Memorandum 6M-3730 COPY NO 1 of 160 copies

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

SUBJECT: BIWEEKLY REPORT FOR 1 JULY 1955

To: Jay W. Forrester

From: Division 6 Staff

Approved: John C. Proctor

CONTENTS

I - SYSTEM TEST & PLANNING

1.1 Air Defense

1.1.1 Test Program

(F. Heart) (CONFIDENTIAL)

The study of azimuth-only tracking is continuing. Interest in the problem has increased recently, as it applies to the time-storage requirements of air defense computers.

Several weeks ago, Memorandum 6M-3662 regarding "Programming Interrogation of the Display Cycle", was issued; soon after, a cover letter indicating Group 61 concurrence was sent to H. Anderson. It is my understanding that MIT-IBM concurrence has not yet been completed, due to IBM questions as to the necessity of the modification.

Increased time has been spent on the AEW problem, but as yet the small inter-divisional AEW committee is in organizational stages.

On June 30, personnel from the University of Michigan, Willow Run Research Center, visited the laboratory to discuss various ECM problems. They were particularly interested in the possible applications for a Rome-developed passive detection system. This visit is reported in an inter-office memorandum to C. R. Wieser.

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

(F. Heart, W. Wells) (CONFIDENTIAL)

Continued support has been given to the Radar Co-ordinating Committee. A draft of Chapter A of a report for this committee has been completed and submitted to the committee for integration with other contributions.

(W. Lemnios) (CONFIDENTIAL)

Two more tracking accuracy tests have been run making a total of seven thus far. Some of these are now being processed by M. Curran and M. Smith. Test specifications for non-maneuvering B-47 tracking accuracy tests have been written by M. Curran.

Test specifications for interception tests Series 2, 3, and 4 are being written by A. Budd and F. Graham.

(D. Latimer) (CONFIDENTIAL)

I have "married" my "Single Track History Print-out" program with A. Budd's tape read-in program and now I am completing the check-out of my program.

(F. F. Gucker) (CONFIDENTIAL)

A time study has been made of the experimental azimuth-only initiation program written for Whirlwind I. There are several places where large savings in time could be made by reorganizing and modifying the program. During the next bi-weekly period, I intend to investigate additional savings that would be possible in a program run on an AN/FSQ-7 type computer.

(H. A. Keit) (CONFIDENTIAL)

Recognition of discrepancies between program specifications and program content have led to a decision to postpone the evaluation of initiation procedures for the coming month and concentrate upon determining the location of, and correcting, all discrepancies and programming errors. The automatic initiation program will initiate all 100 per cent blip-scan tracks regardless of speed. A test is scheduled for July 6 to checkout several means of altering the program so that low speed tracks will be rejected.

Two interoffice memoranda have been released which describe (1) the results of the initiation tests, and (2) the objectives of future tests.

(H. Neumann, W. Holst) (CONFIDENTIAL)

Eleven general-utility subroutines are presented in coded form for use on MTC in Memorandum 6M-3497. Information is given about average operation time, accuracy, storage requirements and operating details pertinent to each subroutine.

(J. F. Nolan) (CONFIDENTIAL)

Present efforts are being directed toward familiarization with the present Analysis and Simulation work areas and in defining extensions of these for the following half-year. The recent work has consisted mainly of operation and modification of the Manned-Interceptor Simulation Program (MISP), and programmed analysis of track and noise data characteristics of the SDV System. It is anticipated that future work will add to these studies of tracking techniques and data characteristics of the FGD System. The most difficult feature of simulation work continues to be that of forming realistic background noise data (clutter). Techniques for generating and using such data are being considered.

(A. Mathiasen) (CONFIDENTIAL)

The use of track centered noise from the Data Generation program is ineffective in monitoring tests since the noise moves along with the track. The monitor effectively can track the aircraft by tracking the noise. I am, therefore, writing a noise generation program. While its initial motivation comes from the Monitor Test Series I, it will be general enough to be used in other tests.

Memorandum 6M-5029, "Simulated Data Reference Program" by J. Nolan and myself will be published in the next bi-weekly period.

(E. Bedrosian) (CONFIDENTIAL)

The records for the system-simulation program which are required for the 1954 CCS computer program documentation have been completed. I am now studying the CCS monitoring programs for evaluation of the Monitoring Test Series #1.

(F. F. Gucker) (CONFIDENTIAL)

On June 29, 1955, I attended a seminar at Evans Signal Corps Laboratory at Belmar, New Jersey on the vulnerability to countermeasures of the AN/GSG-2. Further information may be found in an interoffice memorandum to C. R. Wieser.

(E. J. McEvoy) (CONFIDENTIAL)

I have begun background work for testing and evaluation of trouble detection in the 1954 Cape Cod System. A definition of the problem must be made before tests can be designed.

(J. Nolan) (CONFIDENTIAL)

The tracking-monitoring series of tests of the 1954 CCS will now be the responsibility of E. Bedrosian and A. Mathiasen. The beginning of this test series is still waiting upon the checkout of the Data Generation program.

(B. Smulowicz) (CONFIDENTIAL)

The clutter generator and correlation section of the MISP correlation program have been checked out.

A new study has begun of improved weather clutter generation methods, capable of a more realistic representation of the actual conditions. This demand for more realistic weather clutter simulation has arisen in connection with the proposed study of new tracking techniques.

(H. D. Houser) (CONFIDENTIAL)

The sections of the weather clutter and correlation program which do split detection and track comparison have been written.

(C. Friedman) (CONFIDENTIAL)

Study continues into the various methods of analyzing MISP results. Several parameters were taken, and 100 runs were made by D. Neumann with each parameter. These 100 runs constitute our statistical sample. The parameters involved the following:

1. Changing blip-scan ratio from .9 to .75.
2. Changing sampling rate (i.e., Antenna scan rate) from 12 to 16.
3. The geometry and velocities were held constant.

The data recorded was the angle λ, which is the target heading with respect to line of sight: and $\Delta\phi$ which is the error in the interceptor's bearing.

Frequency distribution histograms were made, means and standard deviations were computed for 8 parameters. Comparisons are now being made into how tracking is being affected by these parameters.

(H. D. Neumann) (CONFIDENTIAL)

Two summer students, R. Friedberg and A. Ipsen were indoctrinated during this period. They are writing a program which will perform several tests on the output of random number generators. One test will find the number of random numbers generated before the original sequence, if any, is obtained again. Another one will test the compatibility of the observed and theoretical frequencies of occurence of numbers by performing a Chi-square test. A third one will perform the Chi-square test on the frequencies of occurrence of two-digit sequences. Any one of the five octal digits can be examined separately.

The program is flexible so that any test is optional, other tests can be included, and various schemes of random number generation can be compared.

(H. D. Neumann) (CONFIDENTIAL) Cont'd

Simulation (F-99)

The 216 simulated F-99 runs with detailed print-out were completed.

(B. R. Stahl) (CONFIDENTIAL)

Although results attained with the blip-scan analysis program are considerably more promising than before, the program is not yet working. The largest area of difficulty is still in the analysis and computation section. However, in repeating an optimistic prediction that the program will be working within a fortnight, I believe there is this time more assurance of fulfillment.

(R. N. Davis, P. F. Dolan, R. L. Smith, E. Conley) (CONFIDENTIAL)

During the past biweekly period this section attempted eight missions in support of the SAGE Test Office.

Of these eight only two were conducted as scheduled, these were of the ABN series; and the remaining six were cancelled. Two AIN missions were cancelled due to Mark X(L)availability, one IA mission because of Montauk availability and three ABN missions because of South Truro jamming.

There were five missions,other than STO, attempted, three HOR and two LT, only two of these were conducted,one an HOR and one LT due to Mark X (L) availability.

(A. L. Smalley) (CONFIDENTIAL)

Three simulation tests consisting of ((1) straight line, (2) turns, (3) splitting and crossing) simulated flight paths have been prepared for operational training in the 1954 CCS DC. Blip scan tables on B-29 and B-47 type aircraft have been prepared from tabulations supplied by Group 22. Three data characteristic ((1) Olmstead, (2) Moderate, (3) Independent) tapes on scan-to-scan transition probabilities and one (Standard) multiple print frequency tape have been prepared for simulated training, testing and evaluation use.

(S. Manber, H. Peterson) (CONFIDENTIAL)

We are continuing work on the 1954 Cape Cod System Program Modification and Checkout.

	hr	min	hr
Total assigned Time			184
Analysis & Program Checking	92	30	
System Operation	50	30	
Raydist	12	30	
Equipment Checkout	6		
TOTAL	161	30	
Time Lost to Computer (malfunction)	1	30	
Time given Group 64	1		
Time assigned weekend not used because of holiday	20		

hr	min
161	30
1	30
1	
20	
GRAND TOTAL 183	60

1.1.4 Rand Permanent Facility

(L. R. Jeffery) (CONFIDENTIAL)

A study of possible permanent facilities for the Rand Corporation has been completed. The results are reported in Memorandum 6M-3683, " Study of a Modified Combat Center for Use as a Permanent RAND and Air Training Command Facility." This study was initiated at the request of Air Defense Command.

