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Memorandum 6M-4139

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Page 1 of 29

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SUBJECT: BIWEEKLY REPORT FOR PERIOD ENDING 27 JANUARY 1956

To: Jay W. Forrester

From: Division 6 Staff

Date: 2 February 1956

Approved: J. C. Proctor

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CONTENTS

|   | <u>Page No.</u> |
|---|-----------------|
| ESS DC IMPLEMENTATION AND COORDINATION (Group 62) . . . . . | 2               |
| ADVANCE DEVELOPMENT (Group 63) . . . . .                    | 8               |
| ESS TEST PLANNING - WWI MTC OPERATION (Group 64) . . . . .  | 13              |
| VACUUM TUBES (Group 65) . . . . .                           | 16              |
| SAGE CC AND DC SITES (Group 66) . . . . .                   | 19              |
| PROGRAM PRODUCTION (Group 67) . . . . .                     | 20              |
| ADMINISTRATION AND SERVICES (Group 60) . . . . .            | 22              |
| STUDIES IN PROCESS . . . . .                                | 24              |
| INDEX . . . . .   | 25              |
| DOCUMENTS ISSUED . . . . .                                  | 27              |

NOTE: Group 61 has just moved to Murphy at Waltham (Bldgs. 136, 137; Wings A, B). They regret missing this issue of the BIWEEKLY, but will be heard from in the next. Ed.

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6M-4139

ESS DIRECTION CENTER IMPLEMENTATION AND COORDINATION

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

EXTERNAL EQUIPMENT AND COMMUNICATIONS (I. Aronson)

Height-Finding Subsystem Testing (T. Sandy)

"Test Concepts for SAGE Height-Finding Input Subsystem," 6M-4057-1, has been issued and released on a TIR. "ESS Height-Finding Subsystem Acceptance Test Specification," 6M-4101 has been completed and will be issued next week.

One SAHL (semiautomatic height, line) test was scheduled but the aircraft was canceled because of rudder control difficulties. We would have been unable to run it anyway because the search radar was inoperative.

Crosstell Subsystem Testing (T. Sandy)

A draft copy of 6M-4078-1, "Test Concepts for SAGE Crosstelling Subsystem," is being circulated for comments relative to TIR approval.

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

Telephone circuit orders have been issued for some of the ESS communications facilities at CAA control centers. The remaining orders will be issued following a meeting with the CAA on January 30th.

The inspection of telephone facilities at all gap-filler sites was completed on January 25th. Orders have been placed with the telephone company to correct the deficiencies which were found.

The final draft of the "Test Concept for SAGE Wire Communications" has been completed and is now being circulated for comment and sign-off.

PROGRAMMING (R. P. Mayer)

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Eleven new programmers have joined EPSCOM. It has become necessary to use office space at Murphy Army Hospital for some of the EPSCOM activity. In general, BTL and WE programmers will be at Murphy; RAND and Lincoln programmers will be in Room B-107 at Lincoln where Murphy programmers may also hang their hats while working on XD-1 or consulting with test teams.

Jim Mazza should be contacted, on a daily basis, for use of EPSCOM's XD-1 time.

An organization chart showing present EPSCOM programmers, programs, and affiliations is available in B-107.

- 2 -  
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6M-4139

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The simulated-data generation program, 830100, has been dropped. A program from Group 67 will eventually be available for our use, but meanwhile EPSCOM programmers must write their own radar data simulation programs. (W. J. Vollmer)

The XD-1 geographic display program to be used with the tracking test program has been written. (A. Werlin, J. Mazza)

Tracking Program (C. S. Sherrerd, BTL)

The data-count printout feature of the tracking program has been completed. This is an optional feature permitting a printout of the number of radar returns received from each site per scan as well as the total number of returns converted and displayed.

In view of the forthcoming modifications of the tracking program to include radar-status monitoring, height-finding message processing, and range-azimuth printout, and also in view of the eventual necessity of rewriting the entire program and all of its modifications in the new compiler system, the decision was made to completely revise the entire program as soon as possible. This revision will include division of the program into subroutines and groups of subroutines, most of which will be stored on auxiliary drum fields and called into core memory when needed. By this method, the basic program can be reduced to a short, master routine which will simply select the subroutines in the proper sequence, read them from the drums, and branch to them. All intercommunications will be accomplished by means of a permanent table of constants and temporary storage registers. It is hoped that the logic of the entire program can be greatly simplified by this method, and the future modifications can be made simply by adding the required additional subroutines to the subroutine table on the drums and by slightly modifying the basic master routine accordingly. Furthermore, the otherwise anticipated core-memory shortage problem will be avoided. Recoding of the existing program into the compiler language will also be done during this revision.

Revision and recoding of the tracking program is still in the planning stage. Actual coding will begin within a week. (C. Kellogg, C. Sherrerd, M. Dolan, W. Gramling)

Considerable progress in planning the modification for height-finding message-processing has been made. (C. Kellogg, C. Sherrerd, J. Maroney)

The modification for range-azimuth printout is urgently needed by the LRI test team and is presently being coded. It will be made available as soon as possible. (N. Mardirosian, C. Sherrerd)

A radar quick-check program that will automatically monitor all radar sites in a subsector and display on a Typotron a summary of their status has been started. (H. Quirk, G. Baker)

6M-4139

Radar Pattern Checking Program (W. J. Marston BTL,  
B. M. Beatty WE)

The program has been run using MTC as the data source. The first attempt to use the program with patterns generated at radar sites showed that our concept of the patterns was incorrect. There are three sets of range-azimuth combinations being generated at the various gap-filler sites. The South Truro pattern is more difficult because it is subject to change whenever the radar-azimuth commutator is adjusted.

CIRCUIT SUPPORT (R. J. Callahan)

Charactron Vector Intensity Decoder (R. B. Paddock)

The decoder amplifier was tested with the 5" tube in MTC and performed reasonably well. This test showed the need of a gating circuit with somewhat faster characteristics than the one now in use. Further tests using a new gate should be run soon under similar conditions.

