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Memorandum M-2911

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DIVISION 6 - LINCOLN LABORATORY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
LEXINGTON 73, MASSACHUSETTS

SUBJECT: BIWEEKLY REPORT FOR JULY 16, 1954
To: Jay W. Forrester
From: Division 6 Staff

CLASSIFICATION CHANGED TO:
Auth: DD 254
By: J. R. Everett
Date: 2-1-60

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SECTION I - CAPE GOD SYSTEM

1.1 Group 61

1.10 General

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

Work on the 1954 Cape Cod System is somewhat behind original schedules, but initial program testing should begin around the first of August.

The first successful raid-size test of the second series was conducted 16 July. This initial data indicates that the TPS-10D may be less sensitive than the MPS-4 for raid-size assessment. As in earlier tests, the view presented to the radar appears to be a most important variable.

Work is under way on programs for using Raydist to check accuracy in the Cape Cod System.

A ten-week indoctrination course for new staff members has begun.

(D. R. Israel)

In conjunction with Arnow and Walquist, work has begun on those sections of the rewrite of TM-20 which have been assigned to Group 61. A fairly detailed outline of the Appendices A and B has been completed, and work will start immediately on the preparation of the first draft.

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1.10 General (Continued)

(D. R. Israel) (CONFIDENTIAL)

On Thursday, 8 July, another of the joint BTL-Lincoln meetings on the Cape Cod test program was held. Recent developments were reviewed, and plans were made for forthcoming tests. To assist in the preparation of future analysis programs, two BTL personnel -- Mary Jane Curran and Harry Meinholz -- are now attached to Group 61 to learn how to program. They are located in Room C-161.

Charles Gaudette and Sue Knapp have just begun an informal ten-week indoctrination course for new staff members. This course will cover elements of programming and the 1953-1954 Cape Cod System. Eleanor McEvoy and Frank Goucker, new staff members in Group 61, are participating in this course along with the BTL personnel. Other personnel from Division 6 are attending parts of the course which are of particular interest to them.

An answer has been received from the Signal Corp Engineering Laboratories regarding certain requirements in connection with AAA integration with the FSQ-7. A proposal indicating how these requirements can be met under various possibilities of mechanization is now being prepared by J. Cahill, A. Favret, and myself.

1.12 Data Screening

(R. L. Walquist) (CONFIDENTIAL)

A meeting was held with representatives of Bell Labs on 8 July to discuss their work on radar-data noise studies and our results to date on how well the 1953 Cape Cod System presents the true air situation.

Work is continuing on the 1954 Cape Cod System. Several meetings have been held by the Data Screening Group to discuss proposals for the track-while-scan functions. Final flow diagrams should be completed early in the next biweekly period. Computer programming and written descriptions of the various program functions will follow shortly thereafter. Initial program testing should start around 1 August.

Considerable time is being spent on the rewrite of TM-20. The Data Screening Group is responsible for part of the writeup of the results of the 1953 Cape Cod System and all of the writeup of the Air Surveillance function in Air Defense.

(D. L. Bailey) (CONFIDENTIAL)

The tracking proposal for the 1954 Cape Cod System is reaching the final stages, and it is expected that sufficient agreement will be reached within the Section to enable programming to begin within the next biweekly period.

1.12 Data Screening (Continued)

(H. Frachtman) (CONFIDENTIAL)

Discussions have continued on the monitoring programs for the 1954 System. A flow diagram for the trouble-track-history display has been completed.

(F. Heart) (CONFIDENTIAL)

Most of the past biweekly period was spent considering track-while-scan problems, with particular emphasis on 1954 Cape Cod "Monitoring" plans.

(J. Levenson) (CONFIDENTIAL)

Programs to analyze track data from the 1953 Cape Cod System are still being written and tested. No data is being collected yet.

A computer program for testing the new IBM mapper has been brought up to date for E. Rich.

(H. Peterson) (CONFIDENTIAL)

This biweekly period was used chiefly to finish up the monitoring proposal and to start block diagrams for the same.

(H. Seward) (CONFIDENTIAL)

The supplement to the correlation and the smooth-and-predict programs was completed with Bailey and Ishihara and is now pending TWS discussion. Meanwhile, detailed work on the programs is now being started.

(E. W. Wolf) (CONFIDENTIAL)

Work on the detailed description and block diagram for the radar-data-input section of the 1954 Cape Cod System is now in progress.

The editing and completion of the report on co-ordinate systems for radar networks has been substantially completed.

1.13 Tracking and Control

(H.D. Hauser, H.D. Neumann) (CONFIDENTIAL)

The subroutines for the manned-interceptor simulation program have been completed and are now coded for MTC. Programs to test these subroutines are also ready.

See M-2912 (Secret) for additional reporting.

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1.13 Tracking and Control (Continued)

(B. R. Stahl) (CONFIDENTIAL)

A memorandum describing the Raydist tracking system and its use in checking accuracy in the Cape Cod System is being prepared for publication. In connection with Raydist, work has begun on the following programs: a two-aircraft tracking and data-storage program for checking interception accuracy; a radar calibration and Raydist-radar data comparison analysis; and a Raydist data-conversion program for MTC (previously programmed for Whirlwind CS computer).

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1.14 Weapons Direction

(D.R. Israel) (CONFIDENTIAL)

Progress on the preparation of the 1954 Cape Cod System continues. The program specifications are being prepared and should all be issued by 23 July. Various aspects of the checkout procedures and details of program records have been discussed, and Benington is now preparing a detailed proposal.

Recent estimates indicate that the general schedule of activities for the 1954 System as described in M-2807, "Suspension of 1953 Cape Cod System Activities" (C.R. Wieser, D.R. Israel, R.L. Walquist), is lagging by two weeks. A current schedule is being prepared by Zraket and Ishihara and will be issued as a supplement to M-2807.

A. Chandler is now assisting George Rawling in the preparation of the equipment testing and checking programs required for the 1954 System. Charles Gaudette and Sue Knapp will take over responsibilities for maintaining records of the equipment installation and the intervention register and indicator-light wiring.

The second raid-size assessment test was held on 16 July and was much more successful than the first. The test is described in detail by C. Grandy, below.

(H. D. Benington, I. Hazel, O. Conant) (CONFIDENTIAL)

The past biweekly period has been devoted to continuing the preparation of detailed program specifications for the master make-up-display (MMD) program. The responsibilities for various sections of this program were outlined in the previous Biweekly. The completed specifications will be issued for approval during the coming period by other programmers.

Since the program organization within the MMD will not correspond to its relationship with other programs, the progress which has been made is best understood in terms of responsibilities of the over-all program. In these terms, the MMD program specifications have been completed roughly as follows:

AA functions	100%
Height functions	100%
ID functions	100%
Simulation functions	100%
WD & IND status functions	75%
Situation-display alarm	
functions for all stations	75%
Situation-display	100%
Tracking functions	75%
Digital display	25%

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1.14 Weapons Direction (Continued)

(H. D. Benington, I. Hazel, O. Conant) (CONFIDENTIAL) (continued)

These figures reflect the degrees to which the MMD section has assimilated its responsibilities in terms of the operational specifications which were previously issued for the entire Weapons Direction Section.

