been planned with the hope that Group 61 might make available operational programs for use in such tests. Group 61 does not have such programs and is not planning to have them (for WWI). The Program Services Committee is about to start writing them.

Some of the tests being run on MTC contain a large percentage of unused wait time (50% of every 620  $\mu$ s interval plus more than 90% during print-out). Experiments are under way to determine the most convenient way of using this time for a second test without interference with the original test. One part of this experiment involves the use of a 'scope to observe neon indicators for determining the amount of wasted time.

A. Werlin's MTC program to study antenna wind loading effects from gap filler radar sites will be used to collect and analyze data during the next two weeks.

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Outputs

(S. B. Ginsburg) (UNCLASSIFIED)

The crosstell data link test program has been completely checked out and is operating satisfactorily. A description of the program has been documented in Memorandum 6M-3759.

Several tests have been performed using the Height Finder phone line loop which is routed between Lexington and South Truro. The tests, thus far, indicate that the data link is one of very high quality.

Mark X (SIF)

(J. P. May) (CONFIDENTIAL)

Group 61, Group 62, and Division 2 personnel have decided on the operational use of Mark X (basic) and SIF in the SAGE System. Division 6 personnel will work more closely with Division 2 personnel to insure that the overall system requirements for Mark X and SIF are met.

A trip was made to Headquarters USAF to obtain more detailed information concerning the implementation of SIF. The commercial system will commence in the New York, New York, area in January 1956.

2.4 Vacuum Tube CircuitsDisplay Line Driver

(J. Kriensky) (UNCLASSIFIED)

The circuit is being changed to enable it to drive a 500 ohm load with all tubes and components remaining within margins. Each tube of the output stage is now brought out separately so that a pair of tubes or more may be used at one time, depending upon the particular application.

Flip-Flop, Model E

(N. J. Okene) (UNCLASSIFIED)

Circuit modifications which reduce the sensitivity of the flip-flop to approximately 7-1/2 volts and 9-1/2 volts at P.R.F.'s of 200 KC and 2 MC, respectively, have been incorporated and tested. The margins with these new modifications are adequate.

Vector Generator

(E. B. Glover) (UNCLASSIFIED)

The sweep circuit has progress as far as the final card layout which is now being tested.

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(E. B. Glover) (UNCLASSIFIED)

In order to obtain a guarantee of 100 volts maximum output, changes have been made in the value of the ladder resistors and the current source resistors. In addition, another pot has been added to the output of each ladder. Since it was desirable to eliminate the gas tubes in the voltage reference circuit for other considerations, the addition of these two pots is accomplished by a simple card change.

Marginal checking of the whole unit will be started as soon as the above changes are complete.

256<sup>2</sup> Core Memory

(D. Shansky) (UNCLASSIFIED)

Three gate generators have been delivered to the Memory Section for installation in the experimental memory system. A fourth is being readied.

Work on the matrix output amplifier (transistor-driven version) circuit has been temporarily halted pending the delivery of some Zener diodes from Transitron Corp.

XP-1 "C" Relay Driver (Thyratron)

A modification to the circuit has been made so that it will trigger more reliably.

Gap-Filler Sweep Circuit

(E. W. Barrett) (UNCLASSIFIED)

Shunt peaking is now being used to make this circuit faster and less sensitive to changes in the input trigger waveform.

Sensing Amplifiers for Memory Planes

(R. C. Zopatti) (UNCLASSIFIED)

Little progress has been made in the effort of developing a better pulse transformer for the sense amplifier. At present, the amplifier has a gain of approximately one thousand, a 0.3  $\mu$ s delay and approximately 15% attenuation due to poor low frequency response. IBM has demonstrated here their breadboard of a sense amplifier which had a gain of approximately five hundred, a 0.3  $\mu$ s delay and approximately 25% attenuation due to poor low frequency response.

2.5 Display

(H. E. Zieman) (UNCLASSIFIED)

Testing is still being carried out on the compensation of magnetic deflection non-linearities. Briefly, the method of compensation agreed upon consists of a pot for a variable damping control, a pot and multiposition switch with capacitors for RC compensation of the output

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(H. E. Zieman) (UNCLASSIFIED)

stage cathodes, and a similar arrangement for RC compensation of the input signal to the preamp. Each console will then have to be individually compensated with these controls.

Present testing is to determine the range of control needed for each variable. Since this has to be carried out with several yoke shield combinations, progress is slow because of the lack of sufficient tube cradles. It is expected that a half-dozen cradles will be available in a week or two, and the testing of these cradles should finalize the compensation design.

