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Memorandum ~~GM~~-4085

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

SUBJECT: BIWEEKLY REPORT FOR PERIOD ENDING 30 DECEMBER 1955

To: Jay W. Forrester

From: Division 6 Staff

Date: 6 January 1956

Approved: JEP  
S. C. Proctor

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SAGE SYSTEM TEST AND PLANNING

(Group 61, J. F. Jacobs)

MASTER PROGRAM PREPARATION (H. D. Benington)

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Program Preparation (D. L. Bailey, A. R. Shoolman)

Memorandum 6M-4061, "Operational and Mathematical Specifications for the Initial ESS Program," 16 December 1955, by H. D. Benington, H. K. Rising, and C. A. Zraket describes the initial program specification list (IPS). A memorandum is being prepared which will list the specifications and request for operational modifications (OMR's) which will appear on the IPS list.

A coding specifications (CS) file has been set up as described in 6M-4018, "Preparation of Coding Specifications for the Direction Center Active (DCA) Program," 26 November 1955, by W. F. Harris. All documents pertinent to the preparation of DCA coding specifications are placed in this file and fifteen copies are automatically maintained for interested Group 61 personnel.

A preliminary sectional draft of DCA 5.5.3.3, "Coding Specifications for ATO, ATT Switch Interpretation," by B. A. Rogers, has been written and will be revised to reflect current table design and new operational criteria affecting raid forming.

Design of most central tables has been completed; IBM cards are being prepared to describe each item fully. Multilith masters prepared from these cards will be used to permit rapid dissemination to interested parties of up-to-date listings of all tables.

XD-1 Computer Time (P. Guinard)

Program Checkout (Utility Assembly)	22:42
Down Time	
In/Out Equipment	7:41
Computer Malfunction	:20
Returned to IBM	15:29
 TOTAL ASSIGNED TIME	 46:12

OPERATIONAL SPECIFICATIONS FOR SAGE SYSTEM (C. A. Zraket)

ESS Planning and Operation (C. C. Grandy)

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Exercise Planning

Memorandum 6M-4051, "Group 61 Proposal for Operation of ESS . . ." has been issued. T. R. Callahan is studying the utilization of simulated data tapes in our exercises.

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OPERATIONAL SPECIFICATIONS FOR SAGE SYSTEM (continued)

Data Analysis

A rough draft of our data analysis requirements has been prepared by R. Luscher and discussed with the Data Simulation and Analysis Section. Our major analysis emphasis will be the collection of detailed track history on selected tracks supplemented by system "cross section" summaries. The ultimate analysis specification must await completion of our study of air defense function output. A draft of the results of this study covering four functions has been prepared by Luscher. J. Wagoner is continuing the study.

A "Proposed Plan of Action to Coordinate Operational Team Participation in Subsystem Testing," dated 29 December 1955, has been issued as an interoffice note by J. Wagoner.

Standing Operating Techniques

A. Thomas has completed the draft of the M-note stating Group 61's requirements for SOP's at external ESS sites. (See also 6M-4071.)

Operator Training

T. Callahan and I have held several conferences with S. Hibbard and G. Reed and with officers of ATC to discuss our need for trained operators. The information needs of the training agency will be met, I believe, by the Operational specifications and by our proposal for ESS exercises (6M-4051). In addition, we have prepared a draft of a statement interpreting these proposed exercises in terms of operator proficiency requirements. This statement, when properly reviewed, will constitute our specification of the level of skill required of the DC operators.

Equipment Coordination

An investigation of miscellaneous equipment needs in the ESS DC has been completed by R. Raffa. A memorandum has been drafted stating requirements and their satisfaction in the following areas:

- |                                                                |                                      |
|----------------------------------------------------------------|--------------------------------------|
| 1. TBS Room                                                    | 7. Maps for IND's, TI, and IS        |
| 2. Manual Inputs Room                                          | 8. Air-defense-alert warning lights  |
| 3. Weather Center                                              | 9. Telephone books (tactical system) |
| 4. Temporary switch labels                                     |                                      |
| 5. Output teletype monitor                                     |                                      |
| 6. Mapping equipment for radar mappers and area discriminators |                                      |

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OPERATIONAL SPECIFICATIONS FOR SAGE SYSTEM (continued)

Schedule and Manpower

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A revised schedule of ESS Planning and Operations activities has been prepared. A memorandum defining our activity and presenting the schedule will be written in the coming week.

Combat Center (W. Lone)

The "Guide to Combat Center Operations" is undergoing minor revision. It is expected that a first draft will be ready by January 9th.

Weapons Direction (J. J. Cahill, Jr.)

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The mathematical specification for Intercept Direction has been delayed about two weeks for further study.

It has been decided to propose removal of SAGE capability for vectoring interceptors against raids as entities. This capability is of little usefulness, and leads to inordinate system complications. Its useful features can be obtained in other less troublesome ways. Bruno Strauss is preparing a memorandum describing the proposed change and giving details of the effect of the change on the several operational specifications involved.

Francis Garth attended a meeting at Whippany which reviewed the status of the BTL Intercept Study. The capabilities of interceptors to be used by the Navy between 1960 and 1965 were proposed. A memorandum will be issued giving details.