Switch Driver Input Amplifier (M. Flanagan)

Work continued on this unit in an effort to find a stable fix. Three different fixes were tried but each was marginal. A new fix using another transistor amplifier is being tried.

SD Recording Camera (L. Sutro)

We are helping the programmers who plan to use the camera. John Ackley (IBM) is writing a program to photograph the contents of the memory, and Eileen Cavanaugh (BTL) a program to plot frequency distributions for ESS testing. A memorandum explaining both how to use the camera system and how it works is in preparation.

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

A 27-foot length of K109A cable has been very satisfactorily damped with resistance wire, allowing the use of a passive probe driving 27 feet of coax and terminating in a cathode follower at the permanent junction box.

Experiments are being conducted to investigate the possibilities of using a 227-foot length of K109A cable with resistance wire in a 100:1 completely passive probe system.

An investigation into the merits of RG 62/u and RG 114/u coaxial cables is being made at the request of C. Bading of IBM.

Interference (1.76 mc) from the Raydist equipment has been troublesome the past few days. However, we understand from R. Cayouette in B-329 that the situation is being corrected.

6M-4139

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

The final data and drawings are now in drafting and 6M-4109 will be published during the next biweekly period.

DESIGN CONTROL (J. A. O'Brien)  
(Formerly the SYSTEMS OFFICE)

Master Reference Lists and CER's (J. Giordano)

Supplement 2 to the Master Reference List of Equipment Specifications for XD-1, 6M-3851-1 covering specifications concurred with from 18 November through 15 December 1955 has been issued. In addition, 6M-3884-1, S1 and S2 and 6M-4104, master reference lists for AN/FSQ-7 and -8, respectively, have been issued.

XD-1 Automatic Inputs (J. D. Crane)

A study of IBM's proposal for the modifications necessary to use production type DDT's and DDR's in ESS is being made.

Display (R. H. Gerhardt)

Second supplements to 6M-3633 and 6M-3635, Console Equipment and Label Layouts for AN/FSQ-7, have been reviewed for equipment compatibility and returned to Group 61.

POWER (J. J. Gano)

XD-1 Power System

Motor-generator sets were designed into the system to filter large power transients introduced through the utility system. Since the installation, several transients have occurred despite early assurances by Edison engineers that those of appreciable magnitude would be very infrequent. These transients usually cause the system to shut down because some control circuits operate directly from the utility. I have asked Dean De Sart, IBM engineer in charge of power, at Building F, along with Piantoni, to determine the circuits which have this adverse effect on continuity of operation, and possible solutions considering cost and computer down time.

D-C Supplies

S. T. Coffin and I visited General Electric at Lynn to discuss power supplies. It appears that they are not presently giving much thought to different ways of overcoming the drift in the XD-1 supplies. They had been given the impression that our manipulating of the multitude of knobs (to which we have always protested) was the cause. Examination of logs indicates that other potentiometers were touched only when out of range of the voltage adjust. I have written to IBM and GE suggesting that GE give thought to other schemes as well as lending more talent to expedite the present program of setting the supplies.

6M-4139

At the present rate of one supply a month, they'll be here well into next year.

Since the cost of the power stage for one of these magnetic power supplies is considerable, Coffin has been using the XD-1 spare banks of units for experimental purposes in developing a transistor amplifier for them. Should it be necessary to use the spares, the experimental circuit can be disconnected in a few minutes.

#### Filament Cycling (G. F. Sandy)

An auxiliary console in Building F has been connected with standard thermistors. It is being automatically recycled to determine reliability and performance. We expect to test it for 3000 operations.

#### TX-0

Installation of the power systems is about to start. Bill Carroll will help J. D. Clarke who is working on the design.

#### R. F. Voltage Interference in Lab. Power (R. Jahn)

The source of a 1.7-megacycle signal which has been interfering with measurements taken in Room B-135 has been traced to a Raydist Transmitter on the roof of Building B. We do not know whether the interference is conducted along Division 6 power lines or radiated directly. Those involved are investigating possible cures.

#### ANALYSIS AND SCHEDULING (C. W. Watt)

##### XD-1 Time Allocation

Time requests from the various users of XD-1 are running between 20 and 30 hours more than the 168 hours that are available each week. Since many of the time requirements are essential and cannot be reduced (IBM routine maintenance, installation, acceptance tests for XD-1 equipment, etc.) the time available for programmers is usually from 25 to 35 percent less than is normally requested. A policy of assigning time on a priority basis is necessary, and we are trying to determine what this priority should be. To provide a week-to-week continuity in the time scheduling, a 3-month schedule of anticipated time requirements is being made up.

##### XD-1 Time Schedules

Time schedules for each week are distributed on Friday for the following week. In the future only the weekly time assignment sheets will be widely distributed. The daily schedules showing equipment assignment in detail will be posted in the maintenance console area of Building F, and a large status board will be mounted on the wall so that everyone can tell at a glance what work is assigned for the day and who is responsible for it. This should both reduce paper work and make the daily schedules more useful. Anyone having questions on the allocation of time in XD-1 and on the schedules themselves should call C. W. Watt at ext. 456.

6M-4139

Maintenance Coordination in ESS

During the next two or three months it is hoped that the functions of maintenance coordination for the ESS will be fully defined, and that the activity itself will be on the way toward realization. What is "maintenance coordination" in this specific case, and what space, equipment, and manpower are needed for it are being studied now. Specific proposals on each of these subjects will be presented in the near future.