A rack is being assembled to supply necessary test signals to the MTC console for testing the forthcoming cradles without tying up MTC unnecessarily during this testing.

(R. Fallows, R. H. Gerhardt, R. Paddock) (UNCLASSIFIED)

The XD-1 display generator frames have been connected to the XD-1 drum system. The drum lines must be terminated before actual systems testing can begin.

Systems test of the digital display generator is nominally under way. However, the programs must be debugged and checked out prior to starting full testing operations. We expect to have a full schedule of DD systems test next week.

Frame 25 has been checked out for all engineering changes to date and has been tied in with the XD-1 drum for system testing.

(J. Woolf) (UNCLASSIFIED)

The five consoles for XD-1 are still being debugged. Three of the consoles have Charactrons installed and appear to be operating under static conditions. Signals will be applied this period. One console has a Typotron installed which has not been tested in this installation.

Without a light source, the thyratron of the light amplifier fires when the trigger is closed. The source of this problem will be determined and remedied.

## 2.6 XD-1 Records

(J. D. Crane) (UNCLASSIFIED)

New log forms have been designed and methods of recording information have been changed in order to reduce the time required to record and transfer XD-1 data to IBM cards. A final log summary is being prepared by IBM for use by the Air Force and MIT in the system test analysis for the month of June.

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XD-1 Testing

(S. Thompson) (UNCLASSIFIED)

RIR 30, a reliability for the addressable drum fields, has been completed and turned over to the XD-1 drum group.

The sandwich program is running, but there is trouble in the special printer plugboard that is needed for this program.

2.7 Memory Test ComputerTechnician Training Program

(A. Vanderburgh) (UNCLASSIFIED)

Memorandum 6M-3509, MTC Technician Training Manual, Chapter III, is now available. This memo is intended as a text - not a reference. It was written to read straight through and assumes that the reader is familiar with Chapters I and II.

Three more chapters are in preparation: Chapter IV, MTC Operation; Chapter V, MTC Circuits; and Chapter VI, Maintenance and Trouble Shooting. Classes will be resumed as soon as Chapters IV and V are completed.

(H. Ziegler) (UNCLASSIFIED)

In order to devote full time to maintenance and improvement of MTC in general, the work of completing the new display system has been turned over to W. Kellogg. The "push-pull" decoders are already in use with the present system and most of the other portions of the system are in drafting.

As a first step in obtaining a higher degree of reliability from MTC, all Monday mornings have been reserved for modification and trouble shooting work. At first this time is to be used to isolate and eliminate known trouble spots in the computer. Later weak areas as indicated by past history will be investigated. A study of all log entries to detect such weak areas is now being done by S. Hazen.

(E. Albanese, B. Searle) (UNCLASSIFIED)

The following is a summary, for the period 4 July to 15 July, of defects found in tubes and in components in MTC:

<u>Tube or Component</u>	<u>Defects</u>	<u>Quantity</u>	<u>Hours Lost</u>
2D21	Out of tolerance	1	0
5965	Grid Emission	1	0
6145	Shorted	2	.75
7AK7	Gone to air	1	.04
Capacitor	Shorted	<u>1</u>	<u>.51</u>
		6	1.30

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(J. Salvato) (UNCLASSIFIED)

July: Distribution of Operating Time during the period ending 15

	<u>Time</u>	<u>Percentage</u>
Programming	84.16	43.7
Development	67.13	34.8
Maintenance and Marginal Checking	14.01	7.3
Installation	9.96	5.2
Reliability Test Programs	12.66	6.5
Interrupting Failure	<u>4.84</u>	<u>2.5</u>
	192.76	100.0 %

General

(W. A. Hosier) (UNCLASSIFIED)

The big news this period from MTC was undoubtedly the drum's overheating a bearing Saturday morning July 2, resulting in its being hors de combat for the last two weeks. IBM very kindly came through with a new rotor of the XD-1 type, complete with photocell timing-track generator, which necessitated a small amount of machining on our casting to provide clearance. The whole job of restoring the drum was held up about two days by the strike's preventing Poughkeepsie men from coming to Lexington, but, thanks to good cooperation from IBM and the Division 7 machine shop, the new rotor is now in and work is progressing on heads and timing track. It should be possible to resume transmission of display signals to Building F July 18 or 19, with (hopefully) complete operation of all drum fields later in the week.

