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Memorandum 6M-4263

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SUBJECT: BIWEEKLY REPORT FOR PERIOD ENDING 23 MARCH 1956

To: Jay W. Forrester

From: Division 6 Staff

Date: 29 March 1956

Approved: J. C. Proctor
J. C. Proctor

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SAGE OPERATIONAL PLANNING

(Group 61, D. R. Israel)

DIRECTION CENTER (J. Ishihara)

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Whirlwind I - SAGE Crosstell Operation (S. Hauser)

A second draft of the operational and mathematical specifications of the WISE system is in preparation and will be issued within the next biweekly period. The second draft includes:

1. Corrections of a few displays
2. Discussion of data link and radio facilities
3. Change in identification and height input switches
4. Minor corrections of an editorial nature
5. Definition of the 32-track capacity.

Programming of the WISE system continues. Package I, as defined in the first draft of operational and mathematical specifications, will be ready on schedule, i.e. by 1 May 1956.

Identification and Manual Inputs (S. Hauser)

The operational and mathematical specifications of the weather, identification and manual-input functions are being reviewed with the objective of making all necessary revisions within the next biweekly period in order to produce a "last word" version of each of these documents.

DATA SIMULATION AND ANALYSIS (W. S. Attridge, Jr.)

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Simulated Data Generation (J. Levenson)

Detailed flow diagrams exist for about one half of the simulated data generation (SDG) subprograms. The long task of coding has begun and a backlog of coded routines is accumulating. No time has been spent on checkout because of the unavailability of MTC.

MTC Assembler (R. Olsea)

The MTC assembler checkout continues as quickly as the machine permits. As soon as the assembler is working, other programs (mainly utilities) will be assembled and checked out.

Data Reduction (R. Olsea)

The data reduction operational specifications are undergoing a major revision by Clark and Slagle following an idea proposed by Olsea, and discussed recently at a meeting of section leaders concerned. The format for output has been tentatively designed. Tower is working on more specific design for the station histories phase.

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Lafferty has returned from a two-week stay with Group 67 where he helped speed up recording planning and programming by revising original proposals. The reason for the change was to make records available to the data reduction section soon. Lafferty is resuming his program writing with a utility program called "octal punchout."

MFC Operations (D. Bancroft)

For the period 5 March to 23 March:

	<u>Hours</u>	<u>Per cent</u>
Scheduled	18.50	100%
Available	2.38	13%
Used	2.38	13%
Useful	0.00	0%

STANDBY AND DUPLEX OPERATION (A. Heineck)

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Duplex Standby (J. Groce)

The draft of 6M-4141 "Guide to Duplex and Standby Computer Operation at a SAGE Direction Center" has been completed and sent to publications.

H. Bridge has prepared a correction to 6M-3930-1 "Operational Specification for XD-1 Startover Function."

Mr. John Newton of IBM has joined the Duplex Standby Group and will assist in the preparation of operational specifications for the standby program.

Work has been started on the operational specification for the operational standby program. The following assignments have been made:

Switchover and Manual Startover - H. Bridge
 Alarm Monitoring and Automatic Startover - T. Hibbard
 Standby Sequence Control - J. Newton
 Startover Data Processing - J. Groce

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ESS DC IMPLEMENTATION AND COORDINATION

(Group 62, J. A. O'Brien)

EXTERNAL EQUIPMENT AND COMMUNICATIONS (I. Aronson)

Wire Communications (F. Irish, W. Glass, C. Carter)

A conference was held on 16 March to crystallize Lincoln's policy regarding ESS operation with the CAA ARTCC in New York. Telephone and teletypewriter communications to that location were discussed.

A proposed allocation of circuits on scatter-link between North Truro and TT-2 was submitted to Division 3 for their approval.

At a meeting held with representatives of Division 3 on 14 March, it was decided that the slot-signalling equipment for the ESS G/A radio channels to TT-2 should be located at the North Truro shore station.

The wire communications test team completed some more tests on the internal communication system in the ESS direction center. These tests on the internal circuits are now about 90% completed.

PROGRAMMING (R. P. Mayer)

EPSCOM

EPSCOM will be enlarged by five new BTL programmers as of March 26, but several W. E. people will be leaving soon.

The assembly test committee has requested EPSCOM to do some programming. Negotiations are under way.

EPSCOM Tracking Programs (C. S. Sherrerd)

The rewrite of the tracking program for use with external equipment subsystem acceptance testing in SAGE production subsectors is nearing completion after several minor delays (#8500). About one-fifth of the program is now being key-punched in the card preparation room. The rest of the program will follow soon. Compilation of the program as a unit should begin 2 April 1956. This represents a delay of about two weeks from the original schedule of 15 March. This first compilation will not include range-azimuth printout nor quantization errors of less than 1/4 mile. These features will be inserted into the program after the basic routine is debugged.

Plans are nearly completed for the height finding flight test tracking program (8700). Nancy Mardrosian has completed most of the coding of the necessary modifications of the basic tracking program for the insertion of John Maroney's height message processing and printout

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PROGRAMMING (continued)

routines. Immediately following the first successful compilation of 8500, these routines will be inserted and debugging of 8700 as a unit will begin. The scheduled completion date of 8700 is still 15 April. Debugging and revising the LRI and GFI subsystem flight test tracking program, 8900, will be going on at the same time.