1.1.6 Program Organization

(R. Walquist, M. Arden, W. Ball, H. Benington, L.Collins, C.Gaudette, R. Gildea, W.Harris, S. Knapp, G. Reed, A. Schwartz, A. Shoolman, P. Vance) (CONFIDENTIAL)

I. Reorganization

R. L. Walquist is leaving the Laboratory on 8 July; the section has been reorganized under H. D. Benington. W. S. Attridge has been transferred from C. Zraket's section to take over the work formerly assigned to Benington.

II. General

The IBM 407 accounting machine for the Card Preparation Room has been delivered.

The logging format for XD-1 utility programs has been revised, and is being incorporated into the existing programs.

(R. Walquist et al) (CONFIDENTIAL)

General (Cont'd)

A definition outline of the Program Organization task is nearly completed; it will be issued as an interoffice memorandum during the next biweekly period.

Core matrix bit assignments have been made for all XD-1 and AN/FSQ-7 switch insertion panels. This information will be issued in the near future by H. K. Rising.

A rough draft of a memo describing program checking from the standpoint of AN/FSQ-7 duplex operation is being prepared.

A memo entitled "Definition Outline - Display Aspects of the AN/FSQ-7 Master Program" is near completion and will be issued during the next biweekly period.

A study of the need for expanded data processing facilities has been started and is being coordinated by M. Feldstein. This task is described in an interoffice memorandum titled "Agenda and Execution of a Study of Expanded Data-Processing Facilities," by Benington, Feldstein Shoolman, and Vance, 24 June 1955.

III. Use of XD-1 Application Time

Total assigned time	10.00 hours
Extra time allotted	1.08
Total time used	11.08
Program checkout (utility & assembly)	9.42
Computer malfunction	1.33
Use of our scheduled time by IBM	0.33
Total down time	1.66

IV. Individual Comments

This is, I hope, the last biweekly I'll need to write as I'm leaving the Lab for the West Coast on July 13. However, I want to take this opportunity to thank all of my many friends throughout Lincoln for making my stay a most enjoyable one. The very best of luck to Lincoln Labs.

1.1.7 Weapons Direction

(R. R. Reed) (HAZELTINE) (UNCLASSIFIED)

The memo on "Preliminary Situation Display Category and Display Assignment Bit Assignments" is being printed and should be issued by July 5. Work on the Final Report will begin as soon as all interested parties have concurred on assignments and station displays.

A similar memo is being prepared for Digital Display slot assignments.

(P. Bragar, A. R. Chandler, C. C. Grandy, A. W. Heineck, R. A. Nelson) (CONFIDENTIAL)

A first draft of Operational Specifications for the Subsector Command Post (Bragar) has been circulated and discussed with representatives of Air Defense Command, and a revision is being prepared.

A draft of Operational Specifications on Raid Forming (Bragar) has been circulated and discussed with respresentatives of ADC, and a revision (1st draft of 6M-3720) has been issued.

Requirements for information to be 'forward told' to the Combat Center are being consolidated (Bragar).

The draft of the first sections of the memo on Weapons Direction reported in the last biweekly (Chandler, Grandy, Heineck and Nelson) has been circulated and discussed with representatives of ADC, and revisions are being made. The sections on Weapons Assignment and Control (Chandler and Heineck) and Intercept Direction (Nelson) are still being discussed and completed.

A summary of the required frequency of performance of Weapons Direction Functions was made and issued (Grandy). In general, this indicates a basic frequency of twice per 15-second computer frame for most functions, with some readings of switches and light-gun data made on each display cycle (six times per frame), and some actions taken only once a frame or less often.

(E. W. Wolf) (CONFIDENTIAL)

A first draft of the operational specifications for the radar input function has been completed. A memorandum dealing with some of the more immediate AEW problem is being prepared.

(F. Brooks) (CONFIDENTIAL)

The XD-1 manual intervention program has been checked out and reassembled, and is now ready for use.

A rough draft of a memo on track sorting for the SAGE correlation program has been written.

Work on Operational Specifications for Radar Inputs continues.

(H. Frachtman) (UNCLASSIFIED)

The final rough draft of the SAGE height finding operational specifications is being prepared.

(S. J. Hauser, F. M. Garth) (UNCLASSIFIED)

A rough draft of the memo "SAGE Operational Plan for Identification", 6M-3709, was written and delivered to members of Group 61. The memo will be rewritten to incorporate changes suggested by the members of the group.

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

I have completed a second draft of the operational specification for the interim SAGE AA Direction Section. The draft is presently being circulated for comments.

(H. Seward) (CONFIDENTIAL)

An outline of the op specs for the Tracking Crosstell function has been forwarded to J. Arnow for evaluation. Some of the specifications which affect other SAGE functions must be deferred until the specifications of these other functions are better resolved.

(J. Levenson) CONFIDENTIAL)

My work in the Test Program Section on initiation studies and post-test data reduction programs has now been turned over to W. Lemnios and H. Keit. I have begun to gather information needed to plan the operations specifications for the Training and Battle Simulation room in XD-1 and SAGE.

(D. L. Bailey, W. S. Attridge, Jr.) (CONFIDENTIAL)

The Operational Specification for Initiation is in the final throes of first-draft form. A document will be issued during the next period.

A preliminary proposal for automatic tracking (mathematical specs.) is now being circulated. Agreement on the basic tracking procedure necessarily precedes completion of the Tracking Op. Spec.

1.2 Whirlwind I

1.2.2. WWI System Operation

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

The reliability of the computer continues to be excellent. The percentage of good operating time for this biweekly period was 98.6 per cent. There were 19 incidents of interruption resulting in 4.5 hours of down time during 324 computer operating hours. With the exception of the 12 hour period required for our monthly installation day on 27 June, the computer operated 24 hours a day, 7 days a week.

1.2.3 Terminal Equipment

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

The shift register for the Crosstelling System is being installed.

The MITE Check Program, T 3800-8, has been shortened by eliminating some superfluous reading instructions.

Close timing between the set and sense of the buffer drum change field synchronizer has caused a number of program alarms recently. This difficulty was corrected by setting Sync #2 with LTP instead of BTP.

Cape Cod Maintenance Coordination

(N. N. Alperin, A. V. Shortell, Jr.) (CONFIDENTIAL)

Considerable progress has been made in re-establishing the maintenance coordination program for Cape Cod. A system of daily reporting by phone of scheduling information and last minute changes in equipment requirements has been instituted with the cooperation of Phil Dolan of Group 61. A summary of equipment malfunctions by mission has been given by phone to Groups 22 and 61 and reports of equipment troubles have been received from Group 22.

Closer communication and cooperation between these three groups seem to be the major factors contributing to this progress. The next steps will be the writing of an SOP for the maintenance coordination function in cooperation with C. W. Watt and an attempt to analyze some of the data collected using the method outlined in 6M-3693.

Ampex Recorders

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

Marijane Curran of BTL reports a random data loss of only 2 per cent in her first test of weather data recorded on Ampex since the installation of the preamplifier panel and the locking of the slice level controls on the demodulators.

Demodulators

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

Group 22 now feels that the phenomenon of envelope delay distortion is not entirely due to the phase characteristic of the phone lines but that the 1,000 cps low pans filter in the demodulator also contributes to this problem. They have ordered some 1,500 cps low press. filters of the same type which should give them a better phase characteristic in the portion of the spectrum where most of the signal energy is present. Pending the results of their tests, we are experimenting with a filter design to give a more linear phase characteristic.

WWI Crosstell Coder System

(J. Ackley) (UNCLASSIFIED)

The crosstell coder system was installed June 27, 1955 and is now being checked out. Potentiometers are being added to the coder DDT to permit adjustment of signal ratios since the output of the DDT may be connected to either the XD-1 crosstell input or the South Truro semiautomatic height finder.

New Instruction

(J. Ackley) (UNCLASSIFIED)

Memos 6M-3359-1 and 6M-3716 describe the new instruction, sum of digits, which was installed June 25, 1955. The code for this instruction is set and J. Frankovich has modified the CS II conversion program to handle it.

(D. Morrison) (UNCLASSIFIED)

The rough draft for Memo M-2784-1, "Marginal Checking Control System - Mod II, WWI," has been completed. Memo M-2784-1 is a somewhat expanded version of Memo M-2784 and includes the latest revisions of the WWI m-c system.

Final checking of drawing E-62305 - Functional Diagram, Marginal Checking Control System - Mod II, WWI, has been completed. Drawing E-62305 has been drawn to supplement block diagrams and circuit schematics of the m-c system. Its principle use is to serve as a trouble -shooting aid, but it should contribute to the understanding of the m-c system.

Program T-3432, WWI Consolidtate Test Program has been modified to check the newly added "sum of digits," sd, instruction.

