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Memorandum M-3007

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

SUBJECT: BIWEEKLY REPORT FOR AUGUST 27, 1954

To: Jay W. Forrester

From: Division 6 Staff

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SECTION I - CAPE COD SYSTEM

1.1 Group 61

1.10 General

(R. J. Horn, Jr.) (CONFIDENTIAL)

The checkout of 1954 Cape Cod Systems is in process and will continue for four to five weeks.

A raid-size test with seven B-47's from SAC was held 27 August.

The Raydist system for use in tracking studies and radar calibration is being installed with the master station at Building B, Lexington, and receivers at Brant Rock (Marshfield), Halibut Point, and North Attleboro. These stations will allow Raydist coverage overlapping all the present radars in the Cape Cod System.

(D. R. Israel) (CONFIDENTIAL)

The week of 16 August was spent on vacation. The preceding week and large part of the succeeding week were spent in connection with the rewrite of TM-20. The last part of the week of 23 August was taken up with reviewing and preparing for publication the memos reporting on

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1.10 General (Continued)

(D. R. Israel) (CONFIDENTIAL) (Continued)

the results of operation of the WD Section of the 1954 Cape Cod System.

1.12 Data Screening

(H. Frachtman, H. Peterson) (CONFIDENTIAL)

The past biweekly period has been spent revising the memorandum on track monitoring in the 1954 System and writing programs for this System.

(F. Heart) (CONFIDENTIAL)

Most of the past biweekly period was spent considering Track-While-Scan problems; particular emphasis was placed on evolving and describing the 1954 Cape Cod Monitoring Function.

One lecture was given in the Air Force indoctrination program.

(S. Manber) (CONFIDENTIAL)

During the past 2 weeks a program which compares four scans of gap-filler data has been checked out. The intervention-switch checkout program is nearly finished and probably will be checked out during the week of 6 September. A program to analyze four scans of data from a heavy radar has just been started.

(E. W. Wolf) (CONFIDENTIAL)

The programs described in M-2498, "Storage of Programs on Magnetic Tape," have been modified so that tape-drum transfers may utilize the buffer drum as well as the auxiliary drum. A supplement to M-2498 will be issued.

The programming and checking of the radar-data input program is continuing.

1.13 Tracking and Control (CONFIDENTIAL)

(F. Garth, S. Hauser) (CONFIDENTIAL)

The flow diagrams for the identification and manual input programs were completed, and work has begun on coding the subprograms. Some subprograms will be ready for testing in the next biweekly period.

A memo "Summary of Operations of Grosstell, Early Warning and GOC in the 1953 Cape Cod System," was written and will be published under the number M-3003.

1.13 Tracking and Control (Continued)

(F. Garth, S. Hauser) (CONFIDENTIAL) (Continued)

A visit to P-10, North Truro Direction Center, was made to arrange details of stationing Cape Cod personnel at the site for cross-telling duties in the 1954 Cape Cod System.

A lecture was presented to Air Force personnel outlining the identification function and operations in the 1954 System.

(W. Lone) (CONFIDENTIAL)

The first draft of the Group 61 Quarterly Progress Report has been completed.

The second draft of the memo describing the status of the XD-1 utility programs has been prepared.

(B. Stahl) (CONFIDENTIAL)

Work is continuing on the tracking and radar-calibration programs to be used in connection with the Raydist system beginning next month (see M-2979).

At present the Raydist system itself is being installed with the master station at Building B, Lexington, and with receivers located at Brant Rock (Marshfield), Halibut Point, and North Attleboro. These stations will allow Raydist coverage overlapping all the present radars in CCS.

1.14 Weapons Direction (CONFIDENTIAL)

(H. Benington, O. Conant, F. Gucker, I. Hazel) (CONFIDENTIAL)

Programming for the master makeup and display program is proceeding according to schedule. During the past biweekly period, F. Gucker has joined the group. This has allowed responsibilities to be shared as follows:

WD and IND Switch Interpretation - H. Benington

HT, AA, and ID Switch Interpretation; Cycle - O. Conant

Digital Display - F. Gucker

Situation Display - I. Hazel

Schedules have been set for the writing of each program and for the order in which they must be tested.

The MMO program specifications are almost completed; as soon

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1.14 Weapons Direction (CONFIDENTIAL)

(H. Benington, O. Conant, F. Gucker, I. Hazel) (CONFIDENTIAL)
(Continued)

as certain points regarding WD switch interpretation are clarified, they will be issued. An inter-office memo has been sent to D. R. Israel suggesting a method for checkout of WD programs.

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

The first raid-size estimation test using a formation of B-47's for test aircraft was performed on 27 August. Results compared very favorably with those obtained with B-29 aircraft.

Two days of the second week were spent at Lockbourne Air Force Base, Ohio, briefing the SAC pilots who flew the B-47's during the test of 27 August. Three more tests are scheduled with B-47's; the next will take place on 2 September.

The 1954 Cape Cod System AAA program was operated successfully on 22 August after manual intervention. A mod has been written to replace the MIV, and it is hoped that the program will be checked out early next week.

Much time was spent during this period preparing proposals for various methods of integrating AAA with AN/FSQ-7. The work is well in hand and should be completed during the next week.

(A. Chandler) (CONFIDENTIAL)

Revision of the 1953 Cape Cod equipment checkout programs is underway and is partially completed. New mods of the calibration and light-gun test and the si-address display test are on paper tapes No. 3078-11 and 3064-4, respectively, and can be run from the master control program, tape No. 3022-7, from E31.

These programs have been run and have revealed incorrect wiring at Y-11 and incorrect light-gun action at several stations. Intermittent trouble exists in attempting to insert a digit in the sign-digit position of the IOR with the light guns. Tests of this equipment will continue.

Meanwhile, new mods have been written (but not put on paper tape of (a) the master control program, with new program numbering; (b) the calibration and light-gun test, awaiting final specifications of parameters affecting the calibration circles for the 5-inch scopes; (c) the si display test; and (d) the indicator-light test, which should be completed and tested within two weeks.

