

APPROVED FOR PUBLIC RELEASE CASE 06-1104.

Memorandum M-2280

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Lincoln Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: DIVISION 6 BIWEEKLY REPORT, July 3, 1953

To: Jay W. Forrester

From: Division 6 Staff

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Auth: DD 254
By: R.P. Everett
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Section I CAPE COD SYSTEM

1.1 Group 611.10 General

(C.R. Wieser) (CONFIDENTIAL)

One of the two 14-channel Ampex tape recorders has been received and mounted in racks, but installation of associated facilities is not yet complete. The second Ampex unit will not be installed until the Division 2 SDV converters can be removed to provide needed rack space.

AFCRC has been notified that we are ready for them to deliver the ground-to-air-link coder so that it can be tested here prior to interpretation with the WWI in-out system.

Considerable progress has been made coding and checking out the various Track-While-Scan Subprograms. The present status of the following programs is given in Section 1.12: Master Control, Radar Data Collection and Analysis, Correlation, Initiation, Smoothing and Prediction, Track Trouble Detection and Assignment, TWS Displays, and Intervention Switches Interpretation.

Data on an aircraft track from an M-33 tracking radar to be made available by Group 22 will be compared with data available through the computer in order to obtain an estimate of the tracking accuracies for Boeing Aircraft.

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SECURITY INFORMATION

1.10 General (Continued)

(C.R. Wieser) (Continued) (CONFIDENTIAL)

As a result of various difficulties with aircraft and equipment several attempts at a flight test with the Four-Pair Intercept Program had to be cancelled.

Final decisions and approval for the non-track-while scan functions have been reached. The changes involved are discussed in Section 1.14.

1.11 Equipment Engineering

(E.S. Rich) (CONFIDENTIAL)

Further changes in the layout of Rm. 224 have been made during the last two weeks. One of the two 14-channel Ampex tape recorders was received and has been mounted in racks. The circuits of this unit have been aligned but associated pre-amplifiers and signal-switching facilities have not yet been installed. The second unit was delivered July 3 but will not be installed in Rm. 224 until the Division 2 SDV converters can be removed to provide needed rack space.

AFCRC has been notified that we are ready for them to deliver the ground-to-air-link coder so it can be tested here prior to integration with the WWI in-out system.

It is planned to complete and test the radio links first, then the coder panel itself following that. (The system involves a UHF receiver and a VHF transmitter installed at the Barta Building.) Tests by an AFCRC representative this week indicated that the receiving antenna they have on hand is not satisfactory for the Barta Building site; a different one is being procured.

Five days out of the last two weeks have been spent attending meetings of the Project Grind Committee at Building B and at IBM. The Committee has been evaluating proposals for the design of various parts of the XD-1 system.

(N. Alperin) (CONFIDENTIAL)

The interaction between light guns has been corrected by decoupling the -300-v and +150-v lines.

The 14-channel Ampex recorder has been installed in Rm. 224. The amplifiers have been calibrated and the levels set. A test recording will be made during the next two weeks.

A new method of masking for the video mappers is being investigated. The process is a modification of the Kodak Flexichrome process for making color pictures.

1.11 Equipment Engineering (Continued)

(H.J. Kirshner) (CONFIDENTIAL)

Further changes in the cable layout of the North Truro SDV data circuits have been made by New England Tel. & Tel. at the request of Group 24. A noisy N-carrier link between Provincetown and Hyannis was replaced by voice-frequency cable circuits after Group 24 determined that automatic dial equipment at Wellfleet introduced an intolerable amount of impulse noise on the N-carrier link. The modified circuits now appear to be as quiet as other SDV circuits, but because of sharp high-frequency cut-off characteristic, a degree of distortion is introduced which makes adjustment of the SDV receiver more critical. The reduction of noise, however, more than outweighs the increase of criticalness of adjustment.

A flight test was held on the evening of June 24 involving all of the Gap-Filler sites. Data from the sites was observed both at the Barta Building and at Building B. Evaluation of the test will be reported by Group 22, and a subsequent test will be made during the week of July 20.

One of the two 14-track Ampex recorders has been delivered and is being installed. Installation of associated pre-amplifiers and monitor panels is in progress.

(G. Young, B.E. Morriss) (CONFIDENTIAL)

A number of programs have been written for checking the new scope displays, indicator lights, and intervention registers. The programs were written primarily for testing and checking corrections during installation and are not well adapted for daily testing. However, they may be used if the connection and operation of the part of the setup to be checked are known in detail by the person wishing to use the equipment.

To test displays - T2637-M3,
To test intervention registers - T2637-M3,
To test indicator lights - T2636-M1.

Programs to be used for daily testing are being devised.

As soon as the PPI radar mappers are available they may be checked by Program T2750-M0 which displays incoming radar data exactly as Program T2622 except that the display is in PPI instead of B-scan form.

Memorandum M-2232 and its first supplement have been issued describing the procedure for using MITE and associated equipment, the real-time clock, the light guns, GOC box, and display boxes. This memo covers the equipment which is most often used at present by Group 61 programs with the computer and magnetic drum.

A supplement to M-1963, "The Introduction of Data for the North Truro CPS-6B and Small Gap Filler Radar directly into the Computer," has been issued describing changes in instructions used with MITE units due to the connection of this equipment to the computer clear button.

A ready-reference list with all up-to-date si instructions is now being prepared.

1.11 Equipment Engineering (Continued)

(J.H. Newitt) (UNCLASSIFIED)

All equipment important to the functional operation of the SCC (Sub-Sector Commander) Control Room is now complete and installed, except for the telephone system which is well under way. This is in close accordance with my schedule which indicated the bulk of the equipment would be completed and installed (not operative however) around the end of May with the special panels (Walquist's) being installed around the end of June.

The remaining details consist mainly of special hardware, a central control for lighting, and other miscellaneous items which (while useful and convenient) will not prevent operations from getting under way.

More and more attention is being directed toward the final appearance of the control room. After operational debugging is largely over, I will complete the enclosure of the scope consoles. After some operating experience has been accumulated, I will make a survey and issue shop orders to cover necessary spares. Fortunately this is not expected to create much of a shop load since most system revisions of late have tended to increase our supply of spares rather than to decrease them.

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

Mapper scopes Y31 and Y32 are now operating. Y31 displays and filters data from the Truro radar while Y32 displays filtered output from Y31. A switch has been installed at the bottom of rack K3 (Rm. 156) which will select filtered data from either the PPI mapper or the B-scan mapper.

Group 24 has devised a method for modifying the Pathfinder scope deflection coils to reduce the dissipation in the 807 driver tubes. We have received one modified coil from Group 24, and at present I am changing our modifications to fit the new coils. This work is being done on scope Y33 which will be installed with the new coil.

New deflecting coils will be installed in Y31 and Y32 during the week of July 6, and installation of Y33 should be completed by the end of the same week. Y33 will be connected to either MITE 1 or MITE 2 through the Demodulator-Filter Switch Panel located in rack K9 (Rm. 156). Scope Y34 will also be connected through this panel and should be installed by the end of the week of 13 July.

The Teletalk panels in the Control Room have been connected. These panels can be used to call master stations located in test control, station P, 224, and station E31. Master station P is still located physically in Rm. 228 but will be moved to station P soon. The intercom panels may also be used for conversing with master stations in Rm. 228 (station W) and Rm. 156, but these calls must be initiated at the master station since the speaker panels cannot call these masters.

1.12 Data Screening

(R.L. Walquist) (CONFIDENTIAL)

The past biweekly period has been spent almost entirely on checking out the various Track-While-Scan Subprograms. A brief summary of the present status of these programs is included below:

1. Master Control Program - A coded program has been written and checked out for the subroutine control and clock timing. Work on computer alarm recycling is being delayed until the problem is more thoroughly understood; however, initial experiments with alarm recycling have been very successful.
2. Radar Data Collection and Analysis - Coded programs have been written and are about 90% checked out. First attempt at using program only with N. Truro was very successful. A second attempt using N. Truro and 2 gap-fillers (all 3 MITE units used) gave arithmetic-check alarms. All of the difficulties have not been cured as yet.
3. Correlation - All programs for sorting, correlation, etc. have been checked out on the computer. However, no attempt has been made at combining these individual programs to see if they will operate as a single unit.
4. Initiation - About 50% of this has been coded; none of it has been checked out on the computer.
5. Smoothing and prediction - Completely checked out by itself. It still must be checked with other programs.
6. Track Trouble Detection and Assignment - Completely coded but only about 75% checked out on the computer.
7. Displays - Only one display program has been checked out on the computer. The remaining TWS displays have been coded but are awaiting Peterson's return from vacation before they can be checked out.
8. Intervention Switches Interpretation - Initial tests have been made, but both programming and equipment difficulties are slowing things down. This program is about 50% checked out on the computer.

As soon as all programs appear to be working separately we will try to tie them together as an integral unit. It is at this point that we expect the most trouble.

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1.12 Data Screening (Continued)

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

The Smoothing and Prediction Section has been tested on the computer and appears to be in 100% working order. During the next biweekly period we plan to test this program with several other related programs as they will be used in the 1953 Cape Cod System.

The master control program has been run on the computer with test parameters. Operation was satisfactory except that one parameter had a tape-preparation error. A rerun appeared satisfactory, a definite decision pending upon receipt of post-mortem results.

(H. Frachtman) (CONFIDENTIAL)

The recent biweekly period has been spent revising and writing a trouble-track display and display make-up program.

(D. Goldenberg) (CONFIDENTIAL)

A comparison is being made between the methods of stereographic and gnomonic projections in the cross-telling problem. The work of W.D. White of Airborne Instruments Company on this problem showed a high degree of accuracy and simplicity in the use of the stereographic-projection method for cross-telling between two widely separate planes of coordinates, corresponding to the two radar systems which exchange position data. In my work it has been found that the gnomonic method was the most accurate for converting slant range and height to distance in the plane of coordinates using the simplest form of conversion. In addition, the gnomonic method was sufficiently accurate to allow the simplest form of cross-telling from each radar to the center of coordinates in the Cape Cod System. Early results of the comparison for the long range cross-telling indicate that the stereographic projection is simpler than the gnomonic, for the same degree of accuracy but the conversion of slant range and height to planar distance is more complex, if the same degree of accuracy as in the gnomonic method is to be achieved.

These results indicate that for the Cape Cod System, the choice of the gnomonic method is best, because the processing of data is simplest without a deterioration in accuracy. For cross-telling it would therefore be necessary to use more complicated calculations than for the stereographic method.

The preparation of the report on the earth-curvature problem has been delayed by the above work and by the need to expand the analysis and calculations to include more general systems of radars. This need became apparent after a discussion with people from Signal Corps Electronics Lab (SCEL) on the problem. In addition, the accuracies which SCEL, W.D. White, and others are interested in are of such a size that the effect of the ellipticity of the earth must be taken into account. This analysis is being done now.

1.12 Data Screening (Continued)

(J. Ishihara) (CONFIDENTIAL)

The Correlation Subprograms (Track-Sort, et al, and Correlation) for the 1953 Cape Cod TWS have been checked out (to the best of our knowledge) on the computer using test parameters.

All related programs are now being combined, and further tests using parameters will be made.

(J. Levenson) (CONFIDENTIAL)

The Monitor Program for Track Cross Check was tested and found to operate satisfactorily. The Switch Input Program was checked out using data supplied by a test parameter since the equipment was not ready. A second parameter is ready which tests switch inputs from the TWS stations and their interpretation. This should be checked out early in the next biweekly period. The Monitor Program following Smooth and Predict is also scheduled to be checked out in the next biweekly period.

(H. Seward) (CONFIDENTIAL)

The Track Sorting and Correlation Programs were run successfully on the computer. These programs are now being altered in preparation for checking their operation in conjunction with other Track-While-Scan programs.

1.13 Tracking and Control

(J. Arnow) (CONFIDENTIAL)

After discussions with representatives of Boeing Aircraft, we are making an effort to obtain further information relevant to tracking accuracies. In line with this, Group 22 will make available in the near future an M-33 tracking radar at the Pine Hill site. Data on an aircraft track from the M-33 will be compared with the data available through the computer in order to obtain an estimate of the tracking accuracies.

(S. Best) (CONFIDENTIAL)

A correctly converted tape for a program to investigate velocity-heading smoothing has not yet been obtained.

A program which will track a single aircraft using the N. Truro radar and print-out range and azimuth in order to learn certain facts about that radar is now in the tape room.

(M. Frazier) (CONFIDENTIAL)

The non-linear 2c smoothing parameter study program has been run and has so far shown surprisingly few bugs.

It is hoped that a run this week end will track down and dispose of any remaining faults.

1.13 Data Screening (Continued)

(W. Lone, A. Mathiasen) (CONFIDENTIAL)

A second run of the tracking-study program, (see May 22 biweekly), was, it appears, entirely successful. There remains now the writing of the track parameters and the subsequent computation on WWI to complete this phase of the study for Boeing.

(A. Mathiasen) (CONFIDENTIAL)

Difficulties with the terminal equipment one Sunday and with the computer another delayed still further the study of tracking with the small radars.

Because of dropouts in the recorded data, a program is to be written which will use live data from two radar sets simultaneously but will treat them for the main part independently. This in essence is what is attempted with the single radar program now in four runs through the same data.

(H. D. Neumann) (CONFIDENTIAL)

This biweekly period was spent writing a memo on Test reports for the 1953 Cape Cod System.

(W.M. Wolf) (CONFIDENTIAL)

The Data Reset, Data Analysis, and Data Conversion and Display Programs for TWS were tested on the computer in conjunction with the Data Collection Program written by H. Frachtman and a simulated Master Control Program written by R. Walquist. Initial trouble was encountered due to the inclusion in the programs of the selection of MITE 1 and MITE 2 which were inoperative. This selection was bypassed, and the programs operated successfully. It was observed that adjustment of data limits is desired.

