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

SUBJECT: BIWEEKLY REPORT FOR 29 JULY 1955

To: Jay W. Forrester

From: Division 6 Staff

Approved: John C. Proctor

CONTENTS

The research reported in this document was supported jointly by the Department of the Army, the Department of the Navy, and the Department of the Air Force under Air Force Contract No. AF 19(122)-458.

SAGE SYSTEM TEST AND PLANNING

(Group 61, C. R. Wieser)

Master Program Preparation (H. D. Bennington)

Master Program Organization (W. S. Attridge, Jr.)

A detailed schedule for the program organization subsection for the period ending October 5 has been prepared. This schedule reflects progress to date as well as the following changes in manpower:

William Ball has left.

Those who have joined the subsection are:

Alan Shoolman who will work on the general input-output problem.

Fred Ogg (Rand) to work on the switch input and interpretation problem.

Ray Olsen (Rand) to work on the track scan problem.

Utility Programs (C. H. Gaudette)

The specifications for the Lincoln Compiler are being prepared.

The 407 Accounting Machine Training Course will begin on August 8 and last approximately one week. This course has been designed specifically for the computer operators. A more advanced course may be given at a later time.

The 402 Accounting Machine will be removed on August 15.

Duplex and Checkout Studies (P. R. Vance)

A new proposal and schedule for Group 61's duplex-standby requirements was prepared and submitted to C. R. Wieser, J. Arnow and D. Israel.

Operational Specifications for SAGE System (C. A. Zraket)

The operational specifications for the SAGE Direction Center listed in 6M-3751, "Concurrence Procedures for SAGE Operational Specifications," are expected to be completed by 22 August. Some of the memoranda have already been issued.

Air Surveillance (J. A. Ishihara) CONFIDENTIAL

Memorandum 6M-3766, Draft #1, "SAGE Operational Specification: Track Detection and Initiation," has been issued and discussed with ADC representatives (4620th).

Memorandum 6M-3774, Draft #1, "Operational Specifications for Radar Inputs," has been issued and discussed with ADC representatives (4620th), and is now being revised.

Air Surveillance (continued)

A revised draft of a preliminary study of crosstell facilities has been completed.

A rough draft of automatic tracking specifications is in progress. It will include specifications for the processing of AEW, GOC, picket ship, AA, and manual crosstell reports.

Nothing has been written yet on the specifications for track monitoring.

The Air Surveillance display requirements and assignments have been reviewed and submitted to R. Reed.

It has been recommended that further study be given to the problem of coverage masking.

In order to shorten the time required for initial data processing, a change has been requested in the drum word bit layout for incoming radar data.

Peggy Strait of the Program Organization Section is checking the rough draft of the memorandum on track sorting for the correlation program.

Weapons Direction (C. C. Grandy) CONFIDENTIAL

Operational Specifications

Operational specifications for the weapons direction elements of the SAGE System arenearing completion. Final drafts (to be circulated for formal concurrence have been completed for the antiaircraft, raid forming, and subsector command post elements. Final drafts for height finding and weapons assignmen are being prepared and will be issued the week of August 1. The first draft of the specification for intercept direction will be discussed with the 4620th AD Wing during the week of August 1.

Support Work

Studies have been completed in support of crosstelling (6M-3788, "Weapons Direction Requirements," R. Nelson) and forward telling (P. Bragar). This work will be incorporated into the operational specifications for crosstelling (Air Surveillance Section). Material is being prepared for a briefing of ADC representatives on SAGE designation of targets directly to AA batteries. (J. J. Cahill, Jr.)

Weather (S. J. Hauser and F. M. Garth) CONFIDENTIAL

The first draft of memorandum 6M-3778, "Usage and Presentation of Weather Data in the SAGE System," has been issued. Its contents were discussed with ADC representatives at Lincoln Laboratory. Their suggested modifications are being incorporated into the memorandum which will be presented for ADC concurrence.

Manual Inputs (S. J. Hauser and F. M. Garth) CONFIDENTIAL

The second draft of a memorandum on Manual Inputs in SAGE is being prepared. Publication date of the memo is set for 3 August.

Identification (S. J. Hauser and F. M. Garth) CONFIDENTIAL

Memorandum 6M-3709, "SAGE System Operational Plan for Identification," was published 29 July. It will be discussed with Lincoln Laboratory ADC personnel preparatory to a revision which will be issued for ADC concurrence.

Training and Battle Simulation (J. P. Levenson)

Data-General Program

The data-generation program processes simulated flight information to provide simulated radar returns and is useful for training and system testing. Conferences have been held to review Rand and Lincoln requirements and a joint effort in which programming can be shared by the two organizations seems possible.

Operational Specifications for Recording

Recording of summary information during SAGE System operation must satisfy requirements for operations analysis, training, systems testing, and general record keeping. No specifications will be written until ADC presents recommendations from an operations analysis group, and until training needs are more fully discussed.

Operational Specifications for TBS

A first draft is being prepared of specifications for system operation with simulated inputs. The main stumbling block to its completion has been the question of whether or not simulated inputs must be used simultaneously with real inputs to allow subsectors to continue operation on the real air situation during simulated exercises. At present the OPS specifications are being written with the assumption that both simulated and real inputs will be combined and must be handled within the confines of the present input equipment and display facilities.

Combat Center (W. Lone, Jr.)

A draft of 6M-3748, "Detailed Schedule for Operational and Mathematical Specifications for Combat Center," has been issued.

Memorandum 6M-3732," AN/FSQ-8 Console Equipment and Label Layouts," has been issued.

A rough draft of forward telling (ground-to-ground data link communications from a Direction Center to a Combat Center) requirements has been written.

Combat Center (continued)

A study period, prior to the writing of a Guide to Combat Center Operations, will be in progress until August 8.

Equipment Coordination (R. R. Reed)

Situation displays have been specified for all consoles except those in the TBS room. A chart has been prepared which shows driving requirements for all RD CAT, CAT, DAB, and mixed lines. The system uses only about half of the total driver capacity.

Two CAT's and eighteen DAB's still remain for future expansion.

Feature switches cannot be specified completely until one of the proposed changes in the wiring has been adopted.

I believe a meeting is in order to determine message costs of all CAT's and DAB's. Attention devices must be decided upon and use of message pools must be determined.

Test and Analysis (W. I. Wells)

Test Planning (W. Z. Lemnios) CONFIDENTIAL

1954 Cape Cod System

During early experiments of the test program, it became evident that several functions of the 1954 Cape Cod System contained program and logical errors. It was decided to concentrate studies on the Data Input, Tracking, Monitoring, and Recording Programs, since most errors seemed to occur in these functions. These programs represent about one-half the 1954 Cape Cod System. The checkout is now almost completed with the following results: All the Data Input Programs have been completely checked out, and a new Recording Program has been written. The Monitoring Programs are about 80 per cent checked out. This includes the writing of a new program, the "Track History Display." About 80 per cent of the Tracking Programs have been checked out.

Interception Tests

We have been preparing the test specifications and program specifications for the post test data reduction programs. Two final steps remain before the tests can begin: The present 1954 Cape Cod System Recording Program must be modified to record some information from Fighter Data Storage, and flight paths for the simulated hostile aricraft must be produced by the Data Generation Program.

Tracking Accuracy Tests

The concentration on these tests has been to modify the data reduction

Tracking Accuracy Tests (continued)

programs and to simplify the data processing schemes. In this regard a simpler method of recording time on the Raydist Brush Recorder has been effected. Because of the current shutdown of the Direction Center for the testing of FGD, no tests were conducted.

Initiation Tests

No progress can be reported on these tests because of the current shutdown of the Direction Center for the testing of FGD.

Test Direction (R. N. Davis) CONFIDENTIAL

During the past biweekly period this section scheduled and completed ten missions. None of these were in support of the SAGE Test Office; all were for development.

Analysis and Simulation (J. F. Nolan) CONFIDENTIAL

Simulation

The documentation of MISP as it has been used to date has been completed. A memorandum will be written shortly to explain the operation of the program and facilitate its use.