(C. Grandy) (CONFIDENTIAL)

Programming specifications for the height-finder program of the 1954 Cape Cod System were completed, and preliminary programming was

~~CONFIDENTIAL~~

1.14 Weapons Direction (CONFIDENTIAL)

(C. Grandy) (CONFIDENTIAL) (Continued)

started. Much of the actual programming will be done by A. Favret and J. J. Cahill in addition to myself.

Additional consideration has been given the WD simulation programs for checkout of the WD programs; however, operational and program specifications are not yet completed. This work, which has been neglected in favor of more pressing tasks, will be intensified and completed in the next biweekly period.

Considerable time was devoted to preparation of the Group 61 portion of the Division 6 Quarterly Progress Report (issue date 15 Sept. 1954). This work has been a co-operative effort by Bill Lone and myself.

After a review of the raid-size-test data collected to date, it was decided to cancel the mission scheduled for 19 August 1954. A mission with seven B-47's was conducted on 27 August 1954. See A. Favret's biweekly report for a summary of the test.

Two training lectures were given to the Air Force personnel in preparation for operation of the height-finder section of the 1954 Cape Cod System. Also, one lecture was given to new staff members as a part of their indoctrination program.

(S. Knapp, C. Gaudette) (CONFIDENTIAL)

The subframe timing program for the 1954 CCS has been rewritten to incorporate some recent changes in the specifications. This program is nearly checked out and ready for use with other subprograms.

A static MIV program has been added to the utility programs mentioned in the last biweekly. This program allows programmers to examine or to modify any register in MS or on the drum. All modifications made are logged automatically by the program on the direct typewriter.

A memorandum (M-3006) has been written describing tape-preparation procedures for 1954 CCS programs (the S & EC Group's CSII programs will be used by Group 61), utility functions available from CSII, utility functions stored with the system program and available during Group 61's operating time, and the new contents of test storage during Group 61's operation.

A memorandum (M-2984) has been written describing the four subroutines (sin-cos, arctan, square root, and radius vector) which will be in MS during operation of the Weapons Direction Programs in the 1953 CCS.

1.14 Weapons Direction (Continued) (CONFIDENTIAL)

(W. Z. Lemnios) (CONFIDENTIAL)

The analysis of the new method of height extrapolation for interceptors during climbs has been completed.

Together with H. Neumann, J. Nolan, and W. Wells, a 3-day visit was made to the Bell Telephone Laboratories at Whippany, New Jersey, to discuss the results of their simulation of the Lincoln System. Five copies of a report summarizing their results were brought back.

Work is being done with J. Nolan on the intercept-calculations flow diagram and program.

(E. J. McEvoy) (CONFIDENTIAL)

A program is in process for C. Gaudette and S. Knapp which will be used to set up storage for a part of the new indoctrination problem. Indoctrination classes for classified information are being attended in preparation for writing recording program for 1954 Cape Cod System.

(L. Murray) (CONFIDENTIAL)

Work is being continued on the training manual for the Weapons Direction Section of the 1954 Cape Cod System. More emphasis is being placed on this project since the Air Force complement which will operate the System has several new members who will require extensive training.

Consideration is being given to the intercept-saturation tests for the 1954 Cape Cod System. A proposal for these tests should be written within the next few weeks. This will be based upon the experience acquired from the 1953 Cape Cod System and the changes which have been incorporated into the 1954 Cape Cod System.

(J. Nolan) (CONFIDENTIAL)

The summary memo for the final-two test program is now in rough-draft form.

Work has begun in flow-diagramming the interception-calculations program for 1954 CCS.

(C. A. Zraket) (CONFIDENTIAL)

The second 2-week training program for Air Force personnel has been postponed to 7 September.

Checkout of programs for the 1954 CCS has commenced and will continue for a period of 4 to 5 weeks. Memoranda describing operational and programming specifications are being issued.

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1.15 Center Operations (CONFIDENTIAL)

(W. Vecchia) (CONFIDENTIAL)

TOTAL ASSIGNED TIME

	Hr	Min	64 Hr
Equipment Check, Rm. 222	3	30	
Weapons Direction	8	05	
Data Screening	32		
	<hr/>		
Total	43	35	
Time Given to Math Group	9	20	
Time Given to Systems	6	30	
Time Given to Check Equip.	1		
Time Lost to Computer	1	35	
Time Lost to Rm. 224 Equip.	2		
	<hr/>		
Total	20	25	
		Hr	Min
		43	35
		20	25
		<hr/>	
GRAND TOTAL		64	

1.16 AN/FSQ-7 (XD-1) Support (CONFIDENTIAL)

(C. Grandy) (CONFIDENTIAL)

I have assumed some of the functions previously performed by G. Rawling concerning the equipment layouts and installation for the XD-1 Direction Center and for the duplex central.

A review of the XD-1 floor plan was made, and several connections thereto were noted. These have been called to the attention of the individuals concerned. A revised drawing is to be issued.

Allocation of equipment (consoles, auxiliary consoles) in the FSQ-7 duplex central has been made, and an M-note will be issued shortly documenting this allocation.

The above work has been done in conjunction with D. R. Israel. I expect to devote additional time to this task as required.

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1.2 Group 64

(K. E. McVicar) (CONFIDENTIAL)

Computer reliability has been good during the past biweekly period. Computer operators estimate that 96% of the assigned time was usable.

Work on the central computer has been largely concerned with minor improvements which make operation more convenient or help to simplify maintenance and increase reliability. The terminal equipment is still being expanded and tested in anticipation of the needs of the 1954 Cape Cod Program.

1.21 WWI System Operation

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

Computer dependability has been excellent. A failure of a relay in the direct printout-punchout system resulted in the loss of 1 hour.

A logical diagram has been prepared for the newly proposed Room 156 power-control system. The system will be both simple and easy to maintain and troubleshoot. Design of the new panels will commence immediately.