Basically, delays here resulted from one error in our previous plans; although, in the ideal case, operational specifications do not reflect programming responsibility or method, they must be prepared in great detail. In the 1953 CCS, a myriad of minor operational decisions were made as the result of programming problems. The preparation of operational specifications for the 1954 System reduced this tendency; unfortunately, the specifications were not sufficiently detailed with the result that considerable time has been spent in chasing minor omissions. For example, it is not sufficient to state that a certain condition will cause an alarm at one station; in addition, the programmers must know how long the alarm will last, what condition will remove it, what other alarms or conditions will override it. (In the future, it might be desirable to prepare two sets of operation specifications. The first would state the broad philosophy and positive actions which could be taken by one station; the second, which would best be prepared by programmers especially concerned with detail, would cover every nagging contingency to which a digital computer is so sensitive.)

Considerable progress has been made in settling the various storage tables which will be used jointly by all programs. An inter-office memo, "Weapons Direction Program Data Storage" (Index: 8.3) by H. D. Benington, is ready for publication.

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

The raid-size-estimation test scheduled for 9 July was cancelled because the TPS-10D was inoperative. Some time was spent at Truro on 7 July photographing the test setup and making some trial attempts to record the RHI video photographically. The poor quality of the video made results inconclusive.

Some time was spent helping to prepare the programming specifications for the 1954 AAA program.

Some time was spent showing Lt. Col. J. R. Dillon of Army Field Forces Board No. 4 about the Direction Center and discussing possible support for AAA in the Transition System.

(P. O. Cioffi) (CONFIDENTIAL)

Material for the content of the following memos is being

1.14 Weapons Direction (Continued)

(P. O. Cioffi) (CONFIDENTIAL)

collected and organized:

- a. Report of Results of Interception Tests for the period 1 March 1954 to 18 June 1954 (final test phase of the 1953 Cape Cod System);
- b. Report of Results of the Final-Turn Interception Tests Described in M-2785;
- c. Pilots manual (a Cape Cod System familiarization reference for participating aircrews).

(A. G. Favret) (CONFIDENTIAL)

Most of this period was devoted to the preparation of a memo describing the results of operation of the height-finder section of the Cape Cod System from March through June 1954.

The program specifications for the AA programs in the 1954 Cape Cod System were prepared in conjunction with J. Cahill and distributed.

The raid-size test for 9 July 1954 was cancelled because of maintenance difficulties with the AN/TPS-10D radar at S. Truro. The raid-size test for 16 July was carried out as scheduled.

Conferences were held on 8 and 9 July with J. Cahill, D. G. Pamplin, Col. McNamee, and Lt. Col. James R. Dillon from AFF Board No. 4 (Ft. Bliss, Texas). A letter explaining FSQ-7 inputs and outputs was prepared for transmittal to Lt. Col. Dillon.

(C. Grandy) (CONFIDENTIAL)

Much progress has been made in the planning of the 1954 System height finding, and specifications are nearly completed. One major revision in the operational specifications was made to place the function of altitude estimation in the TWS programs. Programming specifications for the remainder of the height program will be issued during the week of 26 July.

Preliminary operational specifications for the WD checkout simulation program have been considered with C. Zraket and H. Benington. Considerable additional work remains to be done for this program.

The first successful raid-size test of the second series (see M-2869, "Raid-Size Assessment Tests") was conducted on 16 July. Four B-29's were in formation for a part of the test, three during the remainder.

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(C. Grandy) (CONFIDENTIAL) (Continued)

B-25's and F-89's, the latter in formations of two, were used as diversion flights. A number of difficulties with the test technique were discovered and are being corrected. Results of the operation were affected by these difficulties; however, much useful data was taken. The data tends to conform to that obtained during the earlier series of tests. Aspect, the view presented by the target to the radar, seems to be a most important variable. The data indicates that the TPS-10D may be less sensitive than the MPS-4 for raid-size assessment. More data is required to substantiate these results. The test is summarized in detail in an inter-office memo from the author to D. R. Israel and C. Zraket.

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

Specifications for the 1954 Cape Cod System identification program were completed and submitted to H. Benington and C. Zraket. The programming has been begun to carry out these specifications, though as yet it is too early to put very much in tape-preparation form.

The first draft of a memo on the evaluation of the Identification (ID) Section for the second 1953 Cape Cod System evaluation period has been written. It is in the process of being edited by D. R. Israel.

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

Two of the master-control programs for the 1954 Cape Cod System have been written, and the third program will be completed in a few days. The three programs are:

1. Master-Control Timing Subprogram
2. Master-Control Counters and Selective Stop
(Test-Storage Program)
3. Start-Over Program

The checkout of the first two programs will begin during the next biweekly period. An M-note which describes these programs will be issued soon.

An indoctrination program for four new staff members plus two staff members of the Bell Telephone Laboratory is being established. The program will take approximately nine weeks and will include three weeks of lectures by Group 61 staff members on the 1953 and 1954 Cape Cod Systems. In conjunction with the program, M-2899, "Reference Material for Programmers," has been issued.

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1.14 Weapons Direction (Continued)

(L. Murray) (CONFIDENTIAL)

A proposal for Fighter Data Storage in the 1954 Cape Cod System has been written. This is at present being modified to conform to the needs of the programs which will utilize its contents.

The second draft of the results of the saturation tests conducted with the 1953 Cape Cod System has been written.

A trip was made to North Truro to observe the 762nd AC&W Squadron operations for the period 9-11 July.

The results of the AFCRC Collins ground-to-air data-link tests are being rewritten to include the more recent proposals for its operation in the 1954 Cape Cod System.

(J. Nolan) (CONFIDENTIAL)

The last of the final-turn test-data memos has been issued. Work has begun with P. Cioffi in summarizing the results of this test program.

Some time has been spent with L. Murry, W. Lemnios, and C. Zraket in preparing program specifications for the 1954 CCS.

(G. Rawling) (CONFIDENTIAL)

Equipment changes and modifications are being kept up to date in the 5 Cape Cod 1954 notebooks. Records will be transferred to Sue Kanpp and Charles Gaudette, who will become the custodians and furnish liaison to Group 64.

A supplement to M-2854, "Assignment of Light Gun Connections, Intervention and Activate Registers and Digits," is being written. This will incorporate all changes to date in the subject matter.

An intensive investigation and correction project is under way with Alan Chandler to understand, revise, and organize the checkout programs for the 1954 Cape Cod Equipment.

The memorandum M-2897, "Assignment of Indicator Light Registers and Connections to Indicator Light and Audible Alarm Panels," written by Rawling and Bailey, is being typed and will be issued shortly.