Later in the biweekly period the aforementioned programs were run with the selection of MITE 1 and MITE 2 which by then were available. A few programming errors were encountered. After these are corrected the programs will again be operated.

A memo to describe the function and logic of the Data Reset, Data Analysis, and Data Conversion and Display Programs is in the rough-draft stage.

Individual, one-hour instruction was given to S/Sgt. Deam and A l/C Sangster on the proper use of the Video Filter. Instruction will also be given to Group 61 operators.

1.13 Tracking and Control (Continued)

(W.M. Wolf) (Continued) (CONFIDENTIAL)

A revision of the Group 61 operator's equipment was carried out patterned after that of the S&EC Group. The operating instructions of the various test, calibration, and post-mortem tapes were brought up to date. One calibration program, written by M. Frazier, is used to calibrate the scope for two small radar sets used together. Its operation necessitates setting up the horizontal and vertical differences between the two sets. A program was written to calculate these for all small (Gap Filler) sets in the September System. This program was run and results obtained.

A bulletin-board memo written by E. Kopley was distributed and generally explained to Group 61 programmers. The memo is a table of the various scope post mortems devised by Kopley and now included with the standard tapes carried by Group 61 operators.

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1.14 Weapons Direction

(D.R. Israel) (CONFIDENTIAL)

The major activity of the past biweekly period has been a detailed review of the various non-track-while-scan functions. As a result of this work, final decisions and approval for all of the non-track-while-scan functions have been reached. Programming for the various functions is now under way and intensive testing of the various programs will commence within two weeks. Provisions and arrangements for this testing have been completed; these are briefly described below.

The following changes have been made in the operation of the Identification Section:

1. Positional information from flight plans and other sources will be inserted in the computer in Georef coordinates.
2. The Expanded Display and associated Digital Information Display will both be provided in one 16-inch scope, rather than on the previous arrangement of a 16-inch scope and a 5-inch scope.
3. A 5-inch scope will be used to present a Flight Plan DID. This display will permit verification of flight-plan inputs.
4. Provisions will be made for revisions in stored flight plans.
5. The Expanded Display and DID will be made independent of the actual identification of particular aircraft.

These changes have required relocation of equipment at the Identification Positions. Mod notices are being prepared by Brand and Geraghty. Staff members from Group 31 have assisted in the planning of the above changes as well as in planning for the handling of flight-plan cards and the operation of the Identification Section.

An additional change has been made in the Weapons Direction Section. The 8-block DID, previously planned for use by the Radio Operator, will now be used by the Interceptor Director and a new and separate DID will be made for the Radio Operator (RO). The RO's DID will show the status digits and time-to-go for all assigned aircraft, and will show command heading only when changes require that it be sent to aircraft.

A log of the use of computer time by members of the non-track-while-scan section has been instituted. The log will be kept in such a way that copies will be available both at the Whittemore and Barta Buildings. In the near future the use of this log will be extended to all of Group 61. Instructions for keeping this log presently exist in rough-draft form, but will be issued as a memo in the near future.

1.14 Weapons Direction (Continued)

(D.R. Israel) (Continued)

Procedures for keeping program and tape records have been reactivated for the non-track-while-scan section. Gaudette and Knapp will supervise the record keeping which has been designed to provide full and complete records of all tapes and modifications. A block of 200 tape numbers has been secured from the Tape Room, and tape numbers have been assigned to all of the various Non-TWS programs being written for the 1953 Cape Cod System. These tape-number assignments will be issued in a memo during the next biweekly period.

Bob Davis of Group 21 is considering various problems concerned with the manning of the Cape Cod Direction and Combat Center. Together with Capt. Sullivan and Bob Crow he will prepare a proposal for the manning of various positions.

M. Brand's FTU program is almost completely checked out; following satisfactory operation of this program it will be combined with Benington's Track Situation Display program. Other programs will be joined to these as they are checked out.

Several attempts at a flight test with the Four-Pair Intercept Program during the past biweekly period had to be cancelled because of equipment difficulties. A single-pair test with this program as well as a test with the 8 Aircraft Height Finder Program are scheduled for next week.

(H.D. Benington)(CONFIDENTIAL)

During the past biweekly period, the Display group (Benington, Conant, Grandy, Stahl) accomplished the following:

1. Optimum display programs for horizontal and vertical blocks in DID's were chosen.
2. Programming started on the final Display Make-up program. The flow diagram has been completed except insofar as programming will indicate propitious changes.
3. Concentrated efforts are being made to program the final make-up and display of Selected Track DID's used by the FTU and Visitors.
4. The following programs are now available in the 2800 series:
 - a. Display Test Program (2800)
 - b. Calibration (2801)
 - c. Simulated IND DID (2802)
 - d. Simulated TSD Track Situation Display (2803)
 - e. Simulated Summary DID (2804)
 - f. Simulated AT Talker DID (2809)

1.14 Weapons Direction (Continued)

(H.D. Benington) (Continued)

5. Digital Information Display (M-2251) was delayed because of changes in the identification and Weapons Direction Sections. These changes have been incorporated and the memo will be issued early in the next period.

6. Discussions were held with M. Brand and W. Attridge concerning the testing of several programs in conjunction with the Master Control Program. Present plans call for using only the FTU program with a Track Situation Display. As soon as possible the Display Make-up and Selected Track DID's will be added.

(M.I. Brand) (CONFIDENTIAL)

The FTU-program testing program was completed and run several times on the computer in accordance with a dry-test proposal submitted to the program-testing committee. It is about 95% checked out. Within a few days it is expected that this program will be available to programmers for Cape Cod program testing. It is expected that during this biweekly period this program will be joined with the Track Situation Display program and W. Attridge's Master Control Program.

During this past biweekly period several conferences have been held with members of Group 31 with regard to the identification system. Several of their suggestions have been incorporated into the system.

Three major changes have been made to the identification system during this biweekly period: (1) a flight-plan digital-information display has been added; (2) a revision switch for changes of ETA over check points has been added; and (3) the identification process and the expanded information display were made independent.

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

The Multiple Aircraft AAA and Height-Finding Program is working. All sections are performing their functions satisfactorily, and two sources of arithmetic overflow have been found and eliminated. A working tape will be run for two hours on July 5, and a Flight Test is scheduled for July 7.

One of the two sources of overflow was an error in the Group 61 Library Radius Vector Sub-routine which permits a divide error alarm when the x is zero and round-off adds a one to the numerator but not to the denominator. The working tape will include a safety to prevent this.

1.14 Weapons Director (Continued)

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

Computer reliability and terminal equipment reliability experienced during this activity was relatively good. Two hours were obtained on June 19, ninety minutes on June 24, and an hour on July 1. An hour was lost on June 29 because of excessive parities.

Coding is under way on all sections of the September AAA and HF programs. It is expected that all will be completed, in relative address form, by July 10.

Some time was spent during this period in coordinating with H. Benington on display problems concerning AAA and HF, and with C. Gaudette on the correlation of the AAA and HF sections with the rest of the non-track-while-scan programs.

(P.O. Cioffi) (CONFIDENTIAL)

The remainder of the work on the three-and two-dimensional intercept memos was cleaned up this period.

I began to study existing material on the weapons-assignment function in preparation for programming of this feature.

I have also been engaged in indoctrination work.

(O.T. Conant) (CONFIDENTIAL)

All DID's written previously were checked out successfully during this period. In addition, both vertical block and horizontal line Radio Operator DID's for eight interceptors were written and checked out. Display time averaged 600 to 700 μ sec/character, which should still be improved. The RO DID has now been taken over by Garth and Murray.

The second week of the period was spent in writing the FTU's Selected Track DID Make-up and Display. This program interprets the track selection by switches and makes up the display table from information in ATDS. It will be checked out next period in conjunction with programs by M. Brand and H. Benington.

1.14 Weapons Direction

(A.W. Curby) (CONFIDENTIAL)

The preliminary programs written by M. Brand, P. Gioffi, and A. Curby for testing out the logic to be used in the September system ID section were combined into a single tape and run on the computer. Their operation was satisfactory enough to warrant ceasing all further work on them.

Since a decision has been made to put ID position data in the computer in Georef coordinates, thought has been given to the switch panels, intervention-register digits, and conversion program necessary for this change. The data-processing program will be revised, for what is hoped will be the last time, to include a Georef to (x,y) conversion program and a "Revise Flight Plan" operation, the latter allowing a change in the time of activation associated with a given DRN. It will also include the possibility of requesting a flight-plan DID, the make-up program for which will be written shortly.

(F.M. Garth) (CONFIDENTIAL)

Principal work during this biweekly period has been the completion of a Radio Operator and Interceptor Director display program which is to be run in conjunction with Benington's Display Test Program. A simulated table was included in this program. The plan is later to insert a table make-up program. Such a program has been written, but it must be modified to include recent changes.

Good progress was finally made on the North Truro Data Single Pair Combined Interception Program in a trial run on the computer. Due to equipment failure the checking out of this program has been considerably delayed.

(C. Gaudette) (CONFIDENTIAL)

A flow diagram of the non-TWS function of the Cape Cod Program is being constructed by S. Knapp and myself.

A record-handling system for the non-TWS section of Cape Cod System has been set up by D. Israel, S. Knapp and myself. This new system includes a log of all non-TWS computer operation time and up-to-date copies of programs, flow diagrams, and check-out instructions of all non-TWS Programs.

The two-aircraft interception program (Truro) is still not operational, but recent results have provided much of the needed information for analysis.

1.14 Weapons Direction (Continued)

(M.A. Geraghty) (CONFIDENTIAL)

Since returning from vacation, I have caught up on the modifications to the Control Room and have available the latest authorized status of each station.

The 8 A/C HF and AA guidance program of J. Cahill and the writer has received a preliminary checkout. Two arithmetic alarms have been eliminated, and it is hoped that all possible cycles will be entered in a check on July 5; in preparation for flight tests the following week.

Programming for the September System for AA and HF has reached the point where final decisions on methods of storage and display must be made.

(J. Hayase) (CONFIDENTIAL)

Tape #2729 mo, which displays 24 cross-tell symbols and their respective altitudes has been successfully run.

The final flight-plan display and auxiliary identification-information display table make-up programs are being put into final form for tape preparation. These programs should be ready for checking out during the first part of the next biweekly period.

(F. Heart) (CONFIDENTIAL)

Efforts have continued on the Cape Cod interception flow diagram. Some study is being made of display questions connected with this problem.

Time has been spent with groups considering timing and program arrangement.

The Truro version of the four-pair intercept program is almost checked out. Final checking has been delayed by inability to run a satisfactory single-pair preliminary flight test.

(S.C. Knapp) (CONFIDENTIAL)

I am now working with Gaudette on the over-all timing, storage, and record keeping for the Cape Cod System. Our main project at present is a flow diagram for the non-TWS function. Some progress has been made on this problem. Several meetings have been attended to discuss program-testing methods and related problems.

1.14 Weapons Direction (Continued)

(W.Z. Lemnios) (CONFIDENTIAL)

The checking out of the Two Aircraft Combined Interception Program continues. About 50% of the assigned computer time during the past two weeks could not be used because of equipment malfunctions. However, the main features of the program have been checked out, and it is hoped that the completion of this process will occur in the near future.

Work has begun on the writing of the Cape Cod intercept calculations program.

(B.R. Stahl) (CONFIDENTIAL)

Work has continued on the DID's mentioned in the June 19 biweekly report. A program has been written and checked out for displaying information to the AA Talker and seems to give very satisfactory results. Furthermore, indications are that the techniques which have evolved in the creation of this program will be applicable to other displays, both horizontal and vertical.

(F.A. Webster) (CONFIDENTIAL)

A scale drawing (1:1,000,000) has been made of the multiple-corridor identification system that is concerned with seaward approaches to Boston. From this the x,y coordinates of the various check points have been determined. A sheet is now available which gives the coordinates of these points according to several different references (x,y; Georef; latitude-longitude).

(E.W. Wolf) (CONFIDENTIAL)

The intervention and activate push button test program described in the last biweekly report has been completed to a point where it will be checked on the computer as soon as computer time is assigned.

(C.A. Zraket) (CONFIDENTIAL)

The make-up of the Radio Operator's Display and Data Link programs, the Intercept Director's programs, and the Weapons Assignment program has been completed and the respective flow diagrams and data storage blocks submitted to the interested people. Coding has commenced on all programs and initial testing will start in the near future. The programs for the Radio Operator are furthest along and should be initially tested during the next biweekly period. The Intercept Director's program, which contains all the interception computations, alarm and status sensing, and control orders will be the last to be completed because of its complexity.

1.15 Direction Center Operations

(M. Brand) (CONFIDENTIAL)

The following is a summary of scheduled computer time used by Group 61 during the last biweekly period:

MEW-Truro Tracking and Control	2 hrs 40 min ✓
Flight Tests	2 hrs 05 min ✓
Data Screening	
Radar Analysis	9 hrs 05 min ✓
Multiple Radar Tracking and Control	
Magnetic Tape	7 hrs 55 min ✓
Air Defense Center Operations	12 hrs 55 min
Miscellaneous	2 hrs 55 min
Conversion	55 min
Calibration	30 min
	<hr/>
Total Time Used	39 hrs 00 min
Computer Breakdown (parities, etc.)	12 hrs 15 min
Time Given to Math Group	1 hr 55 min
Time Given to In-Out	50 min
	<hr/>
Total Time Lost	15 hrs 00 min
Total Assigned Time	54 hrs 00 min
Percentage Assigned Time Used	72%
Percentage Available Time Used	100%

(P.F. Dolan, A.P. Hill) (CONFIDENTIAL)

June 24, 1953 - 1000-1200 - Intercepts, Heart

Fighter: F-3D #3759 - Bedford 10,500 IAS 250 knots
Target: B-29 #4035 - Portland, 11,000 IAS 200 knots

Program appeared to operate satisfactorily but trouble with mapper and/or MITE caused cancellation.