Despite the limitations on operation without the drum, there was sufficient application for MTC to warrant maintaining 24-hour operation, and this continued, even during the strike. GFI testing (which does not use the drum) continued to occupy the third shift, with time apportioned much as before on the first two shifts.

Flatt and Feldstein, as a committee looking into data-processing requirements for the SAGE Experimental Subsector, have proposed as one possibility the addition of magnetic tape, high-speed line printer, or both, to MTC, and have asked for an estimate of the cost of such additions in man power, time, money, and space. A first look at the problem seems to entail a minimum of 1000 tubes in units of our construction (for both printer and punch, that is), with all that this implies in design and drafting time, floor space, augmentation of power supplies, debugging, etc., etc.

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## 2.9 Vacuum Tubes

### 2.9.1 Activities of Group 65

(P. Youtz) (UNCLASSIFIED)

A 19-inch Charactron-type tube was constructed with a new matrix format and a new type of screen (Pl<sub>4</sub>). This tube was sent to Group 62 for evaluation of the screen in MTC operation. A 5-inch Charactron-type tube, constructed to determine the optimum matrix size for a 5-inch high light output tube, will be sent to Group 62 and Group 25 for evaluation for their photographic work.

A number of cathode-study tubes were processed. We received 45 CP guns from Superior Electronics. These guns are similar to the guns used by Convair in their Charactron except for the aperture size of G<sub>1</sub> which was enlarged to reduce leading on the cathode. These guns have been designated for a series of cathode-study tubes.

Activity on the sintered cathode was renewed this past week, and experiments will start early next week with the cooperation of W. L. Gardner of Group 25.

### 2.9.2 Tube Research and Development

(J. S. Palermo, D. C. Lynch) (UNCLASSIFIED)

A 19-inch Pl<sub>4</sub> display tube, CHT-116, has been delivered to the test group for comparative evaluation with a P7 screen. Due to problems of screen adhesion and uniformity encountered in the preparation of this tube, we are presently evaluating better techniques for the deposition of Pl<sub>4</sub> screens onto 19-inch panels.

One of the exhaust hoods in the chemical laboratory has been temporarily modified in order to continue studies for the spraying techniques of cadmium sulfide for Group 25. This modified hood has already been used very successfully to eliminate completely the fumes produced in the preparation of transparent stannic oxide conductive film on glass.

CHT-116 was also assigned to evaluate the Convair Manufacturing Process Specification for the construction of the electron gun and the lathe stem sealing techniques. Both specifications seem adequate for production line practices.

(L. B. Martin) (UNCLASSIFIED)

Seven additional positions in the Typetron life test have been activated. The negative current lead on the +90V supply has

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caused the regulator to lose control. Modification of the intensity circuits will be necessary, and will be taken care of as soon as Charactron work is finished.

All mounts will be modified so the automatic transfer characteristic plotter can be used without changing the matrix lead at the rear.

Six tubes have been on life test for 2523.5 hours and three for 1797.8 hours -- all are satisfactory.

(A. Zacharias) (UNCLASSIFIED)

Investigation of thesis findings continued during this past period. The 2.5  $\mu$  Sylvania P7 (blue) phosphor was tested for light output and found to be distinctly less efficient than the 10-14  $\mu$  particle phosphor. As a consequence, the light output was reduced by a factor of 2 instead of being increased by a factor of 2. Experiments with the ball-milling of 10-14  $\mu$  DuPont phosphor have been started. It is hoped that the finer particle may be obtained and efficiency not decreased so drastically so that increased light output may be obtained. No results are yet available, but obtaining small particles by either grinding or elutriation seems to be inherently a poor method of obtaining the desired particle size of 1  $\mu$ . A measurement of a 2.5 mg/cm<sup>2</sup> blue on 8 mg/cm<sup>2</sup> yellow P7, using 10-14  $\mu$  phosphor, showed the increased output from the yellow (up to 1 sec. or so) that was noted in the blue flash as compared to a 5 mg/cm<sup>2</sup> blue on 8 mg/cm<sup>2</sup> yellow. However, the decay rate,  $\tau$ , was 0.94 for 2.5 mg/cm<sup>2</sup> and 0.80 for 5 mg/cm<sup>2</sup> at the same yellow output at 0.5 sec. Hence, penetration of the blue is evident, illustrating the necessity for obtaining finer particles before attempting to reduce the blue weight below 5 mg/cm<sup>2</sup>.