Work is continuing on recoding of the mathematics of the tracking program for greater accuracy. Ann Tebbetts is assisting Margaret Tefft in this effort.

Wayne Gramling, having completed his work on the tracking program recoding, has joined Helen Quirk on the radar quick-check programming effort, replacing Gerard Baker who has joined the tracking program team to assist Chris Sherrerd.

Margaret Dolan, having completed her work on the tracking program recoding, has begun the radar site calibration and orientation program. This is a routine which is to process the output information of the tracking program in order to formulate conclusions as to possible misorientations and/or miscalibrations of each of the LRI and GFI radar sets.

G/G Display Program (L. E. McHenry)

The G/G format has been completed and debugged. The G/G displays seem to work all right with both the crosstell and height-finder channels. This program has been changed over to the compiler and will probably need more debugging. It is now being punched by the card room. The documentation has been started.

CIRCUIT SUPPORT (C. J. Callahan)

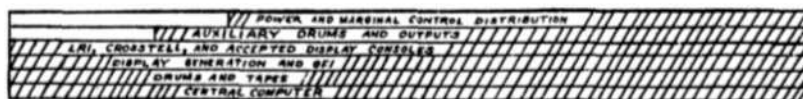
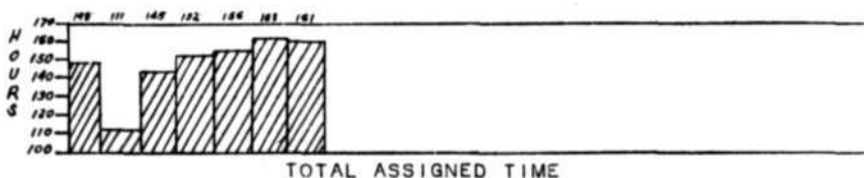
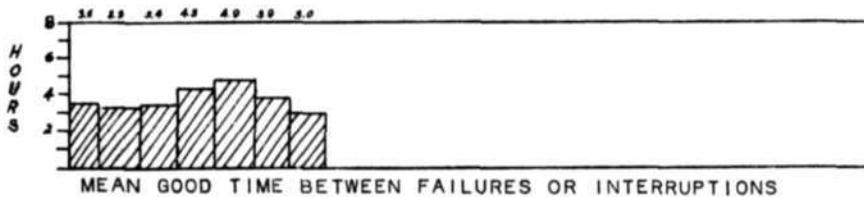
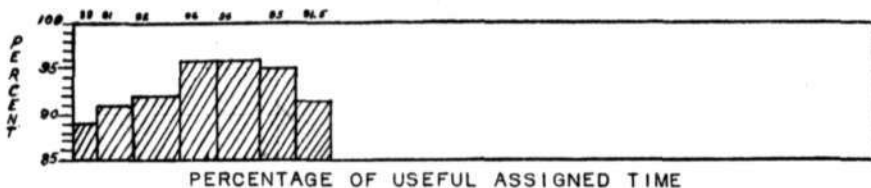
Centralized Probe System (W. Santelman, A. Hingston)

A new passive probe gun has been built and successfully demonstrated in XD-1 to IBM. A model is being assembled for shipment to IBM.

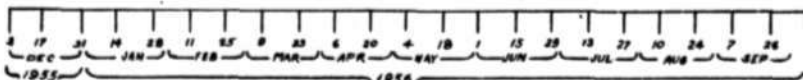
Noise tests on parallel active and passive probe systems in XD-1 have produced measured signal-to-noise ratios of 32 to 39 db on the active probe and 22.5 to 46 db on the passive probe system by comparing the peak-to-peak noise value with a typical 40-volt computer pulse or flip-flop waveform.

Fortunately, most of the "noise" is stray computer pulse pickup which is synchronized with observed computer waveforms, so that its effect is a very slight alteration of waveform rather than a broadening of the trace. The oscilloscope operator is not aware of interference or "noise" on either probe system unless he is viewing a waveform not locked to the computer.

AN/FSQ-7(XD-1) SYSTEM RELIABILITY



EQUIPMENT INCLUDED IN RELIABILITY STUDIES



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CIRCUIT SUPPORT (continued)

Electrostatic charge buildup, caused by motion of the coax cables running at high impedance levels, produces signal voltages of up to 0.2V peak-to-peak. This rather serious difficulty is expected to yield to proper manufacturing treatment of the special crimped-resistance-wire coax cables being made by Federal.

IRI Monitor (B. W. Barrett)

The racks of breadboard equipment are being tailored to accommodate the Bendix consoles.

(M. J. Flanagan)

Work was completed on the switch driver input amp. for TX-0. All modifications were delivered to the Memory Group. The amplifier requires an input of 0 to -2 volts and delivers a 0 to -90 volt signal into approximately 200 μ f, with a rise and fall time of less than 0.6 μ sec.

A type 1050W pulse generator was modified for the transistor group to give a variable pulse width (.05 to .1 μ sec) at a P.R.F. of 1.6 to 5mc.

DESIGN CONTROL (W. A. Hosier)

Concurrence Meeting (J. D. Crane)

Results of the concurrence meeting held during the last biweekly period are presented in 6M-4243, "Minutes of the IRM-DCO Concurrence Meeting No. 56".