June 30, 1953 - 1400-1600 - Coverage, Arnow

Target: B-29 flying between Warwick, R.I., and Whitman, so as to utilize data from sites at Fall River and Foxboro.

Fall River: terminal equipment trouble (data)

Foxboro: data poor

July 1, 1953 - 0900-1500 - Coverage, Heart

Target: B-29 flying on predetermined plan to determine coverage on CPS-6B. The results of this test have been mapped out and are available from P. Heart. The last hour was cancelled due to power failure at site.

1.15 Direction Center Operations (Continued)

(P.F. Dolan, A.P. Hill) (Continued) (CONFIDENTIAL)

July 2, 1953 - 1000-1200 - Intercepts, Knapp, Heart

Fighter: F-3D, Rockport 16,000, IAS 250 knots
Target: B-29, "Lurcher" 17,000, IAS 200 knots

Due to various difficulties with aircraft, test was delayed and no actual intercepts were recorded. Computer trouble and phone-line (data) trouble also delayed operation.

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1.15 Direction Center Operations (Continued)

(P.F. Dolan, A.P. Hill) (Continued) (CONFIDENTIAL)

DATE	TIME	SCHEDULED TEST		TEST ACTUALLY RUN		REASONS FOR CHANGES OR COMMENTS
		A/C	Description	A/C	Description	
6/24	1000-1200	2	2 A/C Intercepts	2	A/C airborne for 1 1/2 hr. cancelled rest of test	Barta equipment
6/30	1400-1600	2	2 A/C Intercepts	1	held Cape Cod Coverage	Scheduled radar not available
7/1	0900-1500	1	IFF COVERAGE	1	held from 09-1400	Cancelled last hour due to site power failure
7/2	1000-1200	2	2 A/C Intercepts	2	held from 1130-1230	A/C delayed filing ATC clearances Phone-line trouble, computer trouble

* Added to schedule during week of test

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1.15 Direction Center Operations (Continued)

(F. Heart) (Continued) (CONFIDENTIAL)

The unavailability of official, up-to-date, SECRET scheduling information for the Truro radar has continued to hamper present flight-test operation seriously.

Attempts have been made to conduct a single-pair intercept test; so far these tests have aborted either because of equipment trouble or radar scheduling.

UHF is now available at the Operations Center in Barta, and preliminary tests using the F89 will be attempted during the week of July 6. Only one channel is now available.

On July 1, a single aircraft coverage test was successfully run for over four hours. A plotted result of this test is available from F. Heart.

As of July 2 it is suggested that engineers requiring canned Truro data use Ampex Tapes TT191, TT192.

(F. Heart, A.P. Hill) (CONFIDENTIAL)

The following statistics apply to the last biweekly period:

- | | |
|---|-------|
| 1. Computer hours scheduled for flight tests | 6 |
| 2. Computer hours used for flight tests | 5 1/2 |
| 3. Computer hours returned due to flight test cancellations | 0 |
| 4. Total Aircraft hours flown | 15 |
| 5. Aircraft hours flown by 6520th Wing at Bedford | 11 |
| 6. Aircraft hours flown by Navy (Quonset-based Squadron) | 4 |

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1.16 WWII Support

(D.R. Israel) (CONFIDENTIAL)

June 30 and July 1 were spent at IBM in Poughkeepsie at sessions of Project Grind covering display and in-out facilities. An important outcome of these meetings was the acceptance of a once-per-two-seconds display rate for the Track Situation and the DID displays.

(B.G. Farley) (CONFIDENTIAL)

The "bootstrap" program which combines a "worst" memory pattern and testing in all four quarters of the memory of MTC has been run; this program was written with H.E. Anderson. Several other programs testing various parts of the computer have been written.

At present, consideration is being given to a program to determine the effectiveness of the post-write disturb pulse. This is to be accomplished by appropriately timed and spaced disturbing pulses to produce the worst pattern without post-write disturb.

1.2 Group 64

(S. H. Dodd) (CONFIDENTIAL)

The following paragraphs outline the present status and problems associated with the pieces of equipment required for the Initial Cape Cod System. Equipment engineering is slightly (about two weeks) behind schedule.

The Phone-Line Demodulators and Switching between Phone Lines

The demodulators for the Truro link and all gap fillers have been installed, and provisions have been made for switching the outputs of these demodulators so that any phone-line circuit can be used with any MITE - video-mapper combination. The demodulators require frequent adjusting of clip levels. This is necessary because of changes in phone-line characteristics and probably drift in the demodulators themselves. Enough experience has not been obtained to estimate accurately the reliability of these units.

MITE

There are three MITE units with their associated buffer storage. MITE 0 is used with the Truro data, and MITE's 1 and 2 are used with the gap-filler data. MITE 0 has been completely installed and tested and has been in operation for several weeks. Marginal-checking techniques are in operation, and work is progressing toward improvement of the marginal-checking techniques and improvements in circuit operation. MITE's 1 and 2 have been completely installed and are now being tested. We can expect reliable operation from these units as soon as they are integrated into the system, and routine marginal checking has been established.

Video Mappers

Two of the mappers have been installed and operated with the associated demodulators and amplifiers under test conditions, and operation has been satisfactory. The third mapper has been completely modified and should be ready the first part of the week of 6 July. One major trouble with the Pathfinder units was caused by overloaded drive tubes in the deflection amplifier. This has been temporarily fixed by the addition of more tubes, and we are looking into the problem of procuring a new deflection yoke with higher deflection sensitivity. The azimuth drive unit is marginal in operation. It works well on synthetic data generated by test equipment but does not work on recorded data. The quality of the recorded data is poor and we have no information on how the drive units operate on live data. The malfunctioning of the azimuth drive unit seems to result from inadequate fly-wheel characteristics making the drive unit very sensitive to missing azimuth-change pulses. A new azimuth drive design has been promised by Group 24 but has not yet been delivered. The delivery date is at present unknown.

The mapper photocell pickoffs are operating satisfactorily.

Recording

One 14-channel Ampex FM recorder was delivered to the lab last Friday and has not yet been operated. It is expected that this unit will be much more satisfactory for recording phone-line data than our present amplitude-modulated recorder.

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1.2 Group 64

(S. H. Dodd) (Continued) (CONFIDENTIAL)

Auxiliary Drum

The auxiliary drum has been operating with the computer for several weeks and has given good reliability. Most of the work now being done on this drum is involved with the installation of new equipment for improving trouble-shooting techniques and for continuing the maintaining of the auxiliary drum at good reliability.

Display

All display scopes except those in Room 250 and in the Sector Command Post have been installed and checked out satisfactorily. There is still a substantial amount of noise on the deflection line, and work is progressing on a balanced deflection system to correct this difficulty. The present system is probably quite usable for obtaining operational experience, training, and testing out programs but is probably not satisfactory for operation in September. This deflection-line-noise difficulty is probably one that is not completely under control, but there is a very good chance of fixing it by September.

The display-selection system is now operating satisfactorily. Cross talk between selections at various scopes gave us trouble when the equipment was first installed, but operation was improved substantially by changing the power-supply filtering system. If any further trouble shows up when programs are operated, this can be corrected without too much trouble.

The vector generator has been operating satisfactorily.

The symbol generator has been operating very well. There has been difficulty with cross talk between the symbol generator and the deflection generator. This has been substantially improved by changing the mixing of these two signals but is not satisfactory yet. This difficulty should be corrected during the next couple of weeks.

Light Guns

The light guns have not yet been operated from programs which will be used in the operation of the Cape Cod System but have given no trouble when operated from test programs.

Indicator-Light Registers

The indicator-light registers are now operating with marginal reliability. It is expected that this situation will be improved in the near future.

Activate Register

The activate register as originally designed caused trouble due to heater-cathode shorts. It has been redesigned and is now being built in our shop. The shop is expected to deliver this unit by 3 July, assuming that

1.2 Group 64

(S. H. Dodd) (CONFIDENTIAL)

Activate Register (Continued)

the new system operates satisfactorily, it should be working next week.

Manual Intervention

All the manual-intervention circuits have been checked out, and operation is satisfactory.

Telephone Intercommunication System

The installation of this intercom system is about two weeks late but is progressing satisfactorily.

Special Panels

A number of special panels have been recently specified and many of these have been constructed and installed. Progress on these is very satisfactory.

Equipment Changes

Many changes in equipment have been requested by Group 61 programmers. These will be made during July.

1.21 WWI System Operation

(N. L. Daggett) (UNCLASSIFIED)

Operation of the computer has been seriously interrupted recently by a rash of storage-tube failures and by a large number of ES deflection-shift troubles. The tube failures were particularly troublesome because the spare ES digits have not yet been installed, making it necessary to suspend operation each time until a new tube was installed.

The deflection shift troubles were apparently due entirely to 715C failures in the decoder output amplifiers. These were new tubes which had been installed without preburning. As a result of this trouble, racks have been set up to preburn all 715C's before installing them in the computer. They will also, of course, be thoroughly tested for plate-current drift at the end of the preburning period.

(L. L. Holmes) (UNCLASSIFIED)

The facilities for installing the spare ES digit are ready. The power wiring and video cabling have been completed. The installation of the necessary panels (with the exception of the Storage-Tube Mounts) is also completed. The storage tubes were placed in service 3 July. The availability of this spare ES digit will help reduce the loss of computer time during applications work.

1.21 WWI System Operation (Continued)

(A. J. Roberts, D. M. Fisher, S. E. Desjardins) (UNCLASSIFIED)

Electrostatic Storage

Trouble with deflection shift in the ESD output panels continues. The cause of the trouble appears to be drifting plate current in the 715's. These tubes are now being "burned" prior to their use in the output panels in an effort to increase their stability. A complete set of tubes should be ready for installation during the week of 6 July.

Several tubes have been rejected during this period because of failure to hold a plus array. The two spare digit columns are being prepared for operation and should considerably reduce the time lost because of tube failures.

(H. L. Ziegler) (UNCLASSIFIED)

Auxiliary Magnetic Drum

Both the Drum Monitoring System and the Test Rack have progressed satisfactorily during this past biweekly period. Even though some parts such as the 74-pin chassis plugs still have not been delivered, the Test Rack is essentially complete, and the monitoring system can be completed in the next week or so providing the missing parts are soon delivered.

Extensive testing of the ERA chassis for the magnetic drums is expected to begin immediately. Data obtained from these tests are primarily intended to establish test specifications for future trouble shooting and maintenance work.

(P. W. Stephan) (UNCLASSIFIED)

A new marginal-checking program for the auxiliary drum was written. It checks all the drum except group selection and so preserves the relays in the drum. The other marginal-checking program will be used to check the group selection circuits.

The rest of the time has been spent checking the buffer drum.

(J. H. Hughes) (UNCLASSIFIED)

Marginal Checking

The new Auto Control Panel, Mod. III, went into WWI 29 June. It took a couple of days to iron out some bugs which did not show up on bench test but the machine seems to run O.K. now. Spare parts have been ordered.

Electrostatic Storage

I have redrawn and brought up to date Herb Ziegler's block

1.21 WWI System Operation (Continued)

(J. H. Hughes) (Continued) (UNCLASSIFIED)

schematics of ES time pulses. These new drawings may be found in the back of the Register Driver Book in the Computer Room.

(D. A. Morrison) (UNCLASSIFIED)

Marginal-Checking Panel Selection Frame

Hardware is being installed on the Marginal-Checking Panel Selection Frame as it arrives. The roller latch and limit bar have been installed. The plug-in capacitor hold-down clamps are scheduled for mounting on the next installation period.

Marginal-checking drawings are in the process of being brought up to date.

(L. H. Norcott) (UNCLASSIFIED)

Typewriter and Paper Tape

The Drafting Room has almost completed the drawings for the paper-tape verifier. They should be ready for signing in a few days.

Some trouble was experienced with the delayed print-out system during the past two weeks, and two Flexos were completely overhauled in an attempt to find the cause of the trouble. Farnsworth meanwhile checked his relay panel and located the cause of the trouble. In one case he found a shorted relay had been keeping the translator clutch magnet continuously energised; in another case he found that the trouble was caused by arc-suppression circuits he had been connecting across the coils of the Flexo-writer. He has modified his circuits accordingly.

1.22 Terminal Equipment

(J. A. O'Brien) (UNCLASSIFIED)

The installation of the new terminal equipment is essentially complete. A number of changes and corrective modifications need to be made, but all the 16-inch scopes are in and operating.

The activate register has undergone an extensive modification and is now being inspected. A modification to improve the operation of the indicator-light registers has been decided upon and will be worked out next week.

1.22 Terminal Equipment (Continued)

The noise on the scope-intensify lines has been reduced to an unobjectionable amplitude by removing the choke in the power-line filter supplying the intensify gates; no additional work on this noise is contemplated at present.

The initial MITE installation for three radars is now complete. The gap-filler MITEs with storage were put into operation during the week of 30 June. Some of the voltage margins are low and need improving, but they are better than MITE 0 was initially.

(T. Sandy, S. B. Ginsburg) (UNCLASSIFIED)

Equipment Installation in the New Control Rooms

All intervention digits have been completely checked out with the exception of the digits located at consoles "Q" and "U".

All indicator-light digits which have been assigned were tested statically. However, the extinguishing circuits have to be modified.

The display-gate circuits assigned to the large scopes were checked; several of the switch positions are not operating correctly.

The activate-register panel is expected back from the shop this week. Part of the week will be used to test all the intervention registers using the activate switches and a test program written by Guy Young.