Identification, Manual Inputs, TBS (J. Bryan, S. Hauser)

The following memoranda have been completed and will be issued during the week of 3 January 1956:

6M-3899, S1	"Operational Specifications for Training and Battle Simulation in the SAGE System"
6M-3780-1, C1	"Operational Specifications for the Identification Function in the SAGE System"
6M-4028	"Mathematical Specifications for the Identification Function in SAGE"
6M-4077 (rough draft)	"Mathematical Specifications for Training and Battle Simulation in the SAGE System"

CARD PREPARATION ROOM (H. Newhall)

Effective 3 January 1956, the Card Room will establish a logging system

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CARD PREPARATION ROOM (continued)

for all work to be processed, and will initiate strict priorities for such work in order to provide more support and facilities for the XD-1 programming effort. In addition to the above, several other steps have been, or will be, taken to achieve the utmost efficiency and accuracy from the Card Room operation as follows:

Card Room personnel will be increased to ten people in February to make the maximum use of available equipment for a 44-hour work week, and the possibilities of an additional shift are being considered.

A move of the card processing facility to the basement of Building A is scheduled to be completed by 16 January to provide space for the new magnetic tape card equipment to be delivered about January 23rd and to provide more space for the existing equipment.

A highly skilled technical assistant has been hired to aid the Card Room Supervisor with many of the internal problems of the Card Room. His primary responsibilities will be to handle machine methods and procedures and conduct training courses to increase the skills of the Card Machine Operators.

DATA SIMULATION AND ANALYSIS (W. S. Attridge)

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Data Generation (J. Levenson)

The first draft of 6M-4067, "Preliminary Operational Specifications for Simulated Data Generation," has been distributed.

A trip to the RAND Corporation in Santa Monica to discuss and compare RAND and Lincoln methods of simulated data generation is reported in an interoffice memorandum to W. S. Attridge dated 30 December 1955.

Data Analysis (R. Olsen)

The study phase for the Data Analysis Operational Specification is approximately 50% completed. The preliminary draft for the track history section of data analysis has been prepared.

Recording (E. L. Lafferty)

The approved memorandum 6M-3989, "Interim Operational Specifications for the Recording Function in the Experimental SAGE Subsector," will be issued during the week of 3 January 1956. The recording mathem-

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DATA SIMULATION AND ANALYSIS (continued)

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atical specifications are in rough draft form and should be issued as a first draft during the week of 9 January 1956.

MTC Programming (S. Tower, J. Bockhorst, R. Collmer)

A faster divide subroutine has been coded for use in the Data Generation Program.

Arrangements have been made for program paper tape punching to be done by the Card Room.

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FSQ-7 PROTOTYPE DESIGN AND INSTALLATION

(Group 62, N. H. Taylor)

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

ESS Schedules (N. L. Daggett, H. F. Mercer)

We have been assigned to the ESS Planning and Coordination group headed by Ed Rich and Walter Wells. Responsibility for the above schedules has been transferred to this new group.

LRI System Test (W. J. Canty)

The LRI Test Team has been engaged in debugging Chris Sherrerd's tracking program. With this program, live aircraft and tracks generated by MTC have been initiated and tracked for the time specified in the LRI test specifications.

On 20 December 1955, a demonstration of the system tie-in operation was given using both LRI and GFI data.

The LRI Test Team has made further checks on the 14-channel Ampex recorder. Recorded data of ten minutes has been played back six times with no errors.

Video Probe (R. H. Gould)

The video probe circuit that is sophisticated enough to be adequate in gain and bandwidth for all possible uses requires a package much larger than desirable. Rather than a compromise circuit that is equally unsatisfactory, both as to packaging and performance, the better solution seems to be to build a simple circuit that can fit in a small probe and will be adequate in performance for most but not necessarily all uses. A second circuit giving the ultimate in performance but not in convenience should be available for the relatively few times its capabilities are needed. The simplest circuit now available will be packaged and modifications to the best performance circuit will be made with no restrictions as to size or power requirements.

DISPLAY DEVELOPMENT (C. Corderman)

I accompanied members of Hazeltine and IBM to Dumont for a discussion of a large display tube having controlled persistence. This visit completes the series of conferences with tube companies who would be interested in developing such a tube. A formal request to bid should be released by Hazeltine in the near future.

With members of Groups 25 and 65, I visited the Buckbee Mears Co. in

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DISPLAY DEVELOPMENT (C. Corderman)

St. Paul, Minnesota. Many of the techniques which they use in making dot masks for color TV tubes are applicable to the construction of mesh for direct-view storage tubes. It may be possible to construct a mesh in which the hole size varies in some symmetrical manner so that storage and viewing characteristics can be more readily improved.

New character matrices have been received from the W. & L. E. Gurley Co. These matrices have the XD-1 Charactron format but with the character height and spacing suitable for the 5" tube to be used in the Kelvin & Hughes projector. Recent tests in MTC have shown that 40-50,000 characters can be displayed on a 5" tube. This should easily permit the printout of two fields of memory for program diagnosis or data output.

Some of the display consoles in Building F have been compensated for magnetic deflection. In the first trial some characters appeared to be moving during the intensification period. However, this difficulty was traced to marginal ten-bit decoders. When the decoders were replaced, no movement could be detected in any of the characters displayed.

As soon as a sufficient number of these consoles has been satisfactorily compensated, more work will be done to determine the best Nyquist compensation for the magnetic deflection preamplifier. A phase-lead capacitor has been added between the two output pins in the amplifier to permit compensation to be carried out for core lag and eddy current effects. It is felt that the proper choice of R-C compensation circuits will eliminate the unorthodox capacitor.