Computer shutdowns have been planned for the weekends of 11 and 18 September. The first shutdown is to be used to realign our 600-amp alternator. The second shutdown will permit the relocation of the delayed-printout equipment. Presently it is in P Row and is difficult to maintain. It will be moved to E Row.

1.21 Test Program

(D. A. Morrison) (UNCLASSIFIED)

The consolidated test program, T-3432-16, is now in use in the WWI marginal-checking routine. PMC can now be modified to start over from a line number inserted in FF 4. A memo describing T-3432-16 is being written.

1.22 Terminal Equipment

(R. H. Gould) (UNCLASSIFIED)

A synchronizer has been provided for use with extraordinary inputs to the timing register. Negative 0.1- μ sec pulses of 20 volts or more, separated by at least 16 microseconds, may be fed into J1-4 of

1.22 Terminal Equipment (Cont'd.)

(R. H. Gould) (UNCLASSIFIED)

PIUMP 342 in E7H for counting in the timing register. The switches controlling the extraordinary input and the Z^2 precounter must be used as before.

Checking of the light guns in the Cape Cod Control Room has shown that digit 0 of the T.R. occasionally is not set by a light-gun return. With this exception the equipment in the Room is operating correctly. The audible-alarm panels on the video mappers have still to be installed.

The partial curtain dividing the Control Room was removed when the duct which supported it was removed. Before replacing the curtain or adding more curtains more definite information is needed as to what the curtains should accomplish. If a difference in light intensity between the two parts of the Room greater than before is desired a much lower curtain than before will probably be needed.

1.22 Buffer Drums

(L. D. Healy) (UNCLASSIFIED)

The buffer-drum parity system is back in operation.

Buffer-Drum Groups 2 and 3 are ready and will be tested as soon as time permits.

1.22 MITE

(A. Werlin) (UNCLASSIFIED)

The construction of MITE 0 fine-grain data has been completed, and testing of it has begun. The construction of the fine-grain-data MITE to supersede the present MITE 2 has been started.

1.22 Pathfinder Scopes

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

To date, eight scopes have been installed in Room 228. The four remaining scopes have just been received from the shop and will be checked out during the next biweekly period.

1.22 Azimuth-Drive Amplifiers

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

Three more amplifiers were received from the shops and will be installed next week.

1.22 Raydist

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

The first receiver was tried out at Lexington but the phone-line attenuation (26 db at 2 kc) exceeded what we had anticipated. The gain of the receiver input stage has been increased to permit operation with this lower signal level. The second receiver has been completed and installed with the transmitter in Room 224.

1.22 IBM CRT Testing

(S. Ginsburg) (UNCLASSIFIED)

The test equipment for generating an SDV signal with and without the computer has been assembled and checked. The program which will be used for testing the IBM mapper has been used for checking Cape Cod mappers and operates satisfactorily. It may be desirable to employ this system of testing for all Cape Cod mappers.

1.22 CRT Filter Control

(S. Ginsburg) (UNCLASSIFIED)

The cause of the smearing on the flyback of the sweep has been determined, and steps are being taken to eliminate the fault.

1.22 Data Link

(R. B. Paddock) (UNCLASSIFIED)

Construction of all PIUMP's and most of the rack interpanel wiring for the output coder has been completed. Testing should begin next week.

1.23 Records of Operation

Component Failures in WWI

(L. O. Leighton) (UNCLASSIFIED)

The following failures of electrical components have been reported since 13 August 1954:

<u>Components</u>	<u>No. of Failures</u>	<u>Hours of Operation</u>	<u>Reason for Failure</u>
<u>Crystals</u>			
1N34A	2	2000 - 3000	2 low R_b
	2	8000 - 9000	2 low R_b
<u>Rectifiers</u>			
Selenium, IRC, 19PA-6, 156 VDC, 805 M.A.	2	4000 - 5000	2 open
<u>Tubes</u>			
5963	3	0 - 1000	2 open grid 1 short
	2	1000 - 2000	2 short
	6	2000 - 3000	2 short, 2 open grid, 2 low I_b
	5	8000 - 9000	4 low I_b , 1 short
	1	9000 - 10000	low I_b
6145	1	2000 - 3000	short
	1	4000 - 5000	leakage
	2	5000 - 6000	1 short, 1 low I_b
	1	6000 - 7000	short
7AK7	2	3000 - 4000	1 short, 1 leakage
6AU6	2	6000 - 7000	1 short, 1 low I_b
	8	8000 - 9000	4 short, 3 low I_b , 1 leakage

1.23 Records of Operation

(F. J. Eramo) (UNCLASSIFIED)

The following is an estimate by the computer operators of the usable percentage of assigned operation time and the number of computer errors for the period 13 - 26 August 1954:

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1.23 Records of Operation (Cont'd.)

(F. J. Eramo) (UNCLASSIFIED)

Number of assigned hours	161
Usable percentage of assigned time	96
Usable percentage of assigned time since March 1951	88
Usable percentage of assigned time since September 1953	92
Number of transient errors	5
Number of steady-state errors	2
Number of intermittent errors	5

1.25 AN/FSQ-7

DUPLEX CENTRAL

(B. E. Morriss) (CONFIDENTIAL)

The following notes are to be reviewed and concurred upon during the coming period:

- IBM D-24 "Preliminary Output Specifications for the Production Machine";
- IBM D-23 "General Switching System, Duplex Central";
- IBM D-25 "Design Specifications for Display Consoles."

A large portion of the period was spent working with Fred Irish on M-2925-1, "Physical Characteristics of the AN/FSQ-7 Direction Center Equipment," and on a first-floor plan for the Direction Center. The first-floor-plan drawing is available as E-60004. It has been officially released by Lincoln. The note on physical characteristics is to be released at the beginning of the coming period.

Some consideration has been given to the miscellaneous-radar-input system for the production machine. The need for mapping scopes for the MRI has been demonstrated, and a method of doing this which is compatible with the present MRI specifications and the drum system is being investigated by a joint IBM-MIT committee.