Prototype Changes (J. Giordano)

In order to conform with the policy expressed in 6M-4233, "Changes to Experimental Subsector," by J. W. Forrester and C. F. J. Overhage, all proposed XD-1 equipment changes will be classified as follows:

1. Changes that are concurred with and are considered necessary for the initial operation of ESS.
2. Changes that are concurred with but will not be incorporated until the initial operation of ESS is realized.
3. Changes will not be reviewed for concurrence until after the initial operation of ESS is realized.

The minutes of IRM-DCO concurrence meetings will indicate the above status to proposed XD-1 equipment changes.

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DESIGN CONTROL (continued)

SAGE Improvement Study (W. A. Hosier)

At a meeting on 23 March, the draft (PLGZ-1) of the preliminary report on program cycle time and means of decreasing it was discussed and revised. The revised report will be issued in the next few days as an M-note.

<u>New CER's</u> (A. A. Rich)	<u>Originator</u>
137 Request of information for a proposal to modify the LRI Parity System to add one bit to the site identity and one bit to the clock time so that even parity can be maintained.	IBM
138 Modifications to PERSELBSN Codes, D-16-9 A change to make possible to apply a marginal checking excursion to Duplex and Simplex equipment simultaneously.	IBM
139 Change to FSQ-7 GFI Mapper Console Specifications, D-34-5, to describe the no target to computer alarm.	IBM
140 Alternate writing surfaces of edge lit plastic for auxiliary consoles and CP DD desks.	IBM

POWER (J. J. Gano)

XD-1 Power System (J. J. Gano)

At a meeting with IBM and GE on the d-c power supplies, it was learned that the Lynn division of GE has contracted with the Schenectady development group to investigate the cause of the drift in the output voltages. They plan to study the problem for a week or two and then make any necessary modification. First suspicion is directed to the minor loops which reduce the overall loop gain as mentioned by Coffin in his early report on drift studies.

D-C Supplies (S. T. Coffin)

A power transistor heat dissipator is being tested by the Components section. This dissipator will be used in various power transistor applications.

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POWER (continued)

MFC (R. C. Jahn)

Ways of improving the MFC power supply reliability were discussed by interested parties from the power group and MFC. No one has been checking the type 6080 series tubes, and the result has been an excessive number of blown fuses. A recent check has shown many tubes not conducting at all, and some conducting less than half their design load. MFC has instituted a regular maintenance inspection of all series tubes which should greatly reduce blown fuse outages.

TX-0 (S. T. Coffin)

Three of the TX-0 thyratron d-c power supplies have been tested and installed. The fourth is on order.

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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 2,673,000. In addition there are approximately 45,000 single-tested cores on hand. There are also 8,000 unused cores that were returned from Koch, retested, and sent back to them.

Chemistry

Analysis: Recently developed methods have been used to analyze various experimental compositions giving us an increased knowledge of the real chemical nature of these samples. A large boule of a manganese oxide was shown to have the composition $Mn^{++}Mn^{+++}O_4$

corroborating the evidence obtained by X-ray diffraction for a hausmannite phase.

Refiring: Latest experiments with the refiring process indicate that the range of refiring temperature for the production of good memory cores increases with decreasing molecular weight of the gas used for the refiring atmosphere. Cooling rates short of quenching have little effect on the magnetic properties. Good cores have not been produced by refiring in air; this treatment, however, changes the output wave form.

Experimental Ferrites: Additions of cobalt ferrite (less than 1 mole percent) did not improve the magnetic properties of lithium ferrite. Cobalt ferrite is being added to a square-loop lithium-nickel ferrite and the resulting properties will be examined.

Physics

Apparatus (D. O. Smith, R. A. Pacl)

It is found that the fast switching of films cannot be observed without the use of a preamplifier. This is currently being set up. In addition, apparatus for applying a transverse d-c magnetic field has been designed and is being constructed.

The instability of the mechanical vibration resonant frequency makes its utilization in a feedback system impracticable. A new circuit which compensates for this resonance as much as possible has been designed and is being tested.

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MAGNETIC MATERIALS (continued)

Work is continuing on the high frequency fluxmeter in an effort to obtain the best operating conditions.

Experimental (D. O. Smith, N. Menyuk)

An attempt was made to obtain the magnetization of powder samples at liquid helium temperature. However, unexpected magnetic impurities in the glass Dewars forced a delay in the experiment. A number of design improvements suggested by this experiment have been incorporated in the system, and a new attempt will be made during the coming week.

TRANSISTORS (D. J. Eckl)

SBT Life Tests (R. L. Burke)

The shielded SBT shift register has been in operation since last June 8, a total time of 6928 hours, without losing its pattern. This continuing "run" of the shielded register represents 686,000 transistor-hours without a single transient error. This unit is a double-rank, direct-coupled, 8-digit shift register which shifts its pattern every microsecond. There are 80 transistors in the double registers and gates and 19 in the control unit. The device runs on two 1.5 V dry cells in series and dissipates 420 milliwatts. The pattern is checked morning and evening with a scope.

A similar unshielded register has been in operation for 2622 hours without losing its pattern. A TM-1 type, single-rank register has been operating for 1568 hours on lab a-c power with the same pattern.