A new weather clutter and tracking program was written and is being checked out. It will be incorporated into MISP shortly.

It is planned to modify MISP and use it to study tracking methods. To this end, work is being continued on a study of track evaluation methods. Detailed specifications are being written for a program to evaluate the quality of tracks simulated by the modified MISP. Both the accuracy of tracking and the ability of the various tracking methods to follow a single track under adverse conditions will be measured.

Simulated Data Analysis

A program has been written which will compute means and standard deviations of the MISP. The program is written for general computations (i.e., it will compute means and standard deviations for any set of data). However, for MISP it will compute the means for λ, which is the angle formed from the line of sight between interceptor and target, target heading, and $\Delta\chi$, which is the error in heading of the interceptor. A study will be made to determine the variation of these means and standard deviations with changes in parameters (i.e., varying blip-scan, sampling time, etc.).

Monitoring and Track Trouble Detection

In a continuing study of the Cape Cod System monitor programs, several logical and program errors have been found and corrected.

Monitoring and Track Trouble Detection (continued)

The general area noise generation program for the Cape Cod System has been written. It has been tried once on the computer, but no results have been obtained as yet.

The Simulated Data Reference Program has been used once with tape prepared by the Data Generation Program, but results were inconclusive because of an error in the blip-scan table tape.

Special Studies (F. Heart) CONFIDENTIAL

Tracking Study

A tracking study effort has been in progress during the past biweekly period. This study, described in Memorandum 6M-3743, involves a two-week steering session which started on 20 July. To date the steering session has received numerous comments from Lincoln staff members as to tracking techniques, study proposals, etc. The steering session is now in the process of filtering these ideas with the goal of defining further research efforts.

Azimuth-only Tracking

The study of azimuth-only tracking has been continued with emphasis on the best techniques for minimizing the computational problems. In addition, further emphasis has been placed on "ghost" estimation for a number of system configurations.

Radar Coordinating Committee

Continued support has been given to the Lincoln Laboratory Radar Coordinating Committee. Several attempts have been made to clarify Division VI opinion about the relative importance of radar design goals. Memorandum 6M-3783, "SAGE Radar Requirements - Priority Estimate," was issued and an addendum to this memorandum is now in preparation. Much of this effort has revolved about the importance of altitude information as an integral part of search radar information.

Airborne Early Warning

A small interdivisional committee has been considering the problems involved in integrating AEW with the SAGE System. The objective of this committee is to rapidly reach a proposal which can then be presented for study by others in the Laboratory.

Visits and Visitors

On 13 July, two visitors from a United States-Canadian Committee (Cussat) visited the Laboratory. This visit is reported in an inter-office memorandum to C. R. Wieser.

Visits and Visitors (continued)

A symposium on the AN/GPA-37 system was held at Rome Air Development Center on 26 and 27 July. This system involves a technique for ground control of interceptors by use of the Tracker-Computer (AN/GPA-23), which was developed at Columbia University. Field tests on this system will begin in November 1955; it would be worthwhile to follow the activities of these field tests.

Computer Time Difficulty

Computer time has not been available to complete checking out the test program, "Detailed Single Tracking History Print-Out."

Computer Operation Time

Whirlwind I (W. Vecchia)

Scheduled Time	158H	
Extra Time	24H 40M	
Total Time		182H 40M
This time was used as follows:		
Analysis	11H 45M	
Data Reduction	18H 25M	
Program Checkout	42H 15M	
CCS Operation	22H 15M	
Equipment Checkout	2H 30M	
Raydist	60H	
Subtotal		157H 10M
Group 6345	3H 45M	
Group 64	17H 15M	
Subtotal		21H
Time Lost Due to Malfunction		4H 30M
Total Time		182H 40M

XD-1 (P. L. Guinard)

Total Time Used - Utility Assembly	7H 15M
Down Time - Computer Malfunction	45M
Total Assigned Time	8H 0M

Training

(S. B. Hibbard and G. C. Reed)

Results of a prolonged study by ADES, Western Electric, Bell Telephone Laboratories, ATC and Lincoln to plan a training course, materials, and aids required for XD-1, E.S.S. and subsequent SAGE, will be published as memorandum 6M-3781. This study was based on experience gained by the study group in an on-the-job training course for operators in the Cape Cod '54 System.

Under continued investigation are:

1. Space for classroom instruction.
2. Availability of computer time for training.
3. Simulated training programs.
4. Use of test programs for training.
5. Need for operators for XD-1 console positions before 1 April 1956.

(A. P. Hill and P. Bagley)

Plans for the next SAGE familiarization course to be given by Group 61 have been started. It is expected that some decision will be made during the next biweekly period as to the dates and place of meeting for the course.

FSQ-7 PROTOTYPE DESIGN AND INSTALLATION

(Group 62, N. H. Taylor)

XD-1 Installation (J. A. O'Brien)

Assembly and testing of the XD-1 machine is proceeding well. The drum system is operating satisfactorily except for a crosstalk problem that is being tracked down. The tape system performs well as long as it is programmed correctly. The digital display generator is now working with the drum system and displaying on a DID tube.

We hope to provide within two weeks a temporary set of manual input switches at the maintenance console for use of the Group 61 programmers.

All XD-1 frames have now been delivered. The LRI and output frames arrived 29 July. Display consoles and associated equipment have not yet been delivered.

Several changes to the display system have been discussed which drastically affect the cabling. Tentative solutions to the cabling problems were proposed at a meeting of those concerned with installation. If the Air Force approves the changes, we may be able to install them with something less than total disruption of other work.

System Integration

We have had several meetings on the problems involved in tying together the various subsystems in the experimental subsector. There are two principle areas of concern: (1) The planning of the tests to be performed on the separate systems, and (2) the coordination of the activities of the various groups of people involved.

An engineer will be assigned to follow each subsystem from planning to final test. He will be supported by programming and planning services and will have help from the ADES people here who will work on these problems in the SAGE System. The engineer assigned to the GFI system is H. W. Boyd, and the LRI system will be followed by W. J. Canty.

Programming

S. Thompson has completed work on his sandwich program. The program is designed to allow the simultaneous operation of several test programs in XD-1, allowing two or more test activities to proceed at the same time. Anyone writing test programs is requested to contact S. Thompson.

A program has been written to record GFI data on the RD drum for display.

LRI Monitor

The breadboard model of the LRI monitor for displaying long-range radar

LRI Monitor (continued)

inputs has been constructed and is now being debugged. A present 60-cycle pickup is causing trouble in the decoder outputs.

Automatic Camera

The camera control system in Frame 25 is now operating, but the console to be photographed and the camera have not been connected. Modification of the console to permit the camera to control intensification is underway.

Large Board Display

Progress report 6M-3745 was issued on the large board display. Work is now underway to install a 5" charactron in the Kelvin-Hughes machine now in the lab. Burroughs Research Center has demonstrated a means of displaying predetermined words on a status board with good clarity. The system is described in a memo by W. L. Gardner issued 14 July.

Display (R. S. Fallows)

The two central display generation frames have been connected to the XD-1 drums for over two weeks. System testing of frame 25 has shown the frame margins to be satisfactory except in type C flip-flops, which are being investigated. There seems to be an error in the operation of the situation display drums (RD and TD). The IBM system test group is analyzing this problem. Testing of frame 24 has been delayed for final changes to the test console (168) and to the frame.

Supplement #7 to the display specifications, 6M-2877, has been written by Bob Gerhardt, describing the requirement for a new point address for the charactron, and describing the frame circuitry needed for vector intensity control.

Three new SD consoles and two auxiliary consoles were delivered in the period. The first two SD consoles to arrive were debugged to the point of installing pluggable units in about one day each. Mechanical difficulties in installing sub-assemblies have delayed further testing. Except for mechanical rework, it appears that the installation time for a console may be less than the one-week estimate made last April.

