

Memorandum M-2257

Page 1 of 64

Lincoln Laboratory
 Massachusetts Institute of Technology
 Cambridge 39, Massachusetts

SUBJECT: DIVISION 6 BIWEEKLY REPORT, June 19, 1953
To: Jay W. Forrester
From: Division 6 Staff

CONTENTS

| | |
|--------------------------------|----|
| Section I - Cape Cod System | 1 |
| 1.1 - Group 61 | 1 |
| 1.2 - Group 64 | 21 |
| 1.3 - Group 65 | 33 |
| Section II - Whirlwind II | 36 |
| 2.1 - Group 62 | 36 |
| 2.2 - Group 63 | 55 |
| Section III - Central Services | 59 |

Section I CAPE COD SYSTEM

1.1 Group 61

1.10 General

(C.R. Wieser) (CONFIDENTIAL)

Organization of the equipment in Room 224 is being studied to determine space requirements for future equipment and to lay out a monitoring station for SDV signals.

A floor plan for the Direction Center to be located in the basement of Building A has been prepared.

An improved system of displays and alarm indications for the interception section of the Cape Cod programs has been adopted. A good part of this work has been written up in rough-note form in preparation for future publication.

A simulated track program for testing non-track-while-scan programs is expected to be tested next week.

Excellent progress is being made in the display sections of the Cape Cod programs and several programs have already been tested.

A single-pair flight test with Truro data will be attempted the week of June 22.

~~CONFIDENTIAL~~

1.10 General (Continued)

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

Memorandum M-2236 was prepared jointly with Dodd to minimize loss of programmers' time because of inoperative equipment. Programmers will check by telephone to see that all necessary equipment is in operating condition before coming in to the Barta Bldg; if the equipment is not in good condition the time will be turned over to Group 64 or Adams' group.

Several days were spent at meetings with representatives of the Wright Air Development Center and Boeing.

A meeting was held with Boehmer, Whelan, and Martin of Group 22. The following items were discussed:

1. Voice UHF. It is estimated that it will be ready for normal operation by July 1. Temporary operation can be achieved earlier if necessary.
2. Telephone lines. Permission for lines still to be procured will be obtained by Entiknap (Gr. 22) who will consult Arnow on Barta terminal equipment.
3. Teleregister Totes. Leary of Group 22 will see Israel regarding installation of a small amount of teleregister gear (now at Truro).
4. Manning Stations for Flight Plans, Identification, and Cross Telling. Group 22 will supply the people to man these stations (outside of the Center) and devise an alerting system.
5. Manning Height Finders. Group 22 will supply personnel to man the height finders and Truro RHI height scopes.

1.11 Equipment Engineering

(E.S. Rich) (CONFIDENTIAL)

Organization of the equipment in Room 224 is being studied to determine space requirements for future equipment and to lay out a monitoring station for SDV signals -- both from the phone lines and from the magnetic tape recorder. It is hoped that this central station, which will have controls for making amplitude adjustments of individual SDV signals, will eliminate the need for any adjustments at the demodulator panels in Room 156. Also at this station will be a panel of indicator lights to show the status (ON-OFF-CALIBRATE) of special units such as the mappers which do not have such indication in Test Control. These central lights are especially needed now while installation and testing is still in progress.

The demodulator equipment for the 6B set has been moved from Room 140 to Room 224 to give it more satisfactory operating location and to provide additional lab bench space in Room 140.

1.11 Equipment Engineering (Continued)

(E.S. Rich) (Continued) (CONFIDENTIAL)

One of the 14-channel Ampex tape recorders is expected to be delivered about June 26 and the second one about a week later. At the moment there is a problem as to whether one can be set up now since the Division 2 SDV converters cannot be removed to provide rack space for the recorders.

Group 24 has reported that deflection coils for the Pathfinder indicators that require about half the current of the present deflection coils can be obtained from Raytheon. They will obtain four new coils for us which will be installed in our indicator units to reduce the dissipation load on their sweep driver tubes.

(N. Alperin) (CONFIDENTIAL)

Interaction between light guns was noticed and is now in the process of being eliminated.

A power-status indicator-light panel for the video mappers is being built. This panel will indicate if the High Voltage is on, if the room lights are on, and if the scopes are in "calibrate" or "operate" position. The panel will be placed in Room 224.

(D. Neville) (CONFIDENTIAL)

The Activate Register panel developed new trouble during testing after installation. It is now in the process of additional modification.

The Audible Alarm panels are in my possession and are still awaiting buzzers.

(J.H. Newitt) (UNCLASSIFIED)

Odds and ends necessary to the completion of the Control Room are now receiving serious attention. There are innumerable one-of-a-kind accessories needed here and there. A plan of room lighting has been formulated, and experiments will be carried out soon to determine the most practical method for room and panel illumination.

The schedule has been receiving very little attention lately since we have passed the point of its value to our program. All the special requests of late I have been handling on a personal basis in the most expedient way available at the time.

There are still a few critical parts outstanding from vendors but these only influence Walquist's special panels. We stated some time back that these special panels could not be done much before July 1 (since they were started in design at the end of May). We still expect to complete them before July 1.

UNCLASSIFIED
CONFIDENTIAL

~~CONFIDENTIAL~~
~~UNCLASSIFIED~~
1.11 Equipment Engineering (Continued)

(J.H. Newitt) (Continued) (UNCLASSIFIED)

The last of the 16" scopes have finally straggled in from the vendors (three weeks after scheduled date). The vendors of these scopes and some 10 PB panels (which were also late) were mistakenly given longer deliveries than was anticipated by my schedule and my original discussions with them. Through continuous expediting pressure we were able to better this very bad situation, and under the circumstances we can consider ourselves lucky to have the outside work completed to date.

Inside shop work (where we have good control) has been doing very well. Schedules have been met and bettered in practically every case. Except for work given to outside vendors, shortages (with very few exceptions) occurred only in spares and not in quantities needed for installation.

Intercom (teletalk) wiring is virtually complete. Telephones will go in shortly.

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

Radar Mappers

Installation of two Pathfinder mapping scopes and the Filter Amplifier and Pulse Generator Panel has just been completed. Y32 is temporarily connected to monitor the output of Y31.

(G.A. Young) (CONFIDENTIAL)

A list of the computer action on illegal si commands has been made. Anyone interested in this list should see me.

A computer program, T-2699, has been written for testing light guns, the GOC box, the display boxes, and the real-time clock.

Memorandum M-2232, "Procedure for Using Group 61 Equipment for Introducing Data into WWI," is being completed and will be issued soon. This is a modification and amplification of an Inter-Office Memo written by B.E. Morriss.

Memorandum M-2257

Page 5

1.12 Data Screening

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

The Smoothing and Prediction section has been coded for the computer, discussed in conference, and is about to be run on the computer with a test parameter that I have written.

M-2143, Supplement #1, has been issued and, together with M-2143, should answer all questions concerning the master control program except for entry addresses. These addresses will be fixed shortly as soon as the program has been completely coded and tested on the computer.

The track-while-scan changeable constant registers have been allocated to the various TWS program sections. Of interest to the non-TWS programmers are the timing registers: hours (0-23) x 2^{-15} are stored in 2602 (o); minutes (0-59) x 2^{-15} are stored in 2603 (o).

