Division 6 - Lincoln Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

SUBJECT: BIWEEKLY REPORT FOR FEBRUARY 26, 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)

A large part of the Group's effort this biweekly period has been spent studying proposals for the 1954 Cape Cod System. The goals are improvement in System operation and evaluation and provision for testing ideas and procedures for the XD-1 installation.

In connection with XD-1 activities, floor plans are being prepared, preliminary estimates of switch requirements have been made, and tentative specifications for the tactical telephone system have been written.

The problems of simulation and of making measurements during live interceptions have been discussed in joint Bell Telephone Laboratories-Project Lincoln meetings.

Flight tests this biweekly period included five simultaneous intercepts, the use of the automatic ground-to-air data link, interceptions involving AI radar (APG-33) contact, and the successful calibration of the South Truro radar. Interceptors may now be scrambled and returned to base at South Weymouth.

1.11 Equipment Engineering

(N. Alperin) (CONFIDENTIAL)

I am presently planning the modifications for the Raytheon Pathfinder scopes to be used as radar mappers.

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

The IBM sweep circuit has been tested and modified for use with a Raytheon deflection coil.

The experimental scan-synchronizer design is being changed by the addition of feedback around the free-running multivibrator to stabilize its operation.

Intermittent failure of the Truro mapper (Y31), caused by varying scope intensity, has been tentatively traced to high-voltage breakdown of one of the resistors in the high-voltage power supply. This resistor will be replaced on 1 March. Meanwhile, the monitor scope Y30 is connected as the Truro mapper.

(G. Young) (CONFIDENTIAL)

Engineering Note E-466, "The Operation of the In-Out Element," has been revised and should be issued during the next biweekly period. This note describes the basic logic and operation of the in-out element. Although the basic logic is still the same, the details of operation have been changed in the past year.

A memorandum is also being written which describes the present visual-display system.

1.12 Data Screening

(W.S. Attridge, Jr.) (CONFIDENTIAL)

I have been working on a proposal for TWS program and equipment specifications for the 1954 Cape Cod System. The most significant changes proposed are the inclusion of a 16-inch display scope for the Mapping Supervisor, rearrangement of the F and G stations with three 16-inch scopes each, and provision for ten data inputs.

A program for a count of the number of returns in range increments has been run partly for Group 61 benefit and partly for Group 22 benefit. Various radar operating modes were analyzed in this manner. Graphs of the data are being plotted.

1.12 Data Screening (Continued)

(W.S. Attridge) (CONFIDENTIAL)

I have spent a large amount of time discussing various aspects of the XD-1 system.

A system for handling Ampex tape recordings has been set up with C. Zraket and P. Cioffi. We hope that this will relieve the congestion on use of magnetic-tape reels.

(D.L. Bailey) (CONFIDENTIAL)

The correlation program using the buffer drum has been run through some initial tests. It is expected that more extensive testing will be completed during the next period.

(H. Frachtman) (CONFIDENTIAL)

Errors were found in three programs which were checked out during this period. One of them is working satisfactorily, but the other two need further checking.

(J. Ishihara) (CONFIDENTIAL)

Initial testing of the modifications to the Cape Cod Program to incorporate buffer drum has progressed satisfactorily. Full-scale testing will be started next week.

An inventory of tapes and programs of programmers of this section was made and records brought up to date.

(J. Levenson) (CONFIDENTIAL)

The assistance display for initiation on interceptors, described in the last biweekly, operates successfully, although it has not been used by the operating personnel yet.

Plans are being drawn for equipment panels for the TWS stations in the 1954 Cape Cod System.

The analysis program for printing track history on a scan-by-scan basis is ready to be used; difficulties in the recording program have been corrected.

1.12 Data Screening (Continued)

(E.W. Wolf) (CONFIDENTIAL)

Three calibration missions have been flown since the correction of the one-unit errors in the range and azimuth zeros of the S. Truro radar data reported in the Biweekly Report of 29 January. An analysis of the data obtained from these missions shows that the largest minimum error is 0.5 mile in range and 0.2 unit in azimuth. The average minimum error is 0.20 mile in range and 0.07 unit in azimuth. A plot of indicated versus true values of range and azimuth shows no zero or incremental errors in either; it may therefore be assumed that the site is calibrated with an accuracy that is within the experimental errors of our procedures. This includes all associated transmission and conversion equipment.

It is now planned to calibrate the Mark X and the gap-filler radars, using S. Truro as a secondary standard. The program for doing this has been ready for some time. The procedure for this operation is less dependent on weather and equipment than the Truro calibration missions.

(W.M. Wolf) (CONFIDENTIAL)

The input-data-analysis program is composed of two parts. Part I consists of the storage of data from the buffer drum on the magnetic tape. Part II consists of a master control program which controls:

a. Rapid display,
b. Selective display,
c. Data categorization,
d. Pictures of frames or categories,
e. Data analysis.

The programming for Part I is nearing completion.

An exhibition of the prototype IBM mapping unit was attended on 23 February.

1.13 Tracking and Control

(A. Mathiasen) (CONFIDENTIAL)

A program to convert Raydist data to x,y-coordinates has been written in CS. While the input of Raydist data and its conversion to a form suitable for use in programmed arithmetic seems to be working, automatic output is not yet working. This will be discussed with members of the S&EC group.

The simulation section of the analysis program discussed in previous biweeklies is now working.

1.13 Tracking and Control (Continued)

(B. R. Stahl) (CONFIDENTIAL)

The present status of the radar accuracy and calibration programs is as follows:

a. M-33 Tracking Radar - Plots are being made of data from the Cape Cod gap fillers used in the test as well as from the M-33. The photographic data from the M-33 data dials has been converted (after a prodigious amount of human computation by someone in Group 22) to x,y-coordinates with respect to the Belmont site of the M-33. Upon the plot of this track are being superimposed the data from the gap fillers. At this date it is not yet possible to draw any valid conclusions concerning the comparisons, since the index of correlation seems to vary along the entire range from zero to one for the small sample so far plotted.

b. Raydist Tests - A considerable amount of radar data from the Raydist flight tests has now been stored on paper tape in such a manner that future tracking tests using these flights may be run from the paper tape rather than from the Ampex reels. It is desired to run a comparison of these radar-reported tracks with the Raydist reports by using Whirlwind rather than the unwieldy and potentially inaccurate method of human conversion and comparison required by use of the M-33 (see above). Raydist data is received as lane counts (half-wave lengths of the Raydist transmitter frequency) and can be converted to x,y-coordinates with respect to N. Truro by a program now being checked out (see Mathiasen's report).

1.14 Weapons Direction

(D.R. Israel) (CONFIDENTIAL)

The major activity of the past biweekly period has been a study of the proposals for the 1954 Cape Cod System and the ways in which it will differ from the 1953 System. During the past two weeks each of the positions of the 1953 System has been studied in detail, and the desired modifications, reasons for these modifications, and the required equipment and program changes have been gone over in detail with members of the Weapons Direction Section. The general reasons for changes in the Weapons Direction programs are:

1. Improve the operation,
2. Test ideas and operating procedures contemplated for XD-1,
3. Improve the program (save time and storage space) to permit future program expansion and changes,
4. Improve facilities for simulation, evaluation, and measurement.

1.14 Weapons Direction (Continued)

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

It appears that all sections of the program will be completely rewritten. It has been tentatively agreed with members of the Track-While-Scan Section that the master control program will be revised to permit more frequent switch read-ins and DID presentations. It further appears desirable to reallocate the internal storage to better accommodate the needs of the TWS and WD programs.

As a result of the work of the past two weeks, an inter-office memo has been prepared describing the desired modifications to the Weapons Direction, Intercept Direction, Antiaircraft, Identification, Height Finding and Flight Test Umpire sections and stations. For each modification, the corresponding equipment changes have been indicated. For the most part, these equipment changes consist of moving panels from one position to another; in the case of the Weapons Direction, Intercept Direction, and FTU stations, the moving of consoles is required.

On Wednesday, 24 February, these changes were discussed with J.W. Forrester, R.R. Everett, C.R. Wieser, and S.H. Dodd. General approval to proceed was given, although further investigation of the time and effort required to make the equipment changes was felt necessary. These changes have since been discussed with Rich, Gould, Irish, and Sandy, and they are preparing estimates of how and when these changes can be made. Two alternatives present themselves:

1. All changes could be accomplished during shutdown period of four to eight weeks during May or June; or,

2. The majority of changes could be made on a piecemeal basis during the normal Monday installations over the next few months with a shorter shutdown period to make several of the changes which cannot be accomplished on this weekly basis.

The latter alternative seems feasible inasmuch as many of the changes involve relocation of panels and would in no way affect the 1953 program. It is hoped that within a week a decision will be made on the procedure to be followed for these changes. G. Rawling will undertake duties previously handled by M. Geraghty and will coordinate these changes with the Group 64 personnel.

A tentative timetable for the preparation of the 1954 Cape Cod System indicates that the System might be operative by the beginning of July. Under this schedule, the month of March would be spent in detailed formulation of flow diagrams and the allocation of internal storage and timing slots. During April and May, programs will be coded, and some initial checkouts will be made. The month of June would be spent on over-all program checkouts and System shakedowns. It should be noted that it is highly desirable to have the 1954 System in full operation prior to Group 61's move to Building C in Lexington.

1.14 Weapons Direction (Continued)

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

The Weapons Direction Section is now proceeding full speed in accordance with the above timetable. It is hoped that within the next two weeks a new series of memos to replace the 1953 series will be well under way.