The actual schedule of future deliveries from Crosley is still not clear.

Another problem which has come into focus in the past period is related to the keyboards and warning lights for XD-1. The problem is confused with other considerations, but it amounts to a statement from IBM that no action has occurred or is planned for the keyboard or warning light equipment beyond that described in IBM document IM62-2. If equipment

Display (continued)

were installed to this plan, the XD-1 installation would be incompatible with the operational programs.

Evaluation (W. J. Canty)

The operational records of the XD-1 computer beginning 1 June 1955 have been placed on punched cards and a summary of computer operation for the month of June has been made. Records for the first few weeks in June were not useful because of ambiguous and incomplete entries. Most of these difficulties have been corrected and data for the month of July should be very useful.

Memory Test Computer (W. A. Hosier)

The MTC drum is again in operation: six fields (3, 4, 5, 6, 13, and 14 octal) have been checked out, and the other six are in process. Some delay was encountered because the new rotor had a radius some .004" less than the old. The extra heads on fields 13 and 14 reading to building F were also checked out and can be used for testing the XD-1 display system. Fallows has indicated that, for the present, he will connect the display frames to the XD-1 drum rather than to MTC, leaving the MTC lines free to test Joe McCusker's r, θ display for the LRI.

SAGE Subsystem Testing CONFIDENTIAL

John Wilford of IBM has decided for the present not to use MTC signals further to check GFI equipment. The MTC tests have aided GFI materially in getting ready to tie in to XD-1. Now that some nine channels are tied in and operating, the emphasis of his effort will be elsewhere.

Mayer and Werlin have continued to gather data on the statistical nature of radar data on SDV phone lines. Ginsburg has run a series of phone line transmissions over a closed loop, checked received messages for errors, and tabulated the results. Ginsburg's phone line signal-generating and checking program has also been useful to John Hansen and others of Group 22 to check their scatter-link transmission.

Corderman, Sieman, and Woolf have used two evenings a week to improve circuits in the display console such as deflection amplifiers.

Analysis and Data-Processing

Group 61 (Neumann, Stahl, and others) have used about 15 hours a week for simulated tracking and vectoring procedures. Group 22 (Harris, Uskavitch, and Miss Fleming) have used 14 hours a week to reduce and analyze flight test data. Group 24 and 34 (Mrs. Kannel, Miss Jensen, and others) have used about 6 hours a week in their pattern-recognition studies.

Memory Test Computer (continued)

Utility Programs

Farley and Durgin have completed a program and card-machine procedure for punching instructions or numbers in blocks out of core memory to IBM cards in IBM code; these cards can then be listed on the 407 printer, eight instructions to a line.

Vanderburgh has written a relative-address program to facilitate arbitrary location of subroutines in memory and also a block print-out in octal form on the camera scope for post-mortem purposes.

Farley's general card and tape symbolic-address-assembly program is still in process.

Maintenance and Records

Herb Ziegler has begun an energetic attack on several aspects of the maintenance problem: He has compiled a list of deficiencies to be corrected and has established regular Monday morning hours for working on them; he has set up an inspection procedure with Nickerson; he has rearranged the technicians' room to facilitate installation of better testing equipment; and is trying to organize the technicians' work into more definite areas of responsibility. The fruits of this attack will not be immediate, but should gradually show up in improved performance. Complaints and suggestions should be brought to Ziegler's attention.

Stan Hazen has laid out a new form for recording the computer log so that entries will be more complete and easier to abstract. He is working on card techniques for processing the information so obtained.

John Newitt, having seen the GFI testing through, is now undertaking to clarify and complete the MTC marginal checking system.

Training

Vanderburgh has started Chapter 4 of his technicians' training manual, covering the mechanics of operating the computer.

Installation

The Program Counter end carry has been routed through a gate to permit storage of program in address 3777.

Planning

Bill Kellogg has been organizing details of the new display system, including experiments with the transistor light-gun designed by Elkind of Group 38, and a decoder-controlled intensity gate to enable programming of spots of variable intensity.

Planning (continued)

The proposal to install tape units, printer, or both on MTC is still awaiting a decision. Frank Durgin has proposed a new low-current selection-plane drive system for core memories.

Reliability and Operating Statistics

Considerable intermittent difficulty has been experienced with the Ferranti photoelectric tape reader which Earle Gates has just diagnosed as oscillation in the photocell amplifier circuits. Also, a transformer supplying the console and camera display scopes shorted out, necessitating substitution of a temporary high voltage supply.

Distribution of time this period has been as follows:

	Total	Percent
Programming	97.06	40.2
Machine Development	111.45	46.1
Interrupting Failures	4.86	2.0
Reliability Check Programs	9.33	3.9
Maintenance and Marginal Checking	18.83	7.8
Total	241.53	100.0

Display Development (C. L. Corderman)

Six production light guns were evaluated in MTC and appeared to be in good condition. The average signal to noise ratio was about 100:1, and the signal outputs were 16 times the amount needed to trigger the thyratron which generates the output signal.

The final component values needed for compensating the yoke deflection amplifier have been determined, and will be incorporated into drawings and equipment.

The vector intensity modulation unit has been built and W. Santelmann is doing the preliminary debugging.

A rotary switch has been designed for the digital expansion circuitry to enable an operator to move his normal area to any one of the nine positions available on a times-2 expansion.

A new matrix design for the charactron has evolved from Group 38 evaluation of performance in MTC. This will be recommended to Hazeltine as the best design for production tubes. A similar effort is in progress on the typotron.

Basic Circuits (R. L. Best)

Sensing Amplifiers for Memory Planes (R. C. Zopatti)

A tape core was used as a center-tapped choke in place of the 1:1 transformer, resulting in an overall sense amplifier delay of 0.21 μs and a p.r.f. sensitivity of 12 per cent. It is the best combination tried so far, and will be tested further in a memory to discover any unknown faults.

256^2 Core Memory (D. Shansky)

Matrix Output Amplifier

Publication of a note on this circuit has been delayed pending the collection of additional experimental data.

Digit Plane Driver

The collection of data concerning the operating margins of this circuit are nearly complete. The circuit will successfully drive a 180-ohm impedance. A total of five cathodes are employed to produce the required 410 ma pulse ($\tau_r + \tau_f = 0.5$ μsec) at a duty factor of 0 to 45%. An M-note on this circuit is being prepared.

Flip-Flop, Mod. A (N. J. Ockene)

(Production Machine) DC-1

The revised Model A flip-flop circuit which has been found acceptable now contains the following parameters: trigger circuit, 820 ohms and 100 μμf; cathode bias circuit, 680 ohms and 270 μμf; grid circuit damping resistor, 5600 ohms.

DC-2

This flip-flop circuit is now being tested on the old cards before being wired up for use on the revised cards. Results should be finalized during the next two weeks.

Direct-Coupled Video Probe (W. F. Santelmann, Jr.)

Experiments are underway to determine the feasibility of an eight-foot passive probe. It is recognized that the transmission-line effect of this length cable causes many difficulties.

Charactron Vector Intensity Decoder (W. F. Santelmann, Jr.)

The breadboard of this circuit has been received from the shop. The decoder portion appears satisfactory, but the amplifier portion seems to need further work.

Basic Circuits (continued)

Display Line Driver (J. Kriensky)

The circuit modification permitting it to drive a 500-ohm load has been checked. The best compensation for stability is now being determined.

Vector Generator (E. B. Glover)

All circuit changes mentioned in the past biweekly have been checked and are satisfactory. A method of marginal checking, using only one marginal check line for the whole vector generator, has been tested and found to have possibilities.

Five complete vector generators, built according to the old circuit schematic, have been received from Hazeltine. Although they will eventually be completely modified, we now have them available for system testing. One vector generator is also available for use in checking margins and design changes.

Some work has been done to provide a test pattern that can be used for alignment and marginal checking; tests will be started to check its effectiveness.