SBT Measurements (P. A. Fergus)

All SBT's originally requested for TX-0 have been delivered. We have on hand approximately 150 tested and acceptable SBT's and 600 untested. Distribution curves for SBT parameters have been plotted and will be incorporated in an M-note in the near future.

Transistor Circuits Course (C. T. Kirk)

One-hour lectures are being given every Tuesday at 11:00 A.M. in D-218 as usual. I am preparing the first set of lecture notes at present.

SBT Hole Storage (C. T. Kirk)

I am completing a paper on this subject for publication and another paper on the same subject is to be given in June for an I.R.E.-sponsored transistor conference.

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MEMORY (J. L. Mitchell)

Cooling

The Westinghouse compressors have been installed and should be in operation next week. The installation of the power supplies is still awaiting the completion of the mounting hardware.

256² Memory

To date, 313, 64 x 64 memory-plane modules have been accepted. Twelve, 256 x 256 planes have been assembled. The switch-core plug-in units have been checked and it was necessary to replace cores in a few of these units. Power has been applied to the 3-bay rack and the rack has driven the magnetic-core switch. A more detailed check of the selection equipment will be made during the next few weeks. The assembly of the memory stall has slowed down somewhat and it looks like the first plane will be in operation around April 1st.

Advance Development

Davidson has completed a report on the 2N136 transistors. The prototype sense amplifier units are not under construction and a note is being written describing the amplifier.

SYSTEM DESIGN (K. Olsen)

TX-0

The mechanical parts of TX-0 were installed and during the next biweekly period the circuits and wiring will be installed. We will be able to run only one operation at a time until a memory is connected because of the limited toggle-switch storage but, this should be a fairly good check.

LOGICAL DESIGN (W. A. Clark)

Possible ways of expanding the TX-0 to accommodate the 36-plane memory stack have been studied. The most promising scheme involves the construction of a second 36-bit frame of central computer equipment, leaving the present 18-bit frame which comprises the present TX-0 for coupling to a future experimental memory. The principal logical feature of this second frame would be the use of several program counters stored in a small, fast-access memory also holding index registers.

DCFAR

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An MIC program which simulates the DCFAR proposed by Bazemore and Nelson has been written and operated on test patterns. Doppler data

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LOGICAL DESIGN (continued)

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is fed directly into the arithmetic element of MTC at a high rate and is stored on the drum and subsequently punched on cards for future analysis. An interesting fact is that the operating time of the simulated analyzer is 15,000 times longer than for the actual proposed DCFAR computer.

DISPLAY (C. L. Corderman)

The week of March 12-16 I accompanied representatives of IBM and HEC in a visit to Stromberg-Carlson in San Diego. Various phases of 7" and 19" Charactron production and HEC test results were discussed. Several minor revisions to the test specification were made or are planned for the near future. The Charactron production area has been expanded to approximately 1 1/2 times its original size and a well implemented chemical laboratory has been set up. The general state of cleanliness and in-line inspection and control of tube production were both quite encouraging.

The following week I attended the IRE National Convention and a meeting of the Working Group on Special Tubes committee of AGET. Information on special tube developments sponsored by the government is available for anyone interested.

Line Drivers (J. Kriensky)

An M-note summary of the operation and marginal checking of the line drivers is in progress.

Character Legibility Studies (R. Gould)

The cards for the first of the display legibility tests on XD-1 have been prepared and the display has been checked out. Cards for two other test pattern groups are nearly ready.

With a Simpson meter as an indicator, the spot photometer that we have been using seems adequate to give comparative measurements of the brightness of the displays in the experimental lighting room and in XD-1.

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ESS TEST PLANNING - WWI MTC OPERATION

(Group 64, E. S. Rich)

WWI COMPUTER OPERATION (L. L. Holmes)

Scheduled Computer Hours	283
Interrupting Incidents	2
Hours Lost	0.5
Percent Good Time	99.8
Mean Time Between Failures in Hours	141.3

The system dependability was excellent. Two tubes were the cause of the two interrupting incidents. One tube had a tap short, while a gas tube located in a power supply was found to be not firing. During this biweekly period, 25 tubes were replaced through the use of the marginal checking facility.

Raytheon Magnetic Tape System

L. H. Norcott is investigating the possibility of replacing most of the bulky panels of the present control system with plug-in-units. The existing panels have no replacement units, occupy five times the amount of space that would be required for plug-in-units, and are not concentrated in a single area.

G.E. G/A Data Link Subsystem

Two G.E. G/A data link subsystem tests were conducted using the Prospect Hill transmitters, the Lexington airborne equipment mock-up, and the WWI computer. The employed program checked the output data by a loop closed through MITE I and was capable of printing errors on the Flexowriter if they occurred. Each bit of the transmission was checked separately on a real-time basis through equipment not used in the transmission, insuring that any errors in transmission would be detected immediately. On the latest test there were no errors recorded at WWI, but several errors at the mock-up were observed and were apparently caused by a faulty transducer. An aircraft that was receiving our messages at the same time as the mock-up racked up the information correctly.

The subsystem was used during the Cape Cod System SOT mission of 23 March. Five aircraft with G.E. equipment were assigned to D/L operation. Two aircraft operated satisfactorily, while three reported difficulty with their equipment. In the tests conducted it appears that the airborne system (equipment and operator) is the weakest link in the subsystem.