Output coder

(L. N. Norcott) (UNCLASSIFIED)

Because of a bad crystal in the test message generator panel, the test message generator will not function if test message # 3 has a "one" in digit 21. Since we can still generate 5 other test messages and since this trouble in no way affects the use of the coder with WWI, we will postpone replacing the crystal until the first time that the power can be conveniently removed from the panel.

Fairchild camera

(L. H. Norcott) (UNCLASSIFIED)

Recent film-feed troubles with the Fairchild camera were caused by broken retaining rings in the feed linkage. Heavier retaining clips have been installed.

Wiring in the spare Fairchild camera was modified to meet the requirements of our "no-film" alarm.

(T. Sandy) (UNCLASSIFIED)

The new automatic light gun and display checking program has been tested at one scope station and will be extended to six stations in the near future. The light gun pulse generators and marginal checking relays were moved from Rack L 13 to Rack E 1.

The automatic Raydist order Si 16 has been installed on the In-Out switch.

2.1 Liaison

2.1.1. System

(B. E. Morriss, Jr.) (UNCLASSIFIED)

1. Buildings

In order that activity may be reduced in areas, which can and are being picked up by other organizations, and concentrated in those in which the Laboratory is more uniquely suited, the amount of Laboratory effort (Group 66) being spent on physical facilities has been the subject of some discussions. A number of the building drawings prepared by Lincoln are being discontinued and replaced by IBM drawings with the understanding that their drawings and future changes to them will be submitted for concurrence prior to use. There have been some discussions about establishing a master drawing list of the drawings of all organizations to insure that the same information is being used by all parties.

A review of the building design under ADES's direction has been proposed and was discussed at the joint ADES - Lincoln Meeting 28 June. A general list of items which should be considered requirements and another list of tiems which should be investigated were reviewed. Lincoln's role in the design review, and on buildings in general was discussed. It was generally agreed that Lincoln could reduce its efforts in collecting and coordinating data and that a memorandum of understanding would be prepared specifically citing responsibility.

2. Status of XD-1 Exhibit Amendments

Supplement # 1, Additional Auxiliary Drums - incorporated in contract. Supplement # 2, Command Post - RAFD awaiting go ahead from ADES - Project Office which has now received a more detailed cost estimate from IBM. Supplement # 3, Additional Index Registers - IBM cost estimate now in Air Force hands (AMC plant representative).

3. Equipment Modifications

A meeting was held with representatives of CRC, WE-ADES, and ADES - Project Office to discuss the procedure to be used for Lincoln to initiate changes to either XD-1, or the FSQ-7. It was agreed that the use of a TIR should trigger the necessary action. The procedure discussed was the release of the TIR through CRC to the ADES - Project Office. ADES and the Project Office would then take the initiative in evaluating the ECP from the contractor in terms of time and money with the need as presented in the TIR, and would provide the coordination and information needed by the various organizations for their planning purposes.

(H. J. Kirshner) (UNCLASSIFIED)

Status of XD-1 Communications

Over 50 per cent of the external circuits needed for XD-1 have now been ordered. It is expected that all of these circuits will be installed on schedule if the cable facilities are made available in time. Some internal circuits are being held up pending revision of the XD-1 internal telephone traffic diagram which is going to be made compatible with the revised SAGE specifications. Maintenance intercom phones are being held up by the installation of the frame covers by IBM. Cable harnesses and telephone key units are being installed in consoles as they arrive. The data circuit patch panel and the telephone circuit recording console will be available as scheduled on 18 July. The monitoring console will be available as scheduled on 12 September.

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

A meeting was held at EADF Tuesday, 21 June 1955, to discuss ways and means of getting on-base cable for XD-1 circuits at AC&W sites. It was agreed that the first step in the procedure would be to have a siting party visit each site to determine what was needed so that specific permission may be requested from the Air Force by the Telephone Company.

The first siting part visit to Montauk was held 30 June. All necessary supporting structures for XD-1 circuit requirements were found to exist. We now are awaiting word from the Telephone Company before placing a detailed order.

(W. Ayer, F. Manning) (UNCLASSIFIED)

XD-1 Tube Orifice Tester

All outstanding purchase orders for instruments were completed 27 June 1955. The status of the assemblies is as follows:

A. Orifice Tester

1. Sheet metal complete.

2. Wiring and assembly were started 1 July 1955 on the Orifice Tester and the D-C Control Panel. The Filament Power Panel Mod III is a standard piece of Test Equipment. Work should be complete by 8 July 1955.

B. Air-Show Measuring Equipment

1. The hand truck was completed 27 June.

2. An outstanding pipe fabrication and assembly order with Robinson Boiler Works of Cambridge is currently in the works and should be completed by 8 July.

XD-1 Tube Orifice Tester (Cont'd)

3. At the completion of the tube orifice test, this equipment will be turned over to the Laboratory for future use.

C. Recording Equipment

1. The hand truck will be completed 7 July 1955.

2. Assembly and wiring should commence 7 July and be completed by 13 July 1955.

D. Power supply

1. The test area located in the Air Plenum space in Building F will have a D-C outlet Bux. This service will supply all the standard D-C laboratory voltages to test area.

2.1.2 Power

Power Distribution

(F. G. Sandy) (UNCLASSIFIED)

The thermistor investigation is still proceeding. Additional thermistors have been ordered which should have better characteristics than the ones tested so far.

The "modular" mechanical design of the Duplex Inputs and Output MCD's was reviewed. It looks very good and should be used for the design of the other MCD's as soon as possible. IBM has agreed to make a proposal to this effect as soon as possible.

Power Generation

(S. T. Coffin) (UNCLASSIFIED)

I have prepared some data which summarizes the studies made on XD-1 to determine the susceptibility of the AN/FSQ-7 computer to errors caused by generating bus transients. With this data we should be able to predict, given a line fault anywhere in the system, whether it will or will not cause computer errors. This will aid us in evaluating various proposed power generating systems.

Mimic Panel

(A. Chopourian) (UNCLASSIFIED)

The specifications for the mimic panel for AN/FSQ-7 have been written, and MIT personnel are in agreement as to its contents. Comments have been received from IBM, and a meeting has been planned to settle our differences.

(J. J. Gano, R. C. Jahn) (UNCLASSIFIED)

Equipment Cooling

Preliminary memorandum 6M-3692, "Equipment-Cooling Loads for a Direction Center," has been distributed to IBM for concurrence prior to issue as a T.I.R. Including a growth of 20 per cent, refrigeration for this portion of the load, which does not consider air-well loads, nor the fresh-air and humidity requirements, must provide for a heat dissipation of 1451 kw. Francis Associates will supplement this document with another to cover these additional requirements.

(J. J. Gano, R. C. Jahn) (UNCLASSIFIED)

Power For C. C. and D. C. Site

We have been assembling information on loads as preparation for a memorandum on power generation and distribution in a combined center.

2.1.3 Specs and Building

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

The DC building drawings have been revised to delete details of the IBM areas in the Buildings and include references to the IBM demensioned layout and hole drawings for the equipment. These drawings are being circulated throughout the system for concurrence and comments. They should be released in the next biweekly period.

The broad-band blue lighting specifications have been incorporated in a revision of Memorandum 6M-2926-3 and are now being circulated for concurrence.

Installation

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

I. Building Construction

Exterior wall finish will probably be completed during week of 4 July.

The following items of the IBM Contract still have not been completed:

Roof emergency air monitor
Movable sash installation
Paint one section of the first floor plenum wall
Patch around the equipment cooling control panel

II. Equipment Cooling

IBM appears ready to accept the installation, as last reported. However, some additional changes and modifications will be necessary to accomodate additional equipment and changes in room layouts.

Installation (Cont'd)

III. Cabling

About 90 per cent of XD-1 cabling has been installed.

IV. Equipment Layout

Command Post - structural drawings, reflecting the required changes necessary to increasing the size of the projection booth, have been completed. Specifications will be revised during the coming week. We will try to get bids on the work during the nest reporting period.

V. Lighting

Orders have been placed with suppliers for many of the items needed for the revision of the second floor lighting. We hope to complete the ordering of material within a week and then proceed with contract negotiations for installation.

Technical Information Releases

(E. D. Lundberg, J. J. Carson, R. R. Shorey) (UNCLASSIFIED)

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

TIR	M-Note	Subject
1-79	6M-2769, Supplement 1	Radar Data Capacity of AN/FSQ-7, Supplement 1
1-80	6M-3683	Study of a Modified C. C. for use as A Permanent Rand and Air Training Command Facility.

2.2 Systems Office

AN/FSQ-8

(A. D. Hughes) (UNCLASSIFIED)

The necessary data is being gathered to write the AN/FSQ-8 equipment specifications and the AN/FSQ-8 equipment list. The new AN/FSQ-8 equipment list should be available in draft form by 8 July 1955.