(H. Frachtman) (CONFIDENTIAL)

The data -collection program has been checked out. Its starting address is 3150 (octal) which is consequently the address section of the SB order required in all September programs as explained in M-1913 and M-1913-1. This will not change unless the allocation of registers in M-1913-1 is revised.

The Kodak filter lacquer seems to be the best commercially available video-mapping material so far proposed or tried. We hope to use it on the Pathfinder as soon as possible.

(D. Goldenberg) (CONFIDENTIAL)

During the first week of this period, work was continued on the preparation of a report on the effect of earth curvature. A program was written to compute the errors in converting from slant range and height to ground distances for the spheroidal shape of the earth. The lack of computer time still proves to be a major source of delay in deriving results.

(J. Levenson) (CONFIDENTIAL)

All monitor programs for TWS have been completed. Tapes have been prepared for the monitor programs for crossing tracks and for switch-input interpretation. In addition, test parameters have been written and the programs will be checked out on the computer.

The following memos have been issued:

M-2233 Track Trouble Detection, Interpretation and Monitor Display
M-2238 Input Switches Interpretation for Track-While-Scan

(H. Peterson) (CONFIDENTIAL)

During this period I have rewritten the program for Trouble Track display using a display make-up table. I have also written the Combat Data Director's

~~CONFIDENTIAL~~
UNCLASSIFIED

1.12 Data Screening (Continued)

(H. Peterson) (Continued)

(CDD) intervention program, the auto-initiation program, and the uncorrelated data display and associated light-gun action program.

(H. Seward) (CONFIDENTIAL)

Checking parameters for the Track-Sorting and related programs are being drafted. These programs will be tested initially sometime next week.

(W. Wolf) (CONFIDENTIAL)

The Data Conversion and Display and Data Analysis programs for the TWS of the 1953 September System were completed and tested on the computer. A complete test was not performed since trouble was encountered due to incomplete wiring in the Indicator-Light equipment. This has been corrected and a complete test will soon be made.

Some time was spent in an effort to select the most suitable filtering material. It was observed that the Kodak Stripping Filter Lacquer suggested by H. Frachtman was superior to other materials such as plastic chips, theatrical color filter paper, the "Jet Handee Marker", etc.

The Kodak Lacquer has the required filtering properties; is ideally suited for translucency; and, if applied in a thin layer, is as quick drying as other liquids. A serious objection appears to be the fact that the intensity must be lowered to correlate with the desired thickness of application. Some compromise consistent with the Pathfinder filters appears imminent. Further testing will be performed as soon as the Pathfinder photocells are installed.

The permanent B-scan filter was modified to indicate N,E,S, and W azimuths for the convenience of the Air Force personnel.

1.13 Tracking and Control

(S. Best) (CONFIDENTIAL)

A 556 Tape of T2677, the program for finding suitable velocity-heading smoothing parameters has not been obtained due to minor difficulties with the CS (Comprehensive System of Service Routines) which is being corrected. Meanwhile, it was discovered by analyzing print out from a program designed to compare various smoothing methods, that an arctangent routine was being used in a region where it was not sufficiently precise. This necessitated changes in T2677 and implied that all prior results concerning velocity heading smoothing were invalid.

An analytic estimate of the probability of crossing tracks switching was attempted and abandoned as being mathematically too difficult. A flow-diagram of a program to further investigate this problem by a simulation method making use of sequences of pseudo-random numbers is being prepared. Radar misses would be treated by simulating the blip-scar-ratio.

(M. Frazier, A. Mathiasen) (CONFIDENTIAL)

Some delay was encountered in the tape preparation of the NLS-2c (Nonlinear Smoothing) parameter optimization program. It is suggested that, until this program has worked, programmers use the values of parameters found by C. Gaudette now current for mile quantization, namely:

$$\begin{aligned}\alpha_1 &= 1/16 \\ \alpha_2 &= 1/4 \\ a_1 &= 5/16 \\ a_2 &= 9/16 \\ R_c &= 45 \text{ miles} \\ P_c &= 1\frac{1}{8} \text{ miles}\end{aligned}$$

(Wm. Lone) (CONFIDENTIAL)

Coding for the Flight Test Umpire Program has been completed. Following my return from vacation, a parameter which will permit the program to be checked out without dependence on the TWS functions will be written.

(Wm. Lone, A. Mathiasen)

A run on the computer of the tracking-study program described in the May 22 biweekly disclosed some tape-preparation errors and some programming errors. Although a good deal of time was lost because of parity alarms and difficulties with the read-in program (random blocks not reading in), enough information was gleaned to permit discovery of probably all of the troubles in the initial phase of the program. The final computation phase and the use of the drum have not been checked out.

(A. Mathiasen)

Some programming troubles, occasioned by the various changes made recently in the computer, and equipment troubles lost considerable time in processing data recorded from Chatham and Nantucket in a flight test of May 29. Some data, however, was processed and showed Chatham to be operating quite satisfactorily while the MTI at Nantucket seemed too inefficient. Not enough data was taken in the short time remaining after the troubles were eliminated. A second attempt to get this data for the Boeing study was fruitless because of failure in the SDV equipment.

1.13 Tracking & Control (Continued)

(B. Stahl) (CONFIDENTIAL)

Several additional tracks have been plotted on the basis of data generated by A. Mathiasen's flight tests using the Chatham and Nantucket radars simultaneously; these are being subjected to the analysis indicated in the previous biweekly report.

It was hoped that checkout time would be available for the tracking and printing parameters described recently, but unfortunately this has not been the case. Further work on the program is at a standstill.

Some thought has been given the problem of adaptation from one radar to two radars of B. Lone's program for duplicate (double azimuths and double ranges) report analysis, but this has now been given second priority to work with H. Benington on DID (Digital Information Display) programming.

1.14 Weapons Direction

(D.R. Israel) (CONFIDENTIAL)

A large part of the past biweekly period was spent in reviewing problems and previously proposed solutions for the interception section of the Cape Cod programs. As a result of this work, an improved system of displays and alarm indications has been adopted. Much of this work has been written up in rough-note form in preparation for future publication.

Milt Brand and Fred Webster are working on a simulated track program which will be used in the testing of non-track-while-scan Cape Cod programs. Brand has written the program; Webster is working on the flight plans, track positions, etc. The program will be used in the place of the TWS program for initial testing; the substitution will be done in such a fashion that the non-TWS programs will not be aware of the source of the track data. It is expected that the program will be tested next week.

Eric Wolf has been assigned to work with Walquist's section but will initially prepare a program for daily testing of input switches.

Excellent progress is being made in the display sections of the Cape Cod programs. Benington, Conant, Grandy, and Thomas have already tested several programs, among them the Track Situation Display, the Summary DID(Digital Information Display), and the Radio Operator's DID. Ben Stahl is temporarily assisting in the programming.

Work on the simulated ID program by Brand, and Curby will be suspended. Sufficient information has been obtained from this program; recent changes in the input program as well as changes in the nature of the Cape Cod ID program will reduce the benefits of further work on this particular program.

Discussions with various programmers indicates that audible alarm panels could profitably be used at several of the non-TWS stations. Mod notices for this equipment and other changes have been written and submitted to Fred Irish. Other decisions and changes have required the preparation of supplements to M-2154, "Indicator Light Registers" and M-2180, "Light Gun Connections to In-Out Register". These supplements will be distributed in several days.