On Tuesday and Wednesday, 23 and 24 February, Lemnios, Neumann, Sittler, Wells, and I visited the Bell Telephone Laboratory at Whippany, New Jersey. At this meeting the possibility of using the BTL Naval Intercept Project (NIP) Simulator was discussed. These discussions were continued on 25 and 26 February at joint BTL - Lincoln meetings held at Lexington on Thursday and the Barta Building on Friday. At these meetings the simulation problem and the problem of making adequate measurements during live intercepts were considered.

(M.I. Brand) (CONFIDENTIAL)

During the past biweekly period evaluation studies on the identification system have been continuing. Many attempts have been made to conduct early-warning tests with the Navy. To date we have received reports but have not as yet inserted them into the computer because the coding of the reports could not be understood. There have been two meetings with the Navy, however, and a system of tests has been set up. In conjunction with D.R. Israel planning has progressed on the design of the 1954 System. Steve Hauser and I have planned a scoring system which we feel is ideally suited for the automatic determination of identity. The system allows for automatic identification for sure friendlies and unknowns and forces manual identification for unsure cases. The system allows the variation of the level of unsureness. An inter-office memo has been written which explains the system in detail.

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

Work is in progress on an ATABE (automatic target-and-battery evaluation) program to operate with the 1953 Cape Cod programs. It is not intended that the program will ever be operated during actual Cape Cod exercises, but it is hoped to demonstrate the principles. As usual other duties leave little time for programming, but it is hoped that the program will be checked out before work is begun on the 1954 Cape Cod programs.

No live AA-guidance missions were performed during this period. A saturation simulated test was performed on 25 February with Maj. J. DeRosa, USA, acting as Cape Cod AALO. The results were quite satisfactory, despite the AALO's relative unfamiliarity with the position. One track penetrated the defenses without being engaged, but this was chiefly because the system was over-loaded with eight tracks hitting the Boston area practically simultaneously. The level of phone calls from AALO to WD was as usual

1.14 Weapons Direction (Continued)

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

quite burdensome to both positions. The number of calls is now a bare minimum; but a conference will be held shortly with C. Zraket and Maj. Burns in an effort to shorten the messages being sent.

A proposal for the 1954 Cape Cod AA-guidance program has been presented to D.R. Israel.

C. Grandy and I visited the MPS-4 installation at Pigeon Hill on 17 February in an attempt to evaluate visually the capability of an A-scope associated with a nodding-beam height finder for estimating raid size. Traffic was light at the time, so no definite conclusion could be reached, but the method seems to have promise.

No progress has been made in the attempt to evaluate the capabilities of the height finders in general for finding raid size. No exercises were scheduled before 1 February with enough aircraft per strike to give a useful test of raid-size estimation. Four such tests were scheduled for February, and two were actually held. One was practically useless since the FPS-3 was not available and the Mark X does not cover more than 40 per cent of the flight path used for such exercises. The second test was partly successful but was spoiled at a crucial point by failure of the Track-While-Scan to track part of a split track despite the fact that the split was called to their attention.

A meeting was held on 24 February with C. Grandy and W. Martin, N. Benedict, W. McDonald of Group 22, and J. Arthur, P. Sebring, and R. Mechlin of Group 24 in an effort to find means to obtain more consistent height-finder performance. The problems of raid-size estimation and the desirability of attempting to learn, in advance, the calibration problems to be experienced with new height finders (FPS-6, TPS-10D) were touched upon. Some conclusions were reached; the meeting will be reported on in an inter-office memo addressed to interested parties.

(O.T. Conant) (CONFIDENTIAL)

A first proposal for Digital Information Displays in the 1954 Cape Cod System will be included in Herb Benington's general display proposal. DID's will approximate as closely as possible the types planned for XD-1.

The intercomm system reorganization is still waiting for components from NET&T, but completion is expected shortly. Direct lines to Weymouth airbase in place of the present Otis line and to Manchester GOC center are scheduled for installation during the next biweekly period.

1.14 Weapons Direction (Continued)

(F. Garth) (CONFIDENTIAL)

A proposal has been completed of a method whereby a return-to-base minimum-fuel path can be approximated by the use of characteristics data found in the Instructions Handbook of the various weapon aircraft which will be used in the 1954 Cape Cod System. It will shortly be put into the hands of the Weapons Direction Group members for comment.

Independent analysis and conference group work has been done to plan the Weapons Director's and Intercept Director's station for the 1954 System. An attempt has been made to determine the best possible DID to fit the 5-inch restriction of the IND's scope.

(C. Grandy) (CONFIDENTIAL)

Height-finder evaluation for operations during February 1954 continues and will be completed early in the next biweekly period. In connection with this evaluation, a trip to the Pigeon Hill MPS-4 site was made to study operational techniques, especially for raid-size determination, and to discuss maintenance procedure with the technicians in charge. After this a conference was held with Group 22 concerning the height-finder operations at which the results of our operations in January 1954 and in 1953 were discussed. The achievements of this meeting were: (1) an agreement by Group 22 to expend more effort in calibration and maintenance of the MPS-4 sets at Pigeon Hill and Nantucket including a) calibration of the sets twice daily, b) better facilities at Pigeon Hill for housing the equipment, and c) moving the Nantucket set to Martha's Vineyard where maintenance will be easier and reliability improved; (2) an agreement for joint investigation by Group 22 and Group 61 personnel of the calibration procedure and maintenance techniques for the FPS-6 radar to ascertain the ease and speed with which this can be done; (3) an agreement for manning additional facilities (the A-scope and the PPI scope) at the MPS-4 sites to study the utility of the various presentations in determining raid size; and (4) an agreement for us to continue to supply Group 22 with our height-finder evaluation data.

Raid-size tests conducted during February were generally unsuccessful, and more such tests should be scheduled to properly evaluate the new technique indicated above. See also J. J. Cahill's comments on this subject.

A collection of alterations and improvements in the Cape Cod System has been discussed and will be the basis for the changes needed for the 1954 System. The most important improvements can be accomplished only by program changes.

(S. Hauser) (CONFIDENTIAL)

With Milton Brand I have been considering a proposal for modification of the identification program for the 1954 version of the Cape Cod System. We are at the point of designing program changes to effect greater automaticity.

1.14 Weapons Direction (Continued)

(S. Hauser) (CONFIDENTIAL) (Continued)

P. Cioffi and I have agreed on a procedure to account for unknowns in the System during test periods of Cape Cod 1953. The procedure involves a change in logging data at the ID station, an analysis of uncorrelated flight plans, and a comparison of records of identification and the Flight Test Umpire.

(F. Heart) (CONFIDENTIAL)

Study is continuing on proposed Cape Cod revisions and applications to AN/FSQ-7 planning.

After study of XD-1 card-input proposals by W. Lone and W. Thomas I participated in several discussions of these proposals.

Some time is being spent in acquiring and studying written material regarding combat centers and present air-division responsibilities.

(W. Lemnios) (CONFIDENTIAL)

During the past biweekly period, three days were spent in conference with representatives from Bell Telephone Laboratories relative to the evaluation of the Cape Cod System. An inter-office memo covering the two days of conferences at Whippany, N.J., is being written.

Mr. Harold Brownman of the Teleregister Corporation visited the lab seeking information on intercept equations. An inter-office memo regarding this conference has been written.

New types of foldback techniques have been considered. It is hoped that in the near future a paper describing a number of possible types of foldback courses will be circulated to interested staff members.

Work has been done on automatic threat evaluation for weapons direction. This work is being done in conjunction with the proposal for automatic identification by M. Brand.

(L. Murray) (CONFIDENTIAL)

The data link (D/L) checking program has been slowed down because of aircraft unavailability. Only 21 per cent of the scheduled flights materialized. These were not concentrated enough to give any positive results.

Plans are now being made for the 1954 Cape Cod System. A proposal for the Intercept Director (IND) and Intercept Techniciar (INT)

1.14 Weapons Direction (Continued)

(L. Murray) (CONFIDENTIAL) (Continued)

Digital Information Displays (DID's) is now being considered.

The Air Force training program is still being conducted. The matter of data collection is being studied.

(J. Nolan) (CONFIDENTIAL)

Time during the past biweekly period has been spent (1) in discussions of the Weapons Section of proposed 1954 Cape Cod System, (2) revamping log-keeping techniques at the Weapons Section station, (3) making preliminary analysis of the problem of threat evaluation, (4) monitoring and evaluating operations of Weapons Section personnel during flight tests, and (5) drawing the flow diagram of the interception program.

(G. Rawling) (CONFIDENTIAL)

The revised memorandum M-1979-3, "Frame and Panel Layouts," (1953 Cape Cod System) has been completed and will be issued. It is a current listing of such equipment, incorporates numerous changes, and supersedes M-1979 and earlier supplements.

A complete revision of "Wiring of Push-Button Panels to Data Insertion Registers," (1953 Cape Cod System) has been made and will be issued as M-2185-2. It incorporates all wiring changes, lists correct nomenclature of push-button panels, and includes a quick-reference drawing of data-insertion registers and digit allocation.

(C. A. Zraket) (CONFIDENTIAL)

Testing and evaluation of the Cape Cod System continued during the past biweekly period. A summary of the operations is given in Section 1.15.

The necessary modifications to the Cape Cod program have been made and tested to allow scrambling and return-to-base of Navy interceptors out of South Weymouth. An inter-office memo has been distributed describing the change.

The preliminary design of the program and the necessary equipment changes for the 1954 Cape Cod System have been discussed and agreed to. Detailed design of the System will follow.

One session of the series of conferences held between Lincoln and BTL representatives on evaluation was attended. Meetings with IBM on the program-input system for XD-1 were attended with other Group 61 staff.