Test Equipment (L. Sutro)

Ten of the new 30 Mc bandwidth Tektronix scopes (types 541 and 545) have been received and seem generally satisfactory. Transistor people are seeing new shapes on their old waveforms.

The test equipment committee at its meeting on 22 July approved construction of 30 more plug-in flip-flops Mod. II, MTC, known as "high-speed flip-flops," for use as test equipment. These units contain the flip-flop circuit used in FSQ-7. Output levels are +10 V and -30 V. This order brings the total of this type of test equipment to 140.

ADVANCE DEVELOPMENT

(Group 63, D. R. Brown)

Chemistry of Magnetic Materials (F. E. Vinal)

Memory Core Production

The total number of cores produced and double tested by this section for the TX-0 memory is 1,150,000 (Sacco, Schallerer). The relatively small increase in total figures for this biweekly period results from the use of the furnace equipment to establish exact firing conditions for the several batches now on hand in the form of 350,000 unfired cores. The next biweekly period will be a high output period as proper conditions have now been established.

Work continues with adjustments to the Colton Press (L. B. Smith). Producing at a rate of 11,520 cores per hour, the press was run for 2-1/2 hours, during which the height tolerance on the cores was ± 0.0004" and the weight tolerance was ± 0.00004 grams. These are highly acceptable tolerances for core uniformity and indicate that the capabilities of the press have not been misjudged. It is now apparent that the biggest problem is the insufficient compressive strength of the tubular steel punches. Past experience with the Stokes press indicates that this problem will be solved by replacement of the steel tubing with carbide tubing when the carbide on order is received.

Inorganic Chemistry

Synthesis of tetragonal substances is continued (Wickham, Maddocks), with preparation of $PtFe_2O_4$ now in progress. $PdFe_2O_4$, previously prepared, is being examined by X-ray diffraction preparatory to working out the lattice structure. Structural determinations will be greatly facilitated by the Hanewalt structural index file which has been received and, for the tetragonal system, by the construction of charts for graphical analysis of X-ray diffraction patters (Croft, Maddocks). Precise X-ray data have now been collected on oxides of manganese and, to assure precision in the future, plans are being drawn for controlling the temperature of the samples while their diffraction patterns are taken.

Experimental lithium ferrites continue as a subject of active interest (D. L. Brown). New data from compositional batches now in process will be more significant if a satisfactory control method for analysis for lithium can be established. Analytically this is difficult, but we are now attempting to work it out through spectrophotometric techniques (Keith, Reimers).

Physics of Magnetic Materials (N. Menyuk for J. B. Goodenough)

Work on the various components to be used in conjunction with the vibrating coil magnetometer is continuing. The study of the sample holder

Physics of Magnetic Materials (continued)

design has been completed and a final design has been submitted for construction.

Two panel meters have been added to the DC fluxmeter to facilitate adjustment of zero drift and gain stability.

A series of measurements have been made to determine the eddy current effect in magnetite at room temperature. At the core thicknesses investigated thus far, the switching coefficient varies as the logarithm of the thickness, as predicted by Menyuk and Goodenough. In addition, these measurements permit a determination of the parameter d, the distance moved by the domain walls during the remagnetization process. The resultant value obtained is higher than expected. A number of problems arising in conjunction with this result are being investigated with the help of the chemistry section. These measurements are being carried further in an attempt to obtain a direct experimental evaluation of the relaxation contribution to the switching coefficient.

A theoretical study is being made of the size of domains of reverse magnetization in zero external field. At equilibrium, the sum of the domain wall energy, E_w, and the demagnetization energy, E_d, must equal the magnetic-pole distribution energy, E_p. A calculation of the reverse domain size has been made using the expression for E_p given by Goodenough. For the result to be physically meaningful, stringent assumptions must be made concerning the relative magnitudes of E_p and E_w. At the present time, there is no physical justification for these assumptions.

New Components and Circuits (T. Meisling)

Delivery of SBT's

Although Philco has fallen behind their delivery schedule, the arrival of 300 SBT's on 19 July and 400 on 27 July has brought us out of immediate difficulties. Nearly all of the first group has been tested and the second group is being tested now. The testing and reduction of the data is done by P. Fergus.

SCEL Transistor Program

The Signal Corps Engineering Laboratory sponsors an extensive industrial program for development of military transistors. Several transistors developed under this program appear to hold promise as computer transistors. We have taken steps to secure samples of some of these transistors. D. J. Eckl will revisit SCEL to obtain further details about their program.

Transistor Circuits

A compact regenerative carry-line simulating the multiplier carry-line

Transistor Circuits (continued)

was built by Freeman to secure an independent measurement of carry propagation time. The propagation time was found to be 37-40 millimicroseconds per digit as compared with 45 millimicroseconds per digit measured in the multiplier. The conclusion is that wiring capacitance in the multiplier does not contribute significantly to the carry propagation time.

The transformer-coupled gated pulse amplifier developed by M. Cerier has proven superior in driving capacity to other drivers available to date.

A single-pulse generator has been built by K. Konkle after a suggestion by K. Olsen. It is being incorporated in the multiplier.

P. Griffith is testing a plug-in shift register to be added to the life test rack. Also, he is making the first tests on SBT matrix switch.

E. Cohler is reviewing our circuit work and will come up with a circuit program. He will be aided by K. Konkle and J. Pugh in this work.

SBT High Frequency Measurements

L. Jedynak is designing and testing equipment for measuring the high frequency performance of the SBT. The alpha cutoff frequency for a transistor measures the speed of operation in non-saturating circuits only. The frequency measurement is important, however, since it indicates some basis characteristics such as base width.

Memory (W. N. Papian)

Experimental Switch and Plane

The experimental 256-position core switch is operating dynamically. Operation seems satisfactory so far except for the bias-current source, whose effective impedance is too low. The switch is being used to drive the Y coordinate of the 256^2 plane; sufficient logic is available to "raster" through the Y coordinate lines. Only a single X coordinate line can be fully driven at any time; the drive comes from the "crossarms-mockup" of a core switch which was used in earlier tests.

TX-0 Cooling and Supplies

Division 7 has started to design the walls and ceilings of the TX-0 computer room in the basement of Building A. Final specifications on the air conditioning by Francis Associates are almost complete. A bank of Sola voltage-regulating transformers has been ordered for the TX-0 filament supply.

Memory (continued)

256^2 Memory Construction

Raster-testing of completed unit planes (64^2) has been discouraging so far in that most of the units show up with a couple of bad cores each. Replacement and repair time averages about one-half day per unit plane. Tests are starting to determine if the cores are being damaged during plane wiring.

Eight prototypes of the V.T. plug-in unit are under construction. Bids have been requested for the production of 200 units.

Stack, stall, and rack structures are all in various stages of detailed design.

Advanced Work

Transistors and transistor circuits are under investigation for sense-amplifier and memory-driver applications.

Work has been resumed on the "printed" plane. This is an attempt to develop a technique for complete wiring of a memory plane by modern "printing" processes. A 4 x 4 experimental model is being made.

System Design (K. Olsen, J. Fadiman)

The past biweekly period has been spent in modifying and taking data on the multiplier, and in constructing the transistor control. Accurate carry time measurments have been made, and peaking coils added to shorten this time. The results indicate that the peaking coils reduce the carry time from 37 to 25 millimicroseconds per stage. There is a fixed time of 200 millimicroseconds required for setting up the flip-flop. Thus, the total carry time for eight digits is 400 millimicro-seconds. Measurements have also been made to determine pulse amplitude drop along the lines and the tolerable noise limit in the system.

A modification of the indicator light circuit was made to insure reliable operation. Different types of register drivers have been evaluated and it has been decided to use a low voltage pulse transformer driver. Logic boards and flip-flops have been modified for this type of driver. The problem of whether or not to use RC combinations in the pulse bases is being studied along with the register driver problem.

The transistor control for the multiplier is nearing completion. Back panel wiring is being completed, transformer pulse drivers are ready for etched-wiring, and all other plug-in boards are finished.