New Specifications Documents
(N. T. Jones) (UNCLASSIFIED)

IBM's Technical Publications Group has been re-writing the AN/FSQ-7 Specifications as new R- and S- documents as replacements for their D- and P- documents. Copies of these are being received by our Systems Office, distributed to our people for comments and returned to Poughkeepsie. During this biweekly period, nine of these documents were returned and about four remain on hand.

Command Post DD Desk

(N. T. Jones) (UNCLASSIFIED)

At the concurrence meeting of 23 June, H. Weber and P. Stemmer pointed out that the rear surfaces of adjacent portions of the desk would not fit smoothly. Minor changes to the drawings were made to correct this.

Telephone switch panel modules designed to be mounted side-by-side are being produced by Western Electric. These are narrower in width than two normal modules mounted beside each other as shown in the drawings of the desk. This means that the overall length of the desk may be reduced by a few inches. Drawings of these new units are on their way here from BTL.

Console Front Panel Equipment

(R. D. Buzzard) (UNCLASSIFIED)

Changes and corrections are being compiled for the series of memoranda on Console Equipment and Label Layouts as a result of discussions with various groups. These will be published as fast as they are crystallized.

Command Post Liaison Desk

(N. T. Jones) (UNCLASSIFIED)

A proposed design for a desk for liaison personnel in the Command Post has been described in 6M-3705.

(R. S. Fallows) (UNCLASSIFIED)

Present plans are to start system testing by tying in frame 25 (Digital Display Generator) to the XD-1 drum next week. Due to the fact that computer time is needed only to load the drums during most of the display system testing, we expect to be more-or-less independent of other equipment except where the drum may be written by error. This schedule is being followed inspite of the fact that several known additions or modifications to the equipment have yet to be made.

During the last biweekly period, all expected changes to frame 25 logic were completed. Typotron tubes were installed in the first two consoles in Bldg. F. The signal bus to distribution boxes 2 thru 14 was completed and cables were run to the five consoles now on the top floor. A versatile situation display test program for MTC has been debugged and is ready for use in taking frame margins. Most of the defective circuits in frame 24 have been repaired and all but a few of the Stemag precision resistors in the central display frames have been replaced.

The console delivery schedule is as unclear as ever. The only fact that appears certain at this time is that all consoles will not be installed by October 1 and possibly not by October 31. We are attempting to take advantage of this delay to improve our knowledge and organization for the work ahead.

Digital Display Generator

(R. B. Paddock) (UNCLASSIFIED)

Wiring changes to power the Display Tester separately from the rest of Frame 25 are about 80 per cent complete.

The table of failures and indications for marginal checking the Digital Display Generator (DDG) is complete. Programs to develop worst cases must still be written; meanwhile, the Display Tester is very useful on most cases.

An initial check of margins on similar ciucuits in the DDG and in the Central Computer shows the most of the present margins for the DD are reasonable and generally good.

2.2.1 Systems (general)

(J. Giordano) (UNCLASSIFIED)

IBM-SO concurrence meeting # 32 was held Wednesday, June 29, at Lincoln. Minutes of the meeting are reported in 6M-3727.

C. E. R. status report # 7 is being written. It should be published and distributed during the next biweekly period.

The layout for the CP Room of Bldg. F (Drawing D-75123) has not been incorporated into Bldg. F second floor layout drawings E-58233 and D-58821. It is requested to refer to drawing D-75123 until such time as the other drawings reflect this change.

Pre-preliminary Manual

(R. H. Gerhardt) (UNCLASSIFIED)

I have been reviewing the rough draft of the Pre-preliminary Manual of the Situation Display Generator Element. Cecil Bronson of the IBM Technical Publications Group and I will get together to discuss possible rearrangements of the organization of this manual. It should be noted that I have a preliminary copy and that this manual will not be ready for general distribution for some time.

MTC Connection to Display Frames

(R. H. Gerhardt) (UNCLASSIFIED)

It has been decided to connect the XD-1 drums to the display frames as soon as possible. This connection will be made to a panel such that each frame may be connected to either the XD-1 drum or the MTC drum. For the past biweekly period, the operation with the MTC drum has been excellent.

System Test Plans

(R. H. Gerhardt) (UNCLASSIFIED)

Systems tests of the Digital Display Generator will begin July 5. All pulse signal cables from the drum will be terminated before any efforts are made to determine if the generator will perform as specified. One program, to test "Initiate DD #2", remains to be written. All other programs have been written and checked.

The systems tests for the Situation Display Generator will begin about July 18. All programs for this test have been written and about one-half of them have been checked.

2.2.3 Testing

(J. Clarke) (UNCLASSIFIED)

The regulation of the voltage units of bank "A" XD-1 have all been brought within specifications. The computer is now operating on bank "A" except for the 600 volt units. This unit gave us trouble when cycling on. A short occurred on several filter capacitor trays. This short was due to faulty component design of a fuse indicator. A change to the method used in the production units has been suggested to General Electric. This means a neon dial indicator light mounted in a socket rated at proper voltage rather than the fuse holder neon capacitor arrangement we have now.

2.3 Production

Mark X and SIF

(J. P. May) (CONFIDENTIAL)

A study by an ad hoc committee of Division 2 and Division 6 personnel has determined that certain operational implementation phasing of the SIF Equipment may (1) furnish undesirable information or (2) not furnish some critical data to the FSQ-7. During a trip to RADC at Griffiss Air Force Base, it was learned that these problems will exist due to aircraft with Mark X (IEF) or SIF being operational in the same timerperiod. Efforts are now being made by the committee to resolve the details of the problem and insure that a solution is being provided.

Programming Services Committee

(R. Mayer, H. Rundquist) (UNCLASSIFIED)

A progress report has been issued as an interoffice memo on the semiautomatic height finder tests using WWI and the FPS-6 radar at South Truro. This report is mainly an accumulation of data pertinent to the problem.

The crosstell message parity check and GFI wind test programs should be operative during the coming biweekly period.

Dual-Beam Scope

(R. H. Gould) (UNCLASSIFIED)

A representative of Electronic Tube Corporation has been presented with preliminary specifications of what is needed in a dual-beam scope. He felt the specifications could be met and will forward them to ETC for an estimate.

Production Machine Mimic Panel

(R. H. Gould) (UNCLASSIFIED)

The power and airconditioning mimic panel problem which was apparently settled months ago has reared its ugly head again. Interested persons at Lincoln have reached agreement and a meeting will be held at Poughkeepsie on July 6 to reach agreement with IBM.

Outputs

(S. B. Ginsburg) (UNCLASSIFIED)

A program which operates with MTC for checking the transmission characteristics of phone lines and the behavior of crosstell messages has been completely coded. The program has been checked out and appears to operate satisfactorily.

Equipment and computer checks are presently being made to ascertain that all errors will be due to the phone line.

A closed-loop phone line from MTC to South Truro is available for test. This line is a N-carrier type of data circuit. However, the circuit does not adequately correct for transmission losses around the loop. After this difficulty is corrected, tests will be made daily until sufficient data is accumulated.

Test Planning and Coordination

(K. E. McVicar) (UNCLASSIFIED)

A pilot group of Bell Telephone Laboratories and Western Electric personnel has started to work with Lincoln personnel on writing the test specifications and test methods for the experimental subsector. These test specifications and test methods will be extrapolated for SAGE application.

A joint study is being made by representatives from Group 61, Division 2, and the Test Planning Section of the problems involved in making operational equipment at South Truro and Montauk. At both sites the equipment is now partially in operating condition. We hope to get from this activity a rough draft ot test specifications and test methods which can be used as a pattern for radar input sites.

(A. Werlin) (UNCLASSIFIED)

The data collection and print-out portions of the GFI "Wind Test" program has been written and successfully run with MTC. Work is continuing on the display portion of the program and an evaluation is being made to determine if the data presented is in its most meaningful and useful form for testing the GFI equipment and determining the phone-line data characteristics.

2.5 Display

(C. Corderman) (UNCLASSIFIED)

An order has been placed with Hughes Aircraft Company for ten additional Typotrons. These tubes have approximately six times the amount of ceramic of earlier tubes in order to reduce interelectrode leakage. Gas pressures will be closely monitored in these tubes to note whether these longer ceramic tubes release appreciable gas. Five of the tubes will also be operated with both sections of body dag at the same potential. Hughes would like to eliminate the separate connection to the third anode and connect it internally.

Preliminary specifications have been written for a large character-writing tube having bright persistence. Such a tube would have the appearance of a Typotron but with each character fading out automatically at a fixed time after writing.

Three different types of 19" tubes will be tested in MTC during the next period for evaluation by Group 38 and for light gun testing. These are:

1. Charactrons having several of the matrix characters redesigned to reduce the possibility of confusion with other characters.

2. Tubes having a P 14 phosphor in place of the P 7 since there is some possibility that this phosphor might match the FSQ-7 requirements somewhat better than the P 7.

3. Tubes having a P 7 phosphor but with a thinner layer of the blue component than is now being used. This should increase the blue flash output and excite the yellow layer to a higher level.