1.15 Direction Center Operations

(R.N. Davis) (CONFIDENTIAL)

Don Macbeth of the Lincoln Laboratory Flight Test Coordination Office (re: p. 16, Biweekly Report for January 15, 1954) has asked me to remind our operational people that the Group 22 Cape Cod electronic equipments that support our operations can only be ordered "on" and "off" through his office. None of the supporting sites need obey any direct requests; in fact, they have been instructed not to comply. To schedule any supporting equipment, contact me or my designated alternate (normally Art Hill or Phil Dolan). In critical cases, you may call Don Macbeth directly on extension 30358. At the termination of any exercise involving equipment other than our own, the person responsible for the exercise should ascertain that the supporting equipment is released by notifying me, my alternate, or Don Macbeth directly if that is necessary. It will avoid misunderstandings and confusion if initiation and termination are carried through the regular channels using direct contact only under unusual situations.

(C.Zraket, W.Attridge, R.Davis, P.Cioffi) (CONFIDENTIAL)

The following is a brief summary of the operation of the Cape Cod Direction Center during the past biweekly period. Detailed summaries are available from P. Cioffi. Radar-calibration data is available from E. Wolf. Data on the status of the automatic ground-air data link is available from L. Murray. A system for the recording of test data on the 14-channel Ampex tape has been set up and will be coordinated by P. Cioffi.

Tuesday, 16 February - A height-finder raid-size and accuracy test and interceptor return-to-base tests were conducted. Three B-29's serving as a target raid and two F-89's, one F2H, and one F3D as interceptors were available. Ops. Plan 13 was used.

Operation of the height finders was satisfactory. The MPS-4 at Nantucket was off the air. The return-to-base tests for the interceptors gave accurate results. Tracking was satisfactory.

Wednesday, 17 February - A radar-calibration mission was cancelled due to weather. The computer time was used for analysis of Mark X and radar-calibration data previously recorded.

Thursday, 18 February - A live test utilizing three raids of single B-29's and three F-89's and two F2H's as interceptors was conducted. Five interceptions, three from the Bedford station and two from the Otis station, were attempted simultaneously. Two of the three raids were intercepted twice. All of the interceptions were successful. The two F2H's made visual contact at about three miles while on collision courses. The three F-89's, all on 45°-from-nose attacks, made AI radar contact (APG-33) at about 8 miles with the targets

1.15 Direction Center Operations (Continued)

(C.Zraket, W.Attridge,R.Davis, P.Cioffi) (CONFIDENTIAL) (Cont'd)

dead-ahead (pursuit) as programmed. One of these interceptions was conducted from start to finish with the automatic ground-air data link. Tracking was satisfactory except when tracks became interchanged after interceptions were completed. A solution to this problem is being studied.

Friday, 19 February - A successful radar-calibration test was conducted using a B-29 equipped with bombsight.

Tuesday, 23 February - Operations were cancelled due to maintenance scheduling brought about by the holiday.

Wednesday, 24 February - A successful radar-calibration test was conducted using a B-29 with bombsight.

Thursday, 25 February - A live test was carcelled due to weather conditions. A training mission was conducted utilizing the recorded radar data of 18 February and simulated interceptors. A program error was discovered and corrected after the test.

Friday, 26 February - A successful radar-calibration test was conducted utilizing a B-29 equipped with bombsight.

Summary of Biweekly Operations:

System Operational Test Sorties	
Requirement	50
Scheduled	50
Flown	8
Per Cent Flown (of required)	16
System Evaluation Test Sorties	
Requirement	24
Scheduled	24
Flown	7
Per Cent Flown (of required)	29
Components Test Sorties	
Calibration	
Requirement	2
Scheduled	4
Flown	3
Per Cent Flown (of required)	150
Per Cent Flown (of scheduled)	75

1.15 Direction Center Operations (Continued)

(C.Zraket, W.Attridge, R.Davis, P.Cioffi) (CONFIDENTIAL) (Cont'd)

Data Link Sorties

Requirement	0
Scheduled	14
Flown	2
Per Cent Flown (of scheduled)	14

Total Sorties

Requirement	76
Scheduled	92
Flown	20
Per Cent Flown (of required)	38
Per Cent Flown (of scheduled)	22
Per Cent Scheduled (of required)	121

(A. Morriss) (CONFIDENTIAL)

The following is the statistical breakdown of the equipment-reliability reports for the Cape Cod System operations during the past biweekly period. Data for the cumulative period are also included.

	Last Biweekly Period		Cumulative Period (since 9/29/53)	
	Hours	Per Cent	Hours	Per Cent
Assigned Time for System Operations	8.0	100.0	186.6	100.0
Unrestricted Operating Time	7.3	91.7	102.4	54.9
Down Time	0.5	6.3	29.4	15.8
Recovery Time	0.2	2.0	2.0	1.0
Limited Operating Time	0.0	0.0	52.8	28.3

Time Lost (Hours)	Down Time	Limited Operations	Down Time	Limited Operations
Computer	0.2	0.0	26.4	0.0
Room 222	0.0	0.0	2.6	48.7
Radar and Input	0.3	0.0	0.3	38.2
Miscellaneous	0.0	0.0	0.0	25.3

1.15 Direction Center Operations (Continued)

(W. Vecchia) (CONFIDENTIAL)

Computer Operation:

Total Assigned Time		74.5 hr
Weapons Direction	7 hr 10 min	
Track-While-Scan	25 hr 10 min	
Combined Weapons Direction and Track-While-Scan	8 hr 15 min	
Tracking and Control	17 hr 55 min	
Total	58 hr 30 min	
Time to Math Group	4 hr 45 min	
Time to In-Out	15 min	
Room 222 Equipment Check	1 hr 15 min	
Data Input Trouble	15 min	
Cancellation of Time (Maintenance)	6 hr	
Time Lost to Computer Malfunction	3 hr 30 min	
Total	16 hr	
		58 hr 30 min
		16 hr
Grand Total		74.5 hr

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

(D. R. Israel) (CONFIDENTIAL)

An inter-office memo has been prepared with C. Grandy which gives estimated switch requirements at the XD-1 operating positions. These estimates were prepared hurriedly and are intended only to give an order-of-magnitude approximation both to the total number of switches and to the number at each console. These estimates show that roughly 800 10-push button switches and 200 5-push button switches will be required. These switches are wired to 3,600 intervention bits. The memo also includes initial estimates of the allocation of situation consoles and auxiliary consoles to the operating positions.

As a result of several meetings held during the past two weeks, progress has been made on the description of the Flight Test Umpire's functions and facilities for XD-1. The three major functions will be:

1. Operations (concerned with the operations and safety aspects of flight tests);
2. Simulation;
3. Monitoring and recording.

Two new names have been suggested as replacements for "Flight Test Umpire" to describe over-all activities. These are:

1. Test and Evaluation
2. Operations Analysis Section

An attempt is being made to prepare detailed floor plans for the operating areas of XD-1 before 3 March. C. Grandy has been carrying the bulk of this work.

(M. I. Brand) (CONFIDENTIAL)

The design of the Data Input Room for the XD-1 System has been completed on the basis of three 026's, two modified 026's, one 056 and one modified 056. The layout permits the expansion of this room if it is deemed necessary in the future.

(O. T. Conant) (CONFIDENTIAL)

Meetings with H. Kirshner, R. Enticknap (Group 22) and ADES representatives have culminated in a first estimate of telephone circuits and terminations, both internal and external. It now appears that most of the desired intercomm facilities will be practicable for XD-1 as well as the production centers. Operating specifications will soon be published in a memo by Kirshner. Intercomm planning should proceed at a good pace as a result of the recent allocation of responsibility among the cooperating groups.

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

(H. J. Kirshner) (CONFIDENTIAL)

A set of tentative specifications for the XD-1 tactical telephone system has been written and will be issued in memo form when approved. These specifications have been discussed with representatives of Lincoln, ADES, Bell Laboratories, AT & T Co. and the Project Group for ADES.

(W. Lone) (CONFIDENTIAL)

Part of the past biweekly period was spent with C. Gaudette investigating the needs of the radar-data simulation program in XD-1.

On 24 February a meeting was held with IBM representatives to reach decisions regarding the XD-1 program cards and the information to be entered on them. Utility programs were also discussed. A memo will be written indicating the results of the meeting.

(F.A. Webster) (CONFIDENTIAL)

Several short programs have been checked out on MTC.

1.2 Group 64

(S. H. Dodd) (UNCLASSIFIED)

Computer reliability has remained high during the past biweekly period although some trouble has been experienced during operation due to transient transfer-check alarms. The trouble has been tentatively ascribed to the control section of the computer, but the exact source has not yet been located.

Several computer circuit changes have been completed recently which should improve computer reliability and ease of maintenance. A new time-pulse-distributor output panel has been installed to replace the old unit because of phenolic breakdown caused by silver migration. A new voltage-interlock system will stop the power sequencing when the computer power is coming on if any of the voltages fail to appear in assigned order. The fixed and variable voltage-switch panels are being replaced with new models containing more reliable relays.

The programmed-marginal-checking facilities have been expanded to include a program-controlled selection of fast and slow voltage cycle. In addition, marginal-checking circuits have been installed for the activate registers.

The installation of a new, regulated power supply for the bias to the magnetic drums has evidently solved the problem of writing between the slots to a large degree. A noticeable reduction in the number of drum parities has occurred since the new power supply has been in use. Work is now in progress to install electronic group-switching in the auxiliary-drum system and a parity check on the auxiliary-storage section of the buffer-drum system.

1.21 WWI System Operation

Core Memory

(N. L. Daggett) (UNCLASSIFIED)

The preliminary model of a new core-memory sense amplifier appears to work very satisfactorily. It is being packaged as a plug-in unit to replace the present amplifier.