M-2255, "Intercept Director, Track Number, and Pair Assignments" (Israel) describes recent standardizations in position and number assignments. This memo is in the process of being typed for distribution.

Knapp and Gaudette are continuing their work on the overall non-TWS program framework and sequence. A number of flow diagrams and charts giving storage allocations have been prepared. All flow diagrams are being graded in the Print Room and will be distributed.

~~CONFIDENTIAL~~
UNCLASSIFIED

1.14 Weapons Direction (Continued)

(D.R. Israel) (Continued)

After discussions with Steve Dodd, changes in the WWI computer schedule have been effected on a temporary basis. These changes give Group 61 two 3-or 4-hour stretches of mid-evening (8-12) time. Plans are being made to extract the maximum utility from these periods. A memo describing the procedures for the preparation and testing of non-TWS tapes is in preparation.

Provisions for the manual input of r-θ data telephoned from N. Truro will be made by minor changes in the ID input programs.

Flight tests with the N. Truro programs have not been possible, although one of the programs has been fully checked out. Blip-scan data on previous flight tests has been lost due to faulty tape recording. A recent test using Mk X data in combination with normal 6-B video was quite satisfactory and indicated excellent returns of an F3D aircraft. It was pleasing to note that large multiple-azimuth returns were not obtained at short ranges.

Operation of the interception programs for Cape Cod will require the availability of climb and speed characteristics for the aircraft we will be using. Efforts are now being made to obtain this data from handbooks and flight tests.

Discussion with J. Leary of Group 21 indicates that the proposed Availability and Scramble Indicator can be built, quite easily, from Teleregister indicators and control equipment available to Group 21. The schematic, it seems, will be quite simple, and the equipment will be assembled when Leary returns from vacation.

On June 17, I visited the Quick-Fix installation at N. Truro with H. Boehmer (Group 22), R. Davis (Group 21) and J. Jarema (Group 21). The possible use of manpower and equipment made available by the termination of the Group 21 activities at N. Truro was the subject of the visit. Arrangements are continuing with Boehmer.

(H. Benington) (CONFIDENTIAL)

During the past biweekly period, the Display Group accomplished the following:

1. Simulated DID's for Selected Tracks, Summary Data, and the Radio Operator have been programmed and tested.
2. The Track Situation Display Make-up Program has been thoroughly investigated and most standards have been agreed on for intercommunication with other programs, eg, identification. The flow diagram is almost completed and during the next period most programming should be done. The check-out schedule has been pushed back to the first week in July.

1.14 Weapons Direction (Continued)

(H. Benington) (Continued)

3. A revision of the M-note, "Assigned Scope Display" (M-1999) has been completed, and will be issued during the next period. All the changes have been discussed with Gus O'Brien.
4. "Digital Information Display" (M-2251) is almost completed and will be issued during the next period. This note specified all the DID's.
5. The Display Test Program has been checked out and described in an inter-office memo.
6. Supplementary programs for calibration and simulation of moving tracks to test long-past-history displays have been written.
7. The optimum tables for vertical block DID's have been set together with the programs for displaying them. Similar work is being done for the horizontal blocks, and the results will be issued early in the next period. In conjunction with this work, the group will cooperate intensively during the next period with J. Hayase and the Identification group in order to settle these displays.

(M.J. Brand) (CONFIDENTIAL)

The Phase Two simulated identification program which worked successfully previous to the changes in the read-in program has never worked as well since it has been modified to work with the new read-in program. Since we have already learned much from this program, since much of the philosophy, programming and all of the displays are inconsistent with present thinking, and since we are busily engaged in writing the final programs it has been decided with D.R. Israel to suspend further concentrated work on this program.

Three different versions of the Identification Correlation section have been written only to be obsoleted due to changes in what is desired that this program do. Further modification of the flow diagram and program will now await further crystalization of ideas.

A flow diagram and program has been written for the FTU (Flight Test Umpire) program-testing program. The flow diagram has been given an SC number and is stored in the Print Room. I have submitted to D.R. Israel a proposal for the testing of this program. It is hoped that this program (a final Cape Cod program) will be checked out this biweekly period and will thereafter be available to programmers for checking out their Cape Cod programs.

1.14 Weapons Direction (Continued)

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

The Multiple Aircraft Height-Finder and AAA Program, T2574, is practically checked out. Over 3 hours of useful time were obtained on the computer during this period and all sections were tested. Some program errors were detected, and it is realistic to suppose that the next run of the program will show it to be checked out.

Though the reliability of the computer and new terminal equipment seems to be greatly improved, it is only fair to report that 5 out of 6 assigned hours on June 7 were lost to MITE troubles, a power failure, and ES troubles; an hour was lost altogether on June 9 because of MITE troubles; and an hour and a half was lost on June 11 because of a misunderstanding within Group 64 regarding the condition of MITE. However, well over 2 hours were found useful out of the 3 assigned on June 10 and 17.

Coding of the input sections of the Cape Cod Height-Finder and AAA sub-programs is well advanced and should be completed soon. The Display sections are held up pending final decisions on display questions, and the actual calculation sections are held up pending flight-test data on T2574. This should be available within the next two or three weeks, if all goes well.

(P.O. Cioffi) (CONFIDENTIAL)

The writing of the three-dimensional interception material is essentially completed and is in the process of being readied for publication as a supplement to M-1815. In connection with this writing, I have engaged in numerous discussions dealing with the selection of suitable collision-course techniques for certain critical cases.

It is planned that M-1489 on two-dimensional intercepts will be brought up to date and reissued as a supplement to M-1815 along with a writing of final-phase attack-intercept equations.

(O.T. Conant) (CONFIDENTIAL)

The telephone-system memo (M-2187) has been sent to the Print Room and should be distributed during the next biweekly period.

The program to calibrate scopes for a maximum range of 180 miles has been checked out and is available for use.

Programs have been written which display the Summary Data, Radio Operator, and Selected Track DID's (Digital Information Displays) from made-up tables. The Summary Data DID has been checked out and requires 68 milliseconds to display 53 characters. Future program improvements should reduce this time considerably, and all other DID's should prove to be faster.

1.14 Weapons Direction (Continued)

(O.T. Conant) (Continued)

The Selected Track and Radio Operator DID's are to be checked out June 19, and all remaining types of DID's will be programmed during the next period.

(A.W. Curby) (CONFIDENTIAL)

The Data-Read-In and Master Control programs, written by M. Brand for preliminary ID program testing, have been combined and rewritten to conform with the new read-in program and to transfer themselves to the drum once per frame for ease in post-parity restarts. It is hoped that without much more time being put on this group of programs they can be made to run satisfactorily.

The flow diagrams of the Cape Cod ID Processing and Extrapolation programs have been revised, since when actual programming was begun, it was found that time and registers could be saved by slight changes in logic. The processing program now handles R₀ insertion, and is being rewritten to utilize the md order.

(F.M. Garth) (CONFIDENTIAL)

One trial of the Combined Interception Rewrite Program was attempted on the computer. At times the initiation, tracking, and displays functioned as anticipated; at other times their performance was disappointing. This condition could be attributed to the Truro Ampex data. When the data appeared to jump to north the program gave poor performance, but when full data came in the opposite would follow.

My other work has been with L. Murray on the Radio Operator's display-table make-up. There is still a controversy as to whether one or two characters should be stored in each table register. We are writing a program which will store two.