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WWI COMPUTER OPERATION (continued)

The WWI equipment that is part of the subsystem is checked daily on closed-loop marginal checking. The rest of the subsystem is employed almost daily in checks with aircraft. Group 64 will not initiate any further subsystem tests employing the computer. Some testing will probably be performed using the recently installed transmitters at South Truro and the transmitters soon to be installed at the Lexington Field Station in conjunction with our Ampex magnetic tape output.

MEMORY TEST COMPUTER (H. L. Ziegler)

Increased loading of several power supplies by the magnetic tape system has revealed present power supply maintenance to be inadequate. Gradual loss of some of the many parallel tube circuits in our series-regulator type supplies is not readily apparent to maintenance personnel and therefore is allowed to continue. Eventually remaining parallel circuits are loaded to the point where some transient condition triggers a "chain reaction" that opens all remaining circuits by blowing their individual protective fuses. To forestall such loss of power followed by the onerous task of replacing several hundred fuses, the following steps have been taken:

1. Each individual tube circuit now has a neon pilot light to indicate its status.
2. A convenient method of measuring current in individual tube circuits has been worked out.
3. A regular schedule for checking items 1 and 2 has been established.

A study is under way to determine future MTC power requirements. Even our present power load indicates the need for several new supplies and/or increasing the current capacity of several of the present supplies.

Troubles with the power supplies - inability to handle the additional load - have delayed magnetic tape work by at least one week. Accordingly, tie-in to the computer control still has not started. Our latest hope is to have the magnetic tape facility available to programmers by the end of the coming biweekly period (April 6).

All instructions except those associated with magnetic tape are checked out and working. The present block-transfer instruction makes it possible to store a Bldg. F test display pattern on the magnetic drum in one-third the time previously required.

The IBM card machine continues to give us considerable trouble. Besides some electronic control-circuitry trouble still with us,

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MEMORY TEST COMPUTER (continued)

a rash of broken punches plagued us during the past week. Cause of the broken punches was eventually found: a hardened spring clip was discovered "floating" about the innards of the machine and occasionally drifting under the punches. New punches have been installed and mechanical troubles appear to be corrected at the time of this writing.

Increasing use of IBM cards for input and output of MTC indicates the need for much greater reliability of card equipment than now exists. Use of newer and better equipment, together with duplexing of such equipment, is under consideration.

The console and camera display scopes are functioning satisfactorily, though not up to their full capabilities as yet. Ed Glover has taken over the task of putting the final touches to the display system.

Special resistors ordered for the MTC probes are expected to arrive about 12 April. All probe cables are now installed. Speakers and/or jacks will be added to the MTC intercom system to aid in the use of the scope-probe system.

MTC users are again reminded that the "installation phase" is not yet complete. Time schedules must remain somewhat tentative until checkout is complete and test programs (as yet unwritten) are available to measure reliability of new equipment.

SHAKEDOWN PLANNING (C. C. Grandy)

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Exercise Design

The Draft 6M-4223, "Schedule for ESS System Testing by Group 64 and Group 22," was issued and comments are being collected by the ESS PCC. The memorandum on the nature and objectives of shakedown is now in rough draft form.

Production of simulated test problems has proceeded using the revised path specification forms. The Flight Path Library being prepared by J. D. Coyne now has 420 paths and will be completed (600 paths) the week of 26 March. The sample simulated problem specification mentioned in the last BIWEEKLY has been worked out by Coyne and Lawrence. This problem is not a practical one that we will ever expect to use; however, it has clarified many procedures and problems involved in writing such a specification. A description of the Flight Path Library and other inputs for the simulated problem production have been documented in an interoffice memorandum by Lawrence.

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SHAKEDOWN PLANNING (continued)

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The assembly testing study has been continued in conjunction with Groups 61 and 67. Interoffice memorandum, PLFC-20, "Desired Product of Assembly Testing and other Prerequisites for System Shakedown," has been written and distributed by W. C. Johnson. Johnson has also proposed a format for the assembly testing test specification in interoffice memorandum, PLFC-23. A sample test specification for automatic tracking is being prepared by T. R. Callahan. This specification, which is not yet completed, involves some 256 different testing conditions, and should be completed for the consideration of the Assembly Test Committee during the week of 26 March.

System Verification

The preliminary verification criteria are now in rough draft form and we expect to be able to issue a draft memo the week of 26 March. Comments are being awaited on the initial data reduction requirements published in 6M-4203. The need for several additions has been discovered by the system verification staff.

Facilities

Memorandum 6M-4071 "Requirements for Operating Procedures for External Sites in the Experimental SAGE Subsector (ESS)" has been completed by M. DiCarlo-Cottone. Supplement #1 to 6M-4088, "Specifications for Air Force Operator Proficiency. . ." has been completed by M. Cannell.

The training manuals written by ATC for the operator training program have been reviewed by Cannell for completeness as far as operating procedures are concerned. Very few deficiencies were found, hence these manuals are considered adequate and we no longer plan to write a statement of requirements for SOP's for DC operators (comparable to 6M-4071). Our revised operator requirements for the shakedown tests will be stated as soon as the test schedule proposed in 6M-4223 has been revised and approved.