The six type II (Superior) cathodes were examined after dissection of the various CT. Ion bombardment was evident in all to the extent of complete destruction of the cathode centers. Those two CT operated cutoff, and then on for 350 hours, showed as much damage as those operated "on" for 1000 hours from initial life. It must be brought out that the source of gas was not readily apparent and, furthermore, all six CT were made from guns of the same lot. One gun had no gold plate on G<sub>1</sub> but showed no significantly different bombardment than the five gold-plated G<sub>1</sub> type guns. A gun has been constructed to determine if a "bent-gun" structure would help the situation. Since first acceleration is 3 Kv, only ions formed a distance beyond G<sub>2</sub> entrance will be prevented from bombarding the cathode in the ordinary variety of bent gun.

(P. C. Tandy) (UNCLASSIFIED)

Nine 19-inch tubes have completed from 25 to 4216 hours on

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life test. Six tubes showed an average decrease in zero-bias matrix current of 28% and an average increase in maximum ratio of pulse-cathode current to pulse-matrix current of 78% over a 400-hour period. Cathode uniformity on these six tubes was not satisfactory. The cathodes of two tubes were speckled, while the other four had poor emitting areas ranging from 20 to 70% of cathode area. The other three tubes have just started life.

One tube failed 50  $\mu$ a matrix requirement after 5039 hours. Heater voltage on this tube was 7.5 volts for the last 3185 hours.

Leakage tests on nine tubes showed no appreciable changes from previous measurements. Of four tubes not previously tested, three were satisfactory and one had leakages of 0.58 to 0.74  $\mu$ a on  $S_2$  and 0.86  $\mu$ a on the four selection plates in parallel.

No tubes showed grid-cathode leakage with heater voltage on. One, Convair 0083, developed a grid-cathode short when put back on life test and voltage breakdown occurred. The short was sparked off and the tube put back on life test.

The helical-accelerator resistance of nine tubes ranged from 35.9 to 654 megohms. Accuracy of measurement is not entirely satisfactory at high resistance values and the last reading probably should be somewhat lower.

Ion currents on seven tubes were between 0.2 and 1.2  $\mu$ a during gas test. An ion gauge built into GHT-106-2 indicated the gas pressure to be  $1.2 \times 10^{-8}$  millimeters of Hg. Since this tube does not have a matrix, a comparison to a gas-ratio measurement could not be made.

Fifteen CT's have completed from 243 to 553 hours at one-half cutoff d-c. Four different processing schedules were used on thirteen of these tubes. No appreciable changes were noted since the last report. Three tubes previously did not cut off with maximum bias on the tube, but did cut off after 400 hours on life.

The modification of the deflection circuits of the Charactron life-test tube-control box has been completed, but some difficulty was encountered when the system was turned on. The debugging process on these boxes is nearly completed and 20 life test positions are available.

(S. Twicken, T. Clough) (UNCLASSIFIED)

A progress meeting at Tung-Sol on the DT-438 shows slow but steady progress being made. With the acquisition of most parts and dies, the major effort is on the mount line. The emphasis is both on improving working conditions under the hood and on training the team.

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A meeting was held at Bendix to reach mutual agreement on the design of the Bendix gate pentode for AN/FSQ-7. The major points of initial disagreement were resolved as follows:

1. Bendix will use the same types of grid lateral wire as Sylvania (various types of nickel) and will make a concurrent investigation of the use of molybdenum wire which is much stronger.
2. Bendix will not use leakage slots in the micas between electrodes in keeping with the Sylvania design, but will make a concurrent investigation of the effects of the design changes necessary to do this (increasing the grid major diameters).

A 6M-note will be issued detailing all the decisions reached.

There has been considerable trouble with 5881's in Whirlwind with shorts and low plate current fairly early in life. Dissection of some failures showed serious cathode peeling. Discussions with Tung-Sol indicate that the basic manufacturing difficulty was solved in May 1953; our failures date prior to that time. Arrangements are now being made to replace all 5881's in Whirlwind manufactured prior to 1954 as a preventive maintenance measure.

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## III. ADVANCE DEVELOPMENT

(D. R. Brown)

(UNCLASSIFIED)

The 8-digit transistor multiplier was put in operation on July 7. Total multiplication time is 8 microseconds. Margins appear satisfactory. Carry time is longer than anticipated, 0.045 microsecond per stage. The registers are difficult to drive; no simple solution has been found for the register-driver problem.