(F. A. Webster) (CONFIDENTIAL)

Because of illness, I have been in very little during the past two weeks. However, a brief memo is in preparation, outlining the method

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1.14 Weapons Direction (Continued)

(F. A. Webster (CONFIDENTIAL) (Continued)

used in the drum-coding portion of the interception-display program.

(C. A. Zraket) (CONFIDENTIAL)

Programming specifications for the 1954 Cape Cod System have been completed, and it is expected that detailed programming will commence this biweekly period. A checkout procedure for the over-all program has been formulated by members of the Group.

Memos describing the results of operations of the 1953 Cape Cod System during the period 1 March to 15 June are in preparation.

1.15 Direction Center Operations

(W. Vecchia) (CONFIDENTIAL)

Total Assigned Time	64 hr .
Data Screening	17 hr. 10 min.
Tracking & Control	20 hr. 45 min.
	<hr/>
Total	37 hr. 55 min.
Time Given to Systems	4 hr.
Time Given to Math Group	9 hr. 45 min.
Time Lost to Computer	20 min.
Unassigned Time	12 hr.
	<hr/>
Total	26 hr. 05 min.
Grand Total	37 hr. 55 min.
	26 hr. 05 min.
	<hr/>
	64 hr.

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

(D. R. Israel) (CONFIDENTIAL)

July 10 and 11 were spent in Roslyn, New York, at the Combat Center of the 26th Air Division. Operation of the Combat Center was observed during the ADC exercises on those dates. The trip was quite worthwhile in indicating many of the problems which must be considered at the

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

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

Combat Center in the Transition System.

On Friday, 9 July, a meeting was held with representatives of the 4th Weather Group (Baltimore) to discuss some of the requirements for weather information in the Transition System. The proposal presented in M-2857, "Comments on ADC Requirements for Transition System Displays," (7 June by D. R. Israel), was discussed, and the possibilities of establishing an experimental weather-gathering circuit were considered. The 4th Weather Group will discuss this matter with Air Weather Service in Washington.

During the past few weeks, Group 61 has reviewed and concurred in writing to many of the proposals for XD-1 and the production machines. A proposal for grouping the consoles for power distribution has been revised in accordance with the recent changes in the XD-1 floor plan.

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1.2 Group 64

(S. H. Dodd) (UNCLASSIFIED)

Computer operation has been good during the past biweekly period. The applications group estimates that about 98 per cent of assigned computer time was usable.

An increased amount of time is being spent on development of trouble-shooting techniques and the training of personnel in the use of these techniques. This is being done in anticipation of the transfer of a number of engineers from WWI to Lexington during the next few months. An effective maintenance program should do much to minimize the inconvenience to computer operation caused by the loss of experienced personnel.

Most of the changes scheduled for the terminal equipment in Room 222 and Room 156 have been completed and are now being checked out. Remaining work should be finished in another week except for jobs awaiting equipment or scheduled for a later date.

1.21 WWI System Operation

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

Computer reliability continues to be good.

The "divide control" panel has been modified and work is proceeding on "multiply-shift-control." With the completion of these jobs the arithmetic element should be in close to final form.

Recent measurements on the start and stop times of the magnetic-tape units indicate the need for immediate adjustments to the units. It is likely that one unit will have to be placed in a "spare" capacity in order to facilitate maintenance.

Some thought is being given to revising the power-control system for Room 156. It is desirable to provide independent systems for MITE and the drums and to insure proper shutoff of the drum voltages when power failures occur.

1.21 WWI System Operation (Continued)

(D. A. Morrison) (UNCLASSIFIED)

A modification to the control section of the consolidated test program has been written and tested. This new feature (T3432-14) allows PMC to start over from a line number inserted in FF No. 4 and to repeat marginal checking a line whose number is inserted in FF No. 4. During the testing period, it was discovered that certain of the test programs work through portions of CM storage occupied by T3432-14. The test tapes will have to be modified to avoid this condition.

A memo will be prepared describing the consolidated test program when T3432-19 is added.

Typewriters and Paper Tape

(L. H. Norcott) (UNCLASSIFIED)

Both short-carriage Flexos are now equipped with special translator completion contacts for use with a new printout system for MTC.

Modification of two new long-carriage Flexowriters for Group 61 has been started. These machines should be completed by the end of this month.

CRT Filter System

(S. B. Ginsburg) (UNCLASSIFIED)

Part of the system has been tested with live data and appears to be working satisfactorily. It may, however, be necessary to increase the width of the data-intensification signals to improve the phototube operation.

Test Equipment for IBM CRT System

(S. B. Ginsburg) (UNCLASSIFIED)

The system for generating the SDV signal is nearly completely assembled. The demodulator which is to be used in the system is presently being modified.

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1.22 Terminal Equipment

(A. M. Werlin) (CONFIDENTIAL)

The layout and assembly drawings of the fine-grain- data input equipments have been completed, and construction has been started. It is expected that the first one will be completed early next month. It will be used to receive Mark X data.

The MITE's and associated mapper controls are being checked out with the installation of the new mappers and azimuth-drive units.

Magnetic Drums

(H. L. Ziegler) (UNCLASSIFIED)

Installation of the new test setup is progressing satisfactorily except for procurement of a few items. Chief among these is a satisfactory circuit-selecting switch for the marginal-checking generator.

The d-c power supplies are in place and nearly wired. Wiring of the test panel will begin during the coming week if the panel arrives as scheduled.

Extension of the monitor system to include groups 2 and 3 of the buffer drum is in the planning stage. There are several alternative ways of doing this and, as yet, no final decision as to which is best has been made.

(L. D. Healy) (UNCLASSIFIED)

All new circuits necessary for groups 2 and 3 of the buffer drum have been built and are being installed. No plans have been made for a monitor system for groups 2 and 3.

Data Link

(R. B. Paddock) (UNCLASSIFIED)

Layout and assembly drawings for the shift register and for the parity-insertion register have been completed; all remaining drawings should be finished during the week of 19 July. Wiring of PIUMP's will begin 19 July. Power and marginal-checking line requirements have been initially determined with revisions to be settled next week.

Work has begun on construction of the test-message-generator panel; associated control circuitry, checking systems, and alarm circuits are presently under discussion.

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1.22 Terminal Equipment (Continued)

Mappers

(N. N. Alperin) (CONFIDENTIAL)

Two long-range radar mappers, three gap-filler mappers, and the monitor scope have been installed in Room 228. The three gap-filler scopes have been checked out and final adjustments made. The two long-range scopes cannot be adjusted until data is available from the radar sites. Until the monitor-selection relay panel is delivered, in about two weeks, the monitor scope cannot be completely checked out.

Raydist

(N. N. Alperin) (CONFIDENTIAL)

I am now working with H. Kirshner on a system for handling Raydist data.

Azimuth-Drive Units

(A. V. Shortell) (UNCLASSIFIED)

Serial No's. 1 thru 6 have been installed in rack K14, Room 156. Operation of No's. 3, 4, and 5 has been checked with the scopes for gap fillers 1, 2, and 5 respectively. Because of unavailability of long-range data, operational checkout of 1 and 2 has not been possible.