Margins on the display line driver are proceeding satisfactorily. Minor changes in component values may be desirable to improve these margins, but are not absolutely necessary. (H. E. Ziemann)

SD RECORDING CAMERA (L. Sutro)

The procedure for converting a standard SD console to a recording camera control has been written for the benefit of XD-2 engineers by L. B. Prentice, M. Nessilroth (Hazeltine) and me. The memorandum describes removal of the Typotron, alterations of the subpanel, including installation of gauge points that keep the P-11 Charactron in focus, attachment of the camera hood, rewiring, and focusing of the fixed-focus camera. It will be accompanied by 62 drawings.

The procedure for marginal checking the camera control is in final form. A check will be made of it on XD-1 this week.



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MEMORY TEST COMPUTER (W. A. Hosier)

Magnetic Tape Installation

Art Hughes is working on details of the tape adapter frame, so that we may know exactly what we need to modify and connect to it when it arrives about 1 February. Tom Stockebrand is getting a good workout on tape drive units in Poughkeepsie by debugging units as they come off IBM's production line. We hope he may also get to Kingston to have some first-hand experience of debugging the FSQ-7 tape adapter frames.

New Control

Gates and Ziegler have completed the large block schematic drawing except for detailed output pulse mixing and labeling of CPO (command pulse output) lines. The main two frames are essentially filled up except for one PIUMP to be delivered next week and several plug-in gates and buffers which should be on hand about 15 January. When a sufficient proportion of CPO's are assigned to specific buffer amplifiers next week, wiring of these will begin (the last phase of the back-panel wiring).

Display

Test photographs made by Lloyd Sanford on the new camera scope have disclosed a few instances of mechanical misalignment in the Fairchild camera which will take a week or so to correct. A new Eastman film recommended by Sanford, highly sensitive in the blue region, should permit operating the CRT at such settings as to give very good resolution. The fact that this film is not very sensitive in the yellow and red regions poses a problem in illuminating the data chamber of the camera (now done with small tungsten bulbs). If anyone has knowledge of suitable small intense light sources of high color-temperature (mercury arcs, Edgerton-type flash units, etc.) which can be fitted into the Fairchild camera and which will have a life not appreciably shorter than the tungsten bulbs, we would appreciate hearing about them.

Computer Operation and Reliability

There has been somewhat more lost time than usual this period, due largely to card jams and faulty punching in the card machine, but also somewhat to miscellaneous small electronic troubles such as a loose cathode follower tube and a faulty Burroughs gate unit. Adjustment of the punch ball stroke and the read feed stacker seem to have cured the card machine, and as far as we can see, the other circuit troubles have been corrected.

Operating time this period has been distributed as follows:

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MEMORY TEST COMPUTER (continued)

	<u>Hours</u>	<u>Per Cent</u>
Analysis and Data Processing	69.1	27.7
Development and Testing	92.9	37.3
Reliability Check Programs	44.2	17.7
Maintenance and Marginal Checking	19.6	7.8
Interrupting Failures	<u>23.5</u>	<u>9.5</u>
Total	<u>249.3</u>	<u>100.0</u>

Defects in components:

<u>Component</u>	<u>Defect</u>	<u>Time Lost</u>	<u>Qty.</u>
7AK7	Gone to air	0	8

(These tubes were not yet officially part of the computer, being rather part of the new control.)

BASIC CIRCUITS (R. L. Best)

Centralized Probe System (A. Hingston, W. F. Santelmann, Jr.)

The 6216 follower has been rejected because of very high grid current, poor waveform characteristics, and grid-emission runaway problems. The 5639 follower is giving trouble because of excessively wide manufacturing limits, although a single-tube 50:1 ratio follower seems to be possible. The 6197 circuit performs very satisfactorily in a 20:1 ratio follower with only  $10^{-8}$  A of grid current, the lowest of any tube tried.

256<sup>2</sup> Core Memory (M. Flanagan, D. Shansky)

Debugging of the prototype of the switch driver input amplifier continues. Difficulties encountered to date include out-of-specification Zener diodes.

Search-Radar Mapper-Sweep Circuit (B. W. Barrett)

We now have all of the hardware for this circuit and it is being checked out on a Raytheon pathfinder indicator.

Display Line Driver (J. Kriensky)

Marginal checking data is being taken and so far it is indicated that the voltage on the plates of the output driver stage may have to be made more positive. This can be done by reducing the value of the

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BASIC CIRCUITS (continued)

plate resistor to improve the margins of this stage. Further data will have to be taken to insure that a change in the output driver stage will not upset the margins of some other stage.

High-Speed Flip-Flop (MFC) (N. J. Ockene)

The PRF response of the flip-flop has been improved by the use of a diode-resistance configuration. Final data on the flip-flop is being taken and will be reported.

SYSTEMS OFFICE (H. E. Anderson)

IBM-MIT Concurrence Meetings

In the future, R. D. Buzzard will represent the Systems Office at IBM-MIT concurrence meetings. Memoranda that may effect the equipment should include Buzzard on the distribution list. For each document receiving concurrence, a brief abstract, the documents affected, the reason for the document or change, and any information available concerning the effect on contracts and schedules will be included in the minutes of these meetings.