(C. Grandy) (CONFIDENTIAL)

The track-situation display program has been revised, reducing the time needed to display. The program may be altered slightly to include a display of a maneuver digit, a trouble indication, and multiple aircraft (flight size) digit; however, these will be additions to the program and the existing features will not be changed. The program has been thoroughly tested with simulated data.

A flow diagram for the reading of light guns (in the track-situation display) and interpreting the information has been written and made to be compatible with the needs of the non-TWS programmers.

~~CONFIDENTIAL~~
UNCLASSIFIED1.14 Weapons Direction (Continued)

(C. Grandy) (Continued)

The track-situation display make-up flow diagram has been under extensive revision and is not yet in its final form. It has been decided that the following features will be included in the program: (1) make-up of track-situation display table; (2) make-up WD DID (Weapons Director Digital Information Display) table; (3) make up SDD table; (4) assimilate TWS information on initiated and dropped tracks; (5) compute speed and heading and sense for significant change for all hostile and unknown tracks; (6) additional services for the other non-TWS programmers. The flow diagram should be prepared in final form very shortly.

An inter-office memo is being written concerning programming convention for use of ATDS (Auxiliary Track Data Storage) by the non-TWS programmers. The contents of ATDS are considered digit by digit, describing the meaning of each, listing the programmers responsible for providing the information and those who use the information, and fixing the responsibility for setting change digits and resetting information digits. This memo will be circulated early in the next biweekly period.

(J. Hayase) (CONFIDENTIAL)

A table for flight-plan display has been devised, and a program that makes up this display table and displays an arrow and its associated DRN (Data Reference Number) has been roughly completed. The arrow-display section of this program was tested on the computer, and an error was discovered. The corrected program has not been run yet.

Currently a table for the display of auxiliary identification data is being considered.

(F. Heart) (CONFIDENTIAL)

Efforts have continued on the Cape Cod interception flow diagram. Some time has been spent considering questions of display, particularly connected with the intercept problem.

During the last biweekly period the "Usability" of the MITE and associated equipment increased, and the Truro version of the four-pair intercept program is now almost completely checked out. Final modifications are being tested, and a preliminary single-pair flight test will be attempted next week.

(S. Knapp) (CONFIDENTIAL)

The Four Pair Program has been checked out and is ready to be tried in a flight test.

The past week has been spend in continuing with C. Gaudette's work in Cape Cod Non-TWS timing while he is on vacation.

~~CONFIDENTIAL~~
UNCLASSIFIED

1.14 Weapons Direction (Continued)

(William Lemnios) (CONFIDENTIAL)

The Two-Aircraft Combined Interception Program has been partially checked out. The checking of the program will continue.

The interception-calculations flow diagram is being redrafted. A number of changes have been made from the flow diagram described as complete in the last report. The changes deal mainly with new ways of indicating troublesome situations. The actual interception calculations are not affected. It is hoped that no more changes of this flow diagram will be required.

A. Hill and P. Dolan have obtained experimental climb characteristics for the F-89C, F-94C, and F3D-1. These will be analyzed, and appropriate parabolic approximating functions will be obtained.

(L.T. Murray) (CONFIDENTIAL)

The Four Pair Intercept Program has been checked and is now ready for a flight test. It is hoped that this will take place during the week of June 22.

The display program for the Radio Operator has progressed slowly. This has been due to changes in the display and in the display table. The program should be in final form within the next week.

(G. Rawling) (CONFIDENTIAL)

The past biweekly period has been split in two phases.

Phase 1 involved operating and checking T2574, Multiple Aircraft Height Finder and AAA Programs, in conjunction with J. Cahill. Results are to be found in his report.

Phase 2 has been spent in helping program the Height Supervisor Intake function for Cape Cod. The program is now being re-examined and polished.

(B.R. Stahl) (CONFIDENTIAL)

Attempts are being made to program and investigate a variety of ways to display digital information, particularly characters in horizontal rows, the aim, of course, being the reduction of performance time especially as well as the conservation of storage space. The DID Displays involved are those of the Identification Officer, the AA Talker, and the Height Supervisor.

1.14 Weapons Direction (Continued)

(F.A. Webster) (CONFIDENTIAL)

To cover the area to be used for simulated tracks, it has been necessary to shift from the scale of the sectional aeronautical charts to the scale of the world aeronautical charts (1:1,000,000). All check points thus fall conveniently on a D-size sheet. The x,y coordinates of most of these check points have been obtained, though there seem to be minor discrepancies between sources. A set of tracks is being prepared that will represent most of the problems likely to arise. The communication problems involved in handling some of these tracks will be analyzed in detail. Other tracks will be used in simulation programs.

(E.W. Wolf) (CONFIDENTIAL)

A program is being written that will check out each of the intervention and activate push buttons of the 1953 Cape Cod System.

The number of each activate button that has been pushed will be displayed on all scopes. When the intervention buttons associated with any activate button are pushed in sequence, a scope display of the word "BAD" or "GOOD" next to the corresponding activate number will give an indication of whether or not that button is malfunctioning. When the last intervention button in any sequence has been pushed, there will be a display to indicate whether all of the buttons in that sequence were functioning properly.

(C.A. Zraket) (CONFIDENTIAL)

The various alarm indications and interception-status digit displays for the weapons-direction programs have been decided upon in conference with Israel, Lemnios, and Heart. Most of the material for these programs (see last biweekly report) has been consolidated and coding has been started.

Some time has been spent in aiding in the consolidation of storage requirements and the use of indicator-light registers for the non-TWS programs.

~~CONFIDENTIAL~~
UNCLASSIFIED

1.15 Direction Center Operations

(F. Heart) (CONFIDENTIAL)

A third 16" scope is being added to the present flight-test operating area (Room 228, Barta). This scope will allow operating procedures more nearly similar to those planned for Cape Cod. In particular, it will allow experiments isolating "tracking" from "weapon direction."

A flight test was successfully run to test operation of Mark X Beacon. An investigation was also made of the "modes" of Mark X operation. Results of this investigation are available in an inter-office memorandum to C.R. Wieser, D.R. Israel, and J. Arnow.

The inability to exercise any control over the scheduled down-time of the Truro radar has slightly hampered operation. Operation has likewise been hampered by lack of an official SECRET schedule for this down-time. It is hoped that this schedule will be available in the near future.

With the assistance of members of the flight test section, efforts have continued to analyse and properly index the small number of available Truro-data Ampex tapes.

(H.J. Kirshner) (CONFIDENTIAL)

The Plan Twelve Indicator in Room 228 has been repaired and is now operating very well.

SDV data utilizing Mark X IFF at Truro has been recorded and is available on tape 192.

Further changes in Truro SDV telephone lines have been made by the telephone company at the request of Group 24. The results of the change have not yet been evaluated.

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

Much of the past biweekly period was spent coordinating tests on the various types of interceptors to be used in the September system; these are the F-3D, F-94C, F-89C, and the F-86D. The tests pertained to maximum climb, climbing time, nautical miles traveled, indicated air speed, and throttle settings. This information was sent to Bill Lemnios in inter-office memo form for analysis and application.

With the help of personnel from Capt. Sullivan's section attempts have been made to make coverage maps from data recorded during 6-B coverage tests. This has been held up due to demodulator trouble and PPI scope trouble. However, at this writing, this work has been started and should be completed shortly.