Cape Cod Control Room

(F. E. Irish) (CONFIDENTIAL)

The Cape Cod Control Room has been modified to fit the requirements of the 1954 System except for the installation of audible-alarm panels.

The following parts of the system have been checked out at all the remote stations: display selections on the 16-inch oscilloscopes; and the intervention register inputs. The remainder of the system will be checked out during the following week.

The new system requires 36 audible-alarm panels. Fifteen of these will be installed by 1 August. The remaining 21 will be installed by 1 September.

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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 2-15 July 1954:

Number of assigned hours	131
Usable percentage of assigned time	98
Usable percentage of assigned time since March 1951	87
Usable percentage of assigned time since September 1953	92
Number of transient errors	2
Number of steady-state errors	3
Number of intermittent errors	0

Component Failures in WWI

(L. O. Leighton) (UNCLASSIFIED)

The following failures of electrical components have been reported since 2 July 1954:

<u>Components</u>	<u>No. of Failures</u>	<u>Hours of Operation</u>	<u>Reasons for Failure</u>
<u>Transformer</u>			
Pulse 193-7 3:1	1	2000 - 3000	Open filament
<u>Tubes</u>			
5963	1	1000 - 2000	Low I_b
	1	2000 - 3000	Short
	2	3000 - 4000	2 low I_b
	2	5000 - 6000	2 low I_b
	8	7000 - 8000	8 low I_b
	2	8000 - 9000	2 low I_b
	1	9000 - 10000	Low I_b
	2	12000 - 13000	Low I_b
5998	1	4000 - 5000	Low I_b
	1	7000 - 8000	Short
5965	1	7000 - 8000	Leakage
715C	7	no hours kept	6 low I_b ; 1 gone to air

1.23 Records of Operation (Continued)

Component Failures in WWI

(L. O. Leighton) (UNCLASSIFIED) (Continued)

<u>Components</u>	<u>Number of Failures</u>	<u>Hours of Operation</u>	<u>Reasons for Failure</u>
<u>Tubes</u>			
12 AU7	1	2000 - 3000	Short
6145	1	1000 - 2000	Unbalance
	1	2000 - 3000	Leakage
	3	6000 - 7000	2 short; 1 leakage
7AD7	1	8000 - 9000	Short
	1	11000 - 12000	Short
1407	1	6000 - 7000	Unbalance
	4	7000 - 8000	1 leakage; 1 accidental damage; 2 high cut-off
7AK7	1	3000 - 4000	Short
	2	7000 - 8000	1 short; 1 leakage
OD3	1	2000 - 3000	High starting voltage
5881	1	2000 - 3000	Open filament
6AU6	1	1000 - 2000	Short
	1	2000 - 3000	Broken envelope
	1	5000 - 6000	Leakage
6136	4	0 - 1000	Broken envelope; loose pin; gone to air; short
	1	2000 - 3000	Gassy
2D21	1	2000 - 3000	High tube drop
	1	4000 - 5000	High firing point
6BL7	1	6000 - 7000	Leakage
	2	7000 - 8000	2 short

1.25 AN/FSQ-7Duplex Central

(B. E. Morriss) (CONFIDENTIAL)

A time schedule for concurrence on specifications for the first two AN/FSQ-7's has been prepared. The schedule calls for preparation and concurrence on all specifications by the end of September. To date specifications have been prepared for the following:

Memory Element
Program Element
Arithmetic Element
Magnetic-Tape Element
Instruction Control
Card Machines, Maintenance
Card Machines, Input
Keyboard Inputs
Power Supplies, M-G Sets, PCD Frames, Preliminary
MCD Frames, Preliminary
Selection and IO Control
Programmers' Manual

Duplex Planning

(H. K. Rising) (CONFIDENTIAL)

It appears that a certain amount of electronic redesign of radar-data drum and manual-input frame circuits will be necessary in order to meet the requirements of Group 61 for the duplex central. The addition of a third category bit for radar data requires either a reduction in the number of radar-data fields from 9 to 8 or a reduction in XY word length from 11 to 10 bits. Likewise the extra category bit requires a compression of word length entering the manual-input system either by removing some of the redundancy in the console address code (extra electronics) or by again reducing the XY word length from 11 to 10 bits. A further change which will be required in the manual-input frame is facilities for additional direct-entry card machines. While it is desired that eight machines be made available for duplex, it is doubtful whether more than five can be accommodated without the addition of another module in the MI frame. A meeting has been set up between members of the duplex planning groups at MIT and IBM, and members of Group 61 to try to reach a solution to these problems which will be satisfactory from an operations standpoint and at the same time require a minimum of redesign.

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1.25 AN/FSQ-7 (Continued)

AN/FSQ-7 Schedules

(T. R. Parkins) (UNCLASSIFIED)

During this period, posted XD-1 schedules and the Project High Progress Report for June were distributed to persons concerned.

Schedules now being revised are XD-1 Installation, Digital-Data Receivers and Transmitters.

1.3 Group 651.31 Activities of Group 65

(P. Youtz) (UNCLASSIFIED)

Representatives of IBM High Street and Vestal Labs, Convair, and MIT met in Cambridge for a three-day conference on problems associated with the Charactron. The electron optics of the Charactron were thoroughly discussed, and a program for further development was formulated. Convair and MIT will continue work on this problem. Forty-five new 19-inch Charactron bulbs were received from Corning. These bulbs show a slight strain pattern around the anode button because of the thermal mismatch between the button and the glass in the funnel. Also the necks were poorly sealed to the funnels. These were experimental bulbs hurriedly produced before Corning's vacation period. Corning assured us these faults would be corrected in their production runs. Helical-dag coatings were put on these new bulbs successfully. Three tubes were processed to evaluate the post-accelerator configuration. Three bulbs with helical-dag coatings were shipped to Convair so that they can start their program.

Test specifications, test procedures, and data sheets for the 19-inch Charactron were reviewed and discussed. Convair has proposed building a packaged piece of Charactron test equipment for IBM to use for inspection, receiving, and as a maintenance tool.

The next meetings with Convair are scheduled in San Diego on 16, 17, and 18 August. Three preproduction models of the Charactron are scheduled to be ready for delivery on 15 August. These tubes will be tested and evaluated before shipment. Also test specifications, procedures, and data sheets will be reviewed again.

Three Typotron tubes were received from Hughes Aircraft. Work continued on the life tests and the evaluation program. Hughes has not yet incorporated any of the changes in the electron-optical system proposed 23 and 24 June. They agreed to send data on an alternative design by 21 July. If this data is not satisfactory, a higher priority must be assigned to formulating the optimum optical system for the Typotron. Recent checks on the leakage currents in the Typotron indicate that the handling and processing of the tube could be more carefully controlled. They have moved into their new production facilities recently. The next meeting is scheduled for 19 and 20 August at Culver City, California.