The subcontract with Philco is being extended for one year to (1) continue research aimed at establishing the reliability of the surface-barrier transistor and improving its performance in digital-computer circuits, (2) establish specifications for a computer surface-barrier transistor, (3) develop transistors for driving magnetic-core memories, and (4) develop digital-computer basic circuits.

A precision, high-speed, rotary press has been received and will be used to mold ferrite memory cores. Over 1,000,000 memory cores, made in our pilot plant, have been tested for construction of a 256-by-256-by-38 magnetic-core-memory system. Another 1,500,000 will be required.

3.1 Chemistry of Magnetic Materials

(F. E. Vinal)

(UNCLASSIFIED)

Memory Core Production

The Chemistry Section has now produced and double tested in excess of 1,100,000 memory cores for use in the TX-0 memory. During the past two weeks, several test firings were made and two production firings, to yield approximately 220,000 cores produced for the biweekly period. Additional batches are at various stages of processing. Recent batches have been noted to exhibit disturb ZERO values ranging from 15 to 20 mv at the 2-to-1.15 selection ratio used for testing. Our production has been running 25 to 30 mv, and the reason for this improvement is not at once apparent.

The 16-station rotary press has been received in the laboratory and set up for trial runs, with 8 of the 16 stations tooled with steel punches and dies. Test runs indicate that the press is capable of producing to our tolerance requirements, and 7 of the 8 stations did so produce. However, certain minor modifications remain to be made before the press will be ready for routine operation. It will be necessary to switch to carbide tooling when the mechanical bugs have been worked out. During its trial, the press was operated at its maximum recommended rate of 56 RPM for a period of 15 minutes without failure, producing at the rate of 27,000 cores per hour, or 54,000 if all 16 stations were tooled. Normal operation for our needs will not require full operating speed or capacity.

Inorganic Chemistry

In accordance with the semicovalent bonding model proposed by J. B. Goodenough, it is predicted that  $\text{Pd Fe}_2\text{O}_4$  should be a tetragonal substance, along with such materials as  $\text{Cu Fe}_2\text{O}_4$ ,  $\text{Cd In}_2\text{O}_4$ , etc. Synthesis of these materials is underway in order to evaluate this prediction.

Crystallographic examination has been carried out on the substance  $\text{LiMn}_2\text{O}_4$ , predicted to contain a mixture of  $\text{Mn}^{\text{III}}$  and  $\text{Mn}^{\text{IV}}$  and to be possibly ferromagnetic. This material has been shown to be a cubic spinel lattice with a cell dimension of 8.246 Å. Related materials are also undergoing structural examinations.

Experimental work with  $\text{LiFe}_5\text{O}_8$  as possible memory and switch core material has been continued.  $\text{LiFe}_5\text{O}_8$ , with the incorporation of a small amount of nickel ferrite, has shown considerable promise as a square loop material. However, it should be pointed out that this material now stands in approximately the same position as the magnesium-manganese materials did two years or more ago. Much remains to be done before a final evaluation of lithium ferrite is given.

The inorganic chemistry activities and the ferrite production activities are both supported by chemical analyses.

3.2 Physics of Magnetic Materials

(N. Menyuk)

(UNCLASSIFIED)

The design of the modified 12" magnet has been completed, and construction has been started by Varian. Delivery is scheduled for October 1. By then the other components of the vibrating coil magnetometer should be ready. A study of the design of the sample holder to be used with this magnet is being made to minimize the time required to bring the sample to the equilibrium temperature. Design changes as a result of this study have resulted in approximately a 30% improvement thus far.

A study of the magnetization reversal properties of magnetite is underway. Magnetite is unique amongst the ferrites in that it has a high conductivity at room temperature, zero crystalline anisotropy at 130°K, an ordering transition at 115°K, and an additional relaxation mechanism due to the simultaneous presence of ferrous and ferric ions. The polycrystalline samples to be used in this experiment have been obtained from the Laboratory for Insulation Research, and initial experimentation to determine the eddy current effect at room temperature has begun.

A fast rise-time current-pulse generator has been built, but the current pulse produced does not yet meet the desired specifications. The principal difficulties are in the output stage decoupling and the voltage supplies.