M. Peterson has built a pulse generator on a standard plug-in card for the multiplier control. The pulse repetition rate is fixed initially at

System Design (continued)

four megacycles, and the output is a 90 millimicrosecond pulse of 0.75 volt amplitude from a pulse transformer designed by M. Cerier. At present a pulse generator is being designed to cover the frequency range from 1 c.p.s. to 4 m.c.p.s.

R. D. Gloor is designing a completely transistorized 3-volt regulated power supply rated at 600 milliamperes. The internal impedance is 0.2 ohm, and the 120 cycle output ripple is 10 millivolts. Input voltage variation from 105 to 130 volts causes an output voltage change of 30 millivolts. An overvoltage protection device is being considered to prevent application of 15 volts to the output terminals in case of regulator failure.

Logical Design (N. L. Daggett and W. A. Clark, Jr.)

An overall block diagram of the TX-0 computer is available (SC-63430), and will be supplemented soon by a written description of the general operating characteristics.

AN/FSQ-7 AND CAPE COD DIRECTION CENTER

(Group 64, S. H. Dodd, Jr., E. S. Rich)

Cape Cod Engineering (L. L. Holmes, A. J. Roberts)

WWI Computer Operation

Good operating time for this biweekly period was 98.8 per cent: 3.75 hours downtime during 303 operating hours. More than 50 per cent of the lost time was the result of two of the thirteen interruptions: (1) a power failure outside the Barta building resulted in 45 minutes downtime and (2) a shorted tube in the control section of the -60V supply stopped operations for 75 minutes.

A 2D21 tube, used as a pulse generator in Magnetic Tape Delayed Printout System B, gave marginal operation. No computer time was lost because there are two systems, but approximately ten hours of post computer work had to be reallocated.

Reassignment of Responsibility

John Ackley is terminating his Lincoln Laboratory work in September to accept a National Science Foundation Fellowship at M.I.T. Several of his duties have been assigned to other members of the section:

Don Morrison will work on the auxiliary drum automatic trouble location program which was recently brought up to date. He will also be in charge of the program recently written to permit the reading into the computer 556 tapes that do not have a direct reference to the drums. During maintenance periods, it is often desirable to operate the computer without the drum systems.

C. S. Lin will manage the crosstell output coder.

T. Sandy will be responsible for the Group 64 version of Raydist Tracking Program. The program is being modified to initiate height requests.

Development Tests with South Truro Installations

Test operations were resumed with the fine-grain-data equipment at South Truro. Personnel from Groups 22, 24, 61, and 64 contributed their services to ten test missions, each lasting four hours using controlled aircraft. The radar data received at WWI was recorded on magnetic tape using either the Raydist Tracking Program or the CCS Tracking Program. The data was later compared with the Raydist recordings and then analyzed by G. B. Harris, Group 22. These missions will continue for about two more weeks.

Two development tests using the height finder equipment at South Truro

Development Tests with South Truro Installations (continued)

and the WWI computer with its new crosstell output coder were conducted. Each test was scheduled for 1-1/2 hours and required no aircraft. A program recently written by T. Sandy and D. Morrison compared the height requests and replies. Similar tests will be held once each week until the system is believed ready for operational tests.

Crosstelling between WWI and XD-1

The installation of the hardware at WWI has been completed. The output system is being used once each week for tests with the height finder equipment at South Truro. In addition, the output system is being marginally checked daily using a test routine of the Room 156 consolidated test program. The pulse checkout of the input system has begun.

SAGE Systems Office (H. E. Anderson) CONFIDENTIAL

Data Circuit Test

The data circuit test program (MTC) has been turned over to the "Equipment Programming Services" under the direction of R. Mayer. Anyone desiring to check a particular data circuit should consult this group.

A description of the Program has been documented in Memorandum 6M-3759. Preliminary tests of the South Truro data circuits have been completed. Preliminary tests of the scatter link have been temporarily discontinued. These closed loop tests revealed a phase shift problem which needs further study.

AN/FSQ-8

A first attempt at the AN/FSQ-8 specifications was made in 6M-3773, "Proposed Equipment Specifications for AN/FSQ-8." The FSQ-8 equipment will be identical to FSQ-7 except for deletion of some equipment. This memorandum specifies methods of deletion to minimize redesign.

Long-Range Radar Inputs

The LRI probability-of-storage problem is nearing completion. Additional MTC runs using new parameters must be made.

XD-1 Floor Plan

The second floor layout drawings of Building F (E-58233 and D-58821) are being revised to bring them in accord with the latest operational program changes. IBM-SO concurrence will be requested as soon as the drawings are complete.

SAGE Systems Office (continued) CONFIDENTIAL

Tape Compatibility

The FSQ-7 tape units are slightly different from IBM commercial tape units in bit density and information format, and therefore preclude the use of commercial tapes. A meeting of Rand, IBM, and Lincoln personnel was held 26 July to discuss various solutions to this problem.

The Rand Corp. has already solved this problem for the IBM 704 computer being delivered to them. It is being modified so that it can read tapes written on an FSQ-7 or write tapes which can be read by an FSQ-7. The 704 tapes will have 20 per cent less bit density.

Group 61 has made a survey of their need for additional data processing equipment. The method used by Rand may be suitable for putting FSQ-7 tapes on a commercial tape-to-printer unit to meet Group 61 requirements.

Training Devices

The possibility of using FSQ-7 components with a commercial computer to provide displays for training Air Force personnel by ATC was studied. At a meeting to discuss SAGE Training Device Requirements this possibility was reported as being expensive.

Warning Light Interconnection Unit for XD-1

A proposal is being prepared in collaboration with Ralph Marden of IBM for subject unit. The objective is to provide the same flexibility for XD-1 as will exist for the Duplex Centers.

Console Cabling

R. D. Buzzard is a member of a committee which is rewriting the cabling ground rules for the Duplex Center. This will more exactly define the console cabling as actually installed. The new documents will be submitted for concurrence by August 15.

Contractual Specifications

IBM has been rewriting the technical specifications of the FSQ-7 for several months. When these are completed and concurred with, they will be a part of the production contract. Lincoln comments on the drafts of these specifications are being coordinated by Nolan Jones.

Command Post

The design described in 6M-3705 has been revised as suggested by B. Green of Group 38 (Psychology). The new design is now being revised by Green.

SAGE Systems Office (continued) CONFIDENTIAL

Parity Circuits

N. Jones has started a study of parity circuits as a result of a CER initiated by Bill Canty.

AN/GPA-37

The Systems Office has obtained more detailed information about the Radar Course Directing Group, AN/GPA-37, at a symposium held at RADC on 26 and 27 July. The GPA-37 is intended for backup air defense for SAGE and will be operated at the Heavy Radar P-sites in the Zone of Interior.

Test Planning and Coordination (K. E. McVicar) CONFIDENTIAL

Two major subsystems, the gap-filler-radar inputs and the long-range radar inputs, have been defined. System test engineers, Hal Boyd and Bill Canty have been assigned the responsibility for the progress of the test plans for these subsystems.

A first draft of a test specification for a gap-filler input has been circulated. A detailed study is being made of the techniques and programs required to test the gap-filler subsystems for the experimental subsector.

Testing of the semiautomatic height finder at South Truro has begun using WWI to generate request messages and receive replies from the site. The testing so far has been done primarily to check the equipment and has not used live data. Further tests of the height finder loop using aircraft are being planned.

A study has been underway for some time on the questions of how to define reliability and what reliability goals are reasonable to set for the equipment in the experimental subsector. These goals are being discussed with both equipment and operational people in order to establish figures that are both realizable and necessary.

VACUUM TUBES

(Group 65, P. Youtz)

Tube Research and Development (D. C. Lynch)

CS-146 and 147 were processed for evaluation of the effect of increased bakeout temperature on aluminum continuity. Several screens were deposited using increased water cushions to widen the margins in the preparation of a P14 screen. Encouraging results were obtained when three screens were prepared with no slippage and excellent uniformity.