6M-4139

ADVANCE DEVELOPMENT

(Group 63, D. R. Brown)

MAGNETIC MATERIALS (J. B. Goodenough)

Memory Core Testing

Memory cores double-tested by this section to date for the 256 x 256 x 37 memory total 2,407,985. In addition, 5,000 cores have been single-tested and are now on their final test. There are also approximately 100,000 untested cores on hand, making a grand total of approximately 2,512,985. (R. Zopatti)

Chemistry

Refiring

The studies to determine the magnitude of the changes that take place during the refiring of memory cores are proceeding. Previous work has shown the necessity of refined and more exact analytical procedures. (W. J. Croft, D. Wickham)

Domain Patterns

Magnetic domain patterns have been observed in a zinc ferrite-manganese ferrite body which has properties similar to those of memory cores. If a specimen of this material can be mounted and polished without physical damage, correlation of domain-wall motion at the surface with applied field will be attempted. (F. Maddocks)

Physics

Apparatus

A high-gain, stabilized, linear, d-c amplifier has been designed and is operating successfully. This amplifier is to be used in conjunction with the d-c fluxmeter. The only obstacle to satisfactory over-all operation is the tube noise in the Weston Inductronic amplifier. Premium tubes have been ordered to replace those now in use.

(R. A. Pacl)

The noise levels of the input circuit of the vibrating-coil magnetometer have been analyzed. A high-gain amplifier and a 36-cycle frequency standard have been ordered to reduce the noise. The sample holder unit for single-crystal investigations has been completed. A test of the thermal properties of the holder indicates that the heating element can vary the temperature from -196°C to room temperature in less than 15 minutes with the holder immersed in liquid nitrogen. Stabilization can be achieved at any intermediate temperature.

(D. O. Smith, N. Menyuk)



6M-4199

MAGNETIC MATERIALS (continued)Theory

A model for the square hysteresis loop and the induction reversal process has been devised. This model, which is an extension of the Goodenough nucleation theory, indicates that reverse domains exist at remanence. Upon application of a field in the demagnetizing direction, the ellipsoidal domains grow while maintaining constant ellipticity. At a critical magnetic field value,  $H_A$ , the major axis grows; if  $H_A > H_{CD}$ , the critical field value for irreversible wall growth, the resultant hysteresis loop is square with a coercive force  $H_C \approx H_A$ . (J. D. Childress)

The domain-wall velocity of magnetic materials is dependent upon the balance of exchange and anisotropy energies. The evaluation of the exchange constant available in the literature is not applicable to ferrites. A calculation of this constant for materials of spinel structure is therefore under way.

A calculation of the dynamics of spin rotation in a uniaxial material with an applied transverse field has been started. (N. Menyuk)

TRANSISTORS (D. J. Eckl)Life Tests

The three 8-digit shift registers continue to operate very well. The first two are double-rank units with 99 SBT's each; the third is a single-rank unit using a TM-1-type flip-flop. The first two units differ only in that one is completely shielded against outside noise.

The shielded unit has now reached a total of 5576 hours since its last malfunction. The unshielded unit has operated 1269 hours since a malfunction. The TM-1-type unit is now up to 215 error-free hours. The last unit has only recently been put into operation.

Over-all life tests still represent about  $3 \times 10^6$  transistor-hours with three failures in approximately 1000 transistors.

Transistor Test Equipment

Testing of surface-barrier transistors has been speeded up by the use of a multi-test setup incorporating four tests. This unit measures leakage currents and saturation voltages. A still larger unit incorporating more tests is in the early stages of construction. (R. L. Burke)

GM-4139

TRANSISTORS (continued)

Transistor Processing

The yield from the new L-5122 switching SBT is high, as expected. When storage specifications have been completed, the units should come close to 100% acceptance.

A total of 1944 SBT's have been delivered to TX-0. (P. Fergus)

Evaluation Tests

A test of 20 GE 2N123 p-n-p switching transistors gave the following average parameter values:  $\alpha_N$  .981;  $\alpha_I$  .881;  $\alpha(100 \text{ ma})$  .931;  $V_{cesat}$  28 mv; avalanche breakdown 27.5v; punch through 30v; and storage factor 7990  $\mu\text{secs}$ . These units have a cutoff frequency, grounded-base, of about 5 mc/sec. (P. Fergus)

Blocking Oscillators

A blocking-oscillator pulse generator was built employing a Ferramic-Q-core transformer and a high-speed SBT. Pulses 50 to 150  $\mu\text{secs}$  wide with rise and fall times of 20-40  $\mu\text{secs}$  were obtained. The output amplitude was about 4 volts (3-volt supply) and the trigger required ranged from 2.8 volts at 5  $\mu\text{secs}$  to 0.9 volt at 50  $\mu\text{secs}$ . In a similar circuit the transistor was made to oscillate at about 16 mc/sec. It was observed that the RR157, an alloy transistor, oscillated in this circuit at about the same frequency. (E. U. Cohler)

Lincoln-Philco Circuits Meeting

Interested persons can obtain copies of the minutes of the last circuits meeting from E. Cohler.

Switching Time in Junction Transistors

Equations relating the minimum switching time for direct-coupled transistor circuits to the small-signal parameters of the transistor have been obtained for the inverter circuit and the emitter-follower circuit. These will be useful in predicting the high-speed performance of a transistor. (C. T. Kirk)

MEMORY (J. L. Mitchell)

Cooling and Supplies

The installation of the power supplies is now being scheduled and the actual work will start next week. The air conditioning installation is complete except for the compressors and electrical wiring.

6M-4139

MEMORY (continued)

256<sup>2</sup> Construction

To date, 128 memory plane modules have been accepted. The modified plane-wiring techniques are beginning to pay off and the number of rejected planes due to cracked cores has been cut in half. We should show an increase in the number of accepted planes during the next few weeks. The pluggable-unit tester is complete and the testing of the first plug-in units is under way. The order of metallic-tape cores from Burroughs was received and a sample lot of fifty cores was tested. Initial data indicate these cores will be satisfactory for use in the magnetic-core switch. These cores will be used for spare units in the 256<sup>2</sup> memory. The 3-bay rack is complete and will be connected to EMAR as soon as testing of the pluggable unit is complete. The 5-bay rack is now on the floor and the rack wiring is under way. We expect delivery of all parts of the memory stall needed to operate one plane by the 15th of February.