### 3.3 New Components and Circuits

(Torben Meisling) (UNCLASSIFIED)

#### SBT Hole Storage

The operating speed of our surface-barrier transistor circuits is limited by the hole storage effect which tends to delay the turning-off of a saturated transistor. Each transistor is subjected to a measurement of a hole storage coefficient,  $\tau$ , which for the units received so far ranges between 40 and 70 millimicroseconds. Comparable high-frequency alloy transistors (Zj-11, RR-157, CK-762) have  $\tau$ 's in the range 350-900 millimicroseconds. Generally speaking, the smaller the  $\tau$  the faster the transistor. There have been enough exceptions from this rule among SBT's, however, to indicate the need for an improved measurement.

The switching mechanism involves the diffusion of holes in the base and the extraction of holes from the collector. This mechanism is critically dependent on the transistor geometry and, apparently, on the properties of the emitter and collector. A set of experimental curves giving, essentially, storage time as a function of the degree of saturation show quite close agreement with a recent theoretical expression. The result of this may be a better hole storage measurement and some practical suggestions for improvements of the SBT.

#### SBT High-Current Performance

We have provided Philco with specifications requiring a maximum emitter-collector voltage drop for two typical collector and base current conditions. This is the first step toward a complete set of specifications for transistors for TX-0.

As the SBT is now, its current amplification decreases when the collector and base currents are increased. This may prove to be a serious limitation in a large practical system which requires large currents for driving purposes. Accurate measurements of the emitter-collector voltage drop as a function of  $I_c$  for constant  $I_c/I_b$  indicate that the drop in  $\beta$  for high collector currents may be due to an external series resistance in the collector. Another possible cause may be a decrease in emitter efficiency for high currents.

#### Life Tests

There have been no transistor failures among the 286 transistors on life tests during the 544,000 transistor hours accumulated so far. Two recirculating shift registers occasionally lose their patterns.

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One shielded register has maintained its pattern for as long as 887 hours. The other, unshielded, register has run for 332 hours without loss of pattern.

### Circuits

Two types of gated pulse amplifiers, one with and one without pulse transformer, are being tried out in the multiplier. The load can be carried without a pulse transformer. Pulse transformers may, however, prove useful where larger loads are required.

A small SBT matrix has been built and is being tested.

### 3.4 Memory

(W. N. Papien) (UNCLASSIFIED)

Progress on the 65,536-register, 37-bit, switch-driven core memory continues at a steady pace. The experimental  $256^2$  digit plane has been removed from its old setup, where it was driven from the mocked-up crossarms of a core switch, to a new setup which will have our first, full, 256-position switch with breadboarded drivers and sufficient logic to perform more-sophisticated tests.

Unit-plane (64 x 64) fabrication continues. Almost 50 unit-planes have been completed. A unit-plane requires slightly over 1 technician-day for assembly, given the cores, the pre-cut and stripped wires, and the frame. The completed unit-planes are being tested on Test Setup No. VI. Five tested unit-planes were delivered to Group 24 for their experimental work.

Because the internal memory of the TX-0 computer is by far the major dissipator of power and space, this Section has become largely responsible for the cooling, power, and associated space-preparation problems of that machine. Power supplies are being designed and ordered with the help of Gano's Section, cooling with the help of Francis Associates; lighting, cabling, and other space-preparation designs may also involve the help of those consultants and Wainwright's Section.

Investigation of transistor circuits for memory work continues. Transistor sense amplifiers and drivers are presently receiving attention.

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### 3.6 System Design

(Jonathan Fadiman for Ken Olsen) (UNCLASSIFIED)

On July 7th the eight-digit transistor multiplier was first put into operation. The succeeding time has been spent in improving and cleaning up the back panel wiring.

Excessive hum level on our supply voltage has been corrected by additional filtering. The first group of twenty plug-in flip-flop boards and nineteen logic boards has been completed and tested.

Experiments have been performed to determine operating margins and necessary carry time per stage, and measurements are being made to determine the minimum time for a complete multiplication.

Attempts are being made to develop an improved register driver for the multiplier. A breadboard register driver using nine transistors has been built, which will deliver 100 millimicrosecond pulses of about two volts amplitude into the eight flip-flop register.

IV - CENTRAL SERVICES

4.1 Material Requirements and Stock

(H. B. Merley) (UNCLASSIFIED)

Activity in this section has slackened slightly, presumably because of summer vacations. We are taking advantage of the lull to catch up with a backlog of work in catalogs, filing, cross-indexing, etc.

4.2 Engineering Services

4.2.1 Components

(H. W. Hodgdon, C. Morrione) (UNCLASSIFIED)

The long-awaited environmental test chamber has been delivered and is now being installed in the Components Section Lab.

A wide variety of film-type resistors has been ordered for test and evaluation of the factors governing reliability.