The following notes have been reviewed by the Systems Office with IBM:

- IBM D-13 "Drum Specifications for Production Machine";
- IBM D-18 "Main Input Frame";
- IBM D-10 "Input Card Machines";
- IBM D-17 "Light Guns";
- IBM D-19 "Selection and Input Control";
- IBM D-16 "PERSELBSN Codes for Production System";
- IBM D-21 "Automatic Branch and Alarms."

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1.25 AN/FSQ-7 (Cont'd.)

DUPLEX CENTRAL (Cont'd.)

(B. E. Morriss) (CONFIDENTIAL)

It has been agreed with the IBM Duplex Planning Group that the first draft of each duplex specification will be issued by IBM with a D number. After concurrence the document will be reissued with necessary corrections as an official IBM report carrying the same D number.

1.25 Direction Center

(F. E. Irish) (CONFIDENTIAL)

The first revision of M-2925-1, "The Physical Characteristics of AN/FSQ-7 Direction Center Equipment," has been prepared. This revision contains a new appendix which lists all the assumptions that were made while determining the physical characteristics.

A floor plan locating the equipment dimensionally on the first floor of the AN/FSQ-7 Direction Center has been completed. This drawing is the result of the joint effort of Lincoln and IBM personnel during the past two weeks. It is available as a Lincoln Laboratory, Division 6 print, E-60004.

1.25 Cape Cod

(H. J. Kirshner) (UNCLASSIFIED)

Demodulators for South Truro have been remodified to conform with a change to new-type modulators at the radar site. A slight modification will be made to the Truro and Montauk MITE's so that timing may be taken from any of the three demodulators associated with each site.

The additional demodulators which we require will be constructed by the Division 6 shops. The circuit will remain the same, but a new layout of parts will be used.

1.25 FSQ-7

(H. J. Kirshner) (UNCLASSIFIED)

M-3000, "Preliminary Specifications for a Tactical Telephone System for AN/FSQ-7 (XD-1)," will be distributed upon completion by Drafting of a traffic diagram associated with the memo. A sketch of the traffic diagram is available as SR 59935-1.

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1.3 Group 65

1.31 Activities of Group 65

(P. Youtz) (UNCLASSIFIED)

The week of 16 August 1954 was spent on the west coast on problems associated with the Charactron and Typotron tubes. C. L. Corderman, representatives of the IBM High Street Tube Group, and I spent 16, 17, and 20 August at Convair. In addition to these days, R. G. Mork of Endicott and F. A. Rodgers also spent 21, 23, 24, 25, and 26 August at Convair. Convair had been making tubes for their commitment of 15 August 1954 to IBM per specifications and agreements reached at MIT on 12, 13, and 14 July by representatives of Convair, IBM, and MIT.

During the week of 16 August we had an opportunity to test and evaluate five tubes at Convair. All of these tubes met specifications in every respect except: (1) resistance of the helical dag was too low; (2) the full matrix presentation on the screen was trapezoidal instead of square. Two almost identical tubes made at MIT before the trip showed none of these effects. Also, one tube made after the trip did not show this effect. During the visit this was attributed to misalignment of the components in the gun assembly. Since the electron optics design was frozen only recently, Convair was unable to design and make jigs for the 15 August tubes. All the Convair gun assemblies were fabricated without use of jigs or fixtures. We sent Convair one assembly made on a MIT jig. This was copied and by the end of this past biweekly period Convair was making satisfactory tubes which met minimum specifications. It will be necessary for Convair to redesign their electron-gun assemblies and procure jigs before production is started. Also, they need to spend more time refining their other production and processing techniques. This will be complemented and supplemented by some work at MIT. Considerable time was spent at Convair on test specification, procedures, and equipment. IBM is purchasing their inspection and test equipment for the Charactron from Convair.

We spent 13 August 1954 at Hughes Aircraft discussing the electron optics of the Typotron and testing some tubes. Fair agreement was reached on the design of the optics. This will also be supplemented by some work at MIT. We devoted 18 and 19 August 1954 to a careful discussion of test specifications, procedures, and equipment at Hughes Aircraft.

The IBM Tube Group and MIT will continue these discussions at Convair and Hughes on 14, 15, 16, and 17 September 1954.

Considerable effort is being spent on making and evaluating an optimum aluminized P7 screen for the Charactron as operated in the AN/FSQ-7. Peter Tandy of Group 65 and Joseph Klein of Group 25 are building a test setup and evaluating the aluminized P7 screens of commercial companies and our own screens. Joseph Palermo and Frank Caswell are making these screens. Al Zacharias is designing some equipment that MIT, IBM, and

1.31 Activities of Group 65 (Continued)

(P. Youtz) (UNCLASSIFIED) (Continued)

Convair could use for evaluating aluminized phosphor screens and photomultiplier tubes.

Some effort was expended on the SR-1782 and 2420 program. A trip was made to Sylvania. There were frequent exchanges of information between MIT and Poughkeepsie on the subject.

1.33 Research and Development

(P. C. Tandy) (UNCLASSIFIED)

The standard lamp received for the phosphor evaluation equipment was too bright for practical use in equipment calibration. A constant current driver was devised for a small 4-watt bulb. A light-tight box enclosing the lamp, the driver, and the light-measuring phototube during calibration was built. This device can be calibrated if quantitative, rather than relative, phosphor measurements are desired.

More gain in the light-measuring section of the phosphor evaluation equipment would be desirable when persistence measurements are being made. The load resistor on the phototube will be adjusted in an attempt to obtain the necessary gain.

(T. F. Clough) (UNCLASSIFIED)

A sample of SR-1782A's obtained for examination and test showed that several of these tubes had higher-than-normal screen current. Two tubes were carefully dissected for examination and showed poor control-grid to screen-grid alignment. This appeared to be a constructional difficulty rather than a distortion that might be caused by heating effects.

Twenty-five DuMont K-1084 display tubes were given controlled rf heat treatment to eliminate control-grid emission which had developed during a couple-thousand hours of life. Results are encouraging on the first such tubes put back in equipment.