The master schedule of all facilities needed for the conduct of the shakedown exercises has been prepared by Cannell and Lozeau. There is, however, some question about the validity of some of the dates we have scheduled. We are attempting, through the PCC, to "firm up" all information shown in the schedule.

Staff Familiarization

Six members of the section visited the Ft. Banks AAOC and a NIKE installation on 22 March. These visits to the sites have proven most useful in orienting the staff for the integration of the external facilities.

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VACUUM TUBES

(Group 65, P. Youtz)

TUBE TECHNIQUES (J. S. Palermo)

Cathode Study Program

The cathode study program was maintained at a four-tube-per-week rate during the past two weeks. Five of these tubes were processed for the oxide-cathode study section of this program and the remaining three for the bariated-nickel cathode study program.

However, the B-N program has required considerable time during the past ten days due to the data from a series of tubes that had been scheduled to evaluate variations in activator content. We are presently investigating the role of impurity factors in B-N cathodes.

Dr. Gardner of Group 24, F. H. Caswell, P. Youtz, and I have been in conference with Messrs. McNair and Lynch of Bell Laboratories on the subject of B-N cathodes. Every phase of B-N cathode production was discussed in order to correlate the effort of both laboratories. Many of the recommendations presented at these meetings will be evaluated during the next two weeks.

Electron-Optics Study

The development of the processing technique for the panel section of a 19-inch color bulb has been satisfactorily completed. Since many of the processes are extremely marginal and require critical controls, it is planned to continue this study further until the specified 19-inch bulbs are received from Corning Glass Works.

Solid-State Display Studies

The processing of additional components for this program was not scheduled during the past two weeks due to the extra time required by the cathode study program. However, work on this program will be reactivated within the next few days.

RECEIVER TUBES (S. Twicken)

Tung-Sol's "concerted efforts" to solve the grid-bowing and shorts problems in the DT-438 have as yet been fruitless. The lot evaluation program is still being held in abeyance pending solution of these production problems.

A relatively large number of gate tube "failures" at IBM pluggable-unit test has been traced to low, but acceptable, plate current aggravated by insufficient preheating before pluggable-unit test. A preheat panel is to be provided to the pluggable-unit test people. It is well that this problem has arisen at this time, prior to the

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arrival of the Bendix gate tubes; the Bendix tubes, with a ceramic heater-cathode sleeve, require a somewhat longer warmup time and would have been rejected by the dozen on the production floor although passing acceptance tests at incoming inspection.

Bendix is experiencing considerable production shrinkage on the screen grid interelectrode-resistance test and has asked for some relief in the specification limit. Some tests to date indicate the trouble may be $1 \mu\text{a}$ or less of primary screen grid emission under the test condition (screen highly negative). That Sylvania does not have this difficulty points up again Sylvania's advantage in know-how in manufacturing and processing their own furnace-blackened screen grid wire. It is an additional argument for allowing Bendix to use the screen wire with which they have considerable experience, molybdenum, while Sylvania uses their own furnace-blackened wire. Evaluation-approval tests on the moly screen wire are under way at Bendix.

COMMERCIAL TUBES (T. F. Clough)

We were visited by GE representatives who wished to discuss the applicability of their 6283 to the Charactron deflection driving circuit. However, it appeared that this tube offers no substantial promise of improvement over the 6161 now being used.

Electron Optics

At the IRE Convention the week of 19 March 1956, Corning Glass Works had on display samples of the solder glass and 60-cycle seal methods for joining glass faceplates to funnels. I reviewed and discussed with the Corning representative these methods because of their applicability to our electron-optics studies.

Ferromagnetic-Evaporated Films

A new R-F feedthrough of modified design has been installed in our evaporation system. The extraneous R-F coupling should be reduced with this feedthrough.

CHARACTRONS AND TYPOTRONS (P. C. Tandy)

Six MIT 19-inch tubes have completed between 706 and 9676 hours of life test, and seven Charactrons between 2319 and 3074 hours. Latest transfer-characteristic photographs have not been received.

Thirty-seven oxide-coated cathode study tubes have completed up to 7309 hours. Thirty-two of these tubes are on the program as given in memorandum 6M-3965 and have completed up to 1465 hours. One tube, 1022, was rejected after 1174 hours for excessive leakage. Thirty-three tubes of the 54 that were made have passed initial tests. The reject trends of the five lots of tubes were as follows.

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Of the 11 tubes made in lot #2 (Superior gun, RCA cathode, and long processing) numbers 4, 5, 6, and 7 were rejected for nonuniform cathodes. Six of the 11 tubes in lot #4 (Superior gun and cathode, long processing) were rejected for leakage. Two of these six rejects also had nonuniform cathodes. Of the ten tubes made in lot #5 (Superior gun and cathode, short processing) four were rejected for grid emission. Grid emission has not appeared in the later tubes of this group.

Thirty-one bariated-nickel cathode tubes in 2-inch bulbs are now on life test with up to 1465 hours. Nonuniform cathodes with poor activation are still the major problems. They usually improve during early life.

Thirteen triode and five diode early bariated-nickel cathode tubes are continuing to operate on life test, but no data has been taken since the last report.

Eighteen Typotrons are still operating on life test. Monthly data has been delayed by the push to get the CT's on life but will be taken shortly.