Automatic Camera and Control

(L. Sutro) (UNCLASSIFIED)

Wiring of the camera control system in Frame 25 has been completed. Tests showed minor wiring errors and one fault in the design. A thyratron relay driver (CRYD), intended to be ignited by a 10 microsec pulse from a single-shot multivibrator, failed to ignite. Resistive coupling proved to be the reason. Accordingly, the "C" relay drivers will be modified to have capacitive coupling.

Large Board Display

(L. Sutro) (UNCLASSIFIED)

Work continues on both manual and automatic methods of achieving a large-board display. For the manual system, L. Prentice has assembled a mock-up of console, camera, slide-building equipment and projectors. Dr. Bert Green of Group 38 has studied this mock-up and recommended the placing of this equipment within the projection room. For the automatic system, the main question to be decided is what automatic camera and projector shall be used. Dr. W. L. Gardiner of Group 25 is continuing his evaluation of existing systems. He has found the British Kelvin & Hughes machine to be satisfactory but has not yet recommended it. Photographs of both 5" and 19" charactrons have been developed and projected with the Kelvin & Hughes machine.

Test Equipment Headquarters

(L. Sutro) (UNCLASSIFIED)

The first shipment of an order for 10 Type 541 and 5 Type 545 Tektronix oscilloscopes has left the factory in Portland, Oregon, for delivery here. These scopes with 30-mc bandwidth open new vistas in the realm of narrow pulses. Twelve of the scopes will be used by Group 63, two by the vacuum tube circuits section of Group 62.

The area allotted to test equipment headquarters is to be reduced one-third to permit expansion of office space for MTC. Part of the open work area will be given up. The stock of test equipment will be moved to a store room to be made available in the basement of either Building A or B.

Test Equipment Committee

(L. Sutro) (UNCLASSIFIED)

At its meeting on 1 July the committee approved purchase of the following equipment:

Item	Mfr.	Model	Initial User	Group
Micro-ammeter 0-5, 50, 500 microamps.,d-c	Rawson	501	C. Corderman	62
Appliance Tester	Hickok	900c	A. Smith	60
Oscilloscope, 21"	Electronec	2100-series	Tx-o	63

The last item is the first large-tube oscilloscope to be purchased by the division. It will be used for the display system of the transistor computer.

2.6 Evaluation

(J. D. Crane) (UNCLASSIFIED)

Plans for a proposed XD-1 evaluation on 13 July 1955 are presented in Memorandum 6M-3729.

Improvement of XD-1 records and record analysis should be evident during this and future evaluations. The new record system has been in operation for one month. During this time, IBM has made most of the log entries and they are processing all the data.

2.7 Memory Test Computer

General

(W. A. Hosier) (UNCLASSIFIED)

"NAME THE COMPUTER" CONTEST! $ 1,000 PRIZE!

Several influential people, among them Bill Papian and Ken Olsen, have expressed dissatisfaction with the name "Memory Test Computer," and we tend to agree with them. The objections are:

1. The "memory" in the title has lost all significance, inasmuch as the core memory is now as well proven as anything else in the machine.

2. The phrase "test computer" is misleading and belittling to persons not familiar with the machine; it suggests a breadboard or rack of Burroughs equipment.

Unfortunately, we are pretty well stuck with initials MTC since hundreds of panels and drawings bear them; but we are free to change the machine's name within the limits of the initials. Bright ideas are therefore sought, and while comical names are entertaining and all; we hope a few will be sober and dignified enough to use. The best we have come up with to date seems to be "Machine for Testing and Computing." More colorful but not quite in the spirit of things is Bob Everett's "Mighty Tired Computer."

The prize suggested is "in trade" 3 hours computer time at a going rate of $ 333.33 per hour.

Computer operation has continued much as previously: XD-1 console and display frames have continued to use two drum fields, displaying a comprehensive test pattern written by Gurley and Callahan; GFI frames and mappers have made use of the third shift to put simulated SDU data into their equipment and check readouts; Mayer and Werlin have analyzed live SDU Data; Rundquist has made simulated storage runs on the XD-1 drum to estimate the probability of having to throw away data.

General (Cont'd)

(W. A. Hosier)

Ben Ginsberg has successfully run his program to test the noise and reliability of digital phone line transmission with and without message interleaf; more data will be collected in months to come by routine operation of this program . In this connection, it was found quite practical to operate the DDT from MTC high-speed (XD-1 type "A") flip-flops through cathode followers by having a level setter at the DDT.

New decoders have been tied in to the display system (see Ziegler's report below) and drafting has been started for new amplifiers.

Ron Mayer has made a trial of a "zero crossing detector" designed by Dick Best for him to enable the computer to analyze speech waveforms.

Some operational difficulty continues with the tape reader; this will probably not be cleared up until we receive a new reader head from Ferranti. A repetition of the test-equipment checking confusion also caused lost time, though not as much as before. Detailed inspection of diodes in the core memory selection matrix disclosed that several Amperex diodes installed in March 1955 had already deteriorated below specs; further, the shelf life of our spare Amperex diodes was so poor that only 50 per cent of an originally tested lot was still usable.

Distribution of operating time this period was as follows:

	Time	Percentage
Programming	89.23	36.1
Development	109.73	44.1
Maintenance and Marginal Checking	20.67	8.3
Installation	2.47	1.0
Interrupting Failure	13.56	5.5
Reliability	11.46	5.0
	248.12	100.0

Display System

(H. L. Ziegler) (UNCLASSIFIED)

Design of the new camera and cathode-ray tube mount is progressing satisfactorily. Drawings for the construction shop should be ready in about 2 weeks.

The new "push-pull" display decoders are fairly well checked out and are performing according to design. Special adapters are being built to permit use of these decoders with the present deflection amplifiers. This will then release the original ("single-side") decoders for use in McCusker's work.

H. L. Ziegler (Display System cont'd)

The +3000-v regulated supply was received during the past week, and work on the -5 to 10 KV supply appears about on schedule. Delivery date for this supply is about 1 August.

(B. G. Farley) (UNCLASSIFIED)

A general utility memory punchout from MTC to Hollerith coded cards is essentially ready.

Work continues on a direct read-in conversion program for the same type of cards.

GFI-MTC Test + Simulation Activity

(J. H. Newitt) (UNCLASSIFIED)

A substantial library of tapes have been prepared and debugged for testing the GFI equipment by means of the MTC computer. A number of successful test-runs have been made using these tapes. As further requirements come to light additional tapes will be prepared.

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

The following is a summary for the period 20 June to 1 July of defects found in tubes and components in MTC:

Tube or component	Defect	Quantity	Hours Lost
6AG7	Low plate current	28	0
Toggle Switch	Broken	1	0
Diodes, Type 1N38A	Back resistance too low	61	0
Diode, Type IN38A	Open	1	0
		91	0

2.9 Vacuum Tubes

2.9.1 Activities of Group 65

(P. Youtz) (UNCLASSIFIED)

Superior Electronics supplies electrostatic electron guns to Convair for assembly into the Charactron electron optical system. We have been obtaining small sample lots of these guns from Superior Electronics in order to evaluate the Convair processing schedules. At the moment we have used all of our available guns and have not received copies of Convair's most recent processing schedules. This program to evaluate Convair's processing schedules has come to a halt until we receive more information from IBM about the schedules and more guns from Superior Electronics.

(P. Youtz) UNCLASSIFIED

The Charactron life-test rack is being used to life test the available display tubes that we have made and the one surviving Charactron tube. We have available positions on the life-test rack that should be used to life test tubes that represent Convair's most recent productions. However, no tubes have been available for this study. The cathode study tubes (CT) were tested and put on the life-test rack. This is a series of tubes constructed with different cathode processing schedules.

We have not been able to fill completely the Typotron life-test rack. We have not received any of the most recent production tubes from Hughes for this program. Valuable life-test time is being wasted because the vendor is unable to supply the XD-1 requirements and the life-test needs.

Several new research and development programs have been started on the electron guns and phosphor to improve the reliability and light output of the Charactron.

2.9.2 Tube Research and Development

(D. D. Lynch and J. S. Palermo) (UNCLASSIFIED)

Recent data in a thesis report by A. Zacharias indicated that a smaller size particle ZnS will produce more light and that a P 14 phosphor would decrease the "confusion factor" due to the lower buildup and faster decay fo the P 14. A 7-inch cathode-ray tube, XT-184, was prepared for the evaluation of the finer particle size ZnS and is presently being tested. However, the preparation of a P 14 screen has required various modifications in our techniques and formulations. This work will continue in order to evaluate the short buildup and fast decay of the P 14 screen.

Experiments were also conducted in preparation of electroluminescent plates for Group 25 and sent to Lexington for further evaluation.