~~CONFIDENTIAL~~
UNCLASSIFIED

1.15 Direction Center Operations (Continued)

(M. Brand) (CONFIDENTIAL)

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

| | |
|-------------------------------------|---------------|
| Magnetic Tape | 7 hrs 25 min. |
| Radar Analysis | 1 hr 45 min |
| Magnetic Tape | 14 hrs 00 min |
| Air Defense Center Operations | 9 hrs 50 min |
| Miscellaneous | 50 min |
| Conversion | 55 min |
| Calibration | 1 hr 10 min |
| | |
| Total Time Used | 36 hrs 25 min |
| | |
| Computer Breakdown (parities, etc.) | 13 hrs 35 min |
| | |
| Total Time Lost | 13 hrs 35 min |
| Total Assigned Time | 50 hrs 00 min |

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

The following statistics apply to the last biweekly period:

- 1) Total aircraft hours flown 2*
- 2) Aircraft hours flown by Navy (Quonset-based Squadron) 2

* Coverage test without computer.

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

June 12 1000-1200, IFF Coverage, Heart

Aircraft used: One Navy F-3D with MK X Beacon.

~~CONFIDENTIAL~~
UNCLASSIFIED

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 | | |
| 6/9 | 1300- 1600 | 1 | IFF COVERAGE | - | Cancelled Scheduling |
| 6/10 | 0900- 1200 | 1 | IFF COVERAGE | - | a) Barta PPI inoperative b) Truro SDV inoperative |
| 6/11 | 0900- 1200 | 1 | IFF COVERAGE | - | a) A/C with Mark X not available b) Barta PPI inoperative |
| 6/12 | 1000- 1200 | 1 | IFF COVERAGE | 1 | - As Scheduled |

~~CONFIDENTIAL~~
UNCLASSIFIED

* Added to schedule during week of test

1.16 WWII Support

(D.R. Israel) (CONFIDENTIAL)

A revised floor plan for the Direction Center to be located in the basement of Building A has been prepared and submitted to Pete Smead. This plan shows the allocation of floor space to various functions as well as the presently planned partitions. The available space in all cases is equal to or greater than our initial minimum requirements. A copy of the floor plan is in possession of the author.

I attended the In-Out Meeting at IBM in Poughkeepsie on June 11. At this meeting preliminary decisions were reached regarding the Digital Information Displays and the mode and means of manual intervention via switches, push buttons, etc. The results of the preliminary decisions seem quite satisfactory from the viewpoint of usability and flexibility.

(W.A. Clark) (CONFIDENTIAL)

At the suggestion of R. Everett, the problem of total transmission time in a system employing the GE data link in a "round-robin" mode of distribution over several transmitters was set up and successfully run on MTC. The program features a pseudo-random number generator of the type recently employed by Ralston and Denman on WWI and which produces at least one-and-a-half million terms without repeating the initial series.

The results of the machine solution agree remarkably well with results of an analytical solution developed by I.S. Reed and G. Dineen of Division 2 and will be presented shortly in a joint document.

MTC performed excellently throughout the entire computation, executing about 600 million operations in four hours with less than 5 minutes of down-time (caused largely by transients on the laboratory power supply line).

1.2 Group 64

(S. H. Dodd) (UNCLASSIFIED)

Progress on the installation and debugging of the Cape Cod equipment is progressing satisfactorily. It is expected that the system will be operating well enough for use by programmers by July 1, 1953. The installation of all equipment wiring, except for a few special panels, is expected to be completed next week.

The remote-station-distribution-box wiring is at present only 50-percent complete. It is necessary to perform this wiring while power is removed from the remote-station distribution box. Plans have been made to remove all power this weekend, and it is hoped that the wiring can be completed by Monday night, 22 June.

It has been necessary to redesign the activate register because it destroys the gas tubes after a very short operating time. Some troubles have been encountered in the scope-intensify circuits and in the indicator-light circuits. Work is in progress to eliminate these difficulties. MITE No. 1 and No. 2 are all wired and should be in operation in about a week.

Computer reliability has improved substantially during the past two weeks, and work will continue towards even better reliability.

1.21 WWI System Operation

(L. L. Holmes) (UNCLASSIFIED)

The power wiring in rack EX5 has progressed well. The wiring will be completed on Monday, June 22nd. Following a power check-out the panels required by this rack (similar to other ES Digits) will be installed. The equipment in the rack will be connected to the WWI system during the coming biweekly period.

Electrostatic Storage

(A. J. Roberts, D. M. Fisher) (UNCLASSIFIED)

The 715's in the new ESD output panels were replaced because of unstable operation. Storage reliability during this period remains excellent.

Auxiliary-Drum System

(H. L. Ziegler) (UNCLASSIFIED)

Now that more technician help is available, fair progress is being made in the construction and installation of accessory equipment for the drum systems. During the coming biweekly period we expect to start a systematic check of the various ERA chassis. The data obtained from these

1.21 WWI System Operation (Continued)

tests should be useful for future maintenance work and possibly for improvements in circuitry.

(P. W. Stephan) (UNCLASSIFIED)

A small improvement in the auxiliary-drum test tape was made. This is 2658-4; it replaces 2658-2.

The marginal checking of the auxiliary drum has been set up and turned over to the marginal-checking group.

Some time was spent studying the buffer-drum system.

(T. Leary) (UNCLASSIFIED)

The excursions for the auxiliary-drum marginal-checking lines have just been set up so that automatic marginal checking of the auxiliary-drum system is now feasible.

(C. W. Simmonds) (UNCLASSIFIED)

A test panel has been built on a single rack that provides a flexible means of testing both ERA chassis and 24-pin plug-in gate generators (GG Mod. II). It is located at the end of the Drum Bay. When time permits, a program for testing ERA chassis will be put into action.

The 16 cathode-follower circuits being built on an ERA chassis for the video monitoring system will be completed this week. In the meantime, the associated cabling and wiring in the magnetic-drum assembly is being finished. The cathode followers will be mounted in Bay 1. The video monitoring system will be ready for a check-out early in the week of 21 June.

A coincidence detector is being built on an ERA chassis for Bay 1 of the magnetic-drum assembly. The remaining space on the chassis will be occupied by five general-purpose buffer amplifiers. Layouts have been completed, and the circuit is in construction.

Order Code

(J. H. Hughes) (UNCLASSIFIED)

The new order md, multiply digits, is in order position 31 and may be used.

1.21 WWI System Operation (Continued)

Marginal-Checking System, Mod. II

(J. H. Hughes) (UNCLASSIFIED)

The dust cover for the new Auto Control Panel, MC Mod. II, has been completed, and the panel is ready for installation.

WWI Service File

(D. A. Morrison) (UNCLASSIFIED)

As soon as prints are available, a Service File will be set up for Room 156, Barta Bldg., for the convenience of MITE and Drum personnel. The arrangement of drawings will be similar to that used in the WWI Service File.

Flexowriter

(L. H. Norcott) (UNCLASSIFIED)

In accordance with the provisions of M-2200, two 12"-carriage Flexowriters have been turned over to MTC in return for two 20"-carriage Flexos. After overhaul, one 20" FL was installed in Test Control for tape-preparation use; the other has been installed in Room 109.

Modification of our FL punches continues. The original 450-ohm-punch magnet assemblies have been replaced with 900-ohm assemblies on all but four punches. These will be modified as soon as new assemblies are received.