Investigation into the feasibility of applying stannic oxide on glass using a baffle has shown that while a baffle is practical, careful selection of the material is necessary due to poisoning of the stannic oxide by certain metals.

Various methods of spraying cadmium sulfide on glass have been investigated in collaboration with Dr. Klein of Group 25. Several samples prepared by these methods were taken to Lexington for further processing and evaluation.

Charactron (A. Zacharias)

Time was spent in learning to press and assemble sintered cathodes into G_1-K structures. About five such structures were made, two with usable cathodes. A total of a dozen cathodes were pressed and six were sintered. All cathodes were made using ZrH_2 as the activator; no binder was used. Two of the six sintered cathodes were assembled into G_1-K structures and processed. During the processing of the first cathode in the demountable system, other work required an interruption of approximately four hours between conversion and activation. The liquid air trap warmed in this time and the resulting degassing may have poisoned the cathode for no emission could be obtained. The second cathode had just reached peak temperature on conversion when the system pressure jumped from 5×10^{-6} to 2×10^{-1} mm of Hg. Temperature was removed, the diffusion pump turned off and cooled, and the system allowed to rest. The 200-μ pressure remained constant under forepump and liquid air trap operation. No further attempts at using or fixing the system were made. Two cathodes of the six sintered remain to be assembled. They are contained in a vacuum desiccator. However, in the two processed, a hard, metallic surface with no evidence of "boil-out" was the product.

Charactron (P. C. Tandy)

Six MIT 19-inch tubes and three Convair charactrons have completed from 331 to 4522 hours on life test. The d-c cathode currents of two of the tubes at one-half cutoff continue to drop slowly. A drop of 3.3% and 6.3%, respectively from 521.6 to 801.6 hours was noted. Transfer-characteristic curves taken on three tubes showed that two were satisfactory,

Charactrons (continued)

but the third failed to give 50-μa matrix current after only 30.5 hours.

Thirteen cathode study tubes have completed from 553.5 to 863.8 hours on life test at one-half cutoff d-c. No data has been taken since the last report.

A report on each of the Convair life test failures is being written and should be issued shortly.

Typotrons (L. B. Martin)

Capacitance tests made on the storage-to-collector meshes of a sample of typotron tubes show that a good tube will not be damaged by measuring the storage-collector capacity with the General Radio Model 650A Impedance Bridge. The output of this instrument has been found to be about 14 volts r.m.s. at 1KC. C. L. Corderman and I tested to destruction the storage and collector meshes on a tube that had previously been rejected from life test. A 60-cycle voltage was applied between the collector and storage, and the amplitude gradually increased. No diode action was noticeable until the voltage was over 200 volts r.m.s. and no destruction of the meshes until the voltage was over 500 volts r.m.s.

In order to remove the abnormal negative current load from the +90-volt supply, the intensity circuits of the life test will be modified. A prototype of the new intensity circuit is now under construction. After this is checked out, the remaining units will be sent to Lexington for modification. The mounts are being modified to use the automatic transfer-characteristic machine. Until the above modifications are completed, the older tubes will not go back on life test.

The nine production typotrons have been on life test from 2182.1 to 2907.2 hours and are still satisfactory.

PRODUCTION COORDINATION OFFICE

(Group 66, B. E. Morriss)

Power (J. J. Gano)

Power for CC and DC Site

Bob Jahn and I are collaborating on a memorandum that will formalize Lincoln requirements for the first two combined sites and will offer recommendations for future combined sites.

Equipment Cooling

Just before their vacation, IBM challenged the console figures on heat dissipation reported in a preliminary document written for concurrence. We have not yet been able to obtain copies of the letters they quoted as sources of data.

MTC Power

A 600-volt, 3-amp supply has been designed by Stewart Coffin and is under construction. It uses thyratrons and a reference tube, but no vacuum tubes. With this simplicity, reliability should be high. The regulation is not as exact as that of the other MTC supplies, but should be adequate for this and many other applications through the laboratory.

Communications (H. J. Kirshner)

Drawings newly available:
E-75554, "External Voice Circuit Appearances AN/FSQ-7 (XD-1)"
E-75544, "Internal Telephone Circuits AN/FSQ-7 (XD-1)"

Meetings attended (outside organizations):
SAGE Teletype Requirements at Hq. ADC, Colorado Springs, Colo.
SAGE Telephone Monitoring and Recording Requirements at Lexington.
Telephone Key Unit Illumination at Lexington.

TIR's and Coordination (E. D. Lundberg)

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

TIR #	Document #	Subject
1-82	6M-3632, 6M-3633, 6M-3634, 6M-3635, 6M-3636 and Supplements to each	Equipment, AN/FSQ-7 Display Console Equipment and Label Layout

TIR's and Coordination (continued)

1-83	6M-3575-1, Supp. 1	Space for Non-Lincoln Personnel Associated with Operation of AN/FSQ-7 (XD-1) Experimental Subsector (Office Space)
1-84	ADES Bulletin	External Communications, Combat Center AN/FSQ-8
1-85	6M-3583, 6M-3584, 6M-3585, 6M-3586, 6M-3587 and Supplements to each	Equipment AN/FSQ-7 (XD-1) Display Console and Label Layout
1-87	Gp. Rpt. 311-3	SAGE Ground-to-Air Radio
1-88	Gp. Rpt. 311-4	Alternate Routing of Point-to-Point Communications for Texas Towers
1-89	6M-3772	Requirements for Separate Rand-Air Training Command D.C. Facility
1-90	6M-3732	AN/FSQ-8 Console Equipment and Label Layouts

Memorandum 6M-2926-3, "Lighting Requirements for AN/FSQ-7 Direction Centers," has been coordinated with outside agencies and will be released under cover of a new master reference list for D.C. buildings. The master reference list will also release revised drawings for the D.C. buildings: D-75021-2, D-75022-3, D-75023-4, D-75024-4, D-75025-3, and D-75104-1. Drawings to be deleted in the master reference list are D-75026-2, R-75027-1, R-75028, E-75029, and E-75030. The above documents are in the process of internal coordination and will be released by TIR 1-86.

Memorandum 6M-3515-1 entitled, "Proposed Site and Equipment Locations in the Experimental Subsector gives the location, use, and operational date with XD-1 of the various equipments in the experimental subsector. It is being coordinated internally and will be released during the next biweekly period.

Supplemental specifications for the AN/FSQ-7 Automatic Inputs, Power Conversion and Distribution, Drums, and Displays have been prepared and should be released during the week of 1 August by TIR. In addition, a master reference list of AN/FSQ-7 specifications has been prepared and will also be released next week.

Facilities - Building, Air Conditioning, Lighting (W. H. Ayer)

The building redesign study group under the direction of WE-ADES has completed its first phase, which might be interpreted as definition of the

Facilities - Building, Air Conditioning, Lighting (continued)

problem. The next month will be spent in review and expansion of the design requirements for the SAGE buildings with particular emphasis on growth and flexibility considerations. It is hoped to have the entire study, including sketches of a new building design, available in time to affect building number 12 or 13.

The orifice testing program to evaluate the efficiency of the SAGE vacuum tube cooling techniques is now underway. The test apparatus has been set up in the air conditioning plenum in building F with the cooperation of IBM and preliminary testing will be started during the next week.

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

Revision of DC Requirements Drawings

Preliminary sketches have been approved by the agencies involved and their comments incorporated in the final drawings. Drawings are now in the drafting room undergoing final revision and should be delivered to the PCO on 29 July 1955.

Proposed Changes to CC Requirement Drawings

Sketches have been completed and will be delivered to the PCO for distribution and comments throught the system on 29 July.

Burns & Roe Construction Drawings

The construction drawings for the McGuire installation have been filed in numerical order using only the latest revisions. A Francis Associates engineer will start reviewing these drawings on 8 August to insure that the changes include the latest Lincoln requests and that other changes presently incorporated do not interfere with operational requirements. It is expected that this review will be completed by 31 October.