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

A number of transient transfer-check alarms have occurred during the last two weeks. Their origin appears to be in the control section of the computer. A thorough investigation of the control circuits is in progress.

A new TPD output panel was placed in service on 27 February.

1.21 WWI System Operation (Continued)

Core Memory

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

The new indication system for the WWI air-conditioning system will be installed on Monday, 1 March. The system will include added protective devices.

The power-distribution system in WWI is being revised. Approximately 110 panels that are used for distributing fixed and variable voltages will be replaced in the next three months.

Voltage-Interlock Panel

(D. A. Morrison) (UNCLASSIFIED)

The voltage-interlock panel was installed in Rack P4 on 15 February. No trouble was experienced during installation and the subsequent checkout of the panel because of the careful work performed by all concerned. Many thanks.

A plastic cover and lamicoid labels will be installed when available.

An interesting sidelight in connection with the voltage-interlock panel is the increase in relay-coil resistance of the Clare relays under continuous duty operation. I found that for the first hour of operation (approximately) the coil resistance increased from about 3000 ohms to about 3600 ohms. It seems to remain constant after the warmup. The voltage-dropping networks have been redesigned to allow for this effect.

Marginal Checking

(S. E. Desjardins) (UNCLASSIFIED)

This period was spent in working out changes to be made on the marginal-checking equipment to allow the speed of the voltage variation to be controlled by the program when program marginal checking is done. These changes will be incorporated in the system on 1 March.

The consolidated test program has been delivered to Mr. Helwig to be placed on magnetic-tape-unit 1. This will be attempted next week. The program will then be read in daily from magnetic tape rather than from paper tape.

A revised alarm check program is being written to make it more automatic. The modification will allow the program to determine and count what errors (if any) occurred and will print the results after the test.

1.21 WWI System Operation (Continued)

Magnetic Tape

(E. P. Farnsworth) (UNCLASSIFIED)

Reliability of the magnetic-tape system will be increased by two improvements which are in process. Negative 300-v power now available will permit lowering of the read-record heads to ground potential and elimination of the unit-selector amplifiers. Furthermore, directing a supply of conditioned air on the tape-mechanism motors, gear boxes, and crystal packages will improve performance, increase component life, and permit elimination of five small blowers.

The block schematics for magnetic-tape control and delayed print-out are being redrawn and brought up to date. These drawings should be helpful in resolving any problems which might arise when I move to Lexington next month and Al Perry takes over responsibility for the system.

Magnetic-tape print-out unit 2 has been checked out and is ready to be plugged into the spare FL Flexowriter whenever the second sound-proof enclosure is ready for installation beside the present box. This new box is being designed by Mal Demurjian and will incorporate several improvements and operating conveniences. Junction boxes, cables, and transfer switches for the second printer are also in the process of construction. These switches will permit using the spare Flexowriter as either a normal paper-tape machine or as a second print-out and will permit interchanging Unit 2 and Unit 3 in the same manner as Units 0 and 1 are presently interchangeable.

Typewriter and Paper Tape

(L. H. Norcott) (UNCLASSIFIED)

The Flexo shop built up contact stacks, brackets, and selector switches to be used in modifying the three FL Flexowriters which are ordered for delivery in March.

Farnsworth and Demurjian requested that a convenient switching arrangement be designed to permit a delayed-output typewriter to be used as a conventional Flexowriter. A circuit using an Electroswitch Jr. selector switch has been turned over to Farnsworth for incorporation in his proposed new delayed-output system.

1.22 Terminal Equipment

CRT Filter System

(S. B. Ginsburg) (UNCLASSIFIED)

The basic circuits to be used in the system have been designed, and all drawings have been completed by drafting. Assembly of all

1.22 Terminal Equipment (Continued)

CRT Filter System

(S. B. Ginsburg) (Continued) (UNCLASSIFIED)

necessary plug-in units has started in the shop.

The drawings for the required mounting panels will soon be completed. These panels will be wired as soon as the technicians become available.

Attention is now being given to the wiring and cabling schedules.

Marginal Checking

(S. B. Ginsburg) (UNCLASSIFIED)

The "Marginal Checking Panel for Activate Registers" Panel has been installed in the computer and has been checked out satisfactorily. It is now possible to select all activate digits together.

The "Indicator-Light Marginal-Checking" Panel has been bench tested. Ted Sandy is presently getting it installed in the computer.

(T. Sandy) (UNCLASSIFIED)

The marginal-checking panel for the indicator-light registers was bench tested and is now ready to be installed in WWI.

The marginal-checking panel for the activate registers has been installed in the computer and is working properly.

Magnetic Drums

(H. L. Ziegler) (UNCLASSIFIED)

Excellent progress has been made during the past two weeks on the installation of electronic-write switching of heads in the auxiliary drum. All planning, layout, and wire-scheduling work has been completed, and considerable preliminary wiring and metal work have been done in the drum cabinet. Further progress now depends upon delivery of construction and Purchase Requisition items.

Plans are under way for the addition of parity digits to buffer-drum groups 4 through 7 and also the installation of equipment necessary to monitor these groups. The present monitor in TC 9 will be used.

1.22 Terminal Equipment (Continued)

Buffer Drum

(L. D. Healy) (UNCLASSIFIED)

The recording of pulse waveforms appearing at various buffer-drum terminals was continued. Some delay was caused by other work being done on the drum.

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 12-25 February 1954:

Number of assigned hours	132
Usable percentage of assigned time	96
Usable percentage of assigned time since March 1951	86
Number of transient errors	9
Number of steady-state errors	2
Number of intermittent errors	5

Component Failures in WWI

(L. O. Leighton) (UNCLASSIFIED)

The following failures of electrical components have been reported since 12 February 1954:

Components	No. of Failures	Hours of Operation	Reasons for Failure
Capacitors			
0.01 ceramic disc 500-v	1	2000 - 3000	Shorted
Crystals			
1N34A	1	2000 - 3000	Low back resistance (low R_b)
Potentiometer			
Ohmite type-H 1000-ohm 25-watt W/W	1	19000 - 20000	Open
Tubes			
5651	1	0 - 1000	High starting voltage
5654	1	0 hr	Cracked envelope

1.23 Records of Operation (Continued)

Component Failures in WWI

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

Components	No. of Failures	Hours of Operation	Reasons for Failure
Tubes (Continued)			
5881	1	0 - 1000	Low plate current (low I_b)
	1	1000 - 2000	Short
6080	1	0 - 1000	Short
	1	3000 - 4000	Low plate current (low I_b)
5963	1	1000 - 2000	Short
6080WA	1	1000 - 2000	Low plate current (low I_b)
6145	1	No hours kept	Short
	1	0 - 1000	Short
	1	1000 - 2000	Short
	1	6000 - 7000	Short
6AS7G	2	20000 - 21000	1 short; 1 gassy
6SN7	1	22000 - 23000	Short
6X5	1	18000 - 19000	Low plate current (low I_b)
6Y6G	1	22000 - 23000	Low plate current (low I_b)
7AK7	1	16000 - 17000	Short
	1	21000 - 22000	Short
	1	22000 - 23000	Short
7AD7	1	22000 - 23000	Short
VR75	1	20000 - 21000	High starting voltage

1.24 General

(D. M. Fisher) (UNCLASSIFIED)

A desirable feature on some series-tube power supplies, now in operation, is that the output voltage increase slowly when the supply is turned on. A unit has been designed and is in the process of being tested which will satisfy this requirement. This will be an independent unit and with a few circuit changes it can be made to operate most supplies now in service. If the testing is satisfactory, this unit will be used on the new WWI -450-v power supply.

1.24 General (Continued)

D-C Power Supplies

(S. T. Coffin) (UNCLASSIFIED)

A rebuilt 25-amp d-c supply will be installed in WWI on 1 March as a temporary +120-v supply. This will allow the present +120-v, 10-amp supply to be removed for redesigning, after which it will be returned to WWI; the 25-amp supply will be changed permanently to +90 volts to provide adequate capacity for increasing load.

1.3 Group 65

1.33 Activities of Group 65

(P. Youtz) (UNCLASSIFIED)

Most of the effort of the Group during this biweekly period was expended on problems concerning the 19-inch Charactron and 5-inch Typotron tubes. I spent the second week of the biweekly period on the West Coast visiting Convair and Hughes Aircraft. Convair is making progress on improving the electron optic of the Charactron for better registration. They have moved into a new building which they have purchased for Charactron work. This building was designed solely for this activity. They have not yet installed all of their tube-production equipment.

Hughes Aircraft has completed the design and construction of an improved Typotron. I brought back with me one of these new Typotrons, so that C. L. Corderman can evaluate its operation with MTC. Millard Smith, project supervisor in the Tube Division of Hughes Aircraft, will bring more Typotron tubes the week of the MIT Physical Electronics Conference. The Hughes Tube Group had a two-color-on-black storage tube. The two phosphors were yellow and green. They can easily make a four-color-on-black storage tube. All of these features could be incorporated in a Typotron later in the year. Hughes Aircraft has also been working on construction techniques to make a 19-inch Typotron.

Three days of the first week of this biweekly period were spent at Poughkeepsie on reliable-receiver-tube and Charactron problems.

Group 65 is continuing to work with George Sponsler of Group 25 to set up an automatic electron-trajectory tracer in cooperation with the MIT Dynamic Analysis and Control Laboratory. This is being used to study the relative merits of helical vs. multiple-ban post-deflection acceleration.

The program of Joe Klein of Group 25 to evaluate aluminized phosphor screens is continuing. A trip to GE Syracuse Laboratories is scheduled for next week.