Teletype Inputs

Memorandum 6M-4091, "Study of the Use of Teletype Circuits for Low Rate Data Transmission to AN/FSQ-7," describing teletype equipment, present plans for low rate data inputs, and some suggested teletype circuits for them, has been written by Bob Gerhardt and should be published by 13 January 1956.

750-PPS Output Section

The TSQ-7 logic is being studied as background material on the requirements for a 750-pps output section.

Talos Integration (J. P. May)

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A meeting was held 21 December 1955 at Wright Air Development Center (WADC) concerning approval of the procurement specifications for the land-based Talos, USAF, Weapons Systems Project (WSPO). The specifications contained a system of communications between SAGE and Talos detachments which has not been approved by Lincoln. The LPO agreed to the specifications in the interest of expediting contractual procedures with RCA, but Lincoln was not committed. A meeting has been arranged with the RCA personnel for 13 January 1956 to arrange for further planning and study.

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ADVANCE DEVELOPMENT

(Group 63, D. R. Brown)

MAGNETIC MATERIALS (J. B. Goodenough)Memory Core Testing

The total number of memory cores double-tested by this section to date for the 256 x 256 x 37 memory is 2,297,635. In addition, 70,000 cores have been single-tested and are now on their final test. There are also approximately 70,000 untested cores hand, making a grand total of approximately 2,437,635.

Chemistry

Iodometric methods of analysis have been applied to the determination of the higher oxidation state ( $M^{+++}$  etc.) present in the ferrites and related materials. It has been shown, for example, that the nickel in nickel oxide, NiO, can be 70 per cent oxidized to the trivalent condition when reacted with an equivalent amount of  $Li_2O$ .

The quantities of  $Mn^{+++} + Fe^{+++}$  in memory core compositions can be estimated iodometrically. This kind of information, together with that obtained by crystallographic studies and by other chemical methods such as varying the atmosphere during refiring, may possibly explain the changes that take place during the refiring cycle which produces good memory cores. (D. Wickham, W. Croft, J. Sacco, E. Keith, F. Reimers)

Several test firings have been made on a zinc-substituted memory core composition in an attempt to produce toroids of extremely low coerciveness. Test results indicated in  $S_v$  of 0.4 oersted-microseconds and a saturation coerciveness of approximately 0.2 oersteds. (J. Sacco)

PhysicsInstrumentation

Preliminary checking of the VCM continues. A few adjustments and corrections of the original circuitry have been made for improved operation. An initial test of the output signal as a function of the applied field has been made with and without a sample present. The magnetizing field signal was found to be of the order of 10 per cent of the sample signal for fields below 10 kilogauss. (D. O. Smith)

Attempts to measure the phase-gain characteristics of the dc flux-meter amplifier have been unsuccessful due to nonlinear active components in the amplifier. To overcome this problem, the phase-gain characteristics of the linear passive section of the amplifier are

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MAGNETIC MATERIALS (continued)

being determined. An attempt will then be made to duplicate these characteristics empirically with the improved circuitry. (R. A. Pacl)

A program is being initiated to study the properties of evaporated ferromagnetic films and their possible application as memory elements. (D. O. Smith)

S. Bradspies, D. Zopatti, and J. Childress have discussed very high-speed memories. Criteria of memory practicality have been set up as follows:

1. Magnetic material requirements and availability
2. Complexity of fabrication
3. Driving power and driving circuit complexity
4. Sensing complexity and reliability

It is hoped that anyone and everyone will accept the challenge of the development of ideas for very high-speed memories.

MEMORY (J. L. Mitchell)

Experimental Switch and Plane

The experiments on sense winding configurations for the 256 x 256 memory are progressing, and a configuration which appears to be satisfactory has been found. The data on the various configurations are now being consolidated so that new experiments can be outlined. A tentative memory timing diagram has been completed.

Cooling and Supplies

Installation of the lights in the basement of Building A is complete and the painting is underway. The two air conditioning units have been delivered. The second Power Equip. Co. dc supply and the last Lambda dc supply were received.

256<sup>2</sup> Construction

Ninety-six 64 x 64 memory plane modules have been accepted. The small plane tester is being debugged and should be in operation in a week. Thirty-two core switch plug-in units have been completed. The pluggable unit tester is now being assembled. The wiring of the three-bay rack is underway. Construction of the remainder of the memory equipment is going smoothly.

Advanced Development

A decoding circuit for the transistor core driver was obtained from

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MEMORY (continued)

P. Griffith and a 16-position model is being breadboarded. The punching jig for the 4 x 4 printed planes has been received from the vendor and is now being inspected.

TRANSISTORS (D. J. Eckl)

Procurement (P. A. Fergus)

We have received 2600 SBT SB100's, of which 1800 have been tested and 1215 delivered to users.

Power Transistor Curve Plotter (R. L. Burke, E. U. Cohler)

The tester has been immensely improved by the substitution of mercury contact relays and is now ready for measuring all types of power transistors presently available.

Diodes (E. U. Cohler)

A series of tests recently conducted show modern diodes to be greatly improved in forward conduction and hole-storage characteristics. A sample diode made by Bob Rediker (Group 35) is better than a 1N92 in forward conduction (40 ma at 1/4 volts) while equal to a point-contact (1N34A) in recovery. A new transistor diode surpasses the point-contact in recovery and has excellent forward characteristics (40 ma at 1/2 volts).

Diode Noise (E. U. Cohler)

Noise generators using silicon diodes are now being tested for "randomness." These generators are simple, using only one diode, one transistor, one transformer, and two resistors.