Trips have been made to Sylvania, Emporium; RCA, Lancaster; and DuMont, Passaic, in behalf of the commercial-tube improvement program. Investigations indicate the recent difficulties facing Sylvania in producing tubes of the 7AK7 family have been the development of a shift in contact potential on the suppressor grid instead of cathode poisoning. These tubes can be used as interim tubes until this problem is solved.

A trip is scheduled next week to Owensboro to discuss production of Z-2177 with General Electric.

1.31 Activities of Group 65 (Continued)

(P. Youtz) (UNCLASSIFIED) (Continued)

The tube-production facilities at Barta will be shut down this next period during the vacation period of the tube construction section.

1.33 Research and Development

(P. C. Tandy) (UNCLASSIFIED)

The d-c cathode current apparently changes very little with life test. This is not true of pulse-beam current, however. Three tubes, Cht-36, Cht-37 (both helical-dag tubes), and Cht-41, a double-band tube, were life tested. Cht-41 showed a 40-per-cent drop in pulse-beam current at zero bias as life progressed from 125 to 317 hours. After 357 hours of life the cathode image showed 70 per cent of the area with poor emission. In the last 163 hours the grid drive for 1-ma cathode current increased 4 per cent while the poor-emission area of the cathode increased from 30 per cent to 70 per cent.

After 165 hours on life test, Cht-36 had a zero-bias pulse current of 195 microamperes, while the d-c cathode current did not change appreciably. During this period the grid drive for 1-ma cathode current increased 4 per cent, and 5 per cent of the cathode area developed poor emission.

After 357 hours on life, Cht-37 showed a 10-per-cent drop in d-c cathode current in the last 214 hours. In this 214-hour period the pulse-beam current at zero bias dropped from 116 to 42 microamperes for a change of 64 per cent, while the grid drive for 1-ma cathode current increased 4.3 per cent. The poor-emission area of the cathode increased from 50 per cent to 90 per cent.

The life-test data so far indicates that the expected useful life on these tubes is not long enough. It should be noted, however, that all the above life tests were made on a d-c basis with a cathode current of 1 microampere. This extreme condition is designed to give an indication of tube life in a short period of time. In the final analysis, life-test conditions similar to operating conditions should be used on a few tubes to establish correlation.

(H. B. Frost) (UNCLASSIFIED)

Except for several staff conferences, my time during the past two weeks has been spent exclusively on writing my thesis.

1.33 Research and Development (Continued)

(L. B. Martin) (UNCLASSIFIED)

Leakage tests have been made on all Typotron tubes in Barta. A memorandum on these tests is in preparation. In addition to the tests on the Typotrons, leakage tests will be made on the experimental helical-dag tubes for comparative purposes. For further comparison the leakage tests on several randomly selected MIT storage tubes will be included in the memorandum. The storage-tube data will either be taken from storage-tube notebooks or from tests made on the tubes in storage.

While making leakage tests, a strain crack was noticed in the rim of Typotron No. 366. After photographs are taken of the crack, the tube will be returned to life test. The tube is not down to air.

Work is progressing on life-test expansion. The following revision in display plans has been made by C. L. Corderman: since the new Typotrons will have compensation plates, compensation will not be required in the deflection line-drivers. This means that the tubes with no compensation plates will be tested to failure without the character-cycling feature. The new mounts are being designed to take only the new type tubes and the old mounts modified as the old tubes fail.

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

<u>Tube No.</u>	<u>Hours</u>
265	3042.6
280	2224.6
335	1407.6
366	681.8
390	705.8
392	705.8
389	681.8

(S. Twicken) (UNCLASSIFIED)

A trip was made to Sylvania with P. Youtz and A. Zacharias in regard to the low d-c plate currents of the SR-1782A. Sylvania agreed with our findings that the suppressor-grid contact potential and not poisoned cathodes was responsible for the low d-c currents; provisions were made to replace the d-c plate-current test with a pulse-current test in the interim tube only. The final tube will still have to meet both tests.

A trip was made to RCA, Lancaster, Pa., with T. F. Clough and P. Tandy to discuss the Charactron from the point of view of RCA possibly becoming a second source. The 6161 and 6146 were also discussed with a

1.33 Research and Development (Continued)

(S. Twicken) (UNCLASSIFIED) (Continued)

view toward completion of the purchase specs.

At the invitation of RCA, I spent a day at their Harrison, N. J., plant discussing our intermittents detector, a copy of which they are now building, and inspecting plant facilities.

Several days were spent attending meetings held here at the Laboratory with Convair on the Charactron.

(A. Zacharias) (UNCLASSIFIED)

The report on the 7AK7 research was completed and is presently being typed.

The investigation of the problem Sylvania has been having with the 2420 and SR-1782A resulted in finding the shift of contact potential on G_3 responsible for the I_b decrease on aging. The cathodes of five tubes from the current SR-1782A production were thoroughly investigated. No evidence of cathode deterioration was found in any of the five tubes. When five SR-1782A's of the K3P lot were run on life for 100 hours, the same shift of contact potential on G_3 was found, along with a 10-ma decrease in I_b at d-c conditions. The zero-hour currents could be regained by raising E_{c3} about 2 volts, the magnitude of the contact-potential shift. Hence, Sylvania has apparently been having their trouble since December 1953. The evidence we had was presented at Emporium on 7 July 1954. We obtained some eighty SR-1782A's of current production for testing at MIT.

SECTION II - AN/FSQ-7

2.1 Group 622.12 Magnetic-Core MemoriesMiscellany

(W. N. Papian) (UNCLASSIFIED)

The move to Lexington was accomplished about as planned; we are gradually returning to normal operation. The main memory lab and most of its personnel are established in B-170, others are in B-147, and my office is temporarily in B-157.

Although construction of the 128 x 128 plane is completed, its testing on a "rastering" setup may be postponed for a number of weeks because of the heavy pressure on Test Setup VI (mostly the routine testing of IBM planes for XD-1,2). Some data, such as the "impedances" of the digit and sense windings, will be taken during the next week or two. The information is needed to help estimate the problems to be expected in any effort to develop a really large memory, such as a 256 x 256 (65,536 registers).

Memory plane No. 7 of the MTC stack (MTC Digit 6) was replaced by memory plane No. 15. No. 7 had had poor strobe-time margins. The stack will be reinstalled in MTC in a week or two.

IBM Trip

(W. J. Canty) (UNCLASSIFIED)

The IBM magnetic-core-memory array tester is now back in operation with 36 planes installed. Testing of these planes is due to begin immediately with hopes of completion during the latter part of August.

Test Setup VI

(E. A. Guditz) (UNCLASSIFIED)

Good progress is being made in reassembling Memory Test Setup VI. The logic of the tester is being rearranged and somewhat simplified in order to speed up the testing of XD-1 memory planes. Next week an outside contractor will install metal hoods over the racks to draw off the hot air into the building exhaust system. Also, the air conditioner for the memory will be installed in the hallway ceiling with the cool-air duct running through the wall into the memory stall. It is hoped that the tester will be running again by the end of next week.