Work on helical coatings continues.

There has been some work this biweekly period on tubes for the cathode studies of H. B. Frost.

1.33 Research and Development

(J. S. Palermo) (UNCLASSIFIED)

During the past period a 16-inch cathode-ray tube involving basic construction techniques of the Charactron was prepared and sealed onto the vacuum system for processing. This tube, Cht 18, was primarily

1.33 Research and Development (Continued)

(J. S. Palermo) (UNCLASSIFIED)

constructed to investigate the effect of helical-dag coatings on deflection-plate sensitivity. Although only a very small section of this tube could be helically coated with dag, it is expected that some data may be obtained.

Work continues for Group 25 on the preparation of the formed glass plates for the automatic electron-trajectory tracer.

Research on helical coatings continues because of the inability to successfully reproduce uniform and consistent readings.

SECTION II - AN/FSQ-7

2.1 Group 62

2.11 Systems

Outputs

(R. C. Hopkins, R.C. Jeffrey) (UNCLASSIFIED)

Proposed output-system performance specifications were presented at a meeting on 16 February in the Whittemore Building. These specifications, incorporating minor modifications suggested at or since that meeting, appear in Section 2 of M-2697, "Output System Performance Specifications." A meeting will be held at High Street on 4 March for EDO-SO concurrence on the specifications.

Marginal Checking

(R. Pfaff) (UNCLASSIFIED)

The marginal-checking breakdown of the central computer is essentially complete. Further work will be directed towards memory, in the immediate future, and drums, display, and inputs as these groups become ready to think about testing and marginal checking.

Marginal-checking specifications as given in M-64 have been approved. These specifications do not include programmed features.

2.12 Magnetic-Core Memories

Miscellany

(W. Papian) (UNCLASSIFIED)

W. Wittenberg (IBM) and I are trying to get the "Specs for Design" brief readied for Lincoln agreement.

The layouts of the array frame ("shower stall") and the digit-driver and sense-amplifier plug-in units are presently under discussion with IBM.

The 64 x 64 now in MTC has been unofficially clocked with a 6-μsec cycle time; it seems quite safe now to guarantee that the XD-1 memory will have a cycle time of 7 1/2 microseconds or less.

2.12 Magnetic-Core Memories (Continued)

MTC Core Memory, Mod. II

(J. L. Mitchell) (UNCLASSIFIED)

The memory has continued to operate satisfactorily in MTC. The 5965 tubes have been going to air and causing some trouble; however, the tube shop has informed us that it is because the getter was fired too hard; this is true for an entire recent shipment.

Core Memory, XD-1

(J. L. Mitchell) (UNCLASSIFIED)

Last Thursday, 25 February, was spent working with the IBM people at High Street. Marginal checking and some of the memory circuits were discussed.

Memory Test Setup VI

(E. A. Guditz) (UNCLASSIFIED)

A connecting device is being designed which will permit the installation of a single plane into a plane tester or a stack of planes without soldering the 256 connections.

Sensing-Amplifier Design

(S. Fine) (UNCLASSIFIED)

Linear-transformer design for the sensing-amplifier input circuit is continuing. From measurements made on a ferramic-H type F-415 core, maximum power transfer results with 20 primary turns and a 7K load when using a 10:1 turn ratio.

A two-tube sensing amplifier is being constructed for use with the above transformer.

Switch Cores

(A. D. Hughes) (UNCLASSIFIED)

As the first major step in the design of the 64-position Olsen switch, the number of primary and secondary turns, the load resistance, the driver requirements, and a suitable metal core (1/4-mil, Mo-Permalloy, 1/4-inch, 100-wrap) have been decided on. Enough cores have been

2.12 Magnetic-Core Memories (Continued)

(A. D. Hughes) (UNCLASSIFIED) (Continued)

ordered to build two switches. The switches are being designed to drive the MTC memory but could be used to drive a larger one. A dummy load, used in the design, was compared electronically with MTC memory and found to be a very good approximation.

Single-Coordinate Read Investigation

(J. Raffel) (UNCLASSIFIED)

Work was completed on the preliminary evaluation of the 2-core-per-bit memory with P. Baltzer.

The results so far are very encouraging, and analysis of them continues.

Switch-Core Testing

(G. Davidson) (UNCLASSIFIED)

Tests were run on switch cores for J. Raffel.

3:2 Selection

(R. S. DiNolfo) (UNCLASSIFIED)

A study was made of the basic remanent-flux states when a core is used in a 5-coordinate system using 3:2 selection. The block diagram of a core tester capable of obtaining these states was drawn up, and test equipment is being assembled at the present time.

2.13 Vacuum-Tube Circuits

General

(R. L. Best) (UNCLASSIFIED)

Circuits must be submitted to the Basic Circuits Groups of IBM and MIT before being incorporated into AN/FSQ-7. To clarify what information we require about a circuit, these two Groups have jointly issued H-117, "Requirements for Circuit Approval."

Basil Remis has left this Section to work on the display frame. Edward B. Glover will join this Section on 15 March; he is an engineer now working for DuPont.

2.13 Vacuum-Tube Circuits (Continued)

Universal Amplifier

(H. J. Platt) (UNCLASSIFIED)

The specifications for this amplifier were described in the last biweekly by Zieman and Woolf.

The tube layout preferred for the amplifier consists of a 6072 for the first stage, a 5965 for the second stage, and two 7AK7's for the output stage. There will also be a voltage reference tube, 5651, and a second 5965 to be used as a constant-current source for common-mode rejection purposes. These tubes could conveniently fit on a 6-tube plug-in unit.

An initial runthrough of the design for the amplifier showed that the specs outlined by Zieman and Woolf could not be met using 7AK7's in the output stage. Therefore, the rise-time specs are being relaxed until the 7AK7 can be properly operated. Another design will be attempted soon.

Typotron Display

(H. J. Platt) (UNCLASSIFIED)

The deflection amplifier still exhibits some instability caused by the necessary addition of shielded cables on the output. Work is under way to rectify this problem.

In addition, the amplifier is not sufficiently linear to correctly compensate deflection from different points on the character matrix. John Crane has installed, and is debugging, an amplifier on the MTC decoder output which has a gain of 5. Thus, the input to the deflection amplifier will be 20 volts push-pull rather than the previous 4 volts. The increased input signal should help to lessen the linearity problem by allowing the use of more feedback.

Sensing Amplifier

(C. A. Laspina) (UNCLASSIFIED)

A sense amplifier for use with an input transformer has been designed and built and is now being tested. This unit uses two 7AK7's as a feedback pair. Since the input signals are made unidirectional before they reach the first coupling capacitor, each grid may be clamped to eliminate base-line shift.

Another amplifier, using three 5965's, has been tested with constant prf's, and looks very good. The first and second stages are

2.13 Vacuum-Tube Circuits (Continued)

(C. A. Laspina) (UNCLASSIFIED) (Continued)

balanced, and diodes are used to convert the bidirectional input signals to unidirectional signals. These signals are then fed to an amplifier which has its grid clamped to prevent base-line shift. This amplifier is nonblocking for signals as large as 3 volts.

This amplifier will be packaged in an MTC plug-in chassis and will be tried with various programs in MTC.

Digit-Plane Driver

(D. Shansky) (UNCLASSIFIED)

Work on the collection of marginal-checking data is continuing. A trip to Poughkeepsie (IBM) has been scheduled for 1 and 2 March to review the plug-in unit layout of the XD-1 digit-plane driver.

"C" Flip-Flop

(J. S. Gillette) (UNCLASSIFIED)

Data is being taken to determine the allowable capacity loading vs. pulse rates.

Delay-Line Circuits

(J. S. Gillette) (UNCLASSIFIED)

A report, M-2700, has been written on delay-line circuits using high-impedance distributed lines. I spent two days at IBM, Poughkeepsie, discussing delay lines and their application.

Phase Meter

(J. S. Gillette) (UNCLASSIFIED)

The design for a direct-reading phase meter has been started. It is hoped that it will work from 50 kilocycles to 50 megacycles.

Pulse Transformers

(E. Gates) (UNCLASSIFIED)

Thirty-six transformers were delivered to the transistor group,

2.13 Vacuum-Tube Circuits (Continued)

(E. Gates) (UNCLASSIFIED) (Continued)

12 of which are to be used by S. Oken on his thesis.

A 3:3:1 transformer which was originally designed for the slave flip-flop has found some use in Group 24. A drawing of the transformer has been made in case it is decided to make it a standard component in the future.

I am doing some work on a null-indicating transformer for Mr. Kotter of the Insulation Laboratory.

(H. E. Anderson, H. Boyd) (UNCLASSIFIED)

The diode which is desired for use in the drum switch has been submitted to D. J. Crawford (IBM) for approval.

Magnetic-Core Drum Switch

(H. Henegar) (UNCLASSIFIED)

Design of the core part of the circuit is essentially complete. A ferrite core, MF-1312, F26, has been selected for the switch. A 54-54 turn drum head will be driven with current pulses of approximately 220 milliamperes in amplitude and 1.5 microseconds in width.

Plans are now being made to construct a 4-field, 4-bit model and to test it on the MTC drum. However, the present tight schedule of MTC will prevent this from being done until the drum is disconnected from MTC -- probably about the middle of April.

2.14 Memory Test Computer

General

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

The past fortnight has seen MTC settle down to a schedule much more regular than any heretofore. Now that core memory and Ferranti reader are operating, several people have expressed interest in programming, and a few (notably Farley and Clark) have actually written and run two or three sizable programs. Somewhat to our surprise, we found that of the 75 hours of weekly computer time available under 2-shift operation, over 70 hours was actually spoken for during these first two weeks.