Broadband Blue Lighting

Tentative information from R. Gould on light gun performance and from R. T. Mitchell on readability tests indicate that the use of a deeper orange filter than the present Rohm & Haas 2048 may be permissible. In this case the blue filter could be considered less dense than the ones presently installed in B-034. Francis Associates has been directed to procure a set of these new filters and install them in B-034 as soon as Group 38 has completed their fatigue studies. This work will be directed and coordinated by Group 66 on a day-to-day basis.

Orifice Testing

The necessary test equipment and fixtures have been installed in the

Orifice Testing (continued)

front part of the first floor plenum in building F, directly behind the air conditioning control panel. The next two weeks will be spent in "systems testing" prior to start of the actual temperature and air flow measurements. Thayer Francis, Jr., is to deliver an informal preliminary report to Lincoln in October discussing the aims of the program and the testing methods to be used.

Building Redesign Study

A study outline has been prepared through the joint efforts of Lincoln and Western Electric. Consultations at ADC with the aim of establishing more exact requirements for the operational and administrative areas of the building will be carried out in the first week of August. Future participation by Lincoln in the design work is dependent upon their acceptance of Western Electric's written request for specific information that is presently being drafted by D. Patterson in New York.

ADMINISTRATION AND SERVICES

(Group 60, J. C. Proctor)

New Staff (J. C. Proctor)

Don R. Aufderheide is a new staff member assigned to Group 66. He received his MBA from Harvard University and was employed by the Electronic Corporation of America.

Jack Dominitz received his MSE from John Hopkins University where he was a Research Assistant. He has been assigned to Group 61.

Harry Gochman received his BS in Math from Roosevelt University in June. He has been assigned to Group 61.

Stanley S. Hazen is a new staff member assigned to Group 62. He received his BA in Physics from Williams College and is studying Aerial Photography at Boston University. He will be here for the summer only.

Donald L. Richards received his BA in Math from Harvard University in June. He has been assigned to Group 62.

Material (H. B. Morley)

The Navy equipment formerly stored at 6th Street warehouse, except for six or seven items, has finally been transferred to the Boston Naval Shipyard.

Orders have been placed with Power Equipment Co. for power supplies for both the TX-0 computer and charactron test equipment.

Engineering (H. F. Mercer)

Building Construction

All work by the general contractor, with the exception of transite installation for sealing interconnecting pipe Chase between Buildings D and F, has been completed. A current strike of steel workers is delaying the necessary frame work for the transite.

Cabling

More than 95 per cent of XD-1 cables have been delivered here; about 90 per cent of all cables have been installed.

An additional group of display consoles cables are now in place and carrying test voltages.

Installation of cables is being expedited by IBM technicians from Poughkeepsie.

Engineering (continued)

Equipment Cooling

IBM and MIT installations groups are of the opinion that the equipment cooling system has been installed according to Francis Associates drawings and specifications. We have so notified appropriate IBM personnel and have recommended that IBM accept the system from the E. A. Berman Company.

Equipment Layout

Command Post - Bids were received on 27 July. We hope to place a contract for the work early the week of 1 August with completion date six weeks from the date of the contract.

Lighting

All items required to complete the lighting changes have been ordered by Lincoln. Requests for bids were sent to prospective bidders on 27 July; bids are due on 5 August. We hope to complete the lighting installation by the end of September.

Model Shop (A. R. Smith)

All available engineering, design, and model shop time for the past two weeks has been expended toward Groups 65 and 63 in the form of oven revisions, jigs, and fixtures for 19" charactrons; plus mounting of a 5" charactron in the Kelvin and Hughes camera, and 19" charactrons in the display console.

Outside vendor contracts with Waltham Model and Arthur Koch and involving memory planes and pluggable components are on schedule and of acceptable quality.

Standards and Component Test (H. W. Hodgdon, C. Morrione)

The Bowser Environmental Chamber has been installed and is in operation. It provides a test chamber of approximately 27 cubic feet within which temperature can be controlled from 0 to 85°C and relative humidity maintained up to 95%. To supplement the chamber in making component tests, we plan to build a small dry-ice refrigerated box which will provide low temperatures to -55°C.

Visits to manufacturers and other users, and consultations with their technical people, appear to confirm the general opinion that hermetic sealing is the best answer to the reliability problem for deposited carbon type resistors. Data to further substantiate this opinion will require extensive testing, to which end samples have been ordered for test.

STUDIES IN PROCESS

SAGE SYSTEM TEST AND PLANNING (Group 61)

AN/FSQ- Duplex Operation, inactivity and instruction checking (memo) (Feldstein, Shoolman, Vance).

Analytical Tracking Study (Jenney).

CCS'54 Monitoring II, investigation and checkout (Bedrosian).

CCS'54 Program modification and checkout (Manber, Peterson).

CCS'54 Tracking program (Keit).

Data Characteristics Study (Stahl, Peterson).

Data Reduction Program Specifications (Graham).

Display subprogram tasks, manual inputs subprogram task (Attridge, Collins, Harris).

Interception Series 5, 6, 7 - Test Specification (Budd).

Interceptor Guidance, factors contributing to error (Friedman).

Lincoln Compiler, Lincoln Checker, and Utility Control program specifications (Knapp, Gaudette, Gildea, Arden).

MTC, plip-scan data analysis program, Chi-square values checkout (Stahl).

Program design, subprogram sequency, and in-out control studies (Attridge, Collins, Harris).

Radar Input Operational Specifications (Brooks).

Random Number Generation - test program checkout (Neumann).

SAGE Identification, Weather Control, and Manual Input Sections, operation specifications (Garth, Houser).

SAGE Height Finding Operation Specifications (Frachtman).

Single Track History Print out Program (Latimer).

XD-1 inactivity alarm proposal (Feldstein, Shoolman, Vance).

FSQ-7 PROTOTYPE DESIGN AND INSTALLATION (Group 62)

Basic Circuits

Gap Filler Sweep Circuit (B. W. Barrett).

ADVANCE DEVELOPMENT (Group 64)

SBT Hole Storage (Kirk).

PRODUCTION COORDINATION OFFICE (Group 66)

Power (Clarke, Coffin, Sandy)

TX-0 Power System Design; Filament Voltage Cycling, Application of Thermistors; XD-1 Power System, Compilation of Defects and Recommendations.

Communications (Kirshner)

6M-3000, Suppl. 4, "Equipment Requirements for Experimental Subsector Ground/Air Radio System."
6M-3275-2, "Leased Telephone Circuits for AN/FSQ-7 (XD-1)".
6M-3000, Suppl. 5, Rev. 1, "AN/FSQ-7 (XD-1) External Voice Telephone Traffic Diagram."
6M-3000, Suppl. 7, Rev. 1, "SAGE Experimental Subsector External Voice Circuit Appearances in Dial System and Manual Switchboard."
Revisions to 6M-3000 and 6M-3000 supplements 1, 2, 8, and 11, Communications Test - Evaluation Schedules and Procedures.
Experimental Subsector Telephone Installation Communications Planning.