2.12 Magnetic-Core Memories (Continued)

Construction

(E. A. Guditz) (UNCLASSIFIED)

The 128 x 128 experimental memory plane has been completed.

A miniaturized version of the MTC memory-plane lug has been designed. Samples of this lug have been made by CTC and are now being evaluated.

New Techniques

(J. Raffel) (UNCLASSIFIED)

The XD-1 system is being studied with a view towards establishing the feasibility of applying new techniques and components to this type of job.

64-Position Core Switch

(A. Hughes, G. Davidson) (UNCLASSIFIED)

The set-reset driver for the switch is now working into a load simulating the 64-position switch. The switch itself will be ready for testing with the set-reset driver during the week of 19 July.

A semidynamic test of the switch driving one memory plane, with a dummy load for the other memory planes, will probably be in operation during the next two weeks.

One bias-driver panel is being constructed by the shop; upon completion and successful testing, five others will be built.

3:2 Selection

(R. S. DiNolfo) (UNCLASSIFIED)

The experimentation with the 8 x 8 x 8 x 8 memory "plane" has been completed, and the data is now being analyzed. This analysis will form part of a Master's Thesis which includes a discussion of the theory of selection and sensing and will be published in August.

2.13 Vacuum-Tube Circuits

Power Cathode Followers

(R. L. Best) (UNCLASSIFIED)

We now have fairly complete specifications on nine PCF's that are needed in the display system. The basic circuits group at IBM is developing the circuits, several of which have been completed. We are reviewing the applications to be sure that the specs conform to them.

Constant Current Source

(H. J. Platt) (UNCLASSIFIED)

The current requirements for the convergence coils for Typotron and Charactron have been narrowed to 32-42 milliamperes. This allows the 7AK7 to be used without danger of overdissipation or overvoltage on any of the electrodes.

At present, work is being carried out to see how good a regulator can be built using only four tube sockets. It is felt that we might have to accept a current regulation somewhat worse than 0.1 per cent for a 5 per cent voltage-supply variation.

Phone-Line Demodulator

(E. B. Glover) (UNCLASSIFIED)

The instability from one timing pulse to the next, mentioned in the last Biweekly, has been thoroughly investigated and found to be within allowable limits. The pulse shape, which has been too wide, has been corrected to be within limits for both amplitude and width. The margins on the blocking oscillator have been tentatively checked since the changes and so far look satisfactory.

A redesign of the inhibitor circuit has been installed and is at present working properly.

Present efforts are toward getting final data on all margins.

Magnetic-Core Memory

(D. Shansky) (UNCLASSIFIED)

M-2904, "Proposed Changes in FSQ-7 Memory," has been issued.

2.13 Vacuum-Tube Circuits (Continued)

Matrix Output Amplifier

(D. Shansky) (UNCLASSIFIED)

This circuit has been breadboarded and is being tested.

Model C Flip-Flops

(E. Anfenger) (UNCLASSIFIED)

Data for triggering Model C flip-flops from another flip-flop has been taken. In addition, new data is presently being taken.

D-C Probe

(E. Anfenger) (UNCLASSIFIED)

A probe required by J. O'Brien has been completed and is awaiting his approval.

2.14 Memory Test Computer

General

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

The half-dozen channels of effort which have gone into reconstructing MTC (A-frame and console, control, regulated power supplies, terminal equipment, air cooling, and building utilities) are about to converge, with a felicitous approximation to synchronism (i.e., delays in all six channels have been well balanced).

On the A-frame, power from a portable supply has been applied panel by panel to about three-quarters of the frame, checking power wiring and internal signal connections. This will be completed early in the week of 19 July, and enough power will be available to energize entire 6-foot frames at once, thus checking interrelated panels like the accumulator. When this phase is finished, it is anticipated that control will be sufficiently checked out to begin testing the machine as a whole, instruction by instruction.

Auxiliary wiring to the console, such as marginal checking, indicator lights, and pushbuttons, is well under way and should be substantially done during the week of 19 July. Sheet-metal work to cover the top of console cabinets has been completed by the shop and sent out for painting.

2.14 Memory Test Computer (Continued)

(W. Ogden, W. Hosier, J. Crane) (UNCLASSIFIED) (Continued)

Video cabling of control is complete and checked except for about 24 CPO cables which have to be cut to proper length. Control marginal-checking lines and d-c power lines are all installed, and filament power wiring is expected to be finished 17 July. This means that power can be applied beginning 19 July and CPO pulse timing checked with test scopes.

Wiring of the regulated power supplies being complete except for missing a-c circuit breakers, temporary a-c connections are being rigged and tubes installed so that these units, too, will be turned on next week for testing.

New panels for control of photoelectric tape reader and Flexo-writer output are due from the shop, so that installation of this equipment will begin next week.

Plumbing and controls for the air-cooling equipment have made a good beginning; duct work being previously in, the completion of the system should go forward rapidly when the computer-room air-handling unit is delivered next week.

Lighting and utility power wiring are installed in the basement power-supply area and will be complete in the computer room in another week.

2.16 Display

(C. L. Corderman) (CONFIDENTIAL)

The final display specifications have been typed and checked completely and will be issued on 22 July.

Discussions were held at MIT on 12, 13, and 14 July with IBM and Convair personnel concerning the final Charactron optics and test specifications. A tube of the proposed final design will be set up for observation at Convair during the week of 16 August.

Measurements have been taken on 3 post-accelerator configurations in the final 19" - 43° envelope. It appears that a helical accelerator covering only the cylindrical portion of the envelope is best suited to our needs.

Evaluation of various phases of Typotron operation is continuing in an effort to finalize the design of that tube.

UNCLASSIFIED

2.16 Display (Continued)

(R. Fallows) (CONFIDENTIAL)

Some 25 new card assemblies and five new card details have been submitted to IBM for release. These cards, together with those already released by IBM, will permit IBM to initiate procurement of cards and components for some 150 pluggable units. The pluggable-unit designs of the ten types using these cards will be submitted for release in the next period.

Back-panel-wiring design has been started for the DD generator. Block diagrams for this frame are also in process.

Most of the components and materials which will be needed for experimental pluggable units have been ordered from IBM. The operating procedures within Lincoln Lab for etching cards and making pluggable units have been squared away.

The manpower of the Display Section is being augmented by "rented" engineers. We hope to add three or four in the next few weeks. These engineers will replace people who are being drafted or transferred and may allow an increase in our activity for the next few months.

At present the design of the central display frames is four to six weeks behind schedule. There is some question as to whether this target schedule is still compatible with IBM's production plans.