Experimentally, the memory cycle was cut to something less than 6 microseconds, giving a total instruction time of 11.8 microseconds for 2-cycle instructions like ca. This did not include any post-write disturb, but with proper facilities it should be possible to overlap PWD with various setup commands and retain approximately the same cycle length. Margins (over-all margins on sensing-amplifier bias) at this short cycle have not differed perceptibly from those obtained with a 10-μsec cycle (± 10.5 volts over a range of 100-ma digit-plane-driver current).

Accordingly, the short cycle will be retained for general operation pending further experimental data. It was found that the multiply instruction needed slight logical modification in order to function with the short cycle; this was readily done. At the same time, interchange of two equivalent logical forms enabled us to lessen the load on one of the control-switch cathode followers.

Phil Bagley's conversion program has been converted, and he is in the process of debugging it.

Plans for moving the computer to Building B in Lexington are gradually becoming more specific: a cooling-system proposal has been presented by Francis Associates, and details of arrangement and physical support of the various racks are well under way.

Decoder-Output Amplifiers

(J. Crane) (UNCLASSIFIED)

Direct-coupled amplifiers for A-register and accumulator decoders have been installed and given preliminary checks.

Automatic Memory Display

(J. Crane) (UNCLASSIFIED)

Mechanical mounting equipment for the 12 1/2-inch display scope

2.14 Memory Test Computer (Continued)

(J. Crane) (UNCLASSIFIED) (Continued)

has been received. Amplifiers for this scope are now being constructed.

The program-counter end-carry was wired into digits 3 and 4 of the program field register to complement these digits, so that both fields of core memory are displayed simultaneously on AMD. The AMD system is now operating quite well with a 513D test scope and should prove very convenient for quick inspection of memory (including drum fields, two at a time) when the 12 1/2-inch scope is available at the console.

MTC Maintenance and Operation

(R. A. Hughes) (UNCLASSIFIED)

Core memory is running now with a timing cycle slightly under 6 microseconds. Sense-amplifier bias margins are -12.5 to -34.5 volts. This represents a spread of 22 volts. The program used to obtain this margin was MP-60 which is the "Double Complement Checkerboard Bootstrap."

A rough plot of digit-plane-driver current vs. sense-amplifier bias shows that the current can be varied $\pm$ 50 milliamperes without much change in sense-amplifier bias.

The x and y read and write current has been set to 430 milliamperes. This probably is not the optimum current.

Digit-plane-driver current has been set at 410 milliamperes.

Fourteen new 5965 tubes have failed to date in the core memory.

Magnetic Drum

(H. E. Anderson, H. Boyd) (UNCLASSIFIED)

The read transformers arrived on 25 February. The seven transformers necessary to complete two fields of the drum were installed and tested on 26 February. On the same date the new circuits for the read driver, field driver, write driver, and writer were tested for the first time. Further tests are needed.

The following difficulties must be corrected before the drum will be ready for programming:

1. The address-selection system must be thoroughly checked,
2. The parity digit read-out gate-buffer load must be reduced or rearranged,

2.14 Memory Test Computer (Continued)

(H. E. Anderson, H. Boyd) (UNCLASSIFIED) (Continued)

3. A temporary voltage-sequencing arrangement must be provided to make the drum nonvolatile.

MTC Drawings and Records

(L. L. Sutro) (UNCLASSIFIED)

With the arrival of Phyllis Nickerson the staff of the MTC Records Office numbers three. Betty Kollet is in charge of records and makes the summaries of the MTC log. Elinor Albanese is preparing cards showing the history of each panel in the computer. Phyllis Nickerson is carrying out the reorganization of the print file. Aiding the work of the above three is John Ackley who has been marking up prints of drawings that need to be revised.

Programming

(W. Clark, B. G. Farley) (UNCLASSIFIED)

The "Checkerboard Bootstrap" has been successfully run on MTC. It goes in one quarter of the core memory, writes the "checkerboard" in the other three quarters, and then checks by complementing and storing in the quarter diagonally opposite. The whole program then moves to an adjacent quarter and repeats the process, etc. The program has been used to check and improve memory margins by adjusting parameters while running and margin-testing.

A core-address-register check program has also been written and used to check core addresses and drum addresses.

2.15 System Liaison

(A. P. Kromer) (UNCLASSIFIED)

Liaison being maintained with Project ADES (Bell Systems) personnel in connection with general planning for the installation of duplex centrals was continued. The budget and funding for the entire program has been reviewed. Arrangements are under way to have ADES and IBM representatives meet to start discussions concerning the writer's plans for correlation of the engineering development program with the subsequent production manufacturing program.

Meeting of the AMC Phasing Group for the project was attended at which time various aspects of work with IBM and ADES were reviewed by the interested Air Force Commands.

2.15 System Liaison (Continued)

(J. D. Bassett) (UNCLASSIFIED)

IBM has changed over to XXXP paper-base phenolic laminate for etched-wiring cards in the pluggable units for XD-1 and XD-2. Investigation of epoxy-glass laminate is continuing, and this material may eventually be reinstated if tests and experience prove it to be superior to the phenolic.

No definite decision has been reached on a new method for through-connections without the use of silver. Several schemes are being evaluated at Poughkeepsie.

The Lincoln Good Construction Practices sub-committee has chosen Technical Marketing Associates to publish the forthcoming Lincoln Lab manuals on "Construction Practice" and "Design Practice." A target date of 1 April 1954 was set by committee members for submission of subject material on the former.

(W. H. Ayer) (UNCLASSIFIED)

A serious effort is being put into equipment layouts for the second floor of the XD-1 building. It appears desirable to make the XD-1 installation as much of a prototype as possible within the limitations imposed by schedules and our own special requirements for the XD-1 system.

Arrangements are being made with IBM and Francis Associates to assure coordination of Francis Assoc. efforts on the XD-1 installation at Lexington and their work in Poughkeepsie on cooling-system design and the XD-2 installation.

(P. J. Gray) (UNCLASSIFIED)

M-2495-1, the revised equipment list for XD-1 and XD-2, will be published during the next biweekly period.

I worked with ADES in drawing up a revised fiscal program for operational AN/FSQ-7's, reflecting the most recent cost estimate from IBM. The figures indicate that previous estimates for funding required in fiscal years 1954 and 1955 are still valid.

I have been working with AFCRC representatives in setting up official military nomenclature for the various frames and cabinets in AN/FSQ-7.

2.16 Transistors

Power Supply

(D. J. Eckl) (UNCLASSIFIED)

The battery power supply has been disconnected and in its place is being used a Raytheon supply capable of delivering 12 amps at 100 volts. A tapped bleeder resistor provides the necessary 6-v steps. The output of this system operates the control panels which we have used with the batteries. This voltage supply will be used for experimental work.

Transistor Availability

(D. J. Eckl) (UNCLASSIFIED)

Meetings have been held recently with GE and Transistor Products to discuss possible procurement of new point-contact transistors. We have made arrangements to obtain on loan from Transistor Products 20 of each of 3 types of point-contact transistors for testing purposes. They are very interested in supplying us with point-contact units. The situation at GE is less clear. Their major emphasis at present is on junction transistors which in general have an upper frequency limit of the order of 100 kilocycles. They have done some further work on point-contacts but apparently feel that the market is very limited and so are hesitant about assigning a large group to the problem. At present this is principally a commercial development. I expect that we shall receive some sample units of their new developmental point-contacts for testing.

Diode Construction

(N. T. Jones) (UNCLASSIFIED)

Samples of the 0.001-inch and the 0.00005-inch diameter gold wire have been soldered and cemented into the test jig. Dissolving the glass jacket with hydrofluoric acid has been abandoned in favor of simply crushing it with tweezers. The 1-mil wire is easy to work with but the smaller is quite difficult. Three attempts to put the smaller wire into the jig have resulted in only one fair set of electrical connections to both ends. The 1-mil wire passes 1.75 amperes before failing. No current limit has been determined for the smaller wire.

Diode Storage

(N. T. Jones) (UNCLASSIFIED)

A storage measurement circuit using a Sylvania 5647 vacuum diode has been constructed and tested. Comparing the results with those using the germanium diode as a test standard confirmed that (1) the vacuum-diode

2.16 Transistors (Continued)

(N. T. Jones) (UNCLASSIFIED) (Continued)

shunt capacity affects the results, and (2) the Hughes 1N34 standard is beginning to deteriorate. Transitron S4 silicon points diodes are being purchased for use in the measurement circuit.

Sizable samples of all available diode types are being tested for storage. Thirty Hughes 1N68A's were the most recent group processed.

Transistor Magnetic-Core Drivers

(S. Oken) (UNCLASSIFIED)

The latest driver has worked satisfactorily at 200-milliwatts collector dissipation with no harmful effects on the transistor. A theoretical analysis of this driver was completed during the past biweekly period.

A note on junction-transistor magnetic-core drivers has been started.

Transistor Gates

(C. T. Kirk) (UNCLASSIFIED)

Some time was spent considering nonregenerative transistor amplifiers for use as gates.

It was found, as expected, that hole storage caused considerable trouble when overdriven amplifiers were used. The hole-storage effect caused the pulse width of the output to vary from transistor to transistor and as the input pulse amplitude varied. However, since hole storage does represent available power, it is intended to continue investigation of overdriven amplifiers from the point of view of utilizing hole storage rather than eliminating it.

A new type of gating circuit using an overdriven amplifier was investigated, and a new method of controlling the gate from the flip-flop was developed. This gate employed a grounded-base amplifier with the base terminal as the control electrode for the flip-flop. Since there were no RC time constants associated with the control circuits, a pulse-repetition frequency of 500 kilocycles was easily obtained.