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SAGE DC AND CC SITES

(Group 66, B. E. Morriss)

SITE PLANNING (K. E. McVicar)

The revision of the site planning document is continuing. The document is being divided into two separate documents:

Subsector Activation: This involves a study of the jobs necessary to turn over to the Air Force an operational subsector.

Program Checkout: Details of the proposed organization and responsibilities of the program checkout section have been drafted. The program checkout document is being revised and assembled and will essentially indicate Lincoln's responsibilities at the SAGE sites.

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PROGRAM PRODUCTION

(Group 67, Jack A. Arnow)

CENTRAL PROGRAMS (D. L. Bailey)

Display (H. Briscoe)

The first draft of the AS attention device program, the track history program, and the AMD program have been coded.

Preliminary coding specifications for alarm DD, WAD, and AA situation display have been completed.

In-Out (W. F. Harris)

The subsection has been redesignated the "Central and In-Out Programs Subsection" and has assumed responsibility for four programs (central track A, central track B, monitor assignment and track history makeup) that were formerly the responsibility of L. B. Collins. T. A. Kurth and D. Kiley have joined the subsection and M. Loviglio will work with us until about the end of the next biweekly period. Preliminary coding specifications for two of the crosstell programs (crosstell in and crosstell out A) have been completed, and coding has begun on these programs.

Items of information to be recorded by the recording programs have been listed, and specification of record formats is proceeding.

Tables (L. B. Collins)

The tables subsection has been reorganized and renamed "Program Design" subsection: All program responsibilities (CTA, CTS, CMA, CTH) have been assumed by the Central and In-Out Programs Section under W. F. Harris. Personnel transferring to Harris' subsection are T. A. Kurth, D. Kiley and M. Loviglio. New personnel entering the Program Design subsection are M. Ferguson, H. Howell, J. Schissell and G. Rolt. M. Loviglio will return on or about April 12. Transfer of Ferguson, Schissell and Rolt will not be complete until April 12 in order to allow them to phase out of program responsibilities.

In broad terms, the program design subsection is responsible for:

- 1) Continued design and documentation of tables.
- 2) Design and documentation of programs as a system:

Storage Allocation
Sequence
In-Out Transfers
Inter-program Processes

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CENTRAL PROGRAMS (continued)

- 3) System studies, verification of system processes and table items
- 4) Program Evaluation
- 5) Editing and/or generating Sections DCA 1.0, 2.0, 3.0 and 4.0 of the coding specifications

A more objective breakdown of these tasks will be made this week.

Switch Interpretation (A. Marshall)

Coding was completed and sectional drafts sent to the typist on the following programs which are part of the basic package:

KSS - ASO--AST
KSR - Radar Mapping (MSG-MSL)
KSI - Initiation (IS and TI)

Documentation and coding are being pressed on KTB-simulation which is also in the basic package.

Coding and documentation were also completed on KRF-raid forming, thus relieving a programmer to assist on KTB.

Operational Programs (J. P. Haverty)

All tracking programs are now being parameter-checked. Efforts are being made to completely parameter-check all tracking programs by 13 April.

Miscellaneous (F. E. Ogg)

The coding of the miscellaneous nontracking operational programs will be completed 23 March.

The raid forming program has been successfully compiled. Procedures are now being determined for the best method of parameter-checking.

Weapons Direction (J. Leavy)

Preliminary sectional drafts of sections 1.0, 2.0, and 3.0 have been completed for WWA and WIN with the exception of the output makeup portion of WIN.

UTILITY AND SPIS (P. R. Bagley)

Administrative Changes

The Utility Program Subsection and the Documentation and SPIS Subsec-

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UTILITY AND SPIS (continued)

tion have been combined as the Utility and SPIS Subsection under P. R. Bagley. The responsibilities of this combined subsection are to provide the following:

1. Programming, checkout, documentation, and maintenance of the Lincoln utility system
2. Computer operator training
3. Information concerning the use of the utility system and the programming of FSQ-7 type computers.

Status of Lincoln Utility System I

The Lincoln Utility System I, as described in 6M-4229, is now operating as a usable utility system though still lacking a few programs. The six master tapes recorded on 22 March each contain the following programs and tables:

Utility control program
Read-in program
Checker, with delayed output feature
Compiler, with editor-translator feature
Library merge program
Com tag pool, sections I and II
Assemble com tag pool program, for sections I and II
Editor catalog

It is anticipated that the programs to be added to the master tape during the week of 26 March will be:

Card input editor
Print/punch editor
Octal load

During the week of 2 April we hope to add:

Storage print
Library output
Master tape load

Plans for Utility System II

A revised and expanded utility system, to be termed Utility System II, is projected for the end of April. The major additions will be:

1. Provision for assigning values of indexable address tags on a per-program basis so that Master Program

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UTILITY AND SPIS (continued)

central tables may be positioned in memory independently for each program

2. Interim table simulation program for generation of tables to assist parameter checkout of the Master Program
3. Provision for delayed input with compiler, and for delayed output with library merge, library output, and storage print programs.

Computer Operator Training (J. Thompson, RAND)

The present seven computer operators have had approximately six hours of computer time and 26-1/2 hours of lecture time for training purposes since 3 February. Two tests have been given.