1.22 Terminal Equipment

New In-Out System

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

The wiring of the large junction boxes is about one-half complete, and arrangements are being made to disable the equipment feeding the junction boxes so that the wiring can continue while the rest of the computer is on. By this means we hope to finish the wiring next week, excluding any of the recently requested changes.

During the past biweekly period the activate circuits were tried in the computer, and it was found that the 5696 gas tubes were shorting between cathode and heater because of excessive voltage developed in the cathode circuits. These circuits will have to be redesigned to overcome this fault.

1.22 Terminal Equipment (Continued)

It appears that the trouble mentioned last week concerning noise on the intensify lines will require a redesign of the plug-in unit in two respects: (1) to protect the circuit against power supply noise, (2) to prevent the circuit from causing transients on the power supply when a large number of units are pulsed.

The noise on the scope deflection lines is worse than ever now that more and more equipment is being installed. In an effort to improve this situation a breadboard circuit of a differential amplifier is being made to be tested as a possible replacement of the present preamplifiers. In order to use this with the present system an additional amplifier will be needed at each scope to convert the balanced signal to a single-ended signal.

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

The intervention-register digits located in scope consoles B, C, D, E, F, and G are connected in completely and have been checked out satisfactorily.

Cross talk has been found to exist in the display intensification system. This problem is presently being investigated.

About half of the remote-station-distribution-box jumpers are installed and checked out. The remainder will be installed during the weekend of 20 June.

(R. H. Gould) (UNCLASSIFIED)

All 16-inch display scopes in Room 222 have cathode-ray tubes installed and aligned. The third decoder-output amplifier will be connected so that all scopes may be tested as soon as their intensify lines are connected in the junction box.

The final shipment of Plexiglas shields for the 16-inch CRT's has been received. The remaining display scopes will have CRT's installed next week.

Numerical Display

(F. E. Irish) (UNCLASSIFIED)

The position of the character code has been permanently shifted to a position occupying digits 1 through 7 of the IOR.

The circuits have also been arranged so that the contents of IOR in digits 8 through 15 before the display are in digits 0 through 7 following the display. Having the system operate in this fashion allows the codes for two characters to be stored in one register. The first record order can be

1.22 Terminal Equipment (Continued)

followed by a read order to put the code for the second character into a temporary register. A second record order then takes the code from the temporary register and displays the second character.

MITE

(A. M. Werlin, R. B. Paddock) (CONFIDENTIAL)

MITE has been used several times during the past week and has operated reliably. MITE No. 0 has been marginal checked using the six existing lines, and the margins have been improved. Further work will be done in this direction with the use of the computer. It has been decided to retain the six marginal-checking lines, since the addition of more lines would entail extensive changes.

The old "calibrate-operate" switch for the calibration of the B-scan video mapper has been removed, and provisions have been made to switch in calibration patterns for the new video mappers.

A good deal of effort has been bent toward getting the drawings of the MITE and Buffer Storage system up to date; many of these drawings are in the Drafting Room.

The switch panel for the switching in of the various demodulators and the video mappers to MITE's No. 1 and No. 2 is completed and will be tied in next week. A video switch panel has also been constructed to permit testing of MITE's No. 1 and No. 2 independently of the computer and to permit rapid tie in with the computer when the time arises.

Magnetic-Tape System

(J. W. Forgie) (UNCLASSIFIED)

For some time difficulty has been experienced in rerecording information on magnetic tape. The trouble is caused by a transient which is recorded on the tape when the system is returned to the read mode after a rerecording operation. This transient may result in an extra pulse which throws the information out of synchronism when it is read back. No way has yet been found to eliminate this transient, but its effect has been greatly reduced by spreading it out on the tape. This spreading is accomplished by slowing down the mode switching signal. To permit this slowing down, a delay counted by in-out control has been changed. Preliminary tests indicate that rerecording is now as reliable as any other mode of operation with magnetic tape.

To facilitate the recording of information for delayed printer and punch, a new si order is being installed and should be available sometime during the week of June 22. This order (si Record for Print-Out) will result in the proper separation of characters on the tape so that no delays

1.22 Terminal Equipment (Continued)

need be counted by the program. The si order need be given only once, and all rc orders following it (until, of course, another si is given) will be separated by the optimum delay. The program then merely gives an rc order when each character is determined. The new si order will operate for all units, but, of course, only unit No. 3 has print-out equipment connected to it. The addresses of the new order are as follows:

| | | <u>si Record for Print-Out</u> | |
|------------|-----|--------------------------------|---------|
| | | Octal | Decimal |
| Unit No. 0 | FWD | 146 | 102 |
| | REV | 147 | 103 |
| Unit No. 1 | FWD | 156 | 110 |
| | REV | 157 | 111 |
| Unit No. 2 | FWD | 166 | 118 |
| | REV | 167 | 119 |
| Unit No. 3 | FWD | 176 | 126 |
| | REV | 177 | 127 |

A memo will appear shortly describing the operation of this new order in more detail.

Magnetic-Tape Mechanisms

(E. P. Farnsworth) (UNCLASSIFIED)

Checking of tape-drive capstan-clutch air gaps is proceeding. Of the three units completed so far, two have required additional shimming. The starting and stopping times of these units are now better than six milliseconds. Units 3A and 3B remain to be checked out by the new method.

Push-button assemblies for the auxiliary control panels have been received, and wiring of the panels is nearing completion.

Magnetic-Tape Print-Out

(E. P. Farnsworth) (UNCLASSIFIED)

Four programs for testing delayed print-out and automatic punch have been modified for the new code locations. The automatic punch has operated satisfactorily but is failing occasionally at present because of intermittent asynchronous operation of the index-pulse counter apparently caused by thyratron or relay-switching transients, the source of which has not yet been tracked down. Indicator lights for the counter flip-flops and

1.22 Terminal Equipment (Continued)

thyatron registers are being added in Test Control rack TC 17 to facilitate marginal checking and trouble shooting. Drawings are being brought up to date, and some of the equipment has been ordered to replace the breadboard panels now in use.

Buffer-Drum System

(K. E. McVicar) (UNCLASSIFIED)

The Buffer-Drum System has been received from ERA and has been installed in Room 156. The wires which had to be cut to allow shipment of the system have been spliced, and power has been turned on.

Some of the circuitry has been checked and present work involves further testing of the system. The dual heads have been checked for signal amplitude and timing and the settings adjusted where necessary.

There was some evidence that the drum received a severe mechanical shock during shipment, and it was feared that possibly the surface had been damaged. We connected the buffer drum up to run with the auxiliary system and check the surface. All the tracks ran satisfactorily with a large margin on the reading amplifiers from which we deduced that the drum surface was not seriously injured.

Two representatives are now here from ERA to supervise the initial tests on the system and assist us in getting our own test program under way.