Counters, Conferences, and Flip-Flops

(E. U. Cohler) (UNCLASSIFIED)

In the past biweekly period, much time has been spent on preparing a report on the junction-transistor flip-flop which is now complete.

2.16 Transistors (Continued)

(E. U. Cohler) (UNCLASSIFIED) (Continued)

The work on counters for use in parallel with the angular-position counter in MTC is getting under way. I hope to have three types of counters built using two or three different types of gates. These counters will undergo individual tests and then be put into a system which operates from drum pulses. Two of the counters are of the two-transistor type and one is a one-transistor type (per stage). In general the gates to be tried will be one transistor per stage, but some gates might be specially developed which use less than one transistor per stage.

The conference at Philadelphia presented little of a drastically new nature since our group is pretty well up on existing developments. However, one note of cheer is that all the papers were on how and how well various circuits worked. In the past most conferences consisted of complaints as to the unavailability of transistors and the perversity of their characteristics. Although this conference was solely on junction transistors, it indicated that the general level of availability and reliability of transistors is up several orders of magnitude over a year ago. In addition the outlook on point-contacts is following a rapid upward trend despite decreasing interest by manufacturers.

2.17 Display

(C. L. Corderman) (CONFIDENTIAL)

A decision has been made to transfer the work on display from Project High to MIT. We will now do the engineering and layout work for the following frames:

a. Situation-display generator,

b. Situation-display selection,

c. Digital-display generator.

Additional personnel have been transferred to the Display Section to complete this work within the allotted time. The production of etched cards and the assembly and test of plug-in units will remain in Poughkeepsie.

Meetings in Poughkeepsie were attended concerning Charactrons, area discriminators, and simulation of "down" tubes. A meeting is planned for Tuesday, 2 March, at MIT to discuss those items which overlap the manual-input and display systems.

I am now preparing a suggested test program to evaluate Charactrons and their associated analog circuits with MTC and XD-1 equipment as it becomes available.

2.17 Display (Continued)

(R. H. Gerhardt) (UNCLASSIFIED)

Most of the past biweekly period was spent reviewing the logical block diagrams of the display-generator unit made at IBM. One day was spent at Poughkeepsie for a review of all IBM work on the logic of the display system.

A final drawing of the digital-expansion circuitry is being made. This circuitry uses 14 relays and one 16 x 20 plugboard for each console.

(M. Epstein) (CONFIDENTIAL)

Several block diagrams of the DID generator logic were drawn. This brings up to date all of the logic that has been decided. No decision has been made on the erase logic or the display-selection logic. Most of this biweekly period was spent working on a memo about Typotron erase logic.

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

This past period a new amplifier was designed for use in Typotron tests with MTC. While the amplifier was being debugged, it was discovered that the amplifier had become an efficient transmitter due to an output swing of 800 volts, feeding back through a long lead to the feedback circuit. After shielding the output stage and feeding back at a decreased signal level, the amplifier was stabilized. Preliminary checks on the amplifier indicate that the linearity is not quite good enough for the job because of insufficient forward gain. However, it is within the needs of the Typotron so that with slight modifications this amplifier can be used for Typotron tests.

In the X, Y position decoders for Charactron, certain stages require an accuracy of 0.2%. This indicates the use of 0.1% wirewound resistors in these stages. Since the literature indicates that these resistors show considerable capacitance at frequencies above a few kilocycles, the applicability of these resistors was questionable. The measurements made show that it is possible to get a rise time of 2 μseconds and so the shunt capacity associated with the resistors is not objectionable. In order to keep the cost of the decoder within reasonable bounds it is planned to have the first 4 significant digits composed of 0.1% wirewound resistors and the remainder of 1% carbon-deposited resistors.

The vector-generator system was assembled, and the signal fed to the plates of a scope directly. The vectors were sharp and straight, without curling in different quadrants. The system has several minor problems at present which need further debugging. The unbalanced output impedance of the vector-generator system is to feed a d-c amplifier.

2.17 Display (Continued)

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

Since the input grids of the amplifier are now at a negative voltage, this causes a d-c jump dependent on the quadrant of the vector to be displayed. It is hoped that if the level of the input grid is changed to zero the situation will be improved considerably.

The specification for the universal amplifiers has been changed and now requires a rise time of 20 μseconds rather than the 2 μseconds mentioned in the last biweekly report.

2.2 Group 63 (Magnetic Materials)

(D. R. Brown) (UNCLASSIFIED)

Ferrite memory cores for the second AN/FSQ-7 memory bank are being fired at General Ceramics. IBM is expected to place an order in the near future.

Progress in memory-core development at RCA is slow. The most recent lot from there, XF-406, had excessive coercive force.

Two 2000-core lots fired in the Harper furnace here have satisfactory characteristics.

Pulse generators with short rise time (0.03 microsecond) are being used in an experimental investigation of the pulse response of half-selected cores. For a half-amplitude pulse, the memory core behaves like a linear inductance with an effective permeability of about fifty.

Production Testing of Ferrite Cores

(E. J. Stevens) (UNCLASSIFIED)

MIT core testing for XD-1 has been completed. There have been 97,900 cores tested at MIT; 74,700 were classified as accepts, and 23,200 were held as rejects.

The 4,190 cores for J. Raffel's thesis work have been split into 6 groups at 1-amp driving current. These cores, General Ceramics Lot G-98, were first split into two groups of $_{u}V_{1}$ output, 190-200 millivolts and 200-210 millivolts. Next, the $_{r}V_{1}$ of each group was further split into three categories depending on whether the core $_{r}V_{1}$ output presented disturbed sensitivity at certain values of partial-selecting currents. The standard for rejection was disturb sensitivity.

Pulse-Test Evaluation

(P. A. Fergus) (UNCLASSIFIED)

Several lots of cores fired at RCA were tested for deltas and for switching times. Some of the lots were DCL cores fired at RCA. All of these lots, which had good squareness ratios, had low deltas and fast switching times, but the cores fired at low temperatures required high driving currents.

The RCA lots fired at high temperatures showed poor squareness ratios and were not evaluated for deltas. The RCA lots fired at low temperatures indicated squareness ratios of approximately 0.7 and in most cases met specifications on the pulse-test evaluation.

2.2 Group 63 (Continued)

8 Milli-microsecond Rise Time Core Driver

(B. Gurley, J. Freeman) (UNCLASSIFIED)

A current driver utilizing an R-C charging network and a mercury relay has achieved a rise time of 8 milli-microseconds. The driver produces step functions of current of amplitudes up to 850 milliamperes.

Preliminary studies of the core responses of MF-1326-B, F-394, to such very short rise-time pulses have resulted in quantitative data on the spike-voltage amplitude and also much illuminating qualitative information concerning core responses generally.

Switching Mechanism in Ferrites

(R. F. Jenney) (UNCLASSIFIED)

An empirical theory explaining the switching mechanism in ferrites has been developed. Evaluation will be made after some material in the Lincoln calculations section is returned.

The Covalent Bond in Spinels

(J. B. Goodenough) (UNCLASSIFIED)

The first half of an M-note which will discuss the role of covalent forces in cation ordering, transformation to tetragonal symmetry, exchange forces, and lamellar precipitate formation has been completed.

Cryotron

(D. A. Buck) (UNCLASSIFIED)

The superconducting transition in metals at liquid helium temperatures and the destruction at superconductivity by a magnetic field are being investigated as possible nonlinearities on which to base operation of a multi-coincident gate/amplifier. Four test probes consisting of tantalum wire-wound resistors have been immersed in liquid helium; the liquid helium has been made available in Building 41 by Professor Collins. Results have indicated that our tantalum wire has a lower transition temperature than the published value, probably due to high mechanical strains in the drawn wire. Probe 3 went into the transition region between conductivity and superconductivity. A small magnet at the botton of the cryostat caused the probe resistance to increase by a factor of three when brought near. Probe 4, an annealing experiment, failed due to reaction

2.2 Group 63 (Continued)

Cryotron (Continued)

between tantalum wire and sauereisen glaze at the annealing temperature.

Memory-Core Compositions

(F. E. Vinal) (UNCLASSIFIED)

A memorandum has been prepared (M-2692) which summarizes to date the work with the $MgO-MnO-Fe_2O_3$ system, emphasizing compositions and chemistry. With the exception of a few minor preparations, exploratory work with this system is completed. A study of chemical problems associated with the processing of memory cores will be continued to obtain a better understanding of the system.

(J. Sacco) (UNCLASSIFIED)

Processing of a new test series has been completed. The compositions are expected to be more stable in air firing than the present memory cores. D-262 size cores are now being fired, and test data pertaining to this material should be available in several days.

Production of Memory Cores

(J. J. Sacco, F. S. Maddocks) (UNCLASSIFIED)

Four firings in the Harper electric furnace of small lots of F-394 size DCL-1-180 memory cores have been completed. Three of these firings have been refired and preliminary loop squareness and pulse data taken. Results show that the cores are uniform from firing to firing and have good pulse response over the required range; but they have variations in output voltages, probably due to nonuniformity in core thickness or density. Complete data will be compiled as soon as alterations to the semiautomatic core tester are completed.

Pilot-Plant Production of F-394 Cores

(R. A. Maglio) (UNCLASSIFIED)

One additional firing of 2400 F-394 cores of DCL-1-180 composition will complete a series of small batches of memory-core production lots.

These firings have been made to determine the uniformity of the firing procedure and to obtain a sufficient quantity of cores for a

2.2 Group 63 (Continued)

Pilot-Plant Production of F-394 Cores (Continued)

64 x 64 memory plane.