Recently some of our numbered tubes were found at the Lincoln Salvage Section. Will all persons sending gear to salvage please be certain to remove and send us all numbered vacuum tubes for retirement. Only in this way can we close out our records properly.

(H. B. Frost) (UNCLASSIFIED)

During the past two weeks my thesis was completed.

1.33 Research and Development (Continued)

(L. B. Martin) (UNCLASSIFIED)

The following is a list of Typotron tubes and their hours of operation on life test:

<u>Tube No.</u>	<u>Hours</u>	<u>Condition</u>
265	3989.1	Marginal
280	3171.1	Satisfactory
335	2354.1	Satisfactory
366	1652.3	Satisfactory
390	1652.3	Satisfactory
392	1652.3	Satisfactory
389	1568.5	Satisfactory
394	820.2	Marginal

A Typotron report summarizing the life-test results will be ready 3 September 1954.

SECTION II - AN/FSQ-7

2.1 Group 622.11 SystemsSDV and Digital-Data Receivers and Transmitters

(I. Aronson) (UNCLASSIFIED)

The addition of two more people to this effort has solved our manpower problem, at least for the present. Paul Messenheimer (transferred from MTC) and Alfred West (Allstate Engineering) can probably handle the packaging, setting up of production-test facilities, and production testing of all our pluggable units.

All non-MRD book components for SDV and DDR have been approved by B. Paine. Brownline drawings of these components have been sent to the IBM Engineering Control and Records Dept. for inclusion in the final bill of materials.

Circuits work on the receiver has been completed, and the final schematic is now being done in the Drafting Room.

System Evaluation Committee

(P. R. Bagley) (UNCLASSIFIED)

A subsidiary of the Systems Office, the System Evaluation Committee, has been formed under the leadership of Jack Jacobs. The broad aim of the Committee is to insure that the FSQ-7 equipment works reliably and efficiently. The Committee plans to make available information, suggestions, and assistance to those responsible for various phases of the FSQ-7 development, testing, programming, and operation.

The primary activities of the Committee will be:

1. Establishing a training program for Committee members in order that they may become thoroughly familiar with the FSQ-7 equipment, with maintenance procedures, and with the operational computer programs.
2. Developing and maintaining a systematic reference file.
3. Assisting in the co-ordination of activities which make use of computer programs for testing computer components and systems.
4. Assisting in the evaluation of proposals for changes in FSQ-7 equipment intended to improve reliability or efficiency.

2.11 Systems (Continued)

(P. R. Bagley) (UNCLASSIFIED) (Continued)

Initially, the Committee consists of nine members of Group 62, five on a full-time basis, and the remaining four part time. Committee members and their respective fractions of time devoted to the activities of this Committee are:

J. F. Jacobs	1/8	M. D. Feldstein	full
P. R. Bagley	full	A. D. Hughes	full
R. D. Buzzard	full	R. P. Mayer	1/3
B. G. Farley	1/3	H. J. Platt	full
		A. Vanderburgh	1/2

A more complete report on the Committee is given in M-2999, Objectives and Program Proposals for System Evaluation Committee, by Belmont Farley.

Each activity proposed for the Committee is assigned a "task number." To date 12 tasks have been suggested. These are summarized below:

1. Organize a training program for the Committee covering programming for WWI, MTC, and XD-1; general computer logic and design; logic and timing of XD-1 equipment; XD-1 operational programs in terms of flow diagrams; reliability efforts and maintenance procedures, particularly by means of computer programs.
2. Compile a dictionary of terms relating to reliability and maintenance.
3. Suggest what test-equipment facilities should be provided for XD-1.
4. Suggest the best sequence in which to tie the various elements into the XD-1 system.
5. Plan procedures for programmed testing of the XD-1 display system using the Memory Test Computer.
6. Suggest applications of MTC as a piece of test equipment to assist in the installation and debugging of XD-1 equipment.
7. Write programs for MTC to test the FSQ-7 data link composed of a digital-data transmitter and receiver and to test this link in combination with the G. E. ground-to-air data link.

2.11 Systems (Continued)

(P. R. Bagley) (UNCLASSIFIED) (Continued)

8. Condense the XD-1 system specifications to a document of less than 100 pages. (The emphasis will be on presenting a description of the equipment and interconnections in a form easily read and understood. Logic and timing will be treated in its broad aspects but not in detail.)

9. Evolve measures of effectiveness to determine if the various activities concerned with improving FSQ-7 reliability have the appropriate amounts of emphasis.

10. Make up a ready-reference card file of definitions and abbreviations applicable to the FSQ-7 system.

11. Determine the approximate amounts of time to perform area discrimination on fine-grain data by various programmed methods.

12. Reinvestigate the problem of synchronizing the FSQ-7 drums.

Tasks 1, 2, 7, 10, 11, and 12 are being actively pursued. Committee members will commence the remaining tasks when time permits. The activities of the entire Committee will be reported in each biweekly under the name of a single author.

Discussion related to the Committee's activities and suggestions for other tasks will be welcomed.

2.12 Magnetic Core Memory

XD-1 Memory

(J. Mitchell) (UNCLASSIFIED)

IBM has finished testing the 36 planes in their array tester; as a result the shower stall containing the planes has been removed from the array tester. The shower stall is now undergoing modifications so that it can be connected to the XD-1 memory modules and be used to test that equipment.

64 x 64 Memory Plane Outputs

(J. Mitchell) (UNCLASSIFIED)

Tests are now being conducted on Memory Test Setup VI to measure the amplitude of the ZERO outputs that occur when the memory holds the pairs-checkerboard pattern with ONES on the selected line write-disturbed and ZEROS read-disturbed.

2.12 Magnetic Core Memory (Continued)

Memory Test Setup VI

(E. A. Guditz) (UNCLASSIFIED)

Eleven XD-1 memory planes have been tested to date in MTS VI. At the request of IBM all planes (tested and untested) are being returned to them. They will wire them into a complete stack and test the planes as the MTC planes were tested, i.e., each plane will be completely tested in its position in the stack.