Kingston Trip (J. R. Freeman)

I visited IBM, Kingston, to see their production facilities for magnetic core memories. They are testing 8000 acceptable cores per day and are using both General Ceramics S-1 cores and cores developed by IBM. The IBM cores appear to be at least as good as the General Ceramic S-1's. An interoffice memorandum on this trip is being prepared.

LOGICAL DESIGN (W. A. Clark)

The design of the TX-0 has been modified to include an external program counter register and two-cycle operation. In the original design, this register was simply a reserved memory register, with counting performed in the memory buffer register. It had appeared

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LOGICAL DESIGN (continued)

that storing the program counter in this way would result in a substantial saving in equipment, but this, it turns out, is not the case because:

1. Three-cycle operation of the memory complicated the control element considerably.
2. Anticipated late occurrence of the strobe pulse required relatively large very high-speed counting and parity circuits in the memory buffer register.
3. A second set of counting gates was necessary on the memory address register to satisfy a requirement of the Memory Section that the memory be run at maximum speed in the test modes of operation.

The new design requires approximately the same total amount of equipment as the original design, even though thirteen additional flip-flops are used.

SYSTEM DESIGN (K. H. Olsen)

TM-1

TM-1 has operated approximately 3300 hours with no significant change in margins. The longest run with no errors was 20 days. The majority of troubles encountered are as a result of poor soldering. Component failures consist of one intermittent transistor and one intermittent delay line.

No difficulty has been encountered with the etched wire contacts since molybdenum disulphide was applied as a lubricant in September. The contact resistance has been stable for three months.

EMAR

The experimental memory address register has been delivered to the Memory Section to test out the memory. One of its reasons for existence was to give the circuits one more try before we built TX-0. It contains about 600 transistors.

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AN/FSQ-7 AND CAPE COD DIRECTION CENTER

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

SYSTEM TEST PLANNING AND COORDINATION (K. E. McVicar)

EPSCOM (H. I. Rundquist)

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Program numbers 80 00 00 through 89 00 00 have been reserved by Group 61 for EPSCOM use. All programs to be prepared for the Lincoln Compiler are assigned numbers in this region. These assignments are included in the program catalog along with the catalog number.

Paul Coakley, BTL, has been assigned to EPSCOM to aid in integrating the utility program effort.

The following documents were recently issued by Group 61 and copies are available from R. P. Mayer's office:

6M-3994 Lincoln Checker: Operational Specifications  
6M-4069 Procedure for Use of Card Processing Facility

CAPE COD ENGINEERING (L. L. Holmes)

WWI Computer Operation

Scheduled Computer Hours:	269.0
Interrupting Incidents:	9.0
Hours Lost:	3.0
Per Cent Good Time	98.9
Mean Time Between Failures in Hours:	29.6

WWI and XD-1 Crosstelling

Three additional two-hour tests employing both computers have been performed. During the tests, there were intermittent equipment failures that occurred infrequently. The recently installed monitoring and trouble-detecting devices for the DDR and DDT units aided in the localization of some of the faults.

A meeting for the discussion of the progress to date is being tentatively planned for this coming period. In addition, it is intended to talk about future tests.

General Electric G/A Data Link

W. I. Wells and W. Z. Lemniz (Group 22) and J. E. O'Brien (Group 311) have asked our section to investigate the WWI equipment requirements that might be necessary if a decision is made to connect the G.E. data

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CAPE COD ENGINEERING (continued)

link equipment located at Prospect Hill to WWI. They indicate it is desirable to integrate the G.E. data link into the CCS so that Group 22 can complete their planned CCS tests and yet allow Group 311 to replace in the aircraft the existing Collins hardware with G.E. equipment in preparation for their tests with XD-1. In addition, the joining of the two areas would provide live testing of the G.E. G/A equipment prior to the linking of XD-1 to Prospect Hill for ESS tests.

Our section is studying the problem and will introduce an informal report at a meeting of Groups 22, 311, and 64 on Friday, 6 January.

1956 Predicted Time Requests for WWI

The predicted time requests for 1956 point to a full 168-hour week operating schedule. A memorandum, 6M-4058, by D. A. Morrison, describes the WWI time requirements of the various Lincoln Laboratory and MIT groups.

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VACUUM TUBES

(Group 65, P. Youtz)

TUBE TECHNIQUES (D. C. Lynch, J. S. Palermo)

Initial results from the supplementary 14-tube B-N cathode program seem to encourage continued study of titanium activated cathode and the LTPS 306.1 sintering cycle. The maximum activation currents of titanium activated cathodes are consistently uniform and approximately 30 per cent higher than prior B-N cathodes. The use of a nitrogen atmosphere during the sintering cycle will be temporarily suspended as a result of initial unsatisfactory results from 12 cathodes.

Six more titanium activated B-N cathodes will be assigned for cathode study. Two 5" bulbs have been completely processed for further projection studies in anticipation of the arrival of special matrices from Gurley.

RECEIVER TUBES (S. Twicken)

I attended a meeting at Raytheon, Newton, on the progress of the second-source 0528. All major parts are now available and early planning stages are progressing quite well.

At a meeting at Sylvania, Emporium, some of the specification AQL's were relaxed somewhat. This was done not because Sylvania is unable to meet them, but rather to forestall procurement difficulties as the Brookville plant gets into operation. The characteristic limits remain unchanged.