The drum dryer is undergoing repair and modification to make it suitable for ferrite drying and compressing during drying.

SECTION III - CENTRAL SERVICES

3.1 Purchasing and Stock

(H. B. Morley) (UNCLASSIFIED)

Much progress has been made in disposing of surplus Navy equipment no longer of use to the Lab through Mr. Derry of ONR. This consists mostly of furniture plus some old equipment formerly stored at Ft. Heath. This cuts down somewhat our task of maintaining property-control cards on old and obsolete equipment.

Our salvage program has increased considerably in the past month and the Stock Room is virtually swamped with salvaged parts. Only components which we deem useful to the Stock Room are cleaned and re-tested and returned to stock for breadboard use. The majority of salvage was sent by truck to the Lexington salvage depot.

Some effort has been made to straighten out Ft. Heath which has been filled to overflowing with panels and various miscellaneous parts from the computer at Barta. There is still much work to be done in this direction, however.

New Lincoln Lab numbers have been issued on some components, and our boxes have been relabeled to conform.

The two most critical items at present are germanium diodes and (IBM type) pulse transformers.

The perennial germanium-diode problem returned to plague us again with the discovery that Amperex crystals changed characteristics after a comparatively short time on the shelf. B. Paine is investigating this problem. Meanwhile, orders have been placed with Hughes to cover our needs until the situation has been taken care of.

We have been obliged to return several-hundred pulse transformers to the manufacturer, as they did not meet our specifications. Manufacturing methods are being revised, but delivery of new production transformers is not expected to start before 12 March.

Month of February
Total Orders Received - 344

Received on time	142	41%
Received 1-7 days overdue	107	31%
Received 8-14 days overdue	37	11%
Received 15-22 days overdue	21	6%
Received 23-30 days overdue	14	4%
Received 1-2 months overdue	17	5%
Received 2-3 months overdue	3	1%
Received 3 or more months overdue	3	1%
	344	100%

3.2 Construction

Production Control

(F. F. Manning) (UNCLASSIFIED)

There have been 27 Construction Requisitions totaling 382 items satisfied since 12 February 1954, and there are 24 Construction Requisitions totaling 1522 items under construction by the Group 60 electronic shops.

For further information please call the Production Control Office (ext. 3492).

Outside Vendor

(J. V. Mazza) (UNCLASSIFIED)

There are 4 orders now open with vendors totaling 145 items. Deliveries in the past biweekly period have totaled 47 items. Information on specific orders may be obtained from the writer (ext. 3492).

3.3 Component Analysis and Standards

3.31 Component Analysis

Marginal-Checking Relays

(R. Jahn) (UNCLASSIFIED)

Cam bounce is being investigated by more high-speed movies of relay operation with contact springs present and absent. Bounce seems to be caused by back pressure of the contact springs. A redesigned cam which would eliminate torque from the contact spring at the full-open position should eliminate bounce.

3.33 Standards

(H. W. Hodgdon) (UNCLASSIFIED)

Some people have complained of difficulty in locating Circuit Application MD's in the Manual because of lack of up-to-date indexing. Since IBM has supplied no revised index, one will be prepared here and issued shortly.. In the meantime, if users will bear in mind that the Circuit Application Manual is one section (No. 131) of the complete MRD Book and that the MD's are filed numerically under corresponding tabs, it may help in locating material. Call me if you need information, extra copies, etc.

3.33 Standards (Continued)

(H. W. Hodgdon) (UNCLASSIFIED)

A Lincoln Laboratory Standard has been issued on the Sprague-type hermetically sealed ferrite-core pulse transformers. This Standard supersedes Division 6 Standards on pulse transformers, since the Hipersil core types are now considered obsolete. The new Standard contains all available up-to-date information on characteristics, application, and test procedures for these transformers.

3.34 Vacuum Tubes

(H. B. Frost) (UNCLASSIFIED)

Analysis has continued on the 7AK7 tubes removed from the five-digit multiplier. Pulse tests thus far have shown that the available cathode currents are much lower in old tubes than they are in new tubes. New tubes do not show saturation effects below an ampere, while the old tubes show saturation of emission at levels of 300 milliamperes or so.

A new sample of Z-2177 tubes with a higher level of plate current has been prepared by General Electric. These tubes are now being tested by IBM. A discussion of the Z-2177 tube will be held at Owensboro on 1 and 2 March. It is hoped that a final objective specification can be reached at this time.

Thesis Research

(H. B. Frost) (UNCLASSIFIED)

RT 424 was completed during the first part of this period. This tube suffered a number of accidents. One cathode tab was burned off, and the thermocouple shorted to the heater while the tube was on the system. One seal was broken while preparing the tube for basing; this accident made the tube completely inoperable. Another tube, RT 426, which will be similar to RT 424, will be constructed on or about 1 March.

A series of tests on RT 413 was completed during the last two weeks. These tests determined the direct current and pulsed emission, as well as the cathode-coating resistance. The data are not yet completely analyzed. Data for the determination of diffusion constants were taken.

3.34 Vacuum Tubes (Continued)

(S. Twicken) (UNCLASSIFIED)

During the past period a meeting was attended at Poughkeepsie to obtain a decision on how to simulate action of a "40% down" tube. Simulation by reduction of heater voltage, reduction of plate voltage in cathode follower, etc., was discussed without agreement on a satisfactory method. A decision was therefore made to leave the "40% down" requirement as a design criterion but not as a test criterion until such time as a good method of simulation can be agreed upon.

Analysis of the 7AK7 multiplier tubes under pulsed conditions is continuing. Some dependence of pulse plate current on screen current and hours of service has been found; generally only those tubes with abnormally low screen currents have plate currents close to the value expected from d-c measurements. This work is continuing.

The latest lot of 5965 tubes received has characteristics quite close to the published curves for the tube type. Previous lots have had plate currents several milliamperes higher than the curves.

(T. F. Clough) (UNCLASSIFIED)

There have been approximately twelve 5965 failures in MTC which were due to a crack in the dome of the bulb. Most of the defects were apparently the result of a poor tip-off at the factory. The vendor has been notified and is being sent typical samples.

Assistance has been given to Group 25 during this past period in obtaining evaporated gold electrodes and a tiny precise probe for their automatic electron-trajectory tracer.

(A. Zacharias) (UNCLASSIFIED)

This past period was devoted to the study of the multiplier 7AK7 characteristics. Pulse data was taken on all tubes except the two exhibiting interface impedance and is now being analyzed. No conclusive results have been reached.

3.4 Test Equipment

Test Equipment Committee

(L. Sutro) (UNCLASSIFIED)

At its meeting on 23 February the Committee approved construction of 4 more MTC plug-in flip-flops, Model II, making a total of 48 of this type of test equipment. The Committee authorized design of a

3.4 Test Equipment (Continued)

(L. Sutro) (UNCLASSIFIED)

rack power control containing only fuses and a switch. It approved purchase of a DuMont Oscilloscope Camera, Model 295, for the use of the display section of Group 62. It approved a simplification of the test-equipment record cards, whereby only the date of test will be on the card, not component failures.

Test Equipment Headquarters

(L. Sutro, A. Bille) (UNCLASSIFIED)

On 19 February multivibrator circuits in test equipment exhibited bad jitter. This trouble did not respond to our standard cures and by further checking was found to be caused by 0.6-v ripple on the -150 lab supply. This was brought to the attention of the power group. They reported that two fuses were blown in the -150 three-phase supply. After correcting this trouble our circuits performed normally.

3.5 Drafting

IBM Brown-Line Prints

(A. M. Falcione) (UNCLASSIFIED)

There have been several instances where engineers have received brown-line prints from IBM and have not turned them in to the Print Room for Central Control. It is very important that brown-lines received at IBM for delivery to MIT be turned in to the Print Room upon arrival so that proper distribution of prints to interested personnel can be effected.

Document Room

(A. M. Falcione) (UNCLASSIFIED)

The Document Room has been separated from the Division 6 Library in accordance with Administrative Memorandum A-157. We are now in the process of compiling a master file for the Document Room which will contain a complete file of all publications issued by Division 6. This file is a duplicate of the existing one which will be absorbed by the main Lincoln Library. It would be greatly appreciated if copies of old Memorandums, Conference Notes, Reports, Engineering Notes, etc., be turned in to the Document Room for this purpose.

3.6 Administration and Personnel

New Staff

(J. C. Proctor) (UNCLASSIFIED)

Harold D. Houser is working as a DDL Staff Member and has been assigned to Group 61. Mr. Houser received his B.A. in Physics from the University of Buffalo and until recently was associated with the Cornell Aeronautical Lab in Buffalo.

Mrs. Julia Yienger is working as a DDL Staff Member and has been assigned to Group 61. Mrs. Yienger received her B.A. in Math from Emmanuel College and until recently has been working as a Math Programmer for the Ballistic Research Lab, Aberdeen Proving Ground, Md.

Staff Termination

(J. C. Proctor) (UNCLASSIFIED)

Dee Neville

New Non-Staff

(R. A. Osborne) (UNCLASSIFIED)

Eva LeBlanc is a new messenger girl in the Whittemore Building.

George Hanlon is a new member of the Drafting Department.

Margaret O'Brien is Mr. Kromer's new secretary.

Terminated Non-Staff

(R. A. Osborne) (UNCLASSIFIED)

Alice Biladeau
Janet Landis

Open Non-Staff Requisitions

(R. A. Osborne) (UNCLASSIFIED)

1 Electrical Detailer
1 Mechanical Detailer
1 Senior Clerk
1 Secretary for Group 60
1 Secretary for Group 61
1 Secretary for Group 64