Advanced Development

The sense-amplifier circuit is complete except for a few changes in the cable driver. The circuit is insensitive to transistor properties. The packaging of the circuit will begin this week. The Emerson & Cuming plastic memory frame development has been concluded with the delivery of 20 satisfactory modules. On the first evaluation the design looks reasonable. Some success has been had with the scheme for producing a plated memory frame. Cores were mounted in an insulating board, covered with a coat of plastic, and plated over with copper. The copper was then etched to form wires with good results.

SYSTEM DESIGN (K. H. Olsen)

TM-1

The 8-digit multiplier developed an intermittent pulse transformer which interrupted a 40-day run with no errors. There has been only one transistor failure.

EMAR

The experimental memory address register lost one transistor during the last biweekly period.

TX-0

All the small plug-in units for TX-0 are completed or are in process. The flip-flop plug-ins are about ready for construction. The console has been built and is being painted.

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6M-4139

SPECIAL STUDIES (T. Meisling)

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The AICBM program (Group 312) has, so far, been concerned with studies of radar configurations, radar measurements, prediction methods, and prediction accuracies.

The AICBM problem is currently being studied to obtain a picture of the data-processing requirements.

- 12 -

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6M-4139

ESS TEST PLANNING - WWI MTC OPERATION

(Group 64, E. S. Rich)

WWI COMPUTER OPERATION

|                                     |       |
|-------------------------------------|-------|
| Scheduled Computer Hours            | 329.0 |
| Interrupting Incidents              | 11    |
| Hours Lost                          | 1.7   |
| Percent Good Time                   | 99.5  |
| Mean Time Between Failures in Hours | 29.7  |

The reliability of the computer has been good. The percent good time for this period is the highest experienced at WWI.

A Cambridge Electric Co. power failure contributed to 20% of the down time. An opened choke in the plate circuit of one flip-flop in the in-out delay counter caused another 30% of the down time.

Personnel

L. L. Holmes is now recuperating at Mount Auburn Hospital from an operation. He is expected to return the second week of February.

WWI - XD-1 Crosstelling

There were no crosstelling tests conducted in this period, again because of insufficient XD-1 computer time. The crosstelling output coder and input system at WWI are now being regularly closed-loop marginal checked.

GE G/A Data Link

Our section was approached a month ago by W. I. Wells and W. Z. Lemnios of Group 22, and J. E. O'Brien of Group 311, concerning the possibility of providing GE G/A data link facility for WWI. After one week's study, a preliminary proposal was made by us and presented at a meeting with representatives of Groups 22, 64, and 311. The proposed facility would use a certain part of the buffer storage section of the buffer drum as an output memory. The output system would take information from that section of the buffer drum at appropriate times and process it for phone line transmission without interfering with the normal operation of the computer or the drum. The transfer of information to this buffer storage of the buffer drum from the computer could be accomplished with a regular block transfer process. The installation would require an addition of approximately 400 cathodes to the WWI system.

The proposed facility was found acceptable by persons at that meeting and has since been approved. Since the approval, we have been proceeding at a rapid rate on the logical design and construction of hardware for this installation. Almost all constructions and installations that do not require computer power shut down have been com-

6M-4139

pleted. We are planning on completing the installation of the output system on this coming weekend. Necessary pulse checking and programmed testing will begin next week.

#### Buffer Storage Drum

The buffer drum control section has been modified to accommodate the forthcoming GE G/A data link output system. The modification consists of the addition of a 2-flip-flop synchronizer for the clearing of the buffer drum group selection register (GSR). The GSR clearing is now made on slot-7 time so that switching transients caused by the clearing would not interfere with reading operations of the data link output system. This modification was made only on the buffer drum.

#### MEMORY TEST COMPUTER (W. A. Hosier)

The old order changeth, giving place to the new! It has just been arranged for Bill Hosier and Belmont Farley to terminate their long association with MTC, and Herb Ziegler and Earle Gates will run that section. Hosier will work with Gus O'Brien to look for time bottlenecks in the SAGE program cycle and propose means (such as auxiliary equipment) of alleviating them; Farley will transfer to a group as yet undetermined to undertake certain phases of advanced development. Norm Ockene will move into the section Monday, 30 January, to work with Ed Glover in checking out the new control.

A notice has already been sent to most interested parties to the effect that MTC will be shut down at 1500, Friday, 3 February, for installation of the new control built by Gates and Ziegler over the past four months. By the time you read this, the installation should be well under way. At least two weeks' down time will be necessary, and to play it safe we are not committing ourselves to turn the machine back on until about the first of March. At that time it will be possible to perform block transfers between core memory and drum as outlined in Farley's memo 6M-3974; magnetic tape operation will probably not be available for another month or more.

#### Tape Equipment

On-the-spot information from our emissary in Kingston, Tom Stockbrand, has it that certain missing parts and a backlog of engineering changes will have to be installed in the tape adapter frame destined for MTC before it can be shipped, untested, to Lexington; thus the intended shipping date (1 February) cannot possibly be met, and it will certainly be the end of February at least before we see it. Paperwork considerations (such as spare parts policy, maintenance policy, Air Force approval) may add to the delay, but it is hoped that they can be solved in parallel with readying the hardware.

#### Display

The timing of the shutdown seems to fit nicely with the readiness of the new display scopes (camera and console) for installation, so March 1 should see this improved system also in operation. We now

6M-4139

have two DuMont K 1354 tubes with P 11 phosphors, and preliminary test photographs are, in general, quite satisfactory. We are trying a new GE argon-nitrogen glow lamp with high ultra-violet output to illuminate the camera data-chamber; it remains to be seen whether the light output is adequate.

Installation

The upper ("X") half of the counting gates and new cathode followers were installed on the core-memory address register last Monday; the lower ("Y") half will be installed next Monday (30 January). This counting facility is essential to the block transfer feature of the new control.