We are devoting considerable effort to the determination of the major factors governing the transfer characteristic of the SR-1782A. As the  $i_b$  vs.  $e_{c1}$  curve slides laterally back and forth, the difficulty becomes low plate current and high screen current.

COMMERCIAL TUBES (T. F. Clough)

The present processing techniques used by Group 65 for B-N type tubes are now completely covered by LTPS's. An index for these procedures will now be issued.

IBM representatives and I attended a meeting at Tung-Sol in Bloomfield to discuss their progress on the DT-438 (improved 5998) development. Progress continues to be slow. The Westinghouse strike cut off their supply of bases, but expedencies have permitted them to base a fraction of the tubes produced and thus continue operations. Sylvania's Parts Division has agreed to be second source on the base and has promised to ship bases about 1 February. The low plate cur-

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COMMERCIAL TUBES (continued)

rent trouble, previously reported by Tung-Sol, proved to be the result of low cathode emission. Processing changes were reported to have corrected this trouble. Their program is running two weeks behind the latest revised schedule.

CHARACTRONS AND TYPOTRONS (P. C. Tandy)

Four MIT 19-inch tubes and twelve Charactron tubes have completed between 427 and 7734 hours on life test. Data taken since the last report has indicated no failures. A tube is not rejected unless its matrix current is less than 50  $\mu$ a at two successive testing periods. The screen capacitance and dissipation factor test has shown no appreciable changes of screen capacitance. The dissipation factor of Charactron Fab 392 has changed from 0.009 to 0.036 after 385 hours of life test while the other tubes showed no change. This result indicates an increase in series resistance between the side button contact and screen face without a change in capacitance.

Eight cathode study tubes have completed between 4061 and 5441 hours on life test. None of the tubes gave less than 50  $\mu$ a beam current at two successive testing periods (the life test end point).

Thirteen triode and six diode B-N cathode tubes have completed between 6 and 2029 hours. The diodes have shown no great changes between 1629 and 2029 hours. The older triode tubes continue to drop slowly, while those with 300 to 400 hours remain approximately the same. Most of the triodes start low and improve during the first few hundred hours.

The life test rack used with B-N cathode tubes leaves much to be desired. If an extended program is anticipated using the present method of life test, new equipment should be constructed.

Eight Typotrons have completed between 5535 and 6260 hours of life test. More Typotrons will be started as soon as preliminary tests have been completed. Leakage tests on twelve tubes (including three already on life) have found only one which does not meet specification. (15101 had WGAL and WGG1 leakages to low voltage electrodes of 1.5 and 2.0  $\mu$ a. These test limits are 1.0  $\mu$ a.)

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PRODUCTION COORDINATION OFFICE

(Group 66, B. E. Morriss)

POWER (J. J. Gano)

M-G Set Elimination, AN/FSQ-7

At a meeting of selected Division 6 personnel, the technical feasibility of the elimination of the buffer motor-generator sets was accepted for installations at which there will be no utility tie. IBM had already presented a proposal to this effect for concurrence.

XD-1

In order to reduce the use of the computer for acceptance tests, Piantoni is scanning through the last few months of the logs in search of information that would indicate that various protective circuits operate satisfactorily. Sampling will be required where logs present no data.

WWI Air Conditioning

To aid in the training of personnel and facilitate trouble shooting, we are developing a block diagram for pneumatic controls similar to that used for electrical control diagrams. Although the system is complicated by some analogue devices, (in addition to the usual two-valued elements such as simple relays), the diagrams simplify analysis considerably. Previously, catalogue research was necessary for an understanding of each device.

COMMUNICATIONS (F. E. Irish)

(CONFIDENTIAL)

We are now engaged in reorganizing the information we have on the ESS Communication System into a form that can be used by the people who will operate the system.

We have received permission from the Air Force to tap onto their Sedwick-to-Brunswick gap-filler data circuit at Brunswick, but at present the Telephone Company will not agree to the dual ownership of a multi-point circuit. We are now reapproaching the Telephone Company thru the office of the Manager for Military Communications to determine if dual ownership is possible. If it is not possible, we will either have to run our own circuit to Sedwick or we will have to ask the Air Force to extend their circuit to Lexington.

We are preparing for two meetings during the next biweekly period.

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COMMUNICATIONS (continued)

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The first will be with the CAA in Washington regarding the termination of our circuits at AMIS and ARTCC in Boston and in New York. The second meeting will be held at Lincoln with various Air Force agencies participating to discuss the termination of our circuits on the Texas Tower.

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ADMINISTRATION AND SERVICES

(Group 60, J. C. Proctor)

TEST EQUIPMENT (L. Sutro, A. Bille)

When a low-speed 2<sup>6</sup> counter ceases to function properly, take it to Test Equipment Headquarters. Those who try to repair it themselves may fall into a trap. Many of the flip-flops comprising this counter come unbalanced from General Electric. Since they are potted, the only way we can use them is to plug into them tubes (5963 dual triode) which will also be unbalanced, but in such a way as to compensate for the flip-flop. We have built up a stock of matched tubes and "scalers", as the flip-flops are called. Should you interchange tubes, therefore, you may not be able to get a low-speed 2<sup>6</sup> counter operating again.