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

A line driver for XD-1 decoders had previously been designed and built. This line driver consisted of two identical plug-in units each containing seven 6146 tubes as the output stage plus a third plug-in unit which operated as a preamplifier for the output stage. All three units were tied together into a single feedback amplifier. This unit operated quite satisfactorily, but serious objections were raised to a new -450-v power supply required by the preamplifier. A second preamplifier has been designed which does not require the -450-v supply. This amplifier consists essentially of two parts--one to amplify the difference signal being fed into the amplifier from a decoder and a second part to regulate the mean output level. The difference amplifier is operating very well, but the mean-level regulator is too slow to be satisfactory. Present effort is being exerted to speed up this regulator section. Some difficulty has been experienced with the plate caps on the 6146 tubes. Out of 28 tubes used, the plate caps on five have pulled off in the normal course of trying various tubes in the output stage. We would be interested in knowing if anyone else has experienced this difficulty.

Some layout work has been done for a character-positioning decoder for Charactron. Bob Gerhardt has drawn up a logical block diagram

~~CONFIDENTIAL~~

2.16 Display (Continued)

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

for this and has also laid out a preliminary sketch for one of the plug-in units. The entire decoder will consist of five plug-in units and will supply not only the actual character-positioning voltages but also the character-compensation voltages. Of these five units, two identical units will contain the decoder ladders, the necessary switch tubes, and part of the logical circuitry; two more identical units will contain flip-flops, gate tubes, and logical circuitry (laid out by Gerhardt); and one unit will contain the necessary constant current sources for driving the decoder switch tubes plus some logical circuitry. The layout of the fifth unit is being held up until a decision is made on a method for mounting control pots for the constant current sources.

Work is still progressing on the several MTC panels which will be necessary for the new Charactron and Typotron displays. The vector-generator-panel drawings have been completed and checked. Corrections are now being made, and the finished drawings should be available to the shop early in the week of 19 July. Drawings are practically completed on a panel which contains the character-selection decoders and three line drivers. These should also be ready for the shop next week. A third panel containing the character-positioning decoder and its associated circuitry has been started and will be built in this lab by Ernie DiMarzio because of a lack of time to put the drawings through drafting.

(M. Epstein) (CONFIDENTIAL)

There has been some progress in drawing block schematics and wiring charts for the DD system. In the past biweekly period about 15 per cent of the block schematics, intra-coax wiring charts, and yellow wiring charts were drawn in preliminary form. It is hoped that in the next bi-weekly period conventions for these drawings will be finalized and all block schematics and some more wiring charts will be done.

Situation-Display Frame

(R. Callahan, B. Gurley) (CONFIDENTIAL)

The final design of the situation-display frame layout is now in progress. A recent telephone conversation with G. Waite of IBM confirmed the fact that allowable heat description in a module can be as high as 4 kilowatts. This relatively high figure allows us quite a bit of flexibility in laying out the SD frame.

2.16 Display (Continued)

Capacitor Diode Gates

(R. Callahan, B. Gurley) (CONFIDENTIAL)

Some redesign of the capacitor diode gates used in reading off the drum bus is necessary. The switching speed of these gates has to be increased slightly without overdissipating the power-cathode-follower drivers.

Exact testing of the pluggable units using capacitor diode gates is difficult because of the unavailability of type Z diodes.

Pluggable Units

(R. Callahan, B. Gurley) (CONFIDENTIAL)

Eight pluggable unit types have preliminary design completed. Three of these are under construction, and the others are waiting the completion of etched-card assemblies before being put into the shop. The construction of etched boards has run into some difficulty in maintaining high resistance between etched wires. Floyd Manning believes this will be cleared up shortly.

The design release of these PU's will be started as soon as the PU block schematics are complete.

A large order (request) for parts was sent to IBM. This request covers our anticipated needs for special parts to complete all PU types.

Timing and Control

(R. H. Gerhardt) (CONFIDENTIAL)

The logic of this section of the situation-display-generator element has been reviewed and modified slightly. The section has been broken down to pluggable units.

Some time was spent packaging a part of the character-positioning circuits.

2.2 Group 63 (Magnetic Materials)

2.21 Magnetic Cores

(D. R. Brown) (UNCLASSIFIED)

A draft of a new ferrite-memory-core specification has been prepared as a joint IBM-MIT effort and discussed with General Ceramics. This new specification makes 100-per-cent testing possible with only a single pulse sequence, instead of with three different current-pulse setups. The new specification will not go into effect until approximately 1 September.

General Ceramics is still the only source of memory cores in production quantities. IBM is expected to become a second source within the next few months. RCA and Ferroxcube are regarded as possible thirds.

The Group 63 Chemistry and Ceramics Laboratories have been out of operation because of the move. The Ceramics Laboratory is expected to resume operation during the next biweekly period.

Several single crystals (Linde) of ferrite have been cut for study of domain-wall motion and the switching mechanism. These crystals must be polished and etched before attempts to see the domain walls can be successful.

Preliminary measurements on a few silicon-junction transistors indicate that the alpha is less than advertised.

Memory-Core Test Specifications

(D. R. Brown, J. R. Freeman) (UNCLASSIFIED)

W. Wittenberg and R. West of IBM and D. Brown and R. Freeman of Group 63 met with General Ceramics engineers in Keasbey, N. J., on 8 July to explain the details of the newly proposed memory-core specifications. General Ceramics have tentatively accepted the proposed tests and will initially monitor the core production quality control with both present and new tests for comparison purposes. It is assumed that no difficulty in production control based on the new tests will occur.

Experimental Program

(J. B. Goodenough) (UNCLASSIFIED)

An outline of some of the specific experiments which are currently under way or are planned by Group 63 for the next six-month period has been made. Its purpose is to serve as a schedule both for the physics section, which will be making most of the measurements, and for the chemistry section, which will be preparing the many special samples.

2.2 Group 63 (Continued)2.21 Magnetic Cores (Continued)Magnetic Domains in Polycrystalline Metals

(P. K. Baltzer, J. B. Goodenough) (UNCLASSIFIED)

The preparation for the experimental investigation of the nucleation phenomena in polycrystalline metals is nearing completion. It is planned to study the magnetic-domain structures in samples of 3 per cent silicon iron and 68 Permalloy as functions of externally applied stress and magnetic field.

The apparatus for applying the stress, designed by L. Smith, is completed. The magnetic yoke for applying the magnetic field has been machined, tested magnetically, and reannealed. The yoke will be completed after a final magnetic test. The micrometer stage for the microscope, designed by L. Smith, is nearing completion in the shop.

Seven samples have been mounted and polished. Some of these have been given an electrolytic etch. Further sample preparation has been temporarily hindered by the move of the Chemistry Laboratory to Lexington.

Resistance Measurements

(N. Menyuk) (UNCLASSIFIED)

The discrepancies encountered in making resistance measurements of ferrite samples using a two-probe system were discussed in the previous Biweekly Report. As a result, a sample housing unit has been designed for four-probe resistance measurements at low temperatures. An additional unit is being designed for use at temperatures up to 1200 C.