Printed Wiring

(E. A. Guditz) (UNCLASSIFIED)

Facilities for experimenting with printed-wiring methods have been provided by Div. 7. Satisfactory results are being obtained from tests on the proposed modular-plane construction.

64-Position Core Switch

(A. D. Hughes) (UNCLASSIFIED)

The thesis entitled, "The Incorporation of a Magnetic-Matrix Switch into a Multiplanar Coincident-Current Magnetic Memory," was completed and submitted. Some results and conclusions given by the thesis were reported in the last biweekly period. It is thought that a reduction in 300 cathodes can be effected for the MTC memory system by the use of a pair of core switches, but this has not been proven.

Multi-Coordinate Selection

(R. S. DiNolfo)

A Master's Thesis entitled "Multi-Coordinate Selection Systems For Magnetic-Core Storage" has been completed and submitted to the E. E. Dept. The analysis showed that a 4096-register using a 4-co-ordinate read and 5-co-ordinate write could be made to operate if smaller working margins and a memory cycle of 9 μ sec were allowed.

2.13 Vacuum Tube Circuits

General

(R. L. Best) (UNCLASSIFIED)

IBM and MIT basic-circuit sections have agreed on the correction circuit for the Model A flip-flops that allows use of the Z-2177 tube in

2.13 Vacuum Tube Circuits (Continued)

(R. L. Best) (UNCLASSIFIED) (Continued)

place of the 5965. We are very close to the solution of a similar circuit for the Model B flip-flop and are working on the correction for Model C flip-flop. We are examining the basic circuits to release as many as possible by 1 Sept. so that parts may be ordered.

A trip to Vestal was made. The circuits to be used in the console are coming along satisfactorily.

Model C Flip-Flop

(E. Anfenger) (UNCLASSIFIED)

M-2998 has been written on d-c triggering of Model C flip-flops.

Model A Flip-Flop

(E. Anfenger) (UNCLASSIFIED)

The circuit configurations for improved triggering of a Model A flip-flop have been completely checked, and data recorded.

Probes for XD-1

(E. Anfenger) (UNCLASSIFIED)

Twelve probes are being made now in Production to be delivered to Gus O'Brien by 9 Sept. for use with XD-1 at IEM. They consist of a simple probe attenuator, 15 feet of RG 62/U cable, and a cathode follower. The cathode follower drives a long line to an oscilloscope, where the signal is viewed.

Constant-Current Source

(H. J. Platt) (UNCLASSIFIED)

The constant-current source described in the last biweekly was investigated a little more thoroughly and found to be acceptable.

At a meeting at Vestal Labs in Endicott, the circuit was turned over to IEM. The outcome of this circuit awaits a definite decision as to final values of convergence-coil impedances and currents.

2.13 Vacuum Tube Circuits (Continued)

Typotron Intensification Circuit

(R. C. Zopatti) (UNCLASSIFIED)

I have continued investigating this circuit and have found that upon loading the output of the circuit with a 68- μ f capacitor, simulating normal conditions, the rise and fall times were increased. I have been trying to decrease the effect of this capacitance so that there will be a negligible gain of rise and fall times between the input and output waveforms.

Phone-Line Modulator

(E. B. Glover) (UNCLASSIFIED)

All changes in the demodulator have now been incorporated in the final circuit diagram which should be out in a few days. Work has resumed on the modulator. The first margins taken reveal a serious fault in the input circuitry. The d-c level of the cathode follower effects the modulated output directly and therefore reduces margins appreciably.

2.14 Memory Test Computer

General

(W. Ogden, W. Hosier) (UNCLASSIFIED)

MTC is now operating "privately" - that is, small test programs are being run on it from toggle switches, but it will be another week at least before it will be ready for any programming. All instructions have operated reasonably well except input-output (Ferranti reader and Flexowriter) and Charactron display, which are scheduled for test early next week. The magnetic-core memory has been operated for a day but not optimally adjusted; no attempt has yet been made to tie into the drum, since it appears further work on that system is needed.

Control

(W. Hosier) (UNCLASSIFIED)

As mentioned above, all instructions except input-output and Charactron have operated in a preliminary fashion, although margins have not yet been taken nor any attempt made to shave times to a minimum. In fact we are intentionally slowed down to a half-instruction cycle of about 15 μ sec. (as opposed to a potential 5.5) pending addition of cathode followers to the control switch: the "and" current load on the present CF's is too great to allow operation at the minimum cycle.

2.14 Memory Test Computer (Continued)Technician-Training Course

(A. Vanderburgh, Jr.) (UNCLASSIFIED)

A course has been planned to train MTC trouble-shooters. Notes for the first section are being printed and will be available in the MTC Office (B-155) on 1 September. Class sessions will begin on 13 September.

MTC Records

(L. Sutro) (UNCLASSIFIED)

The history of a typical MTC panel has been recorded on IBM punched cards as a test of the new record system. The IBM accounting machine, wired up by R. Cesari, has made an analysis of these cards and printed a record of the hours in service of each component that failed. Experience in punching the cards and in wiring the plugboard for the accounting machine has led to revisions of the form to be filled out by technicians in the computer room.

2.16 Display

(C. L. Corderman) (CONFIDENTIAL)

Final display specifications for XD-1 have been issued as M-2877. The only changes from these specifications which are anticipated are the character layouts for both Charactron and Typotron matrices.

The period 12 - 21 August was spent at Convair and Hughes discussing the final electron-optical arrangements and test specifications for Charactron and Typotron tubes. Some difficulty was encountered by Convair in producing prototype tubes because of poor gun alignment. Some misalignment was expected because the time schedule did not allow for making final jigs. However, the more critical mechanical parameters were established; using a new-type gun construction, a good prototype tube was made on 26 August. It was not completely satisfactory because of a low helix resistance. This can be raised quite readily by adjusting the line width and pitch of the helix. Final jigs are now being made for the Charactron gun assembly, and a prototype tube is expected during the next two weeks. This tube will be operated with MTC for final evaluation tests.