(E. Farnsworth) (UNCLASSIFIED)

Magnetic-Tape Mechanisms

Five Auxiliary Control Panels were completed by the shop and installed in TC17, 18, and 19 during this period. These units add protective power and control interlocks, time delays, semi-automatic rewind, etc. permitting complete control of the magnetic-tape handling equipment without opening the dust covers.

Clutch and brake adjustments to units 3A and 3B have improved their performance considerably.

Magnetic-Tape Print-Out

The magnetic tape to paper tape punch-out portion of the delayed-output equipment is now being used to speed up the output of converted tapes by the computer. No punching errors have been discovered since the last timing problem was eliminated.

Fifty per cent of the equipment to replace the breadboard and Burroughs test equipment is now on construction requisition, and the remainder is in drafting.

1.22 Terminal Equipment (Continued)

(K. E. McVicar) (UNCLASSIFIED)

Buffer-Drum System

All of the dual heads on the buffer drum have been checked for amplitude of read-back signal and spacing between the read and write heads. In addition, some checks have been made on the timing of the dual-head channels.

During the check of the dual-head tracks, it was noticed that there was a nick on the oxide surface on one track. This nick causes a spurious read-out signal which cannot be erased. The effect of this signal is to cause the dual-track to simulate the "have recorded" condition. That is, no new information can be recorded in the corresponding information slot by the computer because the slot appears to be full. When a read operation is ordered, the contents of the information register will be read out, even though nothing was recorded in that slot.

The effect of the nick seems to be confined to a single slot in one track. Attempts were made to eliminate the nick by rubbing the oxide surface with a plastic rod, but they were unsuccessful. Rather than send the drum back to have it resurfaced, present plans are to program around the bad slot.

At present, the timing in the dual channels is being checked closely. There is some evidence that the timing is very critical in Channel 1, especially around the splice in the timing track. The problem is aggravated by the fact that the output of Channel 1 is used directly and then passed through an inverter and used again. Unfortunately, there is a time delay in the inverter which necessitates very close timing of the sense pulse to prevent it from falling off the edge of the gate waveform.

(R. Paddock, A. Werlin) (UNCLASSIFIED)

MITE

MITEs 1 and 2 have both been tied in with the computer and have operated successfully with a new test program written by J. Forgie. They are now available for use by Group 61. Margins have been taken and were satisfactory for an initial tie-in. Further work will be done in pulse testing and improving these margins.

The video-switch panel, which disconnects all lines going to the computer from MITEs 1 and 2 is located at the top of Rack K6 in Room 156. To connect MITEs 1 and/or 2 to the computer, their respective switches must be thrown up. This panel is temporary so that pulse testing can be done independently of the computer.

1.22 Terminal Equipment (Continued) (UNCLASSIFIED)

MITE

An additional switch has been inserted at the bottom of Rack K3, Room 156. This switch permits filtered data to be applied to MITE 0 from either the old B-scan video mapper or the new PPI video mapper located in Room 216 which has just been tied in.

Progress is being made in drafting towards getting the MITEs and Buffer Storage up to date.

The Demodulator-Filter Switch Panel has been cabled in with the demodulators and MITEs 1 and 2; a memo on its operation is being prepared.

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 June 19 - July 2, 1953:

Number of assigned hours	101
Usable percentage of assigned time	82
Usable percentage of assigned time since March, 1951	85
Number of transient errors	44
Number of steady-state errors	6
Number of intermittent errors	7

Storage-Tube Complement in WWI

(L. O. Leighton) (UNCLASSIFIED)

Following is the storage-tube complement as of 2400 July 2, 1953:

<u>Digit</u>	<u>STM No.</u>	<u>Tubes</u>	<u>Hours of Installation</u>	<u>Hours of Operation</u>
0 B	38	ST-619-C-1	10069	4974
1 B	15	ST-820-R-1	14404	639
2 B	31	ST-807	13501	1542
3 B	4	ST-821	14226	817
4 B	33	RT-380	13516	1527
5 B	11	ST-836	14617	426
6 B	3	ST-751	13170	1873
7 B	17	ST-822	14846	197
8 B	44	ST-742	12640	2293
9 B	42	ST-720-C	12937	2106
10 B	2	RT-382	13629	1414
11 B	25	ST-753-1	13129	1914
12 B	28	ST-747	13261	1782
13 B	27	ST-841-1	14845	199
14 B	24	ST-624-C-1	10507	4536
15 B	16	RT-383	13629	1414
16 B	19	ST-845	14886	157

1.23 Records of Operation (Continued)

Storage-Tube Complement in WWI (Continued)

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

<u>Digit</u>	<u>STM No.</u>	<u>Tubes</u>	<u>Hours of Installation</u>	<u>Hours of Operation</u>
0 A	43	ST-722-C	13130	1913
1 A	20	ST-817	14148	895
2 A	9	ST-849	15033	11
3 A	23	ST-802	13411	1632
4 A	32	ST-808	13516	1527
5 A	40	ST-525	13389	1654
6 A	34	ST-710-C-1	12889	2154
7 A	35	ST-800	13340	1703
8 A	45	ST-825	14307	736
9 A	39	ST-814	13910	1133
10 A	30	ST-801	13363	1680
11 A	36	ST-744-1	12822	2221
12 A	8	ST-746	12982	2061
13 A	14	RT-381	13581	1462
14 A	37	ST-819	14404	639
15 A	22	ST-805	13457	1586
16 A	12	ST-831	14517	526

ES Clock hours as of 2400 July 2, 1953	15043
Average life of tubes in service in Bank B	1384
Average life of tubes in service in Bank A	1636
Average life of last five rejected tubes	69

Storage-Tube Failures in WWI

(L. O. Leighton) (UNCLASSIFIED)

The following storage-tube replacements were reported during this biweekly period:

- ST-830 was rejected after 167 hours of operation because of failure to hold a positive array.
- ST-834 was rejected after 274 hours of operation because of failure to hold a positive array.
- ST-803 was rejected after 1434 hours of operation because of weak high-velocity gun.
- ST-843-1 was rejected after 4 hours of operation because of weak holding-gun current.

1.23 Records of Operation (Continued)

Storage-Tube Failures in WWI (Continued)

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

- ST-837 was removed after 1/2 hour of operation because of weak high-velocity gun. Tube and mount sent down to STRT for further tests.
- ST-842-1 was rejected after 78 hours of operation because of failure to hold a positive array.
- ST-840-1 was rejected after 132 hours of operation because of weak holding gun.
- ST-846 was rejected after 64 hours of operation because of failure to hold a positive array.
- ST-844-1 was rejected after 66 hours of operation because of failure to hold a positive array.

Component Failures in WWI

(L. O. Leighton) (UNCLASSIFIED)

The following failures of electrical components have been reported since June 19, 1953:

<u>Components</u>	<u>No. of Failures</u>	<u>Hours of Operation</u>	<u>Reasons for Failure</u>
<u>Crystals</u>			
D-357	2	13000 - 14000	Low R _p and drift
Tube socket	1	18000 - 19000	Defective pin
<u>Resistors</u>			
2000-ohm, 12-watt, w/w +1%	1	0 - 1000	Open
5000-ohm, 12-watt, w/w +1%	1	0 - 1000	Open
5000-ohm, 1-watt, +1%	2	9000 - 10000	Above tolerance
<u>Tubes</u>			
0A2	1	0 - 1000	Broken glass
6145	4	0 - 1000	2-Short, 1-cracked envelope, 1-screen cut-off

1.23 Records of Operation (Continued)

Component Failures in WWI (Continued)

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

<u>Components</u>	<u>No. of Failures</u>	<u>Hours of Operation</u>	<u>Reasons for Failure</u>
<u>Tubes</u>			
6AU6	1	0 - 1000	Short
6V6	1	4000 - 5000	Low I _b
5U4G	1	2000 - 3000	Open heater
	1	8000 - 9000	Low I _b
6X5	1	1000 - 2000	Short
	1	17000 - 18000	Low I _b
6Y6G	1	13000 - 14000	Leakage
715C	1	0 - 1000	Open filament
5881	2	1000 - 2000	Low I _b
6L6	2	6000 - 7000	Low I _b
	1	13000 - 14000	Loose base
	4	18000 - 19000	Low I _b
7AD7	1	5000 - 6000	Unbalance
	1	11000 - 12000	Short
	2	18000 - 19000	1-Short, 1-low I _b

1.24 General

Primary Power

(J. J. Lynch) (UNCLASSIFIED)

All a-c input changes required for the expected increase in d-c loads have been completed.

D-C Power Supplies

(J. J. Lynch) (UNCLASSIFIED)

GL5855 thyatron tubes, which have a high commutation factor, have replaced C16J thyatrons on the +250-volt, 25-amp. supply. Longer life is expected from this new tube.

1.3 Group 65

1.31 Storage Tubes

(P. Youtz) (UNCLASSIFIED)

The primary interest of the storage-tube group during this period continued to be the construction and testing of 800-series storage tubes and their installation in ES row. The construction and testing facilities were operated at full capacity at all times to meet these requirements. The demand for replacements has been so great that spare tubes cannot be stock-piled. The scheduled shutdown of the vacuum-tube construction facilities for a vacation during the last week of July and the first week of August has been postponed until October.

The experiments on the deposition and bakeout of stannic-oxide-coated envelopes and the work with the Philip "L" cathodes continued. Several storage tubes with stannic-oxide-coated envelopes will be scheduled each week because of their satisfactory performance in the computer.

During this biweekly period one experimental tube was constructed for the cathode investigation of H. B. Frost. This tube will be scheduled for processing during the next period.

Previous to this last biweekly period all failures of 800-series storage tubes could be explained. This past week there have been a number of failures in ES row which were inexplicable. An intensive investigation has been started to remedy that.

Storage-Tube Construction

(T. F. Clough, J. S. Palermo, T. R. Parkins) (UNCLASSIFIED)

During this period no 800-series storage tubes were constructed as replacements for any marginal tubes and old-model tubes in Bank A and Bank B. One storage tube with a stannic-oxide-coated envelope was also constructed.

1.32 Test

Television Demonstrator

(D. M. Fisher) (UNCLASSIFIED)

Seven storage tubes were pretested this period; all were satisfactory.

ST837 was transferred to the storage-tube laboratory from WWI for further testing. This tube was removed from Digit 7B after 0.5 hours of operation because no readout signal was detectable. Time did not permit further examination of the tube in WWI. The tube was installed in the TVD, and results showed both guns were dead and could not be reactivated.

1.32 Test (continued)Storage Tube Reliability Tester

(R. E. Hegler) (UNCLASSIFIED)

During this last period ST844-1 through ST852 were tested at the STRT. All were satisfactory except ST848 which had no spot-interaction area. The primary reason why ST848 had no spot-interaction area can be attributed to a decrease in increment voltage at the deflection plates due to the addition of centering and rotating resistors.

(Alfred Zacharias and L. B. Martin) (UNCLASSIFIED)

After reading some of the literature pertaining to the test equipment used in the STRT we set up a number of these units in several combinations and studied their performance. Since then we have been repairing a-c register panels to be used in the STRT.

1.33 Research and DevelopmentVelocity-Distribution Measurements

(C. T. Kirk) (UNCLASSIFIED)

The contact potential between the Faraday Cages and the holding-gun cathodes obtained from Richardson plots were found to be in excellent agreement with the value observed from velocity-distribution curves. The contact potential given by the Richardson plots is 2.8 ev.

The cathode temperature is easily obtained as a by-product of a Richardson plot. The temperatures obtained from the above plots ranged from 800°K to 1000°K, which is the operating range of an oxide-coated cathode. This further substantiates the correctness of these plots in obtaining the contact potential.

Attempts to obtain oscillographs of the restoring-current curve of RT218 have shown that first crossover changes with the potential history of the surface and with direction of net current flow to the surface. This effect was also noticed in RT218 by A. Tanguay, (see MIT Thesis, "Charge Stability of the M.I.T. Storage Tube," by A. Tanguay, pp. 72-74). It also has been noticed that the apparent work function of the surface changes in the same manner, direction, and approximately the same amount as the change of first crossover, (see Biweekly Report, June 19, 1953, "Velocity-Distribution Measurements"). Thus, it appears that the change in first crossover is due to a change in apparent work function rather than a change in secondary emission characteristics of the surface.

In general the surface behaves as though there were an interface impedance present. The apparent change in work function is due to the voltage drop across this impedance.

1.33 Research and Development (Continued)

During the next biweekly period an attempt will be made to measure this interface impedance.

"L" Cathode Research

(E. J. Stevens) (UNCLASSIFIED)

I began working with R. Biagiotti on research of Philip "L" Cathodes on June 22, 1953. At present a study of grid emission is being made to determine the basis and elimination of this phenomenon.

Work is also continuing on the life-test unit where RT367-C and RT372-R2 are undergoing tests to determine the reasons for holding-gun failures. In conjunction with this problem a study has begun to determine the reason for the rash of holding-gun failures which have occurred in the 800-series storage tubes while in computer operation.

On Thursday, July 2, 1953, the V_B power supply in the Life Test Rack failed. The trouble was attributed to a short in the primary of the supply transformer. Attempts have been made to secure a replacement from stock. The unit will be put into operation again as soon as a new transformer is received.

1.34 General

(C. L. Corderman) (UNCLASSIFIED)

The early part of this period was spent attending the IRE Electron Tube Conference at Stanford University. I visited several commercial companies in the area for discussions of special tubes and crystal diodes.

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SECTION II - WHIRLWIND II

2.1 Group 62

(N.H. Taylor) (CONFIDENTIAL)

The last two weeks have been spent to a large degree in attending the meetings associated with Project Grind. The purpose of this effort is to firm up specifications for the FSQ7-XD1 system as early as possible in an attempt to allow the large group of engineers now associated with this project to go ahead with their design efforts. The subjects discussed for the first week are included in Memorandums M-2266, 2267, and 2268 and for the second week in Memorandums M-2283, 2284, and 2285. A summary of the 6 days of continuous conference is given below.