(J. D. Childress) (UNCLASSIFIED)

Some of the materials which are to be investigated do not seem to follow Ohm's law. Therefore, it is desirable to use a measuring instrument which can make sufficiently accurate measurements with a small voltage across the sample or with either a constant current or voltage for a wide resistance range. Also, it may be necessary to minimize contact and "end" effects in the sample by using a four-terminal method.

Single-Crystal Picture-Frame Experiments

(J. B. Goodenough, D. A. Buck) (UNCLASSIFIED)

Three new single-crystal slices were cut by the Raytheon cutter. Three different grit sizes were used to determine the optimum size for both cutting and polishing. One sample was broken, and two were successfully cut. A special polishing jig for these crystals, designed by L. Smith, was sent back to the shop for closer machining of a rotating shaft. This should be ready in another week.

2.2 Group 63 (Continued)2.21 Magnetic Cores (Continued)Hysteresis-Loop Tracer

(R. A. Pacl) (UNCLASSIFIED)

Work on the d-c hysteresigraph has been temporarily curtailed until we can obtain the modified induction galvanometer used in the amplifier. On a recent trip to Weston (14 July) F. W. Sarles and I discussed the salient problems with R. W. Gilbert, the designer, who suggested the modification. Apparently, most of the trouble arises in the galvanometer.

(F. W. Sarles) (UNCLASSIFIED)

A trip was made with R. Pacl to Weston to consult with R. W. Gilbert on problems which have been encountered in the operation of the d-c hysteresigraph.

A relay-type voltage calibrator has been designed and is being constructed for use with the high-current switching-coefficient apparatus. This is a unit which supplies exponential pulses (approximately 200- μ sec time constant) of known initial amplitude having an accuracy of 1 percent or better when properly calibrated. Maximum output amplitude (as designed) is 200 volts.

An auxiliary power supply to facilitate operation of the high-current switching-coefficient apparatus has been designed and is being constructed.

2.22 Transistors

(D. J. Eckl) (UNCLASSIFIED)

Discussions have been held with Raytheon and Sylvania with regard to transistor procurement. A visit was made to Raytheon with several other people from Lincoln. Most of their work has been concentrated on pnp junction transistors in the low RF and audio frequency ranges. A visit to Sylvania at Ipswich is forthcoming. Sylvania has experimental field effect transistors which may be capable of high power handling at high frequencies.

Thesis

(S. Oken) (UNCLASSIFIED)

A final draft of my thesis on "Transistor Magnetic Core Drivers" is all that is left to be completed.

2.2 Group 63 (Continued)

2.22 Transistors (Continued)

High-Speed-Carry Gate

(S. Oken) (UNCLASSIFIED)

An M-note on the high-speed-carry gate employing transistors, vacuum tubes, and magnetic cores has been written. It should be out in several weeks.

Transistor Gates

(C. T. Kirk) (UNCLASSIFIED)

During the past biweekly period more data on the experimental gates were collected, and work was begun on writing the thesis.

SECTION III - CENTRAL SERVICES

3.1 Material Requirements & Stock

(H. B. Morley) (UNCLASSIFIED)

Some time has been spent in adapting our operating methods to standard Laboratory procedures and solving the many problems that have arisen. All Division 6 requisitions are processed by this department, although the actual orders are now placed by Division 1 Purchasing.

Division 6 Components Section has initiated a system of coding orders so that incoming material will receive adequate inspection. This department is co-operating by assigning proper code numbers to requisitions and making correct distribution of incoming components.

We are currently assisting the Property Office in preparation of lists of 6345 equipment to be transferred to Lincoln Laboratory or otherwise disposed of.

Requests for trucking and transportation should be referred to the proper Lincoln department, as we no longer have a pickup truck.

We are assisting Division 1 Stationery Stores with information to enable them to stock office supplies formerly furnished by Division 6 Stock Room. A physical inventory of Division 6 standard components has been completed with the exception of hardware. It has been decided that the Barta Stock Room will carry a representative stock of standard components in small quantities and will call on Division 6 base stock for any large requirements.

We are beginning to catch up with the backlog of clerical work occasioned by the reduction of our clerical staff.

3.2 Construction

Production Control

(F. F. Manning) (UNCLASSIFIED)

There have been 14 Construction Requisitions totaling 150 items satisfied since 2 July 1954, and there are 28 Construction Requisitions totaling 1415 items under construction by the Group 60 Electronic Shops.

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

2.2 Construction (Continued)

Outside Vendor

(J. V. Mazza) (UNCLASSIFIED)

Deliveries of 20 units in the past biweekly period have satisfied our outstanding orders with outside vendors.

3.3 Components & Standards

3.31 Component Studies

(B. B. Paine) (UNCLASSIFIED)

Almost all life tests which were moved from Whitemore have now been restarted at Lexington. Lab-power shutdowns and dial-twiddling by off-hours visitors have impeded progress, but solutions to these problems are at hand.

J. J. Busgang, who has long been affiliated with Division 4, is now also working with the Components Section as a consultant on statistical analysis of component-failure data.

(R. J. Biagiotti, R. A. Cesari) (UNCLASSIFIED)

The program of recording component-failure data on IBM cards has met with approval from WWI, MTC, and Group 22 personnel. A uniform component-failure report form has been completed and has been distributed to the equipment-operating groups for comment. MTC has already accepted the form and will use it when operations are resumed.

An analysis of the diode-failure data which was previously recorded on the IBM cards shows that very useful information can be gleaned from this system. However, because these cards represent failures that occurred prior to the institution of adequate procedures for the gathering of data and analysis of failures, the information on the cards is not considered reliable enough to justify the drawing of firm conclusions.

The recording of resistor failures on IBM cards is in progress.

In co-operation with MTC an investigation is being made into the possibility of using IBM cards to record panel history. The cards would serve as indices to written data and would record component changes and hours in service for the various panels.

3.6 Administration and Personnel

New Staff

(J. C. Proctor) (UNCLASSIFIED)

Eleanor McEvoy is working as a DDL Staff Member in Group 61. She received her BA from Skidmore in June of this year.

Torben Meisling is working as a DDL Staff Member in Group 62. Until recently he was an Assistant Professor at the University of California.

Staff Termination

(J. C. Proctor) (UNCLASSIFIED)

Robert Pfaff

New Non-Staff

(R. A. Osborne) (UNCLASSIFIED)

John Ackley, an MIT student, has returned to Lincoln to work for Group 64.

Richard Gloor is an MIT graduate student, who will work for Group 63.

Mary Paradiso is a temporary clerk working in the Materials Requirement Office.

Terminated Non-Staff

(R. A. Osborne) (UNCLASSIFIED)

Thomas Kee
Robert Martin

Transferred Non-Staff

(R. A. Osborne) (UNCLASSIFIED)

Russell Kraynick has been transferred to Division 1, Group 12. James Mahoney has been transferred to Project 6595.

Open Non-Staff Requisitions

(R. A. Osborne) (UNCLASSIFIED)

1 Electrical Detailer
2 Secretaries for Group 62
1 Secretary for Group 60