(L. B. Martin) (UNCLASSIFIED)

The automatic transfer-characteristic plotter to plot cathodes or beam current as a function of grid voltage under pulsed conditions is completed, tested, and is operating satisfactorily. Work will be done on the photographic recording of the curves. At present, polaroid film is being used, but we plan to change to 35-mm film. The smaller film allows more convenient storage and easier reproduction of prints.

Plans include refining the plotter for more convenient dimensions and more versatility. Initial operation experience has shown several improvements that are desirable.

Six Typotron tubes have been on the 16-position life test for 1579.5 hours, while three tubes have been on for 853.8 hours. All are satisfactory. Typotrons removed from the eight-position life test will be started on the new life test the week of 4 July 1955.

Vacuum Tubes (Cont'd)

(A. Zacharias) (UNCLASSIFIED)

As a result of research reported in the Master thesis, "Studies for a High-Speed CRT Display," the following programs of investigation have been started:

1. Gun Studies

In order to relieve the cathode current density, a program of gun construction has been started. Its aim is the design of a gun having a greater cathode efficiency, i.e., increasing the ratio of beam current to cathode current. Two factors will limit the increase in ratio: ability to focus the beam to the spot size required and deflection defocusing. The guns will be constructed using molded glass rods as element supports. This method is felt to be the most flexible available. A jig is currently being made for this construction with additional parts to be added for mounting of Charactron optics. The first guns will be mounted in 2-inch envelopes for observation of the spot size at the matrix position. Deflection plates will be included for observation of deflection defocusing. An electrostatic lens will be used in an attempt to obtain a fine spot in a less apertured gun having a cathode current utilization of about 50 per cent.

2. Phosphor Studies

As reported in the above-mentioned thesis, phosphor light may be improved by 250 to 300 per cent by use of finer particle screens. The blue component of the P 7 has been obtained (from Sylvania) in a 3-μ size. This is 1/4 the particle size presently used. A tube using 1.8 mg/cm^2 of this phosphor on glass has been made and will be compared to a 7.5 mg/cm^2, 10-14 μ, P7 blue (on glass). If the results indicate the gain in light is realizable, than a P7 will be made and tested for blue flash and yellow light. Since the blue component of P7 is identical to that of P14, the results obtained will be useful if P14 replaces P7.

3. Cathode Studies

The production of interface, as reported in the above-mentioned thesis, has not conclusively been shown to be a factor in the observed destruction of Superior cathodes. It has not been observed as harmful to the RCA cathodes that have been tested. The two Superior guns that were operated cut off for 1,000 hours were put on life at 0.5-ma d-c cathode current and were observed to be "dead" in 350 hours. The effect of of this 350 hours "on" was somewhat different than the effect of the 1,000 hours of "on" life on the three Superiors ran at 0.5-ma d-c cathode current from initial life. The destruction on the latter was confined more to the very center, whereas the former suffered poisoning over the entire conducting area. The RCA cathodes have produced interface resistance equal to that of the Superior but have seemingly suffered no ill effects after being operated "on" for 450 hours.

(A. Zacharias) (UNCLASSIFIED) (Cont'd)

However, it is not felt that these results indicate all is well with the oxide cathode in the Charactron. It is deemed necessary, even to the point of being overly cautious, to return to the investigation of the bariated-nickel cathode for use in a closely spaced cathode-ray gun.

(P. C. Tandy) (UNCLASSIFIED)

Seven 19-inch tubes, and Convair 0083 have completed from 300 to 5272 hours on life test. The matrix currents of CHT-62-1, CHT-80, and 0083 have decreased, while CHT-72-2 and CHT-75 remained approximately the same over a 300-hour period. CHT-112 and CHT-113 are being operated on life test at one-half cut-off voltage. These tubes showed a slight decrease in cathode current over a 73-hour period. The A_2 of CHT-112 and the G_1 and S_1 of CHT-113 show leakage at the test conditions.

Three tubes, CHT-84, CHT-108, and CHT-109, were given quick checks. CHT-108 and CHT-109 were found to be satisfactory for further tests, and they were sent to C. L. Corderman. CHT-84 was received from C. L. Corderman and was found to have poor pulse-matrix current. The cathodes of CHT-61, CHT-68-1, CHT-73, and CHT-84 were removed from the tube and observed for damage to their emitting surfaces. CHT-61 and CHT-73 show one small bad spot in the center of the oxide surface, while the cathode in CHT-84 appeared dark and spotty. This appearance was probably due to contamination by loose chrome oxide in the tube. CHT-68-1 had a spotty cathode area probably caused by grid-cathode breakdown. This tube originally had grid-cathode leakage which was sparked off.

Eleven CT's, were started on life test, but loss of control of bias voltage made investigation of grid-cathode leakage necessary. CT-55 and 65 showed a near short at -150 volt bias and with heaters on. When the remaining nine tubes were turned on, CT-53, 54, and 67 could not be cut-off. The tubes are operated at one-half cut-off d-c unless they cannot be cut-off, in which case the bias was set at -50 volts. The above group of CT's represents four different processing schedules. CT-55, 63, 64, 65, 66, and 67 were made according to Convair's manufacturing schedule; CT-53 and 54 followed schedule "F", 60-2 and 61-2 followed schedule "H", and 68 followed the MIT schedule.

(S. Twicken) (UNCLASSIFIED)

The life-test rack for DT-438's with carbon parts has been completed with twenty available sockets.

A meeting was held at Lexington with the Project High Tube Group to discuss Bendix' suggested changes to the gate pentode. Some changes are necessary because of differneces in equipment between Bendix and Sylvania and some are proposed as improvements to the basic tube structure. It was decided that any improvements to the structure must await the outcome of a separate improvement program, none as yet under detailed consideration. A meeting is scheduled at Bendix for 12 July to resolve the problem in order that drawings,dies,etc., may be begun in earnest.

(S. Twicken) (UNCLASSIFIED) (Cont'd)

At the request of IBM, Kingston, a discussion was held with a representative of IBM, relative to a proposal soon to be submitted to the Air Force for a program to determine the rate of degradation of various tube types with regard to operating conditions, temperature,etc. There is considerable doubt as to the validity of extrapolation of results from the project (MA-2) to our own because of different reliability criteria, environment, operating conditions, tube types, etc.

(T. F. Clough) (UNCLASSIFIED)

We recently received the first shipment of our order of the improved version of the 5965. This tube has previously been known by the General Electric development number Z-2177; henceforth, it will be designated as type 0528.

III. ADVANCE DEVELOPMENT

3.1 Chemistry of Magnetic Materials

Experimental Ferrites

(F. E. Vinal, D. L. Brown) (UNCLASSIFIED)

F-397 type cores were made from the lithium-nickel ferrite compound and fired at temperatures ranging from 1150° C to 1250° C. The fired cores were tested and showed good squareness, but had high coercive force.

A lithium-nickel ferrite series is being prepared to determine the tolerances of the nickel ferrite content.

Colton Press

(F. E. Vinal) (UNCLASSIFIED)

The 16-station Colton Rotary Press which has been tooled by BMS Carbide Company, had a second test run on 24 June. The maximum capacity of this press is over 500 cores per minute but it is planned to operate at reduced capacity because:

1. By operating only 8 of the 16 stations a complete set of tooling will always be on hand for replacement,
2. Reduced speed will encourage longer tool and die life and,
3. Adequate production for our needs will be obtained in 4 hours per day instead of 17 hours on the Stokes press.

At a reduced speed with 8 stations operating, a production of 200 cores per minute is easily attained. For the test run, the press was operated in this manner for 2 1/2 hours during which one steel punch was broken.

An analysis of the cores produced showed a very uniform weight. Dimensionally, 50 per cent of the cores were within ± 0.0005" in height and 87 per cent were within ± 0.0001". On the basis of this test, which is considered quite promising, the press has been shipped and was received in the laboratory July 1. Remaining refinements required for putting the press in routine use will be made here.

No rotary press has, as far as is known, ever been applied to so exacting a forming operation. The precision and tooling which have been built into this machine constitute, therefore, something of a "first".

Xray Diffraction

(W. J. Croft) (UNCLASSIFIED)

Alignment and adjustment of x-ray diffraction Geiger counter measuring device (Philips diffractometer) has been completed for use with Fe characteristic x-radiation.

Sketches and a work order have been submitted for the construction of a darkroom for the processing of film for powder diffraction studies and single crystal orientation studies.

Core Testing

(J. W. Schallerer) (UNCLASSIFIED)

One hundred and six thousand cores were double tested during the past biweekly period, bringing the total to 981,000.

Production of Memory Cores

(J. Sacco) (UNCLASSIFIED)

Four new memory-core batches of the DCL-2-832 type have been processed. The proper time-temperature cycle has been determined for two of these and a 90,000 unit core firing is now under way.

Two hundred thousand "green" cores are on hand and they will be fired during the coming week.