Programming and Training

With several new groups on the horizon as potential users of MTC (38, 47, #312, etc.), as well as operators to be hired for Groups 61 and 22, it has seemed desirable to set up a training class under Vanderburgh to initiate as many new users as possible in a single aggregate. As announced in the Laboratory Bulletin of today (January 27), Van expects to begin his class (which will involve something like an hour a day for a month, plus practice program-writing assignments for the students) on 15 February. Anyone interested should see or telephone him directly. A movement is also on foot to organize and expand MTC utility program facilities. This will be a joint effort of MTC, Groups 61 and 22, and possibly others.

Operation and Reliability

Failures of the machine this period are back down to the small percentage we like to see. The card machine, which had been responsible for considerable lost time over the past month or so, has been lily-white since its last repair job. Figures for the time distribution this period are as follows:

|                                   | <u>Hours</u> | <u>Percentage</u> |
|-----------------------------------|--------------|-------------------|
| Analysis and Data Processing      | 106.4        | 42.9              |
| Development and Testing           | 78.6         | 31.7              |
| Installation                      | 5.5          | 2.2               |
| Maintenance and Marginal Checking | 12.9         | 5.2               |
| Reliability Check Programs        | 41.9         | 16.9              |
| Interrupting Failures             | 2.8          | 1.1               |
|                                   | 248.1        | 100.0             |

  

| <u>Component</u> | <u>Defect</u> | <u>Qty.</u> | <u>Hours lost</u> |
|------------------|---------------|-------------|-------------------|
| Toggle switch    | Open          | 3           | 0                 |

6M-4139

VACUUM TUBES

(Group 65, P. Youtz)

TUBE TECHNIQUES (J. S. Palermo)

The cathode study and bariated-nickel programs have continued at a two-tube-per-day schedule during the past two weeks. Recent modifications incorporated into the bulb-processing and component design seem to have solved the leakage problem reported earlier.

Initial curves prepared from available life data has prompted a further evaluation of unsintered B-N cathodes. In addition to the program, the most recent tubes have been prepared with accurately measured amounts of Ti metal welded inside G<sub>1</sub> in order to evaluate gettering of Ti. Research reports on Ti gettering conclude that certain gases absorbed by Ti can form stable compounds and are not released at elevated temperatures.

A specially designed light tube for Group 35 has been processed with a highly reflective coating of gold to be used to concentrate infra-red radiation into a detector.

A 19" display tube processed to Lincoln tube process specifications and modified for increased brightness has been started for C. L. Corderman.

Additional components for electroluminescent storage devices are being prepared for Group 25's studies.

RECEIVER TUBES (S. Twicken)

The second GE-IBM-MIT meeting on agreement of a MIL specification for the O528 was held at Lincoln. Major outstanding differences of opinion were compromised and a final draft agreed upon for submittal to ASES. Major differences between this proposal and the present IBM specification are on AQL for shorts of 1.0 rather than 1.5% acceptance life tests of 1000-hour duration (with no early release) rather than 500 hours, a dual rating system ("design maximum" as well as "absolute maximum"), and a tight control on inoperatives on all life tests. The inoperatives control on life test assures an improvement in early life failures of a minimum factor of 3 over any existing MIL specification. There remain several points of lesser importance on which GE must accumulate more data. These will be added to the proposal at some later date. Submittal of the proposal to ASES will take place as soon as possible.

A round-robin test for correlation of five pulse-test equipments here and at two Sylvania plants shows satisfactory agreement. It appears that this problem, which had plagued Sylvania for some time has been solved.



6M-4139

CHARACTRONS AND TYPOTRONS (P. C. Tandy)

Four MIT 19" tubes have completed between 4602 and 8423 hours of life test and nine Charactrons between 1116 and 1822 hours. Since the last report, three tubes have been rejected from life test. Two of these were rejected for less than 50 $\mu$ a pulse-matrix current during transfer characteristic tests and one for serious grid emission. Three tubes would not give 50- $\mu$ a pulse-matrix current at the 20% pulse-duty cycle used for life test and are now operating at pulse zero-bias or 100 volts grid drive. No leakages above specification and no changes in helical-accelerator resistance were noted on the six Charactrons which recently completed 1000 hours on life. Latest screen capacitance and dissipation factor tests have not indicated any changes.

Ten cathode study tubes (five old tubes and five on the program listed in 6M-3965) have completed between 216 and 6060 hours. Since the last report, three of the old tubes have been rejected for poor beam current. They had operated about 4500 hours. The rejected tubes were found to have no appreciable leakage.

The cathode life test program (6M-3965) has been started. Leakage was encountered on early tubes, but this problem has not been apparent on recent tubes. The grid bias cutoff voltage on the tubes with Superior guns has been out of specification except for one tube with a smaller grid aperture. Additional grid cutoff data will be taken. The cathode tube test console, which will facilitate data-taking, is nearing completion.

Eighteen Typotrons have completed between 216 and 6028 hours. The transfer-characteristic curves on these tubes appear to fall into three general groups: Five tubes (including one new tube) had quite low writing-gun currents; five tubes (including one new tube) had medium current; eight new tubes had good currents. All the older tubes have operated over 6000 hours.

COMMERCIAL TUBES (T. F. Clough)

I attended a meeting with IBM and Bendix representatives at Kingston, New York, to review their progress as second source on the gate pentode. Bendix is on schedule at this time and reported that they are ready to produce in quantity whenever the life tests presently in progress satisfactorily meet the 2000-hour design requirement.

Ferromagnetic Evaporation Films

At the request of D. R. Brown of Group 63, we have examined our vacuum facilities to find out if we can contribute immediately to their work on ferromagnetic evaporated films. One of our evaporation units has been moved adjacent to the RF induction heater and tests have been started

6M-4139

COMMERCIAL TUBES (continued)

to ascertain our equipment limitations for this application. It is anticipated that bringing RF energy through the steel base plate of the evaporation unit in the quantity required by Group 63 will be a problem.