Slowed-Down Video

No new technical progress was realized as far as SDV was concerned. It was agreed that such logic as may be required for connecting the 3 standard SDV demodulators for large work and radar work will be made by IBM using standard FSQ7 basic circuits. Group 24 will continue basic work on the demodulator.

Video Mappers

A brief review of the video-mapper problem indicates the progress here is reasonably satisfactory. Considerable complication has been included in the system in order to synchronize the north markers and cause automatic correction of video mapper with each north marker. IBM will have a breadboard of this portion of the system running within two weeks. If this breadboard proves to be very complicated it may be wise to omit this refinement on the original model. More work should be done on the problem of parallax correction. It seems that some simple optical system which will allow the operator to see the tube from the same vantage point as the photo cell will be very desirable even in the first models. IBM will concentrate more effort in this direction.

SDV Input Registers

It was agreed that metallic-ribbon magnetic cores would be used to receive the information from the phone lines and convert it into binary numbers to be written on the drum. A "drum demand" system of operating these registers was agreed to. This system will accomplish the result with about 29 cathodes and 99 diodes per phone line. It will allow a material saving of vacuum tubes over any other system considered. The basic logical building block is a magnetic-shift register operating at less than 100 Kc. This basic building block will be usable on the output of the system.

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2.1 Group 62

(N.H. Taylor) (CONFIDENTIAL) (continued)

Marginal Checking

Apparently there is a general agreement on the method of marginal checking to be used. Certain basic aims were set up, but there is still some chance that individual differences of opinion may exist in the exact details of how logical circuits should be grouped together. The Marginal Checking Committee will submit a sample of the proposed breakdown of the arithmetic portion of the machine for detailed comment by all interested members. An estimate of 170 lines to the central portion of the computer was made. If this many lines do in fact seem necessary it will probably necessitate automatic switch equipment to allow the time for marginal checking to become short enough for practical operation. It was agreed that certain groups of the proposed 170 lines could be made so that rather large sections of the computer could be varied for checking conditions. These rather large sections could then be divided for easier diagnosis should the over-all check fail to indicate adequate margins. It was felt by some that this group of large sections would allow rapid marginal checking most of the time and that only on the failure of a large section would it be necessary to go through all 170 lines. There is a difference of opinion still existing as to the time element which this arrangement would provide. WWI experience would indicate that we will probably need automatic switching to provide complete daily check on the whole machine.

Memory

The memory group agreed to provide 4096 registers, 33-bits long, with a memory cycle of $7 \frac{3}{4}$ microseconds as a maximum access time. Two methods of driving will be concentrated on: (1) direct tube driving using the 5998 tube will be studied by MTC group; (2) a transformer driving scheme will be studied by Papiian's group as well as Edwards' group at IBM. High-speed memory situation seems to be in fairly good shape.

Power Supplies

A first discussion of power supplies served to introduce the interested parties and indicated a rather wide difference of opinion as to just what should be used in the XDI machine. It was recommended that a rotary generator be used to isolate supplies from transmission line and that filaments should be turned on slowly. A general agreement on the quality of the required supplies was accepted by the group. All of the quantitative information in this area must be reviewed again, however, and most of the numbers in the memorandum should not be considered final.

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2.1 Group 62

(N.H. Taylor) (CONFIDENTIAL) (continued)

Magnetic Drums

An IBM proposal to supply 5 magnetic-drum frames using the standard IBM drum was made. The problem of magnetic drums seems to center largely around circuitry associated with each drum and the grouping of the drums to obtain maximum usefulness. IBM has recently enlarged their engineering group on drums from 3 to 8 engineers, and within a month a rather detailed proposal will be available both as to logic and basic circuits in this area. Considerable discussion of the status and method of status control seems to indicate that this part of the situation is well in hand.

Display

A review of the display situation indicates that the magnetic-core type of character generator is quite feasible and reasonably close to testing. It was agreed we would proceed with the display design on the basis that each spot or character could be intensified once every 2 microseconds. A study of phosphors, lighting, etc., will be made on this basis. It seems we will be able to achieve this aim using new electronic techniques and that any improvements such as the use of electrostatic tubes or charactrons would serve to allow more frequent writing. It is very doubtful that completely flicker-free displays can be achieved without adding tremendous amounts of equipment. A proposal for mechanical intervention by operators was made by Walker Thomas. The proposal seemed reasonable although it included a large array of switches at most of the consoles. A discussion was held of light guns as we needed to know whether a light gun could operate without the flash. This will be investigated. The details of the display and the mechanical inputs will appear in the minutes of the meeting.

A study of output indicated that we may be able to run the system with a low number of telephone lines if the round-robin technique of transmission is used on the radio transmitters. Each telephone line will apparently demand about 350 cathodes if an all-vacuum-tube system is used, but about 240 cathodes as magnetic cores can be substituted for shifting registers. This seems hopeful.

Digital Display

A proposal for digital display appeared to indicate that a system for a group of registers on the drum for each group of words to be displayed is quite feasible. Any observer could then select which particular group of data he would like to look at at a given time. But only one group of words can be displayed on any one scope. If the proper tubes are available for rapid writing this could probably be made on 3" or 5" tube.

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2.1 Group 62

(N.H. Taylor) (CONFIDENTIAL) (continued)

Console

A rather comprehensive console which will be more of a maintenance console than a strict operator's console was discussed. Almost all of the features of the WWI system will be included, and a list of operations is given in the notes. A directly connected display scope with separate decoders was agreed upon to aid in diagnostic routines and allow direct display from the computer at console location only. Storage will include the 6 registers, one of which will be a live register.

Mechanical Design

The plug-in unit which was accepted is a combination of the Havens unit but using the modified version of 701 type of plug. A method of constructing the machine in sections to allow combinations of the 6- and 9-tube plug-in units was agreed on.

Basic Circuits

The high-speed basic circuitry seems fairly acceptable and satisfactory. The low-speed basic circuits are more in question. The specifications for a lower-speed type of flip-flop was made more firm. An agreement that 0.1- μ sec. pulses be standardized for use with gate tubes was made, and few specifications were evolved for circuits which would connect the phone line to the drum and the drum to the computer, both on the input and output. It was agreed that some of the manpower previously working on low-speed diode gating could be diverted to do some of the basic circuitry associated with magnetic registers.

Four basic tube types were agreed on, namely 7AK7, 5965, 5998, and 2D21. Two other types were accepted for use in special applications: 4X150A and 6116.

Note: Since the meetings the tube people have suggested that the 6136 be added to this list for low-level amplification problems.

Standards

A brief discussion of standards problems seem to indicate a problem of organization and dissemination of information. It seemed reasonable that this can be resolved with little difficulty.

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2.11 Systems

In-Out Block Diagrams

(J.F. Jacobs) (CONFIDENTIAL)

The block diagram of the Radar input system is being prepared. The first draft of this diagram should be ready within a week.

The In-Out Control (I-O Reg, I-O Adr Ctr, I-O Wd Ctr, etc.) is being studied to determine the increase in capacity that a machine with these registers provides over a machine in which the I-O control functions are performed by existing Registers (M Buff, etc.). The results of this study will not necessarily have any effect on the design of XD-1. An M-note covering the investigation will be prepared.

Circuit Application Manual

(J.F. Jacobs) (CONFIDENTIAL)

Most of the basic circuits needed for the arithmetic element and control are now available in the applications manual. There is a definite need for a streamlined approval procedure for these circuits.

In-Out Block Diagrams

(R.C. Jeffrey) (CONFIDENTIAL)

Wesley Clark and I have made a rough evaluation of the registers of the in-out element proposed for WWII by comparing it with a simpler system in which the functions of the registers of the in-out element are performed by registers already existing in the machine. The difference in equipment between the two systems is about three 32-bit registers. The difference in time appears to be only one second per frame. These results will be checked and written up in an E-note.

I spent three days at High Street working on a block diagram for the input buffer-drum system with Thompson's Group. This will continue next week, when we hope to have a complete block-diagram proposal.

Outputs to Weapons - WWII

(R.C. Hopkins) (CONFIDENTIAL)

During the reporting period, a proposal for the weapons' output system was formulated for presentation to Project Grind. The presentation was made on 1 July, and a Memorandum is now being prepared to make the proposal a matter of record and to record some of the factors considered in the system.

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2.11 Systems

Circuit Application Manual

(A.Heineck, R. Callahan) (UNCLASSIFIED)

Copies of basic circuit entries for the Circuit Application Manual were obtained and a few of these copies were distributed at a joint MIT-IBM meeting.

These entries included:

- 1. Flip-Flop, Model 1
- 2. Buffer Amplifier, Model 1
- 3. Delay Unit, Model 1
- 4. Cathode Follower, Model 1
- 5. Gate Tube, Models 1 and 2

WWII Display Control

(R.H. Gerhardt) (CONFIDENTIAL)

A study of the proposed WWII display system of vector generators and of character generators is being made. A first draft of the display-control logical block diagram has been made. However, some details have been omitted since the type of phosphor and the type of deflection for WWII display scopes have not been decided upon.

(Irving Aronson) (UNCLASSIFIED)

The first week of this period was spent working with the Marginal Checking Committee to get a presentation ready for the June 25 Project Grind meeting at Lincoln.

The remainder of the time was devoted to studying methods of setting marginal-checking-excursion limits. A proposal will be made during the next two weeks.

WWII Power

(J.J. Gano, R.G. Farmer, G.F. Sandy) (UNCLASSIFIED)

The first joint meeting between MIT and IBM on power supplies was held last week. The points discussed were primary power, d-c power supplies, marginal-checking power, and standby power to carry the load in case of commercial-power failure. Some tentative specifications were drawn up but few decisions were made. Both groups agreed to investigate the points listed above more thoroughly before the next meeting.

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2.11 Systems

A Study of High-Speed Multipliers

(W. A. Klein) (UNCLASSIFIED)

Progress on R-223, "A Study of High-Speed Multipliers," is slow but sure. A considerable number of figures have been drawn. As soon as it is felt that these drawings are in their final, or nearly final, form, they will be released to the Drafting Room.

2.12 Memory

Miscellaneous

(W. Papian) (UNCLASSIFIED)

E. A. Guditz has received a well-deserved promotion to staff status. He will continue in charge of the large test setup (V) which is being used to obtain pre-design data for the WWII memory.

Two master's theses are developing within the Section, one on memory readout and sensing problems, the other on the one-coordinate memory using a two-coordinate driving switch. A third thesis is expected to develop later in the summer on some of the problems associated with core matrix switches of the binary-selection type.

Group 63 is now testing WWII-type cores for delivery to us in quantity sufficient to make into our first 64-by-64 plane. The plane will first be tested, quadrant by quadrant, on test setup V.

A major effort is under way now on the 5998-and-pulse-transformer driving system; it will be tried first on test setup V, then on MTC.

"Selection Plane" Driving in WWII

(J. L. Mitchell) (UNCLASSIFIED)

A panel of "selection plane" drivers using pulse transformers to drive the memory is under construction. The 5998 tube will be used to drive the transformers. In the near future this type of drive will be tested in Memory Test Setup V where we can simulate actual computer conditions.

A lumped constant equivalent circuit which will represent the memory load seen by the selection-plane drivers is being derived.

WWII Digits and Readout System

(W.J. Canty) (UNCLASSIFIED)

Work is progressing on the memory digits and readout system for WWII. A block diagram of the memory system has been drawn with the aid of W. Papian and J. Mitchell. In addition, the present MTC-type sense winding is being investigated from an analytical as well as an experimental viewpoint. This study has so far indicated the advantages of the present sense-winding geometry since any effect of X and Y selection-plane current pulses is cancelled out in the sense winding.

2.12 Magnetic Core Memory (Continued)

Sensing Schemes

(S. Fine) (UNCLASSIFIED)

An S.M. thesis proposal on the reduction of readout noise from a magnetic-core memory plane is being written. This thesis will investigate the sources of noise associated with the readout signal. Various means of reducing the noise by use of external circuitry and sensing schemes will be evaluated.

Memory Test Setup V

(E. A. Guditz) (UNCLASSIFIED)

Data has been gathered on the following:

1. Balanced vs. unbalanced input to the sensing amplifier.
2. Digit-plane back voltage vs. current rise time for an MTC memory plane.
3. Back voltage on the digit-plane winding of an MTC plane vs. that on a dummy plane.
4. ONE-ZERO ratio for an MTC plane vs. driving-current pulse length. Ratios determined by marginal checking and photographs.
5. Complete set of photographs of outputs vs. patterns. A set of these was sent to W. Wittenberg at IBM.
6. Operating margins vs. time relationship between post-write disturb pulse and the write pulse.
7. Operating margins vs. length of the post-write disturb pulse.

Miscellaneous

(J. Raffel) (UNCLASSIFIED)

A note on switch-core design and power loss was finished.

Preliminary work in preparation for writing a thesis proposal on the Master Plane (Linear Selection) type of memory was begun.

2.12 Magnetic Core Memory (Continued)Core Switches, Temperature

(A. D. Hughes) (UNCLASSIFIED)

Temperature tests of MF1312, F262 and MF1131, F262 ferrite cores and a Mo-Perm 140-wrap metallic core have been made, observing change in output with temperature. The output of the metallic core changed only about 1/5 as much as the ferrite cores for the same temperature rise. Small changes of output of the metallic core with temperature change seem to indicate a great advantage in using metallic cores as switches. A detailed evaluation of these results is being made in an E-note by J. Raffel, to be out soon.

Core Switches, Asymmetrical Drive

(R. S. Di Nolfo) (UNCLASSIFIED)

The problem of asymmetrically driving a switch core, as described in the previous biweekly, has been studied; the metallic cores look very good. A sixteen-position metallic switch has been built and will be tested using both the Model 5 drivers and the new drivers designed by Dave Shansky.