A report has been written covering production process, quality control procedures and performance characteristics of deposited carbon resistors manufactured by Mepco, Inc., Merristown, N. J.. A copy may be obtained by calling ext. 836.

4.2.3 Mechanical Engineering

(H. Wainwright, A. R. Smith, L. B. Smith, L. B. Prentice)  
(UNCLASSIFIED)

August 1st is the expected completion date for XD-1, XD-2, command post and MTC situation display console work, including cameras and accessories.

It is also believed that the 5-inch Charactron tube mount for the Kelvin-Hughes camera can be ready by that same date. However, it should be understood that the mounting to be employed is designed to meet the proposed demonstration date, but not necessarily for design release.

4.4 Administration and Personnel

(J. C. Procter) (UNCLASSIFIED)

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New Staff

Severo Ornstein is a new staff member assigned to Group 61. He received his AB in Geology from Harvard University and was employed by Gulf Research and Development Company.

Judith Stone is a new staff member assigned to Group 61. She received her BA from Smith College in June.

Terminations

William Ball, Robert Walquist, Armen Chopourian.

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Accessions List

(Frances Christopher) (CONFIDENTIAL)

The following documents were published by Division 6 or received from IBM during the period of 1 July - 15 July, 1955.

NO.	AUTHOR	TITLE	CLS.
6M-2769 Sup #1	E. D. Lundberg	Radar Data Capacity of the AN/FSQ-7	C
6M-2527-2 Cor.1	P. R. Bagley	MTC Programming Manual Corrections	U
6M-3291 Sup #2	R. R. Shorey	Specifications for the Central Computer System for the AN/FSQ-7	U
	J. J. Carson		
6M-3292 Sup #1	J. J. Carson	Specifications for the Drum System AN/FSQ-7	U
6M-3293 Sup #1	J. J. Carson	Specifications for the Display System AN/FSQ-7	U
6M-3297 Sup #1	J. J. Carson	Specifications for the Power Conversion and Distribution System	U
6M-3298 Sup #1	R. R. Shorey	Specifications for Manual Inputs System for the AN/FSQ-7	U
6M-3299 Sup #1	J. J. Carson	Specifications for the Output System for the AN/FSQ-7	C
6M-3300 Sup #1	J. J. Carson	Specifications for the Maintenance Equipment of AN/FSQ-7	U
	R. R. Shorey		
6M-3301 Sup #1	J. J. Carson	Specifications for the Automatic Input Elements of the AN/FSQ-7	C
6M-3309 Sup #1	R. R. Shorey	Specifications for the Warning Lights System AN/FSQ-7	U
6M-3501	E. L. Smiley	Annunciator System for Monitoring of Air Flow in Sage Direction Center and Combat Centers	U
6M-3584-1	H. K. Rising	XD-1 Console Equipment and Label Layouts Part II Room S	C
6M-3585-1	H. K. Rising	XD-1 Console Equipment and Label Layouts Part III Room W	C
6M-3586-1	H. K. Rising	XD-1 Console Equipment and Label Layouts Part IV Command Post	C
6M-3587-1	H. K. Rising	XD-1 Console Equipment and Label Layouts Part V Room T, I, D, M, and Computer	C
6M-3632-1	H. K. Rising	AN/FSQ-7 Console Equipment and Label Layouts Part 1, Equipment Summary	C
6M-3633-1	H. K. Rising	AN/FSQ-7 Console Equipment and Label Layouts Part II, Room S	C
6M-3634-1	H. K. Rising	AN/FSQ-7 Console Equipment and Labels Layouts Part III, Room W	C
6M-3635-1	H. K. Rising	AN/FSQ-7 Console Equipment and Label Layouts Part IV Command Post	C
6M-3636-1	H. K. Rising	AN/FSQ-7 Console Equipment and Label Layouts Part V Rooms T, I, M, R and Computer	C
6M-3649	E. U. Cohler	Typical SBT Static Characteristics	U

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Accessions List (Continued)