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 5-18, 1953:

| | |
|--|-----|
| Number of assigned hours | 103 |
| Usable percentage of assigned time | 87 |
| Usable percentage of assigned time since March, 1951 | 85 |
| Number of transient errors | 55 |
| Number of steady-state errors | 4 |
| Number of intermittent errors | 5 |

Storage-Tube Complement in WWI

(L. O. Leighton) (UNCLASSIFIED)

Following is the storage-tube complement as of 2400 June 18, 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 | 4722 |
| 1 B | 15 | ST-820-R-1 | 11104 | 387 |
| 2 B | 31 | ST-807 | 13501 | 1290 |
| 3 B | 4 | ST-821 | 11226 | 565 |
| 4 B | 33 | RT-380 | 13516 | 1275 |
| 5 B | 11 | ST-836 | 11617 | 174 |
| 6 B | 3 | ST-751 | 13170 | 1621 |
| 7 B | 5 | ST-834 | 11551 | 240 |
| 8 B | 44 | ST-742 | 12640 | 2041 |
| 9 B | 42 | ST-720-C | 12937 | 1854 |
| 10 B | 2 | RT-382 | 13629 | 1162 |
| 11 B | 25 | ST-753-1 | 13129 | 1662 |
| 12 B | 28 | ST-747 | 13261 | 1530 |
| 13 B | 9 | ST-803 | 13411 | 1380 |
| 14 B | 24 | ST-624-C-1 | 10507 | 4284 |
| 15 B | 16 | RT-383 | 13629 | 1162 |
| 16 B | 29 | ST-830 | 11641 | 150 |

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 | 1661 |
| 1 A | 20 | ST-817 | 14148 | 643 |
| 2 A | 13 | ST-840-1 | 14770 | 22 |
| 3 A | 23 | ST-802 | 13411 | 1380 |
| 4 A | 32 | ST-808 | 13516 | 1275 |
| 5 A | 40 | ST-525 | 13389 | 1402 |
| 6 A | 34 | ST-710-C-1 | 12889 | 1902 |
| 7 A | 35 | ST-800 | 13340 | 1451 |
| 8 A | 45 | ST-825 | 14307 | 484 |
| 9 A | 39 | ST-814 | 13910 | 881 |
| 10 A | 30 | ST-801 | 13363 | 1428 |
| 11 A | 36 | ST-744-1 | 12822 | 1969 |
| 12 A | 8 | ST-746 | 12982 | 1809 |
| 13 A | 14 | RT-381 | 13581 | 1210 |
| 14 A | 37 | ST-819 | 14404 | 387 |
| 15 A | 22 | ST-805 | 13457 | 1334 |
| 16 A | 12 | ST-831 | 14517 | 274 |

| | |
|--|-------|
| ES Clock hours as of 2400 June 18, 1953 | 14791 |
| Average life of tubes in service in Bank B | 1500 |
| Average life of tubes in service in Bank A | 1148 |
| Average life of last five rejected tubes | 1692 |

Storage-Tube Failures in WWI

(L. O. Leighton) (UNCLASSIFIED)

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

- ST-823 was rejected after 313 hours of operation because of failure to hold a positive array.
- ST-745 was rejected after 1636 hours of operation because of positive switching and poor holding-gun coverage.
- ST-828 was rejected after 205 hours of operation because of failure to hold a positive array.
- ST-816 was rejected after 860 hours of operation because of weak high-velocity gun.

Component Failures in WWI

(L. O. Leighton) (UNCLASSIFIED)

The following failures of electrical components have been reported since June 5, 1953:

| <u>Components</u> | <u>No. of Failures</u> | <u>Hours of Operation</u> | <u>Reasons for Failure</u> |
|---|------------------------|---------------------------|-------------------------------|
| <u>Capacitors</u> | | | |
| 1.0-MFD, 600-volt oil-filled bathtub | 1 | 7000 - 8000 | Leaking oil |
| 1.0-MFD, 600-volt oil-filled bathtub | 1 | 9000 - 10000 | Leaking oil |
| 4-30-MMFD ceramic trimmer | 1 | 7000 - 8000 | Opened |
| 0.01 MFD mica | 1 | 15000 - 16000 | Shorted |
| <u>Crystals</u> | | | |
| D-357 | 4 | 17000 - 18000 | Low R_b and drifting |
| D-358 | 1 | 17000 - 18000 | Low R_b and drifting |
| D-358 | 4 | 18000 - 19000 | Low R_b and drifting |
| 38 - A diode | 1 | 0 - 1000 | Low R_b |
| <u>Tubes</u> | | | |
| C16J | 1 | 18000 - 19000 | Failure to conduct |
| C6J | 1 | 1000 - 2000 | Failure to conduct |
| OA2 | 1 | 0 - 1000 | Pin broken off |
| 3E29 | 1 | 0 - 1000 | Mechanical damage |
| 6AG7 | 1 | 11000 - 12000 | Low I_b |
| 6AH6 | 1 | 9000 - 10000 | Mechanical fault |
| 6AS7G | 1 | 0 - 1000 | Short |
| | 1 | 17000 - 18000 | Mechanical |
| 6L6 | 1 | 14000 - 15000 | Short |
| 6SN7 | 1 | 13000 - 14000 | Low I_b |
| | 2 | 16000 - 17000 | 1-open heater 1-broken pin |
| | 1 | 17000 - 18000 | Short |
| | 2 | 18000 - 19000 | 1-short; 1-low I_b |
| 6Y6G | 1 | 0 - 1000 | Short |

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> | | | |
| 6145 | 2 | 0 - 1000 | 1-short 1-broken pin |
| SR-1407 | 1 | 10000 - 11000 | Leakage |
| 7AD7 | 2 | 5000 - 6000 | Low I _b |
| | 3 | 7000 - 8000 | 1-short; 2-low I _b |
| | 1 | 10000 - 11000 | Short |
| | 4 | 11000 - 12000 | 3-short; 1-low I _b |
| | 2 | 12000 - 13000 | 1-short; 1-low I _b |
| | 3 | 13000 - 14000 | 2-low I _b ; 1-unbalance |
| | 2 | 14000 - 15000 | Short |
| | 2 | 15000 - 16000 | 1-short; 1-leakage |
| | 3 | 16000 - 17000 | 2-short; 1-leakage |
| | 3 | 18000 - 19000 | 3-Short |
| 7AK7 | 1 | 0 - 1000 | High grid cut-off |
| 7X6 | 4 | 10000 - 11000 | Low I _b |
| 715B | 1 | 0 - 1000 | Leakage |

1.24 General

D-C Power Supplies

(R. G. Farmer) (UNCLASSIFIED)

Testing and modifying of a 500-volt, 10-amp power supply has been completed during the past two weeks.

When testing started, the regulator was producing small oscillations at the output although calculations showed it should have been stable. After further investigation, it was found that an OA2 tube, which is used as a voltage reference, was oscillating at 150 kilocycles with a 2-volt peak-to-peak amplitude. Replacement of this tube stopped the oscillations.

After two of the compensating circuits were redesigned, the supply was found to have very good operating characteristics. The ripple is 0.004%. The output impedance, which is a function of frequency, has a maximum value of 0.03 ohms. For a 1.5-amp step transient at the output of the regulator, the voltage is changed by 50 mv and recovers to within 2.5 mv within 50 μsec-onds.

D-C Power Supplies (Continued)

(R. G. Farmer) (Continued) (UNCLASSIFIED)

After the wiring is made permanent, this supply will replace the 500-volt, 5-amp supply now used in WWI. The supply should be in operation within three weeks.

(S. T. Coffin) (UNCLASSIFIED)

The improved -150-volt, 50-amp supply has been installed in WWI and is operating satisfactorily on the unregulated a-c supply. This replaces the -150-volt, 25-amp supply which will be used for -150-volt Whittmore lab supply.