6M-4139

SAGE CC AND DC SITES

(Group 66, B. E. Morriss)

EQUIPMENT (W. H. Ayer)

The past period has seen a rearrangement of the Production Coordination Office under B. E. Morriss. As now constituted, all PCO functions in Division 6, including equipment, operations and facility coordination, are grouped in one section. Staff members in the division needing information on problems within these areas or wishing to release memoranda by TIR may contact either B. E. Morriss or W. H. Ayer.

The redesigned direction center building was reviewed with Gen. Wray, new Commander in Chief of the ADES Project Office and Hq. USAF personnel on 25 January 1956 in an attempt to speed up final approval of the plans. Results were forthcoming immediately in the form of USAF authorization for WE-ADES to proceed with the architectural drawings.

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6M-4139

PROGRAM PRODUCTION

(Group 67, J. A. Arnow)

CENTRAL PROGRAMS (A. R. Shoolman)

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Much of the coding specification task for the central programs closely allied with air surveillance functions has been completed. In several areas, specifications are sufficiently advanced for coding to begin. Work in some areas is dependent on the resolution of problems arising in connection with weapons assignment, crosstell, tracking, and other functions which affect program operation and response.

The furthest advanced programs in the central group are card input, situation display track, and situation display air surveillance, all of which are partially coded. Coding will begin next week on most switch interpretation and central track processing programs.

Three new RAND programmers have joined the section. Bob Landrigan and Alice Schafer will work on display programs and Barbara Ackley, who is currently working on utility programs, will work on input-output programs.

Utility (C. H. Gaudette)

The checkout of the initial utility system has started. This system is controlled by the utility control program using the utility control console switches and includes the following utility programs:

- read-in
- compiler
- master tape loading
- library merge
- library output
- checker
- print/punch editor
- card input editor

These utility programs are stored on a magnetic tape reel (the master tape) and are obtained and operated when requested by the utility control program.

This utility system is scheduled for operational use on 15 February.

OPERATIONAL PROGRAMS (D. L. Bailey)

Coding specifications for the tracking programs are well under way. Several of these are completed to the point that some coding is now being done. A number of problems has arisen in the radar in-

- 20 -  
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6M-4139

OPERATIONAL PROGRAMS (continued)

puts program as a result of differences between XD-1 and production equipment. The resolution of these problems may result in minor operational compromises and slightly increased program operating time.

Four of the "nontracking" programs are in the initial stages of coding: Height priority, height input, raid forming, and track sort. The remainder of the nontracking programs are still in the early stages of design.

Three new people have joined the section. S. Smith and S. Spratt will join the interception-weapons assignment area, and E. Book will participate in simulation program design. G. Rolt, who previously worked on weapons assignment, is now studying tracking system problems.

6M-4139

ADMINISTRATION AND SERVICES

(Group 60, J. C. Proctor)

PERSONNEL

Termination

Suzanne C. Knapp is now employed by the Ramo-Wooldridge Corp., Los Angeles, California.

Transfer

Robert H. Gould has transferred from Group 62 to Group 63.

GENERAL ENGINEERING (A. R. Smith)

Punched Card Facility Room (Bldg. A)

All equipment and personnel formerly located in C-168 were moved to A-055 and A-060 as of 19 January, four days beyond the original, scheduled move date. Although the facility is in operation, Group 12 will require one more week to complete miscellaneous details such as sealing cracks, fitting doors, touching up paint, etc. The air conditioning contractor should complete balancing of their equipment this week, too. Further delay may be experienced in humidity control of A-060 as the result of a malfunction of the GE equipment moved from C-168. Amount of time is indeterminate at this time.

Additional design work will be undertaken immediately following acceptance of the air conditioning equipment to reduce the noise level, particularly in the key punch TX-0 console area of A-060.

The console table has been received and the framework will be delivered, painted and ready for assembly during the week. Assembly of the table and framework should be completed by 3 February.

Stokes Press

The 50-30 core program will be delayed another two weeks, at least, as a result of the difficulties experienced to date in finishing the alignment holes to the required accuracy. Although an outside vendor has made two attempts within the past two months to fulfill specifications, we have been forced to tool up and do the work in our own shop. Ten calendar days will be required to complete boring and honing and the pertinent specialized tooling involved.

TEST EQUIPMENT (L. Sutro)

Since July of 1955 when the first Tektronix 540-series scope became

6M-4139

TEST EQUIPMENT (continued)

available, we have acquired 18 of them and have come to count on them for nearly all the measurements in circuit development. Now we are making the first major adjustments and parts replacements. We find that the 30-mc bandwidth amplifier requires as many as 64 adjustments. A 6AW8 tube used in the vertical amplifier exhibits cathode interface impedance.

Meanwhile, the Test Equipment Committee continued to inquire into the Edgerton Germeshausen and Grier scopes with bandwidths of as high as 2000 mc. The committee has not ordered any yet, but has approved purchase of:

| <u>Unit</u>         | <u>Mfr.</u>   | <u>Type</u> | <u>User</u>   |
|---------------------|---------------|-------------|---------------|
| AC Decade Amplifier | Kay Lab.      | 102C        | VCM, Group 63 |
| Frequency Standard  | American Time | 2001-2L     | " " "         |

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

P. E. Falcione is now in charge of the Document Room and will direct the activities of the Duplicating Room. Combining these two closely related services is expected to result in improved service.