The following subjects have been covered in the lectures:

Maintenance console	'And' and 'or' circuits
IBM binary loading program	Flip-flops
Drums	D-c level pulses
Cores	0.1 ms pulse
Test storage	Utility programs
Register neons	Registers and counters

Plans for the future include outlining an operator's training course for new operators. This outline is just about complete. A copy of the proposed outline will be sent to people involved.

It is also hoped to have lectures conducted by utility programmers and IBM engineers.

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ADMINISTRATION AND SERVICES

(Group 60, J. C. Proctor)

PERSONNEL

Staff

Terminations

Arthur W. Heineck is now employed by International Business Machines Corporation in Poughkeepsie, New York.

Robert D. Klein is now employed by Melpar, Incorporated, Cambridge, Massachusetts.

Division 6 Non-Staff Personnel Changes

Transfers

Robert Hudson Technician Group 60 to 63

Terminations

Joseph Salvato Technician Group 64

GENERAL ENGINEERING (A. R. Smith)

Movable Partitions

Design and fabrication of the General Engineering styled movable partitions has been suspended. In an effort to meet the specific requirement of comparable partitioning for Murphy Hospital at a minimum expenditure of time and money, the Steering Committee, through Division I, has reduced the present design to its most readily mass-produced type construction. Individuals with immediate need for partitions are requested to discuss their requirements with A. T. Newell as to feasibility of application and availability.

Building F Enunciator

Design work has been temporarily delayed, pending delivery of sprinkler system building plans from the Air Force engineering corporation through Division I.

Core Handler

Based on subsequent experiment action, the feed system is being modified. All design work should be complete by the middle of next month. Fabrication will start at the beginning of next month. Completion of one unit is anticipated early in May.

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COMPONENT EVALUATION (H. W. Hodgdon, C. Morrione, Jr.)

Items of special interest in components work are not being discussed in detail at Test Equipment Committee meetings and reported in minutes of these meetings. Interested personnel may be placed on the distribution list for these minutes if desired.

TEST EQUIPMENT (L. Sutro)

Howard Hodgdon, assisted by Charles Morrione, will take over my responsibilities for test equipment sometime during the next two weeks. He has already taken over the position of secretary of the Test Equipment Committee. He is now becoming acquainted with the administration of Test Equipment Headquarters, preparatory to taking that over. I am going into the Design Control Office.

The Test Equipment Committee has approved purchase of the following:

<u>ITEM</u>	<u>MFR.</u>	<u>MODEL</u>	<u>USER</u>	<u>GROUP</u>
Scope	Tektronix	541	K. Shoulders	63
"	"	"	spare	-
Preamplifier	Tektronix	52/54K	K. Shoulders	63
"	"	"	spare	-
Plug-in Preamplifier	Kay Lab.	104A	D. Smith	63
Amplifier Peaked at 34 cps	Kay Lab.	107A		

DOCUMENT AND PRINT ROOMS (A. M. Falcione)

Because our print service is fast and the space is needed in the Documents Room area, the "library print" file of drawings in the Print Room will be eliminated.

The Documents Room will be reorganized to incorporate a subjective indexing system for Division 6 documents (past and future). Ideas on indexing systems would be appreciated and should be given to Malcolm M. Ferguson who is studying various systems for indexing technical data.

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STUDIES IN PROCESS

GROUP 61

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

Math specs for:

Antiaircraft	6M-3982, issued
Intercept Direction	6M-3927, final draft expected week of 2 April
Weapons Assignment	6M-3926, " " " " 26 March
Raid Forming	6M-3973-1, " " " " 26 March

OPS specs for:

Antiaircraft	6M-3739-2, first draft expected week of 2 April
Intercept Direction	6M-3786-2, " " " " " "
Weapons Assignment	6M-3744-2, " " " " 26 March
Raid Forming	6M-3720-2, " " " " " "

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4243	J. Giordano	Minutes of the IBM-DCO Concurrence Meeting #56 Held at Lincoln Lab. 15 March 1956	U
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3297 S#4	E. L. Smiley	Specifications for the Power Conversion and Distribution System AN/FSQ-7	U
3299 S#5	E. L. Smiley	Specifications for the Output System AN/FSQ-7	U
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944	J. Lego	KMPD Engineering Report-- Tape Drive Maintenance Unit	U
945	J. J. Moyer W. C. L. Stone	KMPD Engineering Report--Test- ing Core Memory With the Check- erboard and Worst Pattern	U

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947	R. F. Keating Revised by R. J. Trivison D. A. Kelly	KMPD Engineering Performance Specification -- Simplex Power Control and Distribution Unit Specifications for AN/FSQ-7 Combat Direction Central and AN/FSQ-8 Combat Control Central	U

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623 (D-34-4)	J. D. Crane	Concurrence on Change to the Specifications for the GFI Mapper Consoles for AN/FSQ-7 Combat Direction Central	U
624 (D-77-1)	J. D. Crane	Concurrence on Specifications for IRI Monitor	U
625 (D-78-5)	J. D. Crane	Concurrence on GFI Monitor Equipment for AN/FSQ-7 Combat Direction Central	U
626 (P-275)	R. W. Averyt	Changes in the IRI Frame for XD-1	U
627 (P-259)	J. J. Coughlin	G/G Message Rejection for XD-1	U
628 (P-189-1)	P. Longo	Concurrence on IRI Monitor for XD-1	U

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