2.13 Vacuum-Tube Circuits Section

(R. L. Best) (UNCLASSIFIED)

Recent Project Grind meetings have changed some of the jobs on which this Section has been working. It was once thought that there would be much low-speed diode logic, but now it appears that most of the low-speed logic will be done with magnetic cores. Therefore, we are temporarily suspending work on low-speed (diode-driving) flip-flops, level setters, and level inverters. Work continues on methods of marginal checking the diode matrix in control. We will start actively investigating the circuit problems involved in low-speed magnetic-core logic and drums, two fields in which we have not as yet been involved.

Earl Gates has joined this Section and will continue transformer development for our own and other sections as needed. The data taken here and at IBM do not agree as to the optimum-turns ratio on pulse transformers; no decision will be made on this subject until the data from both locations can be made to agree.

Timing is so tight in the presently proposed control as to make it not practical with our high-speed flip-flop. A flip-flop that would do the job might be a "slave" flip-flop in which both outputs are forced to their new state by the incoming pulse, acting through appropriately biased transformer windings. The circuit is being evaluated now; it would have rise and fall times equal to that of the leading edge of the incoming pulse but could not be readily complemented.

2.13 Vacuum Tube Circuits (Continued)

Low-Speed Level Inverters and Amplifiers

(J. S. Gillette) (UNCLASSIFIED)

Work on these circuits will be temporarily discontinued, as there is little use presently seen for them. The circuits have been completed except for marginal-testing procedure and available-load current specifications.

Magnetic-Core Matrix-Switch Driver

(D. Shansky, J. Mitchell) (UNCLASSIFIED)

A sixteen-position metallic-core magnetic-core matrix switch has been constructed and driven by a driver which utilized voltage feedback for the purpose of regulating the switch output-current waveform. The feedback signal was obtained from 2 windings which linked all the cores. Initial results indicate that we can obtain adequate waveforms and fairly good line-to-line regulation. These are only qualitative observations. More precise measurements will be made in the next period.

Delay Lines

(J. Woolf) (UNCLASSIFIED)

A basic circuit has been developed for a 0.5- μ sec delay, using a tetrode-connected 7AK7 and a 400-ohm continuous delay line.

Pulse-Delay Repeater

(J. Woolf) (UNCLASSIFIED)

The basic circuit of a 2-mc clock is undergoing marginal checks for general-reliability information.

Flip-Flops

(Hal Boyd) (UNCLASSIFIED)

It was recently decided (tentatively) that XD-1 will, in almost all flip-flop applications (both low and high-speed), employ the High-Speed (5965) Flip-Flop. Work on low-speed flip-flops has, therefore, been temporarily pigeon-holed.

There may, however, be a need for a parasite or slave flip-flop, which is now being designed. This flip-flop is required to switch rapidly

2.13 Vacuum Tube Circuits (Continued)

with no delays. As it is to be forced into each state (hence the term "slave"), the maximum steady-state tolerances will be realized throughout the proper, design-center input amplitude range.

The prototype MTC High-Speed (5965) Flip-Flop plug-in unit has been built and tested with satisfactory results. Thirty such units will be built by the shop for use in MTC.

Buffer Amplifier

(S. Bradspies) (UNCLASSIFIED)

The 7AK7 is being used as a buffer amplifier. It has been found that, when hitting the tube with 0.1- μ sec half sine wave pulse at a repetition rate of 2 mc, the droop in the envelope of a chain of pulses is noticeably reduced if the suppressor is connected to the screen grid rather than to the plate. However, the output pulse amplitude is a little smaller, and the positive overshoot is somewhat larger. When the suppressor is grounded the output pulses are too small to be used.

If the repetition rate is reduced to 200 kc and transfer characteristics (output versus input) are plotted, we find that the amplifier has about unity gain for a load of 39 ohms if the suppressor is tied to screen, and at 30 ohms if the suppressor is tied to plate. In each case a 3:1 step-down output transformer is used.

Intensification Amplifier

(Henry E. Zieman) (UNCLASSIFIED)

The new intensification amplifier has been tested and tried in an experimental 16" scope. It appears to work satisfactorily. The rise time of the amplifier is 1 μ sec with a maximum intensification time of 8000 μ sec. The output to Grid 1 of the CRT can be varied from -33 volts to -55 volts for intensification, and from -55 volts to -110 volts for blanking.

Since this amplifier consists of Boyd's flip-flop plus a buffer amplifier and switch tube, it is planned to make this amplifier in the form of two plug-in units; one consisting of Boyd's flip-flop, the second consisting of the buffer amplifier and switch tube (Refer to SB-55242).

2.13 Vacuum Tube Circuits (continued)High-Speed Gate-Tube Circuit

(H. J. Platt) (UNCLASSIFIED)

The pulse transformers being used for this circuit have come under consideration. It has always been found in these investigations, that a hypersil-core transformer will outperform a ferrite-core transformer in the same application. E. Gates suggested that this may be due to the potting process. Thus, several transformers were constructed, using ferrite cores, leaving the transformer unpotted. Tested in the gate-tube circuit, the ferrites compared favorably to the hypersil. When the ferrites were potted, the transformers lost output amplitude in every case. Evidently, it will be necessary to find new potting processes to avoid this difficulty.

Some experimentation is also going on in the transformers concerning:

1. Turns ratio;
2. Number of turns per winding;
3. Coupling between windings;
4. Coupling between wires of each winding.

Sensing Amplifier

(C. Laspina) (UNCLASSIFIED)

The numerous methods for coupling the WWII sensing amplifier have been investigated; the most promising schemes makes use of long time constant RC coupling. Before a final decision is made as to the final coupling method some experimental work will be done.

Single-Pulse Synchronizer

(C. Laspina) (UNCLASSIFIED)

A circuit for synchronizing a 0.1- μ sec pulse with 0.1- μ sec pulses with PRF's of 120 kc, with less than 5- μ sec jitter has been developed using a thyratron and a blocking oscillator. Margins on the circuit are now being checked.

2.14 Magnetic Circuits

(M. Epstein, H. Rising) (CONFIDENTIAL)

George Briggs presented to Project Grind two methods of handling radar input using core registers and flip-flop registers, respectively. A decision was made to use core registers and a drum-demand system.

Rising and Epstein visited High Street. Preliminary details of the core circuitry were agreed upon. Timing of the drum circuitry was obtained from the drum-circuit group and several proposals for the timing of the core counters were outlined.

Magnetic-Core Counter

(C. Schultz) (UNCLASSIFIED)

Eight stages of the capacitor-storage-type shift register in combination with the two inhibitor cores which perform the logical functions involved in counting have been operating at a 75-kc advance pulse rate. The operating limits of the advanced pulse characteristics have been determined for the circuit with optimized values of components.

2.15 Memory Test Computer

General

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

A rough analysis of computer time for the last biweekly period is given in the following table:

Marginal checking, preventive maintenance			16.0 hr
Measurements on magnetic memory			16.0 hr
Conversion of tapes, etc.			1.5 hr
Applications for outside programmers			5.5 hr
Test programs			4.5 hr
Diagnostic work on "mh" instruction			30.5 hr
<u>Diagnostic work on other matters</u>			<u>13.5 hr</u>
Total Operating Time			87.5 hr
Down time for	{ Installation Air-conditioning off Power failure & component replacement }	24.30	{ 11.00
			{ 6.00
			<u>7.30</u>
Total Working Time			112 hr

Plans to run a regular evening shift have been thwarted temporarily by the illness of one of our technicians but will go forward shortly.

Arrangements have been made with the Tape Room in Barta to cut MTC tapes. After conversion, however, these can be stored in the computer room, W2-301.

Looking ahead to the time when MTC will move to Lexington (Bldg. B) has taken some planning. A tentative floor plan has been laid out (SE-55323-1).

Memos

(P. R. Bagley) (UNCLASSIFIED)

"MTC Guide to Code and MTC Operation Code" (M-1881) has been revised and is being issued as M-1881-2.

An M-note, "MTC Parity Checking Scheme," will be issued shortly as M-2263.

2.15 Memory Test Computer (Continued)

Transient Suppression

(P. R. Bagley) (UNCLASSIFIED)

Experiments have been conducted to determine appropriate techniques for suppression in AC lighting and alarm-chime circuits of transients which interfere with computer operation.

Multiply Installation

(H. E. Anderson, P. R. Bagley) (UNCLASSIFIED)

The equipment has been installed for the new instruction "multiply" (mh). The circuit changes necessitated by the installation of multiply have brought to light some heretofore undetected marginal circuit conditions, for which corrective steps are being taken.

MTC Memory

(B. Widrowitz) (UNCLASSIFIED)

A procedure for arriving at optimum settings of the adjustable memory parameters has been planned and will be tried as soon as a means of controlling the X and Y read driver rise times is worked out.

The data already taken indicate that variations as great as +10% in all parameters will not cause memory failure. Many more programs will have to be run before any positive conclusions can be drawn, however.

(J. Crane) (UNCLASSIFIED)

Complete sketches of the Memory Switch In-Gates, Memory Address Panel, and Panel Storage Read-Out Gates have been sent to drafting for final prints.

MTC Alternator

(R. Jahn) (UNCLASSIFIED)

All compensation networks tried to date have given pass bands considerably below the calculated 10 cycles. I am checking each stage of the amplifier to make sure that they are in order. The effect of exciter feedback is also being investigated.

2.15 Memory Test Computer (Continued)

MTC Digit-Plane Driver

(C. A. Laspina) (UNCLASSIFIED)

The MTC digit-plane driver was modified so that a 5998, a supposedly more reliable tube, could be used in place of the 6080. A modified unit will be placed in MTC to be checked before the other drivers are modified.

MTC Power Supplies

(R. G. Farmer) (UNCLASSIFIED)

All panels have been delivered for the MTC power supplies except 4 amplifier sections. Testing of the supplies has been delayed because most of my time has been devoted to WWII power. WWII power will continue to take most of my time for the next 2 weeks, but during that period Bob Hughes will do some preliminary testing of the MTC supplies.

MTC Air Conditioning

(R. E. Garrett) (UNCLASSIFIED)

An increase in capacity of the air-handling unit has been effected by the purchase of a larger circulating pump and by adding anti-freeze to the chilled water, thereby permitting a lower operating temperature.

Component Failures in MTC

(R. A. Hughes) (UNCLASSIFIED)

The following components failed during the last biweekly period:

<u>Component</u>	<u>Number of Failures</u>	<u>Hours of Operation</u>	<u>Reason for Failure</u>
CTC Choke 50 μ h	1	0 - 500	Mech.
Deposited Carbon Resistor 1%	1	0 - 500	Mech.
Burroughs Pulse Control Eqpt.	2	0 - 500	Mech.
Tube 6145	2	0 - 500	Chg. in char.
Tube 6145	1	0 - 500	Mech.

2.15 Memory Test Computer (Continued)

A new marginal-checking fuse panel has been designed and is being constructed.

2.16 Equipment Design and Schedules

(A. P. Kromer) (CONFIDENTIAL)

The final draft of Exhibit AFCRC-1 which describes the equipment for AN/FSQ-7, Combat Information Central (prepared in collaboration with Major G. T. Galt and others of AFCRC) has been approved by Lincoln and forwarded to AMC for use in contract negotiations with IBM. Associated notes and purchase-requisition continuation sheet have also been prepared, approved, and forwarded to AMC.

Activities of all standards subcommittees are now underway, and information on all phases of this work will soon be released by the organization at IBM which has been set up to prepare and distribute the standards sheets.

Development of a program summarizing the scheduling for AN/FSQ-7 (XD-1) which will be installed in Building A, Lexington, has been completed.

(J. D. Bassett) (UNCLASSIFIED)

Three more standards subcommittees have been activated in the past biweekly period. Personnel have been assigned, and preliminary meetings have been held for the purpose of discussing the areas of influence of the committees on (1) mechanical design, (2) materials and processes, and (3) mechanical components. A schedule of biweekly meetings has been set up, and subjects requiring discussion have been listed for action. Proposals from these meetings will be circulated for comment by staff members interested in material concerned.

(W. H. Ayer) (CONFIDENTIAL)

During the last two biweekly periods the mechanical design of the arithmetic element has progressed fairly rapidly. Aside from minor modifications, the pluggable unit has reached its final form. Two sizes are planned at the present time, a 6- and a 9-tube unit. A special plug similar to the IBM 701 connector has been designed for the unit, and tooling will begin in the next 2 weeks.

The racks for the arithmetic element will be assembled out of bays that are 1 pluggable unit wide by 20 units high, separate sizes being available for the 6- and the 9-tube units. Each bay will contain the necessary filament transformers, air ducts, and wire ways to make up a self-contained unit.

2.16 Equipment Design and Schedules (Continued)

An investigation into the adaptability of an etched-circuit technique in building the high-speed flip-flop is continuing. Some results should be available within a month if this method of construction is to be considered.

(J. Giordano) (UNCLASSIFIED)

The IBM-MIT Drafting Subcommittee met for the second time at Poughkeepsie on June 30 and July 1. As a result of this meeting, a formal proposal of a drawing-number system has been submitted to the Central Standards Committee.

Sections of the IBM Military Reference Data book have been agreed on by this Committee for use in our project. These sections will be submitted to the Central Standards Committee within the coming week. Other proposals are still being investigated by the Committee.

(P. J. Gray) (UNCLASSIFIED)

Work on the summary schedules for the AN/FSQ-7 program has been completed and is ready for the print room. These schedules will be published during the next biweekly period as E-562, "Organization and Planning of the AN/FSQ-7 Combat Information Central Program." This note will be reissued on a bimonthly basis showing progress and any schedule revisions that may be necessary.