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6M-4139

STUDIES IN PROCESS

| <u>Study</u>                                | <u>Responsibility of</u> |
|---|--------------------------|
| <u>GROUP 62</u>                             |                          |
| <u>Power</u>                                | J. J. Gano               |
| XD-1 Debugging                              | G. L. Piantoni           |
| TX-0  | J. D. Clarke             |
| MTC Tape Power Supply                       | R. C. Jahn               |
| WWI Refrigeration Memo                      | R. C. Jahn               |
| Appl. of Thermistors<br>to Filament Cycling | G. F. Sandy              |
| Appl. of Transistors<br>to Power Supplies   | S. T. Coffin             |
| <br><u>GROUP 64</u>                         |                          |
| <u>Memory Test Computer</u>                 | W. A. Hosier             |
| Card and Tape Symbolic                      |                          |
| Address Assembly                            | B. G. Farley             |
| Flight Test Analysis (Gr. 22)               | G. Harris, C. Uskavitch  |
| Pattern Recognition (Gr. 22, 34)            | G. Dineen, O. Selfridge  |
| Simulation (Gr. 22)                         | H. Neumann, B. Stahl     |
| New Control Design MTC                      | E. Gates, H. Ziegler     |

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6M-4139

INDEX

|   |    |
|---|----|
| <u>ESS DC IMPLEMENTATION AND COORDINATION</u> (Group 62, J. A. O'Brien) |    |
| <u>EXTERNAL EQUIPMENT AND COMMUNICATIONS</u> (I. Aronson)               | 2  |
| Height-Finding Subsystem Testing (T. Sandy)                             | 2  |
| Crosstell Subsystem Testing (T. Sandy)                                  | 2  |
| Wire Communications (C. Carter, W. Glass, F. Irish)                     | 2  |
| <u>PROGRAMMING</u> (R. P. Mayer) (including EPSCOM)                     | 2  |
| Tracking Program (C. S. Sherrerd)                                       | 3  |
| Radar Pattern Checking Program (W. Marston, B. Beatty)                  | 4  |
| <u>CIRCUIT SUPPORT</u> (R. J. Callahan)                                 | 4  |
| Charactron Vector Intensity Decoder (R. B. Paddock)                     | 4  |
| Switch Driver Input Amplifier (M. Flanagan)                             | 4  |
| SD Recording Camera (L. Sutro)  | 4  |
| Centralized Probe System (W. Santelmann, A. Hingston)                   | 4  |
| High Speed Flip-Flop (N. J. Ockene)                                     | 5  |
| <u>DESIGN CONTROL</u> (formerly SYSTEMS OFFICE) (J. A. O'Brien)         | 5  |
| Master Reference Lists and CER's (J. Giordano)                          | 5  |
| XD-1 Automatic Inputs (J. D. Crane)                                     | 5  |
| Display (R. H. Gerhardt)  | 5  |
| <u>POWER</u> (J. J. Gano)   | 5  |
| XD-1 Power System   | 5  |
| D=C Supplies  | 5  |
| Filament Cycling (G. F. Sandy)  | 6  |
| TX-0  | 6  |
| RF Voltage Interference in Lab Power (R. Jahn)                          | 6  |
| <u>ANALYSIS AND SCHEDULING</u> (C. W. Watt)                             | 6  |
| XD-1 Time Allocation  | 6  |
| XD-1 Time Schedules   | 6  |
| Maintenance Coordination in ESS   | 7  |
| <br><u>ADVANCE DEVELOPMENT</u> (Group 63, D. R. Brown)                  |    |
| <u>MAGNETIC MATERIALS</u> (J. B. Goodenough)                            | 8  |
| Memory Core Testing   | 8  |
| Chemistry   | 8  |
| Physics   | 8  |
| <u>TRANSISTORS</u> (D. J. Eckl)   | 9  |
| Life Tests  | 9  |
| Transistor Test Equipment   | 9  |
| Transistor Processing   | 10 |
| Evaluation Tests  | 10 |
| Lincoln-Philco Circuits Meeting   | 10 |
| Blocking Oscillators  | 10 |
| <u>MEMORY</u> (J. L. Mitchell)  | 10 |
| Cooling and Supplies  | 10 |
| 256 <sup>2</sup> Construction   | 11 |
| Advanced Development  | 11 |
| <u>SPECIAL STUDIES</u> (T. Meisling)                                    | 12 |

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6M-4139

|   |    |
|---|----|
| <u>ESS TEST PLANNING - WWI MTC OPERATION</u> (Group 64, E. S. Rich) |    |
| WWI COMPUTER OPERATION (L. L. Holmes)                               | 13 |
| Personnel   | 13 |
| WWI - XD-1 Crosstelling   | 13 |
| GE G/A Data Link  | 13 |
| Buffer Storage Drum   | 14 |
| MEMORY TEST COMPUTER (W. A. Hosier)                                 | 14 |
| Tape Equipment  | 14 |
| Display   | 14 |
| Installation  | 15 |
| Programming and Training  | 15 |
| Operation and Reliability   | 15 |
| <br><u>VACUUM TUBES</u> (Group 65, P. Youtz)                        |    |
| TUBE TECHNIQUES (J. S. Palermo)                                     | 16 |
| RECEIVER TUBES (S. Twicken)   | 16 |
| CHARACTRONS AND TYPOTRONS (P. C. Tandy)                             | 17 |
| COMMERCIAL TUBES (T. F. Clough)                                     | 17 |
| Ferromagnetic Evaporation Films                                     | 17 |
| <br><u>SAGE CC AND DC SITES</u> (Group 66, B. E. Morriss)           |    |
| EQUIPMENT (W. H. Ayer) (including PCO)                              | 19 |
| <br><u>PROGRAM PRODUCTION</u> (Group 67, J. A. Arnow)               |    |
| CENTRAL PROGRAMS (A. R. Shoolman)                                   | 20 |
| Utility (C. H. Gaudette)  | 20 |
| OPERATIONAL PROGRAMS (D. L. Bailey)                                 | 20 |
| <br><u>ADMINISTRATION AND SERVICES</u> (Group 60, J. C. Proctor)    |    |
| PERSONNEL   | 22 |
| GENERAL ENGINEERING (A. R. Smith)                                   | 22 |
| Punched Card Facility Room (Bldg. A)                                | 22 |
| Stokes Press  | 22 |
| TEST EQUIPMENT (L. Sutro)   | 22 |
| DOCUMENT, DRAFTING, AND PRINT ROOMS (A. M. Falcione)                | 23 |
| STUDIES IN PROCESS  | 24 |
| INDEX   | 25 |
| DOCUMENTS ISSUED  | 27 |

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6M-4139

DOCUMENTS ISSUED

(Frances Christopher)

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The following documents were published by Division 6 or received from IBM During the period 16 through 27 January 1956.