DOCUMENT, DRAFTING AND PRINT ROOMS (A. M. Falcione)

Multilith vs. Ditto Reproduction

Division 6 Official Documents alone require the full capacity of two Multilith machines. Recent increases of requests to reproduce on Multilith 10 to 30 copies of miscellaneous unofficial material that could as well have been done on Ditto masters has necessitated our putting this material on low priority. Our Ditto machine is operated only 40 per cent of its available time and quicker service will be given if the following are done on Ditto whenever possible:

1. Informal notes
2. Interoffice memoranda
3. Short-run forms
4. Rough drafts
5. Any other informal, unofficial work

Required vs. Requested Distribution

It has recently been found necessary to make several reruns of memoranda, in many cases while the original issue was only days old, because:

1. Original distribution list was incomplete.
2. Memorandum was also intended for TIR release and the Document Room was not informed of the additional requirements.
3. Memorandum was intended for course use at Murphy.

Memorandum 6M-4085

DOCUMENT, DRAFTING, AND PRINT ROOMS (continued)

Although 50 extra copies of memoranda are printed as a reserve, this has not been enough to supply the additional copies needed to fill requests caused by the above three points.

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STUDIES IN PROCESS

GROUP 61

Weapons Direction Specifications J. J. Cahill

Math Specs for:

Antiaircraft, 6M-3982, 1st draft issued.  
Intercept Direction, 1st draft expected week of 9 Jan 56.  
Weapons Assignment, 1st draft expected week of 2 Jan 56.  
Raid Forming, 6M-3973, final draft issued.

OFS Specs for:

Weapons Assignment, 6M-3744-1, C2, 2nd rough draft expected  
week of 2 Jan 56.  
Intercept Direction, 6M-3786-1, C2, 2nd rough draft expected  
week of 9 Jan 56.  
Interim Antiaircraft, 6M-3739-1, C1, final draft expected  
week of 9 Jan 56.  
Raid Forming, 6M-3720-1, C1, 2nd draft expected week of  
9 Jan 56.

GROUP 62

Memory Test Computer

Card and Symbolic Address Assy.	B. G. Farley
Flight Test Analysis (for grp 22)	G. Harris, C. Uskavitch
Pattern Recognition (for grp 24, 34)	G. Dineen, O. Selfridge et al
Simulation (for grp 22)	H. Neumann, B. Stahl et al
New Control Design, MTC	E. Gates, H. Ziegler

GROUP 64

Transient Analysis of Transistors	J. R. Freeman
Power Dissipation in Direct-Coupled Circuit and Its Use in a Figure of Merit	C. T. Kirk

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GLOSSARY

AA	antiaircraft
AAOC	AA Operation Center
ac	alternating current
AD	Air Defense
ADC	AD Command
ADES	AD Engineering Service
ADSOD	ADES Project Office
AEW	Airborn Early Warning
AF	Air Force
AFB	AF Base
AFCRC	AF Cambridge Research Center
AFIRO	AF Installation Requirements Office
AGC	automatic gain control
AMC	Air Materiel Command
AMIS	Air Movements Identification Service
APL	Applied Physics Laboratory
AQL	average quality level
ARAACOM	Army Antiaircraft Command
ARDC	Air Research and Development Command
ARTCC	Air Route Traffic Control Center
ASC	Air Situation Coordinator
ASD	Air Surveillance Officer
ASR	automatic send-recv
AST	Air Surveillance Technician
ATC	Air Training Command
ATCF	ATC Facility
ATO	Air Tactics Officer
ATT	Air Tactics Technician
B-N	bariated-nickel
BTL	Bell Telephone Laboratories
BSO	Battle Simulation Officer
CAA	Civil Aeronautics Administration
CAT	category
CBS	Columbia Broadcasting System
CC	combat center
CCDC	Cape Cod Direction Center
CDC	call direction code
CCS	Cape Cod System
CER	change evaluation request
C&E	communications and electronics
CHT	Charatron tube
CM	core memory
CP	Command Post
CPO	command pulse output
CRT	cathode ray tube
CS	coding specification(s)

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DAB	display assignment bit
dc	direct current
DC	direction center
DCA	DC active
DD	digital display
DDG	DD generator
DDR	digital data receiver
DDT	digital data transmitter
DGP	Data Generation Program
EADF	Eastern Air Defense Force
ECM	electronic counter measure
ECP	engineering change procedure
EMAR	experimental memory address register
EPSCOM	Equipment Program Services Committee
ESS	experimental SAGE subsector
FF	flip-flop
FGD	fine grain data
FM	frequency modulation
FORX	FGD orientation with Raydist and calibrated Mark X
G/A	ground to air
GFI	gap filler input
GSR	group selection register
HEC	Hazeltine Electronics Corp.
IBM	International Business Machines Corp.
ID	identification
INS	interceptor simulator
IPS	initial program specification
IRE	Institute of Radio Engineers
JETEC	Joint Electron Tube Engineering Council
KSR	keyboard send-receive
LPO	Lincoln Project Office
LRI	long-range radar input
LTFS	Lincoln Tube Process Specification
MAR	memory address register
MEL	minimum equipment list
M-G	motor-generator
MIL	Military
MISP	Manned Interceptor Simulation Program
MITE	multiple input terminal equipment
MPFS	Master Program Preparation Section
MTC	Memory Test Computer
NAS	Naval Air Station
NET&T	New England Telephone and Telegraph Co.
NRL	Naval Research Laboratory