(R. Fallows) (UNCLASSIFIED)

I presented preliminary summary of work on marginal checking to Project Grind (ref., M-2267). I started on proposed breakdown of AE to establish basic approach to division of M/C lines. I worked with Tube-Standard Subcommittee on 7AK7 spec. Final spec on improved 5965 is waiting on GE and should be settled in the next report period.

A list of recommended tubes was agreed on at Project Grind and will be distributed to Project Lincoln circuit engineers next week as part of the Standards Manual.

2.17 Transistors

Experimental Counter

(D. J. Eckl) (UNCLASSIFIED)

A 2⁵ counter has been built to test the two-transistor flip-flop designed by E. Cohler. No gates are used, the output of the flip-flop being differentiated to drive the next. Pulse standardizers are used between stages. The maximum prf is 660 kc/sec.

2.17 Transistors (Continued) α vs I_E Plotter

(D. J. Eckl) (UNCLASSIFIED)

Considerable difficulty has been encountered in getting the final model to operate properly.

Life Tests (completed)

(D. J. Eckl) (UNCLASSIFIED)

An E-note will be issued shortly describing the results of the transistor life tests which were carried out starting last summer and which reached a duration of about 5000 hrs.

Transistor Core Drivers

(S. Oken) (UNCLASSIFIED)

The initial spike in the output voltage from the magnetic cores undergoing sensing has been eliminated by use of an RC integrating circuit placed directly across the sensing winding of the core. The time constant is made about 0.2 μ sec. This cuts out the initial spike but allows a fast rise time also.

An investigation of the problems and results obtained by paralleling transistors has been undertaken. This connection should increase the current available to the magnetic cores and thus reduce the number of turns on the core windings.

Minority Carrier Storage

(N. T. Jones) (UNCLASSIFIED)

Samples of various types of point and junction diodes have been accumulated for observation of their storage characteristics. Most of these have been received on a loan basis from Bradbury of AFCRC and Baker of Lincoln. A considerable amount of effort will be spent on these diodes during the next biweekly period.

Equipment troubles plague this work. The Tektronix 517 scope and the Rutherford B-2 pulse generator have both been operating poorly. Both these pieces of equipment will be returned to Test Equipment for additional work.

The storage coefficients of a large sample of transistors were measured by D. Smith. These were plotted against various transistor-diode parameters in an unsuccessful attempt to find correlation.

2.17 Transistors (Continued)

Life Tests

(N. T. Jones) (UNCLASSIFIED)

The problems of pulse drivers and power supplies for the expanded life tests are being worked on by D. Thompson. A 5-v, 1-amp supply has been built and tested as the first step in this direction. The lack of a commercially available filter choke led to the manual winding of one on a 5-amp filament transformer core. The resulting choke has 56-mh inductance at 0.8-amp direct current.

2.2 Group 63 (Magnetic Materials)

(D. R. Brown) (UNCLASSIFIED)

Specifications for the FSQ-7 high-speed memory core (Engineering Note E-563) were delivered to IBM on July 1. Orders for 250,000 good cores each are being placed with General Ceramics and RCA Victor. Full-scale production is expected by August 15, and the orders are to be completed by November 15.

Temperature characteristics of MTC cores are reported in E-548. The disturbed ONE changes approximately one percent per degree centigrade.

A preproduction batch of 10,000 FSQ-7 cores is being tested to select the best 4,096 cores to be put into a 64-by-64 plane.

Ferrite-Core Pulse Tests

(J. D. Childress) (UNCLASSIFIED)

A report on the temperature tests has been issued as E-548, "Preliminary Report--Temperature Effects in MTC Type Ferrite Cores."

These tests are being continued. Plans are to make new measurements of Delta vs. Temperature in the next period.

(J. Schallerer) (UNCLASSIFIED)

Ten thousand ferrite cores, MF-1326B, F-394, lots A4 and A5, have been received from General Ceramics. As of this date four thousand cores have been tested at 0.82 amp. Two thousand three hundred and sixty-four of these cores were within the limits of 105 mv to 125 mv at a sampling time of 0.6 microseconds. The yield after the first test was 55 percent.

The good cores will now be tested at current margins of 0.74 amp and 0.9 amp. Cores testing good at the margins will be turned over to Bill Papias's section for construction of a 64 x 64 memory plane.

(W. Klemperer and J. R. Freeman) (UNCLASSIFIED)

Decided improvement in the technique of measuring half-selected and delta outputs has been achieved. The tested cores may be wound so as to very effectively eliminate the unwanted fully selected output signals which have previously affected the reliability of the half-selected output measurements. Use of an audio oscillator and a General Radio Micro-volter allows more precise calibration of the measuring oscilloscope, particularly at low ranges. It is believed that measurements as low as 0.2 millivolts now may be considered reliable.

2.2 Group 63 (continued)Ferrite-Core Pulse Tests (continued)

(J. R. Freeman) (UNCLASSIFIED)

Photographs of the pulse responses of all cores which have a maximum squareness ratio of 0.65 or greater are now taken. In addition, certain other cores which are of interest also are included. Photographs are made of the undisturbed ONE, disturbed ONE, and the disturbed ZERO, with driving forces equal to that corresponding to maximum squareness and also at 10 percent and 20 percent above this driving force. Eighty-one cores have been tested.

Automatic Core Testing

(B. Gurley) (UNCLASSIFIED)

The first prototype sense amplifier for the production core tester has been completed, and the unit is being tested. The second is nearing completion.

Construction of the special current calibrator has been started.

Ferrite Synthesis

(J. Sacco) (UNCLASSIFIED)

Cores pressed from a magnesium-manganese ferrite series, 2-1/2 mol percent deficient in Fe_2O_3 , have been fired at several time-temperature schedules and submitted for testing.

A magnesium oxide-ferric oxide series has also been fired with the intention of determining the effect of the addition of MgO to Fe_2O_3 .

A special series of 15 batches has been completed and will be fired the week of July 6. The series has been prepared in order to determine the effects of the following on a particular composition:

1. Adding varying amounts of binders;
2. Preparing the batch with different percentages of raw and reacted material;
3. Pressing the rings at increased pressures.

A fourth series is under way in which a variety of different binders will be tried under the same conditions.

2.2 Group 63 (continued)Ferrite Synthesis (continued)

(R. Maglio) (UNCLASSIFIED)

The Stokes press is now in the machine shop for reboring. New parts are being machined to replace worn parts or to change the design. Delivery of the press is expected within the next biweekly period.

(R. Maglio) (UNCLASSIFIED)

Systematic temperature measurements have been made within the muffle of the Harper Furnace between temperatures of 1000° C and 1350° C. These measurements include data for a muffle which was occupied and void of shelves. For the muffle stacked with refractory slabs as in actual core firing, temperature variations of 5° C were measured, whereas, with an empty muffle, the thermocouple could not sense a temperature variation. Further qualitative tests are planned using pyrometric cones. The above assumes conditions where the kiln is loaded with 70,000 cores per firing.

(R. Maglio, F. Vinal) (UNCLASSIFIED)

A study is being made of the effects of a second heat treatment on ferrite cores. During the current period, 8 series of cores have been studied comprised of approximately 80 cores with individual properties. Of these, a portion have been reexamined for electrical properties from which a tendency has been observed that a second heat treatment greatly improves the electrical properties. Those which were not improved were batches of experimental compositions whose promise had been slight in previous testing.

(G. Economos) (UNCLASSIFIED)

The testing of the prepared ferrite toroids is progressing satisfactorily. Breakage of about 10 percent makes the task of obtaining a good average value for a particular set of conditions quite difficult. There appears to be some scatter in the values obtained, but the average values fall into a definite pattern. For some parameters, only one toroid remains, and there is still another winding to be put on.

A complete set of reacted B-series ($Mg Fe_{20}O_{4}$) have been tested for μ_0 at 1 Mc and 10 Kc and for 25-oersted hysteresis loops. Reacted A-series (square-loop ferrite) has been started. The numerous parameters being considered make it difficult to obtain a clear picture of the net effects. Various statistical methods of analysis are being looked into in order to obtain the most value from the results of these tests.

2.2 Group 63 (continued)Ferrite Analysis

(A. Loeb) (UNCLASSIFIED)

The Seminar on Magnetism 1952-53 has been concluded, and an introductory note written listing the topics discussed and the corresponding M-memoranda of the notes by Loeb and Menyuk.

A review of the Néel theory of antiferromagnetism and ferrimagnetism is now being written.

P. K. Baltzer, A. L. Loeb, N. Menyuk, and F. Vinal conferred with B. Lax and R. Fox of Group 37 regarding a fundamental-measurements laboratory.

Five staff members of the Armour Research Foundation visited Group 63 on June 30.

(P. K. Baltzer) (UNCLASSIFIED)

The general equation of motion for a cylindrical 180° Bloch wall has been derived using the Lagrangian formulation and has proved to be quite different in form from the equation of motion that is applicable to planar walls.

The difference between these equations is due to the fact that, as a cylindrical wall moves, the total wall area changes. This causes the total mass to vary and also the total static wall energy. For our purposes, the most important difference is the addition of the term involving σ_w . A non-linear restoring force results from this term which is not negligible and may be a major factor causing the variation of incremental permeability with the induction of a material.

When the retarding closure domains which proceed from material defects to domain walls are considered, it was found that at a critical field, $H = 2 \sigma_w / D I_s$, that these closure domains are no longer stable at defects of diameter D or larger. Hence it is postulated that this mechanism is prominent in causing the drastic change in the slope of the hysteresis loops observed for square-loop ferrites. On observation of the order of magnitude involved, D appears to be of the order of the grain size.

Microstructure of Ferrites

(F. S. Maddocks) (UNCLASSIFIED)

A group of twenty-five specimens of the DCL-3-44 series has been mounted and polished. Preliminary examination has shown little specific correlation of electrical properties with microstructure. It has been noted, however, that the grain size seems to change rather suddenly from small to large about the middle of a compositional series in the MgO , MnO , and Fe_2O_3

2.2 Group 63 (continued)Microstructure of Ferrites (continued)

system. This would indicate that $MnFe_2O_4$ is the matrix or host lattice in that portion of the series predominant in manganese oxide while the smaller grains are associated with a $MgFe_2O_4$ matrix.

Core Nos. DCL-3-48 and DCL-3-48A are practically identical in electrical properties, but differ greatly in grain size. In order to confirm these results, intentions are to mount and examine the actual cores from which the electrical measurements were obtained.

As soon as the cores are made available, refired specimens of DCL-3-44 series will be examined in an attempt to determine the structural effects of refiring.

Conductivity of Ferrites

(J. H. Epstein) (UNCLASSIFIED)

X-ray examination of ferrites has been temporarily abandoned in favor of a study from which more concrete results should be obtainable.

Samples have been prepared and are now being fired of magnetite containing 1/2, 1, 2, 4, and 8 mol percent of Co, Ni, Zn, Mn, or Mg. Conductivity is an especially sensitive parameter to determine the effect impurities will have on the transition temperature in magnetite. Therefore, measurements of conductivity versus temperature will be made for the above samples. The impurities were added in the form of nitrate solutions added to the binder before pressing in the hopes of obtaining a uniform distribution of ions.

SECTION III - CENTRAL SERVICES

3.1 Publications

(Diana M. Helwig)

The following material has been received in the Library, W2-325.

LABORATORY FILES (UNCLASSIFIED)

No.	Title	No. of Pages	Date	Author
E-544	Circuit for Measuring Switch Time, Rise Time, etc.	2	5-11-53	B. Gurley
E-548	Preliminary Report - Temperature Effects in MTC-Type Ferrite Cores	3	6-26-53	J. Childress
E-561	Differential Video Probe	2	6-19-53	H. Ziemann
M-2110	A Linear Selection Magnetic Memory Using an Anti-Coincident Current Switch	3	5-8-53	K. Olsen
M-2186	Two Methods of Reducing Delta Noise as Tried on Memory Test Setups I & II	6	5-22-53	S. Fine
M-2228	File on M-1815 Memos in Room 224	1	6-9-53	D. Israel
M-2229	N-Step Procedures for Simultaneous Linear Equations	15	6-11-53	E. Craig
M-2232	Procedures for Using Group 61 Equipment for Introducing Data into M I	5	6-23-53	(B. Morriss (G. Young (D. Finkelstein
M-2235	Summer Session System II Proposed Conversion Program and Tape Preparation Procedure	3	6-11-53	(M. Rotenberg
M-2236	Operation of M I by Group 61	2	6-9-53	(S. Dodd (C. Wieser
M-2237	Transmittal of Publications to IBM	2	6-8-53	A. Kromer
M-2239	Proposal for Documentation of Notes Regarding Equipment Construction	11	6-12-53	J. Newitt
M-2240	A Magnetic Core Test Storage	1	6-15-53	K. Olsen
M-2241	MIT-IBM Project High Central Standards Committee Activities & Meeting Schedule	2	6-15-53	C. Watt
M-2242	Bendix Red Bank Division Tube Plant	4	6-15-53	R. Fallows
M-2243	Mechanical Engineering Service	1	6-16-53	H. Wainright
M-2244	S & EC Group Biweekly	18	6-15-53	.
M-2246	Joint Meeting on Packaging of M I I	2	6-17-53	W. Ayer
M-2248	Tests of Some Magnetic-Matrix Switch Operating Modes	5	6-17-53	J. Mitchell R. DiNolfo
M-2249	Salvaged Components	1	6-17-53	B. Paine
M-2250	Visitors to Group 62	1	6-16-53	N. Taylor
M-2252	M I I Basic Circuits-High Speed Gate Tube Circuit (FB/h)	3	6-18-53	H. Platt
M-2254	Sensing the Slope of Magnetic Memory Output	3	6-19-53	K. Olsen
M-2258	First Meeting of MIT-IBM Central Standards Committee	3	6-22-53	C. Watt
M-2259	Vacuum Tube Failures During the Month of May, 1953	9	6-18-53	(H. Frost (A. Parisi
M-2260	Group 63 Seminar on Magnetism, Introduction	3	6-23-53	A. Loeb