Facilities (Ayer)

Study	Responsibility of	Expected Completion
Orifice Testing	F. Manning	Oct '55
Building Redesign Study	W. Ayer and E. Smiley	Oct '55
Blue Filter Specifications	W. Ayer	Sep '55
Building Design Changes	E. Smiley	Aug '55

DOCUMENTS ISSUED

(Frances Christopher)

The following documents were published by Division 6 or received from IBM during the period 18 July to 29 July 1955:

No.	Author	Title	Cls.
SAGE SYSTEM TEST AND PLANNING (Group 61)			
6M-3474	E. W. Wolf	SAGE System Data Conversion and Transformation	C
6M-3732	W. Lone	AN/FSQ-7 Console Equipment and Label Layouts	C
6M-3740	J. F. Jacobs	Our Understanding of Agreements with Rand	U
6M-3741	R. L. Walquist	Statistical Techniques Applied to Experimental Designs	U
6M-3752	D. R. Israel	Subcontract of "Program and Mathematical Research for Lincoln Laboratory to DIC Project 6345	U
6M-3755	W. E. Ball H. K. Rising	XD-1 Manual Intervention Bit Assignments	U
6M-3756	W. E. Ball H. K. Rising	AN/FSQ-7 Manual Intervention Bit Assignments	U
6M-3757	H. K. Rising	Nomenclature for Consoles and Operating Positions in AN/FSQ-7	C
6M-3758	H. K. Rising	Light Gun Codes and Light Gun Core Assignments	U
6M-3761	P. R. Bagley	FSQ-7 Programming Data Sheets	U
6M-3765 and Cor.#1	R. R. Reed	Digital Display Slot Assignment for AN/FSQ-7 and XD-1	C
6M-3768	P. R. Bagley	AN/FSQ-7 Programming Course Outline	U
6M-3769	P. R. Bagley	Report of Staff Training Activity	U
6M-3772	D. R. Israel L. R. Jeffery	Requirements for Separate Rand-Air Training Command Direction Center Facility	C
6M-3783	F. E. Heart W. I. Wells	SAGE Radar Requirements - Priority Estimates	S
FSQ-7 PROTOTYPE DESIGN AND INSTALLATION (Group 62)			
6M-3700	J. P. May	IBM-SO Concurrence Meeting #30 Held at Lincoln Lab. 15 June 1955	U
6M-3742	W. J. Canty D. Shansky	Biweekly Progress Report on FSQ-7 Memories	U
6M-3764	A. D. Hughes	Removal of LRI and GRI Units from AN/FSQ-7 for AN/FSQ-8	C
6M-3775	L. L. Sutro	Test Equipment Committee Meeting 1 July 1955	U

FSQ-7 PROTOTYPE DESIGN AND INSTALLATION (Group 62) continued

6M-3776	J. Giordano J. P. May	Minutes of IBM-SO Concurrence Meeting #34 Held at Lincoln Laboratory 21 July 1955	U
6M-3791	H. J. Platt	Minutes of Experimental SAGE Subsector Planning Approval Committee Meeting 25 July 1955	C

ADVANCE DEVELOPMENT (Group 63)

6M-3770	D. J. Eckl	Transistor Circuits Course #1 - Introduction	U

AN/FSQ-7 AND CAPE COD DIRECTION CENTER (Group 64)

6M-3746	C. W. Watt	Proposed S.O.P. for System Scheduling and Maintenance in Cape Cod	U
6M-3747	C. W. Watt	Visit to Signal Corpos 414-A System at Fort Meade, Maryland	C
6M-3759	S. B. Ginsburg	Programmed Crosstell Data Link Test, G-95	U
6M-3771	C. W. Watt	Summary of the Discussions Held at a Meeting for the Purpose of Defining of the C & E Duty Officer in a SAGE Subsector	C
6M-3792	L. L. Holmes	ADES-Lincoln Activities in System Test Planning-Working Committee Progress Report #1	C

VACUUM TUBES (Group 65)

6M-3543	L. B. Martin	Studies of Typotron-Tube Performance under Simulated Operational Conditions (Masters Thesis Proposal)	U
6M-3715	T. Clough E. Searle	Vacuum Tube Failures During the Month of June 1955	U

PRODUCTION COORDINATION OFFICE (Group 66)

6M-3189-3	E. D. Lundberg	Summary of Lincoln Technical Information Releases Pertaining to SAGE System Issued by the Production Coordination Office	U
6M-3763	E. D. Lundberg	SAGE System Meeting 18 July 1955	U
6M-3782	E. D. Lundberg	SAGE System Meeting 25 July 1955	U

ADMINISTRATION AND SERVICES (Group 60)

6M-3731	Division 6	Biweekly Report 1 July 1955	C
6M-3760	Division 6	Biweekly Report 15 July 1955	C
6M-3762	C. Morrione	Visit to Mepco, Inc.,Morristown,NJ	U
6M-3777	C. Morrione	Trip to Glenn L. Martin Co.	U

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NO.	AUTHOR	TITLE	CLS.
		IBM DOCUMENTS	
IBM-777	----------	Digital Display Generator Element Sec. 3, Display System	C
IBM-778	----------	Display Indicator Elements-Display System	C
IBM-779	F. Schulman	Systems Test Plans Phase VII-Drums	U
IBM-780	----------	Semi-monthly Report #57	C
IBM-781	----------	Display-Vol. 1-Engineering Data Book	C
IBM-782	H. Hemple	Memory Pulse Transformer Tester	U
IBM-783	H. L. Kurkjian	Warning Lights	U
IBM-784	Z. T. Dearden	Contrast Gate Isolation Amplifier	U
IBM-785	J. E. MacDonald P. J. Mancuso	Instruction Execution Time	U
IBM-799	----------	Tapes and Miscellaneous IO Units-Programmers Reference Manual	U
		LL-DR DOCUMENTS	
DR-284	R. C. Marden	Concurrence on .009 Card Stock for Binary Punching and Reading for XD-1, XD-2 and Production Machine	U
DR-285	R. C. Marden	Specifications for Large Board Display, Prototype and Production AN/FSQ-7	U
DR-286	C. E. Walston	Supplement 2 to the Card Reader Printer and Punch Specifications for AN/FSQ-7	U
DR-287	R. C. Marden	Concurrence on Duplex Input MCD Frame, D-62-1	U
DR-288	W. A. Hunt	Test Memory for the Production System. D-87 Concurrence	U
DR-289	J. B. May	Concurrence on LRI Monitor Specifications	U
DR-290	R. Daehnke	Concurrence on D-69-1-"Tape Power Supply Unit for AN/FSQ-7	U
DR-291	A. J. Pascarella	BTL Memo: Automatic and Manual Switching Arrangements for DPR's Operating on a Dual Basis which Expands D-66.	U
DR-292	R. S. Trivison	Changes in the Selection and I/O Control Element Specifications	U
DR-293	W. S. Squire	Concurrence on "Changes in Selection I/O Control Element Specifications	U
DR-294	R. C. Marden et al	Concurrence on Specifications of the Tape Power Supply Unit-AN/FSQ-7	U

Accessions List (Continued)

NO.	AUTHOR	TITLE	CLS.
		LL-DR DOCUMENTS (Continued)	
DR-295	W.S.Squire	Concurrence on "GFI Monitor Specifications" D-78-4	U
DR-296	J. J. Coughlin R. W. Lowrie	GFI Monitor Equipment for XD-1 and the Production Machine Specifications	U
DR-297	R. C. Marden	Concurrence on Changes on GFI Monitor Equipment for XD-1 and the Production Machine, Specification	U

GLOSSARY OF ABBREVIATIONS

All additions and corrections to the following list will be welcomed by your Publications Office, Room D221, ext. 846.

AA	antiaircraft
ADC	Air Defense Command
ADES	Air Defense Engineering Service
AEW	Airborne Early Warning
ATCF	Air Training Command Facility
CC	combat center
CAT	category
CCS	Cape Cod System
CER	change evaluation request
CHT	charactron tube
CP	command post
CRT	cathode ray tube
C & E	communications and electronics
DAB	display assignment bit
DC	direction center
DD	digital display
DDG	digital display generator
DDR	digital data receiver
DDT	digital data transmitter
ECM	electronic counter measures
ECP	engineering change procedure
ESS	experimental subsector
FGD	fine grain data
GFI	gap filler input
LRI	long-range radar input
MISP	Manned Interceptor Simulation Program
MITE	multiple input terminal equipment
MTC	Memory Test Computer
OPS	operations
PIUMP	plug-in unit mounting panel
PCO	Production Coordination Office
RAFD	Rome Air Force Depot
RD	radar data
SBT	surface barrier transistor
SDG	situation display generator
SDV	slowed down video
SIF	selective identification feature
SCEL	Signal Corps Engineering Laboratory
SOP	standing operating procedure
TBS	training and battle simulation
TIR	Technical Infomation Release

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