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OB	output buffer
OMR	operational modification(s) request
OPS	operations
OT	Overlap Technician
PCD	Production Coordination Office
PIUMP	plug-in unit mounting panel
PPIG	planned position indicator
PRF	pulse repetition frequency
pps	pulses per second
PT	Plotting Technician
RADC	Rome Air Development Center
RAFD	Rome Air Force Depot
RAND	Research and Development Corp.
RC	register containing
R-C	resistance-capacitance
RD	radar data
ROTR	receive-only typing reperforator
S&EC	Scientific and Engineering Computation
SAGE	Semiautomatic Ground Environment
SBT	surface-barrier transistor
SAR	storage address register
SD	situation display
SDG	SD generator
SDV	slowed down video
SIF	selective identification feature
SC	Signal Corps
SCEL	SC Engineering Laboratory
SOP	standing operating procedure
SO	Systems Office
STP	System Training Program
TAPE	Technical Advisory Panel for Electronics
TBS	training and battle simulation
TD	track data
TIR	Technical Information Release
TT	Texas Tower
UHF	ultra high frequency
VCM	vibrating coil magnetometer
VHF	very high frequency
WADC	Wright Air Development Center
WE	Western Electric Co.
WISE	Whirlwind I SAGE Evaluation
WSPO	Weapons Systems Project Office
WWI	Whirlwind I
XT	crosstell

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NO. 6M-	AUTHOR	TITLE	CLS.
<b>ADMINISTRATION &amp; SERVICES (Group 60)</b>			
4070	Div. 6 Staff	Biweekly Report for Period Ending 16 December 1955	C
<b>SAGE SYSTEM TEST &amp; PLANNING (Group 61)</b>			
3814-1 S#1	J. Bryan S. Hauser	Changes in the Operational Specifications for the Manual Data-Input Function in the Sage System	C
3870	R. R. Reed	Operational Specifications for Digital Displays in the Sage System	C
3935	D. L. B ailey	Mathematical Specifications for Automatic Tracking in the Sage System	C
3994	H. D. Benington et al	Lincoln Checker: Operational Specifications	U
3997	H. E. Frachtman	Mathematical Specifications for Height Finding	C
4051	T. R. Callahan C. C. Grandy	Group 61 Proposal for Operation of the ESS Shakedown, Revision and Verification Exercises	C
4061	H. D. Benington et al	Operational and Mathematical Specifications for the Initial ESS program	U
4076	P. R. Bagley	Sage Programming Information Service	U
<b>FSQ-7 PROTOTYPE DESIGN &amp; INSTALLATION (Group 62)</b>			
4060	J. Woolf H. E. Zieman	IRE Conference on Instrumentation	U
4063	J. Giordano	Minutes of the IBM/LL-SO Concurrence Meeting #18 Held at Lincoln Laboratory 15 December 1955	U
3851-1 S#1	J. Giordano	Master Reference List of Equipment Specifications for XD-1	C

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4057	T. J. Sandy	Test Concepts for Sage Height Finder Input Subsystem	C
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3000 S#11 Corr. 2	W. O. Glass	Teletype Facilities for Sage Experimental Subsector	C
3996	R. R. Shorey	Sage System Message Formats (DDR-DDT)	C
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IBM DOCUMENTS			
885	W. J. Johnson	Project High Engineering Report-- Investigation of Back Voltage Characteristics of a 128 x 128 Ferrite Memory Core Plane	U
886	D. C. Ross	Project High Engineering Performance Specification -- Memory Element Specifications for AN/FSQ-7 Combat Direction Central and AN/FSQ-8 Combat Control Central	U
887	M. Krayewsky	Project High Engineering Report-- DC and CC Building Redesign	C

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889	W. VanTuyle	Project High Engineering Report-- Semi-Monthly Report #66	C
890	R. P. Crago	Progress Report AN/FSQ-7 & AN/FSQ-8	C
891	W. I. Congdon et al	Project High Engineering Report-- The Application of Accounting Machine Techniques to Back-Panel Wiring	U
892	E. J. Smura	Digital Display Control Unit	U
893	J. A. Cammans	Project High Engineering Report-- IBM Changes and Releases for Pro- ject High Installation Drawings and Specifications	U
894	P. J. Mancuso	Project High Engineering Report-- Bit Assignments for Marginal Check- ing Control Words	U
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## LL-DR DOCUMENTS

562	W. S. Squire	Concurrence on AN/FSQ-7 DC-1 and 2 Building Floor Plans D-104	U
563	W. S. Squire	Concurrence on AN/FSQ-7 DC-3 Building Floor Plans D-105	U
564	W. S. Squire	Concurrence on AN/FSQ-7 Buildings DC-4, 5 and 6 D-106	U
565	F. P. Hadley	Revised Performance Specification for the AN/FSQ-7 Memory Element P-246	U
566	R. C. Marden	Concurrence on Revised Performance Specification for the AN/FSQ-7 Memory Element for XD-1 P-246	U
567	R. C. Marden	Output Storage Parity Alarm Check for XD-1 Concurrence P-236	U
568	R. C. Marden	Concurrence on Unlocking of the IO Address Counter P-113-1	U
569	R. A. Imm	Color of the Switch Panels for Sit- uation Display Consoles D-25-8	U

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571	R. C. Marden	Concurrence on Production Type DDR and DDT Equipment for XD-1 P-218	U
572	L. V. Ruffino	Maintenance Furniture, Fixtures and Miscellaneous Non-Expendable Items for the Combined AN/FSQ-7 and AN/FSQ-8 site D-98	U