Two changes are in progress on the Typotron which are felt to be necessary before that tube is final. These changes are the addition of a third set of deflection plates, and an increase of character size from approximately 0.1 inch to 0.13 inch. The first Typotron incorporating these changes is now at MIT for evaluation. Information on the differential rotation to the compensation plates and the coil-adjustment pro-

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2.16 Display (Continued)

(C. L. Corderman) (CONFIDENTIAL) (Continued)

cedures will be forwarded to Hughes during the week of 30 August.

A redesign of the holding-gun mounting structure has reduced the leakage between gun elements observed in Typotron tubes.

Design

(R. Fallows) (UNCLASSIFIED)

Work on the central display frames accelerated in the last two weeks with the addition of four outside design draftsmen to our group. These men have started work on block diagrams for the situation-display generator and back-panel wiring for the digital-display generator.

The block diagrams for the digital-display generator are almost complete. Final drawings have started in the Drafting Room.

Pluggable-unit design work is continuing. Five or six units were completed in the past two weeks. About 15 units remain to be designed. Of these, about half require circuit development before layout can start. Nearly all of our experimental pluggable-unit testing lies ahead.

Our first attempt to release card and pluggable-unit designs through IBM met with something less than encouraging success. Approximately half of the design had to be revised or done over because we had not followed IBM recommended procedures. In some cases this was the result of inexperience on our part; in other cases it was the result of incomplete information or revisions in procedures.

We will continue to submit designs to IBM as soon as they are completed.

Timing and Control

(R. Gerhardt) (UNCLASSIFIED)

The limited storage for radar-data slots does not allow a six-bit representation of each character. Hence, the six bits required for character selection are derived from the category. One of the most general methods of doing this is to use OR circuits driven by the category. Each OR circuit goes to a small cathode follower which goes to a gate tube, which sets one flip-flop in the character register. The gate tube is ON only if the particular flip-flop is to be set.

The specifications for the display system state that a de-focused beam will be used for all radar-data slots. A focused beam cannot

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2.16 Display (Continued)

(R. Gerhardt) (UNCLASSIFIED) (Continued)

be used, and it would require a major modification of already designed pluggable units.

David Smith of IBM was here to discuss the display system. Smith is working on the training program for XD-1 maintenance engineers.

All but one pluggable unit for the timing and control section have been laid out and sent to the Drafting Room.

Miscellaneous

(M. Epstein)

In the past biweekly period a set of digital-display block schematics was finished and checked as far as internal connections. The block schematics will be given to Drafting for finished drawings. Back-panel wiring was started and will be continued in the next biweekly period.

(J. Woolf, H. Zieman) (CONFIDENTIAL)

The character position-and-selection decoders with their respective line drivers have been built. The line drivers for character selection have been debugged. The remainder of the equipment will be debugged and installed in MTC this coming period. The vector generator has been installed in MTC.

The vector generator for XD-1 has been laid out in three plug-in units. The necessary cards are under construction and will be assembled in the shop.

The line driver will be assembled in three plug-in units as soon as the necessary drawings are complete.

2.2 Group 63 (Magnetic Materials)

2.21 Magnetic Cores

Exchange Interactions in Magnetic Oxides

(J. B. Goodenough) (UNCLASSIFIED)

A preliminary report by H. Callen (Eckert-Mauchly Div. of Remington Rand) on the various exchange mechanisms in magnetic oxides has been received. He questions, as we have also done, the currently accepted superexchange model. First, he differentiates the superexchange between nonidentical cations from that between identical cations. Second, he lists four possible arrangements of parallel and antiparallel coupling of spins in the two-step process and cautions against choosing any one before quantitative energy calculations of all four possibilities are made. No quantitative calculations were forwarded by him.

Our concept of semicovalent exchange selects one of the four possibilities and gives, qualitatively, the conditions which must be fulfilled for this to occur. The condition for semicovalence is that an empty hybrid orbital which is nearly degenerate with a d shell must overlap strongly a filled oxygen-ion p shell. In the ferrites the tetrahedral Fe^{3+} ion fulfills this requirement. If the octahedral cations also enter into semicovalence, strong antiferromagnetic coupling between the A and B sites results.

Preparation of Memory Cores

(J. Sacco) (UNCLASSIFIED)

A new memory-core composition, DCL-2-720, is now being fired and tested. F-394 cores from this batch have shown outputs as much as 25% greater than General Ceramics cores at comparable driving currents. Switching-time data, although taken rather roughly, indicates that the cores will meet present specifications. Several new batches are now being prepared in order to improve still further upon the electrical properties of the cores.

(P. Reimers, E. Keith, F. Maddocks) (UNCLASSIFIED)

The outside contractor has at long, long last completed installation of stone bench tops and sinks in the chemistry laboratory, making it possible to prepare this lab for use. This work has been completed and by 30 August the laboratory will be in normal operation.

Memory-Core Evaluation

(P. A. Fergus) (UNCLASSIFIED)

The following series of cores were received and evaluated by the routine B-H loop test and pulse test:

2.2 Group 63 (continued)2.21 Magnetic Cores (continued)

DCL-4-70C-1	through	DCL-4-85C-1
DCL-4-70-1	"	DCL-4-85-1
DCL-5-1A	"	DCL-5-11A
DCL-5-1A-1	"	DCL-5-11A-1
DCL-5-1B	"	DCL-5-11B
DCL-5-1B-1	"	DCL-5-11B-1
DCL-5-1	"	DCL-5-11

Several lots of small DCL cores were evaluated for B-H loop properties and for pulse characteristics. Range of operation, output voltage, and switching time of each lot were determined. These lots included 5-DCL-2-720HX-1 through 5-DCL-2-728HX-1 and 5-DCL-2-720HY-1 through 5-DCL-2-728HY-1 and L-DCL-2-418A-1 through L-DCL-2-418C-1.

Automatic Core Tester

(E. J. Stevens) (UNCLASSIFIED)

Work on the automatic core tester is progressing. All plug-in panels have been wired and checked as independent panels. The remaining interpanel wiring should be completed soon. Design and construction of the control panel and core-handler modifications will be started in the immediate future.