Thermal Stability of Magnetic Spinels

(F. S. Maddocks) (UNCLASSIFIED)

Thermal analysis curves of DCL-8-73, $Li_3^{+1}(Mn^{+3}Mn_2^{+4})O_7$, and DCL-8-75, $Li^{+1}(Mn^{+4})O_3$ have been made for comparison with DCL-8-72, $Li^{+1}(Mn^{+3}Mn^{+4})O_4$.

This apparatus will now be made available to members of the Ceramics Laboratory for use as needed, as results obtained during this biweekly period show the set-up to be capable of quite accurate analysis work. The furnace may be heated at a constant rate of rise from 350 C to 1350 C. The differential thermocouple is free of A-C pickup to 1300 C, and pickup is not objectionable to 1350 C. Recorder sensitivity is about 100 microvolts per inch.

3.2 Physics of Magnetic Materials

High-Current Generator

(J. Childress) (UNCLASSIFIED)

The high-current generator is being tested. The drive circuits are in reasonable shape but there is trouble with grounds in the output amplifier.

Pulse Test Measurements

(J. Childress) (UNCLASSIFIED)

A temperature control is being built and tested for the pulse-measuring equipment.

Temperature Control

(N. Menyuk) (UNCLASSIFIED)

Measurements have been made of the cooling and warming curves of a dummy sample holder which simulates the type to be used with the new magnet. Initial tests indicated a time constant of approximately 10 minutes, which is too long. Minor modifications have reduced this value to about 7 minutes, and additional design changes are planned to reduce this value still further.

3.3 New Components and Circuits

Transistors

(P. A. Fergus) (UNCLASSIFIED)

Routine measurements have been completed on 50 of the 300 new SBT's received from Philco. These measurements now include a figure of merit value, determined from a hole storage test. All transistors, thus far tested, have had acceptable characteristics.

Distribution curves of β, I_{co}, I_{eo}, and punch through voltage for the last group of 200 SBT's have been plotted.

CRYOTRON

(D. A. Buck) (UNCLASSIFIED)

Five cryotron clocks are under construction. Made of different wire sizes, they will allow us to check our theories relating speed to wire size.

Fine tantalum wires at low temperatures exhibit a broad transition region between their superconducting and normal states. Higher speed circuits can be built using these fine wires provided the transition can be sharpened. Solid-state purification experiments are being conducted wherein tantalum wires are heated to 2500° C in a vacuum, and one measurement already made shows that this treatment sharpens the transition.

(D. A. Buck) (UNCLASSIFIED) (Cont'd)

Electroplating and dip-plating experiments are underway to make the Cryotron wire ends solderable into printed circuitry.

Lead, tin, and vanadium have been tested for Cryotron use with promising results.

(K. H. Konkle) (UNCLASSIFIED)

During the last two weeks, I continued study of d.c. stability criteria for the SBT flipflop. The most important factor contributing to instability was emitter-collector voltage of the saturated transistor. I have, therefore, further investigated this quantity. Families of curves have been taken for twenty transistors showing V_{ce} vs. I_b for constant I_c and V_{ce} vs. I_c for constant I_c/I_b. Both of these sets of curves indicate that the beta of transistors as measured in the present beta tester is not adequate to predict V_{ce} in the saturated state.

SBT Delivery

(D. J. Eckl) (UNCLASSIFIED)

At the present time, deliveries are running behind schedule. Five hundred units of a scheduled 950 had been delivered by the end of June. These units are now coming from factory production lines. Philco expects to be able to meet the delivery schedule from here on.

Specification Committee

(D. J. Eckl) (UNCLASSIFIED)

A tentative specification sheet was drafted on 28 June for a high-speed, low-power transistor to be delivered in quantity by Lansdale. Limits for some parameters are as yet unknown. MIT's transistor requirements for the next six months were reviewed.

Standard Multiplier Flip-Flop

(A. L. Pugh, III) (UNCLASSIFIED)

The minimum peak current necessary to complement a standard multiplier flip-flop with minimum beta transistors was found to be 2 ma. To set or clear it required 1.5 ma. These currents are the currents into the base of the pulse transistor.

3.4 Memory

Transistor Selection Switch

(G. Davidson) (UNCLASSIFIED)

My thesis proposal " A Transistor Selection System for a Magnetic-Core Memory" has been approved by my thesis supervisor and it will appear shortly as an M-note.

The transient response of the Honeywell H-4 transistor has been observed for one value of base current. The response of the emitter generator (α_I) is slower than the collector generator (α_N), and it also has a lower final value. α_I has a value at the time the transistor is activated while α_N is zero; therefore, more current may be pushed into the collector than may be drawn out of it for the first few microseconds after the transistor is activated.

XD-1 Sensing Amplifier

(S. Bradspies) (UNCLASSIFIED)

The work on the XD-1 sensing amplifier has been completed. Its performance was improved in several ways -- its speed was increased; its gain was increased; and its low-frequency response was improved.

Work has been started on a sense amplifier using transistors. I shall try to make this unit analagous to Zopatti's, in that it will utilize a transformer in the rectifier circuit.

256^2 Memory Planes and Stall

(E. A. Guditz) (UNCLASSIFIED)

One-hundred and ninety mats have been completed to date. Fifteen mats have been wired into frames. Five tested modules have been delivered to Group 24.

Outside vendors have been requested to submit bids on drilling and slotting the remaining 400 module frames.

Design of the memory stall and plug-in unit racks is progressing satisfactorily.

A report on memory plane construction is being written by L. B. Smith and E. A. Guditz.

256^2 Memory

(J. L. Mitchell) (UNCLASSIFIED)

Bill Thomas of Francis Associates has been given the information he needs to start the design of the air conditioning of TX-0.

(J. L. Mitchell) (UNCLASSIFIED) (Cont'd)

Magnetics Inc. has shipped 100 switch cores with test information which indicates that the cores will probably have to be rejected.

We hope to be able to release all memory circuits except the sense amplifier to production in the next few weeks.

Transistor Sensing

(F. W. Sarles, Jr.) (UNCLASSIFIED)

The present design of the transistor sense amplifier requires that the V_{eb}-Ic characteristics of two transistors in the first stage fall within certain limits. Plots of this characteristic for about 70 SBT's indicate that transistors would have to be selected in order to satisfy this requirement. Possible design modifications to avoid selection are being investigated. I plan to investigate the characteristics of some of the high frequency silicon transistors on hand to determine if they exhibit the desired uniformity.

Tests on Zopatti's 64x64 plane indicate that the 64x64 SBT sense amplifier will operate reasonably well, with the exception of some minor hole-storage problems.

Tests on the 256x256 array indicate that common-mode rejection is adequate, but the low input impedance tends to load the sense winding too heavily.

Raffel has suggested the possibility of using a sense winding geometry which would result in unipolar ONES. Sensing circuitry to take advantage of this possibility is being investigated.

V-I curves for respresentative Transitron T25G diodes have been taken and are available to anyone who needs them.

Core Switch

(J. Raffel) (UNCLASSIFIED)

The electronics for driving a complete 256-position core switch is being assembled and checked out. Nine of the sixteen core plug-in units are finished. Construction of the other seven units is being held up by failure of Magnetics Inc. to meet the schedule on core delivery.

3.5 Logical Design

(N. Daggett, W. A. Clark, Jr.,J. W. Forgie) (UNCLASSIFIED)

Block diagrams relating to the experimental multiplier (TM-1) have been prepared and may be obtained from the logical design section. A symbology for block schematics has been developed and a drawing is available which shows how the symbols are used.

3.6 System Design

8-digit Multiplier

(K. H. Olsen) (UNCLASSIFIED)

The 8-digit multiplier had gotten behind schedule as the transistor circuits and logic were being continually improved, but at the start of this biweekly period, the circuits and logic were frozen and with some effort the final drawings were made and the multiplier constructed to meet the original date of July 1. Now power is being applied to it piece by piece with the expectation of having it running in a few days.

The multiplier contains about 400 transistors (and no diodes), on 36 plug-in units. It uses a rack of test equipment for control, but this will be replaced by a transistor control during August. The clock rate is 5 megacyles and after each multiplication the product is checked against a register of toggle switches.

Comparison Circuit

(M. Petersen) (UNCLASSIFIED)

The comparison circuit for the multiplier was bench tested. Leakage current was approximately 10 ua for the 15 transistors in parallel. The level amplifier with the comparison input had a rise time of 0.2 microsecond and a fall time of 0.4 microsecond.

A test set for the logic plug-in units in the multiplier was completed.

IV - CENTRAL SERVICES

4.1 Material Requirements and Stock

(H. B. Morley) (UNCLASSIFIED)

Requisitions have been submitted for the Flexowriters for TX-0 and MTC.

Division VI surplus numbered property which has been stored at 6th Street warehouse, has been inventoried and properly grouped and tagged. Lincoln property declared surplus to Division VI has been released to the Lincoln property office for final disposition. An effort is now being made to return all Navy property back to the Navy.

Because of the space problems, it is requested that all personnel who have material stored in Division VI Building A basement storage area, notify this department whether they wish to keep or dispose of this material.