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| 4107   | Div. 6 Staff           | Biweekly report for Period Ending 13 January 1955   | C    |
| FSQ-7 PROTOTYPE DESIGN & INSTALLATION (Group 62) |                        |   |      |
| 3999   | J. I. Woolf            | MTC Deflection Amplifiers   | U    |
| 4057-1   | T. J. Sandy            | Test Concepts for Sage Height Finder  |      |
|  | R. S. Walen            | Input Subsystem   | C    |
| 4078   | Crosstelling Test Team | Test Concepts for Sage Crosstelling Subsystem   | C    |
| 4091   | R. H. Gerhardt         | Study of the Use of Teletype Facilities for Low Rate Data Transmission to AN/FSQ-7                  | C    |
| 4105   | B. W. Barrett          | Search-Radar Mapper Sweep-Circuit   | U    |
| 4108 (IDO)                                       | S. B. Ginsburg         | Modifications for Converting 60 WPM-TTY Output Section to 100 WPM in AN/FSQ-7                       | U    |
| 4112   | L. L. Sutro            | Test Equipment Committee Meeting of 6 January 1956  | U    |
| 4122   | J. A. O'Brien          | Organization and Responsibilities of Group 62   | U    |
| ADVANCE DEVELOPMENT (Group 63)                   |                        |   |      |
| 4089   | J. D. Childress        | Geometry of Magnetic Memory Elements  | U    |
| PRODUCTION AN/FSQ-7 & CAPE COD DIRECTION CENTER  |                        |   |      |
| 4093   | H. J. Kirshner         | Comments on LPO First Draft of "Semi-automatic Ground Environment Test Program" Dated December 1955 | C    |
| PRODUCTION COORDINATION OFFICE (Group 66)        |                        |   |      |
| 3291 S#5   | R. R. Shorey           | Specifications for the Central Computer System for the AN/FSQ-7                                     | U    |

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6M-4139

DOCUMENTS ISSUED  
(Continued)

CONFIDENTIAL

| 6M-   | AUTHOR                           | TITLE  | CLS. |
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| 6M-3292 S#4   | R. R. Shorey                     | Specification for the Drum System for the AN/FSQ-7                     | U    |
| 3293 S#4  | R. R. Shorey                     | Specifications for the Display System AN/FSQ-7                         | U    |
| 3297 S#3  | R. R. Shorey                     | Specifications for the Power Conversion & Distribution System AN/FSQ-7 | U    |
| 3298 S#4  | R. R. Shorey                     | Specifications for the Manual Input System for the AN/FSQ-7            | U    |
| 3299 S#4  | R. R. Shorey                     | Specifications for the Output System, AN/FSQ-7                         | U    |
| 3301 S#4  | R. R. Shorey                     | Specification for the Automatic Input Element of AN/FSQ-7              | U    |
| 3309 S#3  | R. R. Shorey                     | Specifications for the Warning Light System AN/FSQ-7                   | U    |
| 3884-1 S#1  | R. R. Shorey                     | Master Reference List AN/FSQ-7 Specifications                          | U    |
| 3884-1 S#2  | R. R. Shorey                     | Master Reference List AN/FSQ-7 Specifications                          | U    |
| 4106  | R. R. Shorey<br>W. S. Squire     | Specifications for the AN/FSQ-7 Combat Control Central                 | U    |
| 5301  | E. D. Lundberg                   | ESS-PCC Status Report for Week Ending 20 January 1956                  | C    |
| PROGRAM PRODUCTION (Group 67)                         |                                  |  |      |
| 3761-1  | P. R. Bagley                     | FSQ-7 Programming Data Sheets: Part 1, Central Computer                | U    |
| 3950  | J. P. Haverty<br>G. S. Hempstead | A Guide to Direction Center Operation                                  | C    |
| 4041 C#2  | P. R. Bagley                     | Editor Subroutine System   | U    |
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6M-4139

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| 914 | -----                        | AN/FSQ-7 Engineering Quarterly<br>Progress Report  | S    |
| 915 | -----                        | Central Reference Room Bulletins<br>#108   | U    |
| 916 | R. Warren                    | Project High Engineering Report--<br>Conductor Design  | U    |
| 917 | R. F. Murray<br>D. J. Skelly | Project High Engineering Report--<br>AN/FSQ-7 Combat Direction Center<br>(XD-1 System) Phase III Cross-<br>tell Input Systems Test Plans | U    |
| 918 | -----                        | Central Reference Room Bulletins<br>#109   | U    |
| 919 | N. Christian                 | Project High Semi-monthly Report<br>#69  | C    |
| 920 | R. Cunningham                | Project High Engineering Report--<br>Card Assemblies Released for<br>AN/FSQ-7 Combat Direction<br>Central                                | U    |

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| DR-581<br>(P-261)   | R. C. Marden | Concurrence on Changes in Display<br>Specifications for XD-1 (6M-2877<br>Sup. #9) | U |
| DR-582<br>(D-51-3)  | W. L. Squire | Concurrence on Change to Cross-<br>telling Input Specifications<br>Duplex Central | U |
| DR-583<br>(P-248)   | P. Longo     | Proposal for the Addition of an<br>Inactivity Alarm to XD-1                       | U |
| DR-584<br>(P-248)   | R. C. Marden | Concurrence on the Inactivity<br>Alarm for XD-1                                   | U |
| DR-585<br>(P-177-1) | R. C. Marden | Magnetic Tape & Reels for XD-1  | U |