3.1 Publications (Continued)

LABORATORY FILES (UNCLASSIFIED)

No.	Title	No. of Pages	Date	Author
M-2263	MTC Parity Checking System	2	6-25-53	P. Bagley
M-2264	Testing of Buffer Drum System: FR#1	4	6-25-53	(R. Eulberg (K. McVicar
M-2265	Group II Magnetic Drum Automatic Scope Post Mortem	2	6-26-53	E. Kopley
M-2267	Project Grind Meeting of June 25, 1953	5	6-29-53	(A. Kromer (R. Mayer
M-2270	S & EC Group Biweekly	16	6-29-53	.
M-2271	Division 6 Accounting Procedures	1	7-2-53	H. Fahnestock
A-146	Badges	1	5-20-53	J. Proctor
A-147	Division 6 Move to Lexington	1	5-26-53	H. Wainright

LABORATORY FILES (CONFIDENTIAL)

No.	Title	No. of Pages	Date	Author
M-2174	A "Drum Demand" Sampling System for Storing Radar Returns Occuring at Random Upon the Input Drum	3	5-19-53	G. Briggs
M-2183	Biweekly Report		5-22-53	.
M-2187	Telephone Intercommunication System	19	6-3-53	O. Conant
M-2193	Proposed WWII Interlocks, PB Nos. 52 & 53	10	5-26-53	(M. Epstein (R. Gerhardt
M-2208	Flight Test Activity Report for May, 1953	2	6-3-53	F. Heart et al.
M-2216	Names & Radio Call Signs	3	6-8-53	D. Israel
M-2220	Biweekly Report		6-5-53	.
M-2221	Summary of MIT-IBM Collaboration, April 28-May 30, 1953	3	6-8-53	A. Kromer
M-2223	Visit to IBM to Observe Work on Magnetic Drums, April 16 & 17, 1953	6	6-8-53	(J. O'Brien (K. McVicar
M-2231	Track Sorting and Related Programs of Track-While-Scan	11	6-10-53	(J. Ishihara (H. Seward
M-2233	Track Trouble Detection	4	6-11-53	J. Levenson
M-2238	Input Switches Interpretation for TWS	10	6-12-53	J. Levenson
M-2255	Intercept Director, Track Number, and Pair Assignments	1	6-22-53	D. Israel
M-2262	Proposal for Category Selection in Display System of WWII	3	6-24-53	R. vonBuelow
M-2257	Biweekly Report		6-19-53	.
M-2266	Project Grind Meeting of June 24, 1953	4	6-29-53	(A. Kromer (R. Mayer
M-2268	Project Grind Meeting of June 26, 1953		6-29-53	(A. Kromer (R. Mayer

3.1 Publications (Continued)LIBRARY FILES (UNCLASSIFIED)

No.	Identifying Information	Agency
2394	A Two Transistor Shift Register	Lincoln Lab.
2396	Programming A Digital Computer to Learn	Harvard Comp. Lab.
2397	Bibliography on Data Storage and Recording	Servo. Lab.
2398	The Automatic Electronic Digital Computer as a Potential Aid to Air Traffic Control	British M. of C. A. Lab. Ins. Rsch.
2399	Tables of Dielectric Materials, Vol. IV	U.C.L.A.
2400	Proceedings of the Electronic Computer Symposium, April 30, May 1-2, 1952	N.B.S.
2401	Third Quarterly Progress Report of the Research Program for Improving Cathode Ray Storage for Computers	Ballistic Rsch. Lab.
2402	Computation of the Transonic Flow Over a Wedge with Detached Shock Wave by the Method of Steepest Descent	N.B.S.
2403	Tables of $n!$ and $\Gamma(n+1/2)$ for the First Thousand Values of n	N.B.S.
2404	Problems for the Numerical Analysis for the Future	N.B.S.
2405	Monte Carlo Method	N.B.S.
2406	Tables of Sines and Cosines to Fifteen Decimal Places	N.B.S.
2407	Introduction to the Theory of Stochastic Processes Depending on a Continuous Parameter	RCA
2408	RCA Technical Papers Index, 1952	N.B.S.
2409	A Numerical Solution of Schrodinger's Equation in the Continuum	NAVORD
2410	A Comparison Between Theoretical and Experimental Pressures, at Subsonic Speeds, about a Haack Body	Midwest Research Inst.
2412	A Symposium on Industrial Applications of Automatic Computing Equipment	Comp. Rsch. Corp.
2413	CADAC 102-A Program and Training Course Literature	Univ. Calif.
2414	Idioglossary for Mechanical Translation	Jet Prop. Lab.
2415	The Time-Sequence Controller for Automatic Operation of the Electronic Differential Analyzer	R. Schultz
2416	Transistors as Applied to Gating, B.S. Thesis	A. Cann
2417	An Output System for MIT Electrostatic Storage Tubes, M.S. Thesis	Univ. Illinois
2418	Detection of Pulsed Signals with a Narrow-Band Filter	U.C.L.A.
2422	Nuclear Hyperfine Structure of Mn^{++}	U.C.L.A.
2423	Paramagnetic Resonance in Phosphors	IRE
2424	Convention Record - 1953 - Part V, Circuit Theory	ASTIA
2425	AD Numerical Index to TAB, Issues 1 - 8	

3.2 Purchasing and Stock

(H. B. Morley) (UNCLASSIFIED)

1. The standard Lincoln Laboratory receiving system is being studied prior to its adoption here by July 8.
2. Certain surveys for evaluation of purchasing procedures are being prepared as required.
3. Invoices formerly sent by the vendor to the DIC Accounting Office are now to be sent to the DDL Fiscal Office. Letters will be sent to our vendors informing them of this change.
4. Requisitions for purchase must show the application of the material to be bought and a justification for selection of the particular vendor. The requisitioner can help considerably by showing on the requisition work sheet his use for the material; if no vendor substitution is permissible, the reason for the vendor choice should be given.
5. New personnel are reminded that efficient administration requires that no purchase commitments be made except in compliance with established procedures. Full information on these procedures may be obtained from this office.
6. The Ampex tape recorders promised for June 30 have been received.
7. Some improvement is noted in deliveries, a result of new expediting procedures recently adopted.

3.3 Construction

Production Control

(F. F. Manning) (UNCLASSIFIED)

There have been 41 Construction Requisitions totaling 484 items satisfied since June 19, 1953, and there are 26 Construction Requisitions totaling 997 items under construction by the Group 60 electronic shops.

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

Outside Vendor

(G. A. Murdoch) (UNCLASSIFIED)

There are 12 orders now open with vendors, totaling 2218 outstanding items. Deliveries in the past biweekly period have totaled 951 items. Information on specific orders may be obtained from the writer (ext. 3476).

3.4 Component Analysis and Standards

3.43 Standards

(C. W. Watt) (UNCLASSIFIED)

Six days out of ten during the past two weeks were spent on various Standards Committee activities at Poughkeepsie. All of the eight subcommittees have been activated, and work is progressing rapidly in all of these fields. The Committees as now set up are as follows:

- No. 1. Electronic Components
- No. 2. Mechanical Components
- No. 3. Materials and Processes
- No. 4. Mechanical Design
- No. 5. Drafting
- No. 6. Basic Circuits
- No. 7. Tubes
- No. 8. Terms and Definitions.

(H. W. Hodgdon) (UNCLASSIFIED)

Due to procurement difficulties, it has been found necessary to cancel the a-c coil for Clare telephone-type relays. Steps will be taken to see if Clare can package their standard-type GAC relay with a plug-in base and removable dust cover to make it interchangeable with the d-c type DPJ.

The index and cross reference for the Standards Book has been completed. Copies will not be distributed until necessary revisions of standards sheets have been made, but persons needing a copy may obtain it by calling me.

3.44 Vacuum Tubes

(H. B. Frost) (UNCLASSIFIED)

Considerable trouble has continued to occur with the 715C tubes in the storage-tube deflection circuits. During this past week a number of tubes manufactured by General Electronics were installed in the deflection amplifiers. Within 24 hours the amplifiers were out of service because of drift in the 715C tubes. It should be noted that all tubes were tested for stability, among other things, before being installed. However, since it had not been previously necessary, these tubes had not been preburned. Apparently there is a serious lack of stability in these tubes because of insufficient aging. As a result these tubes are now being aged prior to additional tests. A total of 16 tubes which will have been burned 100 hours will be available on Monday, July 6, and it appears that 32 additional tubes will be available by Friday, July 10. These aged tubes should be stable, but any definite information must await the completion of the aging operations.

3.44 Vacuum Tubes (Continued)

Some odds and ends of tubes on life test for general information were tested before the June 24 ASTM B4-VIIIA committee meeting so that information could be relayed to interested parties at this meeting. Of 6 type 5899 tubes which have been operated 2600 hours cut off, 1 tube is showing some interface impedance. The interface impedance has a very short time constant, about 0.03 microsecond, which is the shortest interface time constant so far measured. The remaining 5899 tubes have no interface impedance as yet. These 5899 tubes have a special cathode alloy containing tungsten. There are also one 12 BY7 and one A4676 which have been operated on life test for the same length of time. The 12BY7 is showing some grid emission, but it is still operable, showing no interface impedance. However, the A4676 is inoperative, with very low resistance leakage paths between almost all electrodes. The main source of sublimation in the A4676 seems to be material from the heater.

Thesis Work

(H. B. Frost) (UNCLASSIFIED)

A new tube for cathode research has been designed and is now under construction. It is scheduled for processing early next week. This tube is a planar triode made with cathode-ray-gun parts. Close spacings are necessary in order that high current densities may be used without the formation of a space-charge-potential minimum near the collector (which corresponds to the anode of a conventional tube). A precise nomogram for the determination of corrections to optical pyrometer brightness temperatures is being drawn as time permits.

(S. Twicken) (UNCLASSIFIED)

The greater part of this last period was spent on the drawings and construction of the new tube tester. Numerous details requiring immediate attention continue to crop up.

Distribution curves have been taken of the 7AK7 cutoff characteristics. Standard deviation of 2-ma cutoff voltage, both pentode- and tetrode-connected, is about 0.5 volt.

3.5 Test Equipment

Test Equipment Headquarters

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

A NE2 lamp used in both 513D and 514D Tektronix scopes burns out so frequently that we examined the circuit to find out why. The lamp is used as a voltage regulator between the screen and the cathode of a 6CB6 constant-current source. Measurement showed that it was carrying

3.5 Test Equipment (Continued)

0.6 ma, whereas its rating is 0.3 ma. We plan to increase the series dropping resistor in the supply to both screen and neon lamp.

Six Differential-Input Video Probes have been tested according to specifications provided by Henry Zieman. They did not meet the specifications entirely. Three have been issued to those who need them in a hurry.

Test Equipment Committee

(L. Sutro) (UNCLASSIFIED)

The Committee has decided to have labeled the Jones plug of all units requiring +10 volts and to distribute a new diagram of the Jones plug when the +10-volt supply is installed in place of +120 volts in Whittemore Building. It approved purchase of equipment costing \$1883.00, principal items being a Dual Channel D-C Amplifier and relays for Rack Power Controls. It decided that plans for the construction of all special test equipment should be reported to the Committee. It approved construction of 6 Switch Time Comparators which it classified as special test equipment. Considering shortages of standard test equipment, it ordered 5 Delay Line Amplifiers, 6 Model V and 1 Model VI Core Drivers. The Committee approved loaning to IBM 38 units of Burroughs equipment, approximately half to be supplied from spares usually held for maintenance.

Low Speed 2⁶ Counter

(H. J. Platt) (UNCLASSIFIED)

There has been some misunderstanding lately as to the use of this piece of equipment. The maximum repetition rate for the counter is determined by the best response time of the binary scaling units. Nominally, the manufacturer says this is 5 μ sec between pulses. This means that all pulse inputs to the scaler must be this far apart.

When using automatic preset and with all the flip-flops preset to a 1, the input pulse takes 4 μ sec to generate an end carry which causes the flip-flop to be set back to a 1. Thus, it is safe to say that the maximum input-repetition frequency under these conditions should not exceed 100 kc.

For normal counting, the counter will still respond to repetition frequencies up to 200 kc.

Whittemore D-C Lab Supplies

(S. Coffin) (UNCLASSIFIED)

The 250-volt, 50-amp Whittemore d-c lab supply has been removed for redesigning and a temporary 10-amp regulated supply installed in its place.

3.6 Drafting

MIT-IBM Drafting Committee

(A. M. Falcione) (UNCLASSIFIED)

The second meeting of the MIT-IBM Drafting Committee was held at Poughkeepsie, N.Y., on Tuesday, June 30. The Committee submitted to the Central Standards Committee the proposal for drawing numbers for MIT and IBM for use on WWII. The Committee has also agreed to adopt certain sections of the Military Reference Data Book, and is submitting recommendations for approval to the Central Standards Committee. Other phases of work have been assigned for future consideration.

3.7 Administration and Personnel

Terminated Staff

(J. C. Proctor) (UNCLASSIFIED)

Lexander, G. A.
Ulman, Prof. J. N., Jr.

Staff Transfer

(J. C. Proctor) (UNCLASSIFIED)

Simmonds, C. W., to Group 42

New Non-Staff

(R. A. Osborne) (UNCLASSIFIED)

Rocco Dantona is a new clerk in the Print Room; he will be trained as a Multilith Operator.

Barbara Ulman is working as a clerk-typist in the Library for the summer.

Terminated Non-Staff

(R. A. Osborne) (UNCLASSIFIED)

Theodore Chleboski
George DiPietro
Ruth DiPietro
Barbara Moon
Joan O'Neil
Ann Pratt
Wendell Wright