<u>NO.</u>	<u>AUTHOR</u>	<u>TITLE</u>	<u>CIS.</u>
6M-3680	T. Clough et al	Vacuum Tube Failures During the Month of May 1955	U
6M-3697	W. H. Ayer	Review of Operational Lighting De- velopments at Lincoln Laboratory	U
6M-3710	M. E. Petersen	Surface-Barrier Transistor Pulse Generator	U
6M-3713	J. F. Jacobs	Rand-Lincoln Relationship	C
6M-3717	G. A. Davidson	A Transistor Selection System for a Magnetic-Core Memory Master's Thesis Proposal	U
6M-3719	-----	Laboratory Personnel List	U
6M-3721	E. D. Lundberg	Sage System Meeting 27 June 1955	U
6M-3722	H. J. Platt	Minutes of Experimental Sage-Sub- sector Planning Approval Committee Meeting of 27 June 1955	U
6M-3723	R. C. Jeffrey	Logical Networks, IV: Arithmetical Analysis of Logical Nets	U
6M-3724	L. L. Sutro	Test Equipment Committee Meeting 17 June 1955	U
6M-3725	J. N. Ackley	Programming for the WWI Crosstell Output System	U
6M-3726	P. R. Bagley	FSQ-7 Programming Seminar	U
6M-3727	J. Giordano	Minutes of the IBM-SO Concurrence Meeting #32 Held at Lincoln Lab- oratory 29 June, 1955	U
6M-3729	J. D. Crane	Proposed XD-1 Evaluation, 13 July 1955	U
6M-3730	C. J. Carter	Siting Party Meeting at Montauk	U
6M-3733	P. R. Bagley	Documents of Interest to XD-1 Pro- grammers	U
6M-3736	E. S. Rich	ADES-Lincoln Activities in System Test Planning-Second Meeting	U
6M-3737	P. R. Bagley	Group 61 Indoctrination Course	U
6M-3738	D. R. Brown	Extension of Subcontract #49	U
6M-3735	W. H. Ayer	Francis Associates Budget	U
	E. L. Smiley		
6M-3743	F. E. Heart	Tracking Method Study	C
6M-3745	L. L. Sutro	Second Progress Report on XD-1 Large Display Board	U
6M-3749	W. L. Gardner		
	H. J. Platt	Minutes of Experimental Sage Sub- sector Planning Approval Committee Meeting of 11 July 1955	C
6M-3750	C. J. Carter	Report of Meeting with Telephone Company Regarding N. Truro Site	U
6M-5004-1	Sage Test Off.	Outline of Test Program for Experi- mental Sage Subsector	C
6M-5029	A. Mathiasen	Simulated Data Reference Program	C
	J. Nolan		

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6M-5031	Sage Test Com.	Sage Test Committee Meeting #4	C
6M-5034	Sage Test Com.	Multiple SDV Prints - Heavy Radar	C
<u>IBM DOCUMENTS</u>			
IBM-768	-----	Computing - Programmers Manual	U
IBM-769	-----	Indexing - Programmers Reference Manual	U
IBM-770	-----	AN/FSQ-7 Engineering Progress Report	S
IBM-771	W. Rooney	Progress High Semi-monthly Report #56	C
IBM-772	R. Cunningham	Card Assemblies Released for AN/FSQ-7	U
IBM-773	-----	Central Reference Room Bulletins #86	U
IBM-774	D. B. Thompson	Military Reference Data Standards	U
IBM-775	-----	Central Reference Room Bulletins #87	U
IBM-776	-----	Display System - Programmers Reference Manual	C
<u>LL-DR DOCUMENTS</u>			
DR-272	B. Morriss	Concurrence on Automatic Camera and Control for AN/FSQ-7	U
DR-274	R. C. Marden	AN/FSQ-7 Auxiliary Console Specifications for XD-1, XD-2 and the Production Machine	U
DR-275	W. A. Hunt	Simplex Signals on "Down" Duplex Equipment	U
DR-276	W. C. Slagle	Warning Light ICP Labeling Change	U
DR-277	C. E. Walston	Concurrence on Card Machine Input-Duplex Central	U
DR-278	D. C. Ross	Concurrence on Drum Specifications for the Production System	U
DR-279	D. C. Ross	Maintenance Intercom Specifications Production Machine	U
DR-2 80	R. C. Marden	Concurrence on D-81-3. Command Post DD Desk for XD-1 and Production Machine	U
DR-281	L. V. Ruffino	Maintenance Furniture and Miscellaneous Non-expendable Items List for Duplex Central	U
DR-282	F. I. Gewickey	Concurrence on D-91. Tape Power Distribution System for AN/FSQ-7	U
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6A-177	R. R. Everett	Group 66 Organization List	U
6A-179	J. W. Forrester	Appointments to Associate Group Leader	U
6A-180	J. W. Forrester	Appointment to Associate Group Leader	U

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