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

The high-current switching-coefficient apparatus has been calibrated and should now be ready for use.

An amplifier for the 60-cycle hysteresigraph has been constructed and is now being tested.

The probe for the permeameter is undergoing some minor modifications.

(R. Pacl) (UNCLASSIFIED)

The selector mechanism on the semiautomatic core tester is being revised to divide the accepted cores into two bands.

(J. Schallerer) (UNCLASSIFIED)

The high-speed S_w tester was moved into the core-testing area this week. The equipment has been calibrated, but personnel still must be trained before it can be used.

2.2 Group 63 (continued)

2.21 Magnetic Cores (continued)

Radar interference has been greatly reduced in the B-H loop tracer by putting the equipment on separate supplies. The interference was coming in on the building d-c ground. When the high-power radar sets are in operation, however, the interference shuts the equipment down. The pickup seems to be directly in the amplifier.

SECTION III - CENTRAL SERVICES

3.1 Material Requirements & Stock

(H. B. Morley) (UNCLASSIFIED)

A decision has been made that Division 6 will cease to stock components listed in the Lincoln Standards Book. These will be stocked instead by Division 1. In line with this decision, this department has been co-operating with Division 1 by providing lists showing Lincoln Lab no., quantities on hand and on order, and past usage.

We are endeavoring to clean up our storeroom at Fort Heath, as it now seems likely that we may lose the space allotted there. All numbered equipment formerly stored there has been transferred to the 6th Street warehouse until it can be disposed of.

3.2 Construction

Production Control

(F. F. Manning) (UNCLASSIFIED)

There have been 24 Construction Requisitions totaling 286 items satisfied since 13 August 1954, and there are 29 Construction Requisitions totaling 1470 items under construction by the Group 60 Electronic Shops.

For further information please call the Division 6 Production Control Office (Ext. 861).

Outside Vendor

(J. V. Mazza) (UNCLASSIFIED)

There is one order outstanding totaling 59 items. One item has been delivered during the past biweekly period.

3.4 Test Equipment

Test Equipment Committee

(L. Sutro) (UNCLASSIFIED)

The Committee has approved construction of 20 high-speed flip-flop plug-in units, bringing to 88 the number now authorized. In addition it has approved purchase of a Z-angle meter (Technology Instrument Co.

3.4 Test Equipment (Continued)

(L. Sutro) (UNCLASSIFIED) (Continued)

Model 310 A) for the use of the Components Section.

See Schallerer's entry in Sec. 2.21 for preliminary suggestions of elimination of radar interference.

3.5 Drafting

Improper Use of Inter-Office Memorandums

(A. M. Falcione) (UNCLASSIFIED)

Engineers are cautioned on the improper use which is being made of inter-office memorandums bearing a secret or confidential classification. A large amount of valuable information, for which no appropriate identification or filing system exists will result through the use of inter-office memorandums. These memorandums should be issued as M-series memos so that proper registration and distribution can be effected within the security regulations of the Laboratory.

Division 6 Drafting Facilities

(A. M. Falcione) (UNCLASSIFIED)

All Division 6 engineers are urged to bring all their drafting requirements to the Division 6 Drafting Room; especially when the drawings are for the XD-1 or Duplex Central system. There have been some instances where some Engineers have brought their drafting requirements to the Division 7 Drafting Room because of the geographical location. This may lead to confusion later on, in that the drawings for the XD-1 system will not be in one central file. It is important that all drawings for the XD-1 system be filed in the Division 6 Print Room for control purposes.

Multilith Masters

(A. M. Falcione) (UNCLASSIFIED)

The Lincoln Laboratory stock room now carries as a standard stock item the regular Division 6 Multilith preprinted master which we have been using for some time. The Division 6 stock room will no longer stock this item, as it has now been adopted as a standard stock item for the Lincoln Laboratory.

3.5 Drafting (Continued)

Central Display, XD-1

(A. M. Falcione) (UNCLASSIFIED)

To date, approximately 54 drawings and associated land masters, etc., have been sent to IBM for release for the Central Display System. We have been making many new block diagrams for the system. However, IBM has been changing their procedures and regulations frequently on the making of block diagrams; so, engineers are requested to seek information from the Drafting Room or Dick Fallows in regard to the latest instructions. This will save a considerable amount of Drafting time and speed up the accomplishment of the logic diagrams for this system.

3.6 Administration and Personnel

Transfers

(J. C. Proctor) (UNCLASSIFIED)

James Schallerer has transferred from Group 62 to Group 63.

Earl Pughe has transferred from Group 60 to Group 64.

Joseph McCusker has transferred from Group 63 to Group 62.

Richard Jenney has transferred from Group 63 to Group 61.

New Non-Staff personnel

(R. A. Osborne) (UNCLASSIFIED)

Sumner Bartlett is a new technician with the Construction Shop.

Maureen M. Cronin has joined Group 61 as a Senior Clerk.

Muriel I. Durso is a new Senior Clerk in Group 63.

Burton Ewalt is a new member of the Drafting Department.

Thomas J. Malloy, Jr., is another new technician in the Construction Shop.

Gerard Sullivan has joined Group 63 as a technician.

Judith P. White is a new Barta Building receptionist.

Alfred W. Wojcicki has also joined the Construction Shop as a technician.

3.6 Administration and Personnel (Continued)

Terminations

(R. A. Osborne) (UNCLASSIFIED)

Diana Bierer

Transfers

(R. A. Osborne) (UNCLASSIFIED)

William J. Carroll, Jr., has returned to Division 6 as a technician with the Installations Group.

Open Requisitions

(R. A. Osborne) (UNCLASSIFIED)

1 Administrative Assistant for Group 61

1 Clerk (Male) for the Print Room

2 Clerk-Typists for Group 65

1 Electrical Detailer

1 Inspector

1 Computer Operator for Group 61

4 Technicians for the Construction Shop

7 Technicians for Group 64