Plant shut-downs due to vacations can be expected to affect the delivery picture throughout the summer.

4.2 Engineering Services

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

4.2.1 Components

Hodgdon attended 1955 Electronic Components Conference and visited several electronics laboratories on the west coast during the period May 23 - June 3. See 6M-3698 for details.

Due to failure experience with deposited carbon resistors in XD-1, efforts are being made to find more reliable film-type resistors.

Final arrangements are being made for the purchase of a Hipot Tester capable of supplying up to 40 kilovolts a-c rms and d-c. We expect delivery will be in about two months.

4.2.3 Mechanical Engineering

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

The mock-up of command post projection room equipment has been installed and is currently being studied by Group 38 for further recommendation.

A program including adjustments, evaluation of further-design innovation, and preliminary trial runs for the Colton Rotary Tablet machine will be started next week.

4.3 Drafting

Document Room

(A. M. Falcione) (UNCLASSIFIED)

All inquiries regarding classified documents from Division 6 Document Room should be made to the attention of Mrs. Frances Christopher in lieu of Mrs. Diana Helwig. Mrs. Christopher is now in charge of the Division 6 Document Room. Mrs. Helwig has been transferred to Barta Building. Mrs. Helwig is working in the Document Room part time and as of July 21 she will be transferred to Barta full time.

4.4 Administration and Personnel

4.4.1 Staff

(J. C. Proctor) (UNCLASSIFIED)

Gardner C. Reed is a new staff member assigned to Group 61. He received his MBA from Harvard Business School and was employed by Civil Aeronautics Administration.

Peggy Strait is a new staff member assigned to Group 61. She received her BA in Math from the University of California where she worked in their Radiation Lab.

Paul Stylos is a new staff member assigned to Group 61. He received his BA from Berea in Berea, Kentucky and was employed by the All Weather Branch - WADC.

James R. Slagle is a new staff member assigned to Group 61. He received his BS in Math from St. John's College in June.

James H. Burrows is a new staff member assigned to Group 61. He received his MS in Mathematics from the University of Chicago and was employed by Phillips Exeter Academy.

William J. Croft is a new staff member assigned to Group 63. He received his PhD from Columbia University and was employed as an instructor at Hofstra College.

Edward L. Laggerty is a new staff member assigned to Group 61. He received his BS degree in Physics from Iona College in June.

Gary Lewitzky is a new staff member assigned to Group 61. He received his BS from the City College of New York in June.

Milton Piatok is a new staff member assigned to Group 61. He received his MS in Math from Oklahoma A & M where he was a Math Instructor.

Staff (J. C. Proctor) (UNCLASSIFIED) (Cont'd)

Marguerite Arden is a new staff member assigned to Group 61. She received her AB in Math from Emmanuel College. She has been working for several years in the Barta Building tape room.

Willis Kellogg is a new staff member assigned to Group 62. He received his MA in Applied Physics from Harvard University and will be here for the summer only.

Robert D. Klein is a new staff member assigned to Group 61. He received his BA in Math from the University of Pennsylvania in June.

John B. Lewis is a new staff member assigned to Group 61. He received his MS in Electrical Engineering from the University of Tennessee where he was employed as an Assistant Professor.

John Williams is a new staff member assigned to Group 61. He received his AB in Math from Harvard University in June.

Terminations

I. B. Hazel

R. J. Horn - Horn has transferred to the MIT Patent Office. He will work principally on Lincoln problems and is expected to spend most of his time at Lexington.

Accessions List

(Frances Christopher) (CONFIDENTIAL)

The following documents were published by Division 6 or received from IBM during the period 20 June - 1 July 1955.

NO.	AUTHOR	TITLE	CLS.
6M-3497	H. D. Neumann W. F. Frost	MTC Subroutine Library	U
6M-3539	W. E. Ball et al	1954 Cape Cod System Data Storage Tables	C
6M-3657 A.#1	A. Vanderburgh	Flip-Flop Adder not good for all Numbers	U
6M-3660	N. T. Jones	Command Post DD Desk Design	U
6M-3673 C. #1	J. F. Jacobs	Need for Programmers Training Course for ADES, RAND, ADC, and Lincoln to be Provided by IBM	C
6M-3683	L. R. Jeffery	Study of a Modified Combat Center for Use as a Permanent Rand and Air Training Command Facility	S
6M-3686	Division 6	Problems of Integrating Antiaircraft and Sage	S
6M-3695	P. R. Bagley	Ades Training, Phase III, Section A: Direction Center Equipment	U
6M-3698	H. W. Hodgdon	Report on West Coast Trip May 23 - June 2, 1955	U
6M-3699	E. A. Guditz L. B. Smith	Specifications for 64^2 Memory Plane Module Frame	U
6M-3701	E. D. Lundberg	Sage System Meeting 20 June 1955	C
6M-3702	R. R. Reed	Special Test Lines for XD-1 Situation Display	U
6M-3703	S. B. Hibbard	A Report of a Meeting Held to Plan for Coordinated Assignment and Stability of Air Force Personnel Required to Man Cape Cod and XD-1	C
6M-3704	Division 6	Biweekly Report for 17 June 1955	C
6M-3705	N. T. Jones	Description of Liaison Desks in the Command Posts	U
6M-3706	B. B. Paine	Documents to be sent to IBM	U
6M-3707	H. J. Platt	Minutes of Experimental Sage Subsector planning Approval Committee Meeting of 20 June 1955	C
6M-3708	A. P. Hill	ADES Training, Phase III, Section B: External Equipment	C
6M-3711	C. J. Carter	Results of Meeting at EADF on Telephone Entrance Facilities for the Sage Experimental Subsector	U
6M-3712	H. J. Kirshner	Additional Rental Charges for Augmentation of Sage Experimental Subsector Ground/Air Radio Channels	C
6M-3716	J. N. Ackley	Operation of the New WWI Instruction sd "Sum of Digits"	U

Accessions List (Continued)

NO.	AUTHOR	TITLE	CLS.
6M-5008	D. R. Israel	Initiation Studies and Tests	C
6M-5010	E. W. Wolf	General Considerations of the Radar Data Input Problem With Applications to the 1954 Cape Cod System	C
6M-5011	W. Z. Lemnios	Procedures and Program Specifications to Compare 1954 Cape Cod System Track Data with Raydist Measurements	C
6M-5012	W. Z. Lemnios	Test Specifications: B-29 Tracking Accuracy Tests, Non-Maneuvering Courses	C
6M-5014	W. Z. Lemnios D. R. Israel	Survey of Tests Required for the Evaluation of Interception Function in the 1954 Cape Cod System	C
6M-5015	D. R. Israel	Data Collection for Noise Studies	C
6M-5015 S#1	D. R. Israel	Same Title	C
6M-5016	D. R. Israel W. I. Wells	Specifications of Processing Programs for Noise Studies	C
6M-5017	S. Manber	Status of SDV Data Collection for Noise Studies	C
6M-5018	J. Levenson et al	Program Specifications for Data Generation Program	C
6M-5019	J. Levenson	Some Post-Test Data-Reduction Programs for the 1954 Cape Cod System	C
6M-5022	D. R. Israel	Planned ECM Activities for 1954 Cape Cod Test Program	C
6M-5023	Sage Test Off.	Sage Test Committee Meeting #3	C
6M-5024	Sage Test Com.	Plan for Initial Period of ESS Test Program	C
6M-5025	Sage Test Com.	Program Specification for Recording SDV Data Inputs on Raytheon Tape	C
6M-5026	Sage Test Com.	Program Specification for Displaying Information on Isolation of Radar Returns	C
6M-5027	E. McEvoy A. Smalley	Procedures for Preparation of Simulated Data Input Tapes for Use in the 1954 Cape Cod System	C
6M-5028	D. B. Yntema	Test Specifications: Interception Series One, Part A	C
6M-5030	M. Curran	Test Specifications: B-47 Tracking Accuracy Tests, Non-maneuvering Courses	C
		R Report	
6R-236	P. K. Baltzer	Magnetostriction in Ferrites Possessing a Square Hysterisis Loop	U

Accessions List (Continued)

NO.	AUTHOR	TITLE	CLS.
		IBM Documents	
IBM-763	R. Cigledy	Progress High Semimonthly Report #55	C
IBM-764	----------	Programmers Reference Manual — Output System	C
IBM-765	F. M. Dellinger	Drum Nomenclature - New and Old	U
IBM-766	----------	Central Reference Room Bulletins #85	U
IBM-767	T. A. Burke	General Information Bulletin #27	U
		LL-DR Documents	
DR-270	R. C. Marden et al	Concurrence on Sup. 2 to Display Console Side Frames Specifications for XD-1, XD-2 and the Production Machine	U
DR-271	C. E. Walston et al	Concurrence on D-12-1: "Proposed changes in the Card Machines."	U
DR-273	C. E. Walston et al	Concurrence on D-40. Power Conversion System for the AN/FSQ-7 Duplex Central	U