We now plan to redesign the Whittmore 250-volt, 50-amp supply for possible use in WWI.

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 test facilities were operated at full capacity at all times to meet these requirements.

Experiments on the deposition and bakeout of stannic-oxide-coated envelopes and the work with the Philips "L" cathodes continued.

During the previous biweekly period two experimental tubes, RT385 and RT386, were constructed for the cathode investigations of H. B. Frost. Work was started this period on a new design based on the test results of the first two tubes.

Storage-Tube Construction

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

During this period, eight 800-series storage tubes were constructed as replacements for any marginal tubes and old-model tubes in Bank A and Bank B. No experimental or research tubes were constructed this period.

1.32 Test

Television Demonstrator

(D. M. Fisher) (UNCLASSIFIED)

Eight storage tubes were pretested this period. Seven were accepted and transferred to the STRT for final testing. One tube was rejected because of failure to hold a positive array.

Storage Tube Reliability Tester

(R. E. Hegler) (UNCLASSIFIED)

ST836, ST837, and ST840-1 through ST843-1 had satisfactory margins and were sent to WWL.

1.33 Research and Development

Alignment Demonstrator

(C. L. Corderman and D. M. Fisher) (UNCLASSIFIED)

ST829 has been installed in the A-D for extended life test. Various elements in the tube are being monitored with Brush Recorders to

6889

Memorandum M-2257

Page 34

1.33 Research and Development (Continued)

obtain more information about positive switching and internal breakdown which is occurring in the tubes. Since the tube's installation, no positive switching or breakdown has occurred.

Philips "L" Cathodes

(R. J. Biagiotti) (UNCLASSIFIED)

Most of the tubes tested for grid emission so far have shown that practically all of the emission from the grid goes to the cathode. Although the total grid emission is best indicated by actual measurement of grid current this does not indicate how much the grid contributed to beam current. In order to get an indication of the grid contribution to beam current, all electrodes on the side of the grid opposite to the cathode are being tied together and their collective currents are being measured with the tube biased 100 volts beyond cutoff as determined by zero cathode current.

In order to measure the operating temperature of an electron gun with an impregnated "L" cathode a tube is being built which is the same as the triode section of a HV gun, except that a number of tantalum-platinum thermocouples are being distributed so that the temperature gradient can be roughly determined. This tube is being built to permit a comparison between cathode and grid temperatures and determination of approximate work functions for the grid emission. When grids of different materials are used there will be this added basis for comparison. If different materials fail to decrease grid emission, attempts will be made to reduce the grid temperature, and this tube will therefore serve as a starting point in this investigation.

Velocity Distribution Measurements

(C. T. Kirk) (UNCLASSIFIED)

An investigation was conducted to find an explanation of the disagreement between the electron-velocity distribution of the holding beam obtained by this writer and that obtained by other investigators in the past. The solid beryllium surface of RT218 was used for detection instead of a Faraday Cage tube in an attempt to determine if any electrons of the holding beam having a primary energy of 100 electron volts (ev) or more exist. It was found that the maximum primary energy detected appeared to depend on the past history of the surface potential. When the previous potential of the surface was such that the electron current was away from the surface, primary energies of 102.25 ev would be detected in an amount that should have easily been observed using a cage. When the previous potential of the surface was such that electron current was toward the surface the maximum energy would be only 97 ev.

Now, the past history of the surface potential cannot influence the electron energy. Therefore, it appears that there are electron energy

1.33 Research and Development (Continued)

levels in the holding beam of 100 ev and greater and that the surface and cages are contaminated with some kind of electronegative material (probably a gas such as oxygen) which increased the contact potential between the holding-beam cathode and the cages (or surface). If this type of contamination takes place slowly over a period of time the discrepancy between the velocity-distribution curves can be accounted for.

Minor peaks have been observed in the energy-distribution curves obtained using Faraday Cages with apparent energies less than 100 ev. These peaks are attributed to primary electrons having energies of approximately 100 ev, but with an angle of incidence to the surface other than normal.

1.34 General

(Lewis Martin, Alfred Zacharias) (UNCLASSIFIED)

Since our employment began on 15 June, the preceding week of 15 June to 18 June has been spent reading pertinent material on storage tubes.

~~CONFIDENTIAL~~
UNCLASSIFIED

SECTION II - WHIRLWIND II

2.1 Group 62

(N.H. Taylor) (CONFIDENTIAL)

The following paragraphs give short summaries of current activity in Group 62:

1. MTC

The MTC computer is undergoing shake-down tests aimed at documenting and solidifying the rapid gains which were made during the past two months. There will be a period of a couple of months where MTC will be undergoing rigid marginal checks, and an attempt will be made to run the system evenings, maybe through the night, as soon as the regulated supplies can be put in operation.

2. Input-Output

Plans have been made by the input-output and systems group of both MIT and IBM to hold a series of meetings for intensive review of the input-output situation and a freezing of those parts of the system at the earliest possible date. These meetings will be held in Cambridge and Poughkeepsie during the next two-week period. They will review input-output decisions to date but will extend to other parts of the system including power supplies, marginal checking, mechanical design, memory, computer console, and basic circuits.

3. Magnetic Memory

An attempt to freeze the specifications for the core to be used in WWII magnetic memory has led to the decision to order about 250,000 good cores from each of two suppliers.

4. IBM Activity

A three-day trip to Poughkeepsie led to the general feeling that activity at that location is proceeding at a better tempo than is indicated by the various reports which have been written. The IBM group is beginning to feel the urgency of the situation and is taking measures to overcome some of the obstacles which always lie in the road of rapid progress. The three activities which seem to need a little more attention are basic circuits, magnetic drums, and magnetic-core procurement testing. Other activities seem to be progressing at a fairly satisfactory rate.

2.11 Systems

(R.P. Mayer) (UNCLASSIFIED)

The E-note describing the comprehensive logical diagram and traffic diagram mentioned in the biweekly of June 5 is being expanded in order to indicate those parts of the design which are frozen, those parts which are not frozen, and those parts which are not yet designed. The number and title will be E-560, "Status of WWII Internal Logical Design."

UNCLASSIFIED

2.11 Systems (Continued)

Display

(R. vonBuelow) (CONFIDENTIAL)

The proposal mentioned in the last biweekly report was reviewed and amplified in the necessary places. A memorandum describing this proposal is forthcoming shortly.

A discussion was held on the circuits for the display system. It was decided that Henry Ziemann would try his decoder output amplifier on WWI to determine the effectiveness of noise elimination in the circuit.

A preliminary discussion was held with Group 39 people regarding the psychological aspects of the display system.

Discussions with representatives of Freed Electronics regarding a "dark trace" tube and of Vultee Aircraft regarding the Charactron has stimulated interest in these items to the extent of planning trips to view these developments.

2.12 Arithmetic and Control

In-Out Study

(J.F. Jacobs) (CONFIDENTIAL)

The study of the input-output system which was outlined in the last biweekly report has progressed to the point where we can begin gathering and studying the proposals for the various parts of the system.

Design Manuals

(J.F. Jacobs) (CONFIDENTIAL)

Three circuits have been processed for the proposed Applications' Manual. One of the circuits, the flip-flop, will be used to test the approval procedure now being set up by R. Nelson.

Circuit-Application Manual

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

The summaries of several circuits are reaching final form and should be ready soon for the Circuit-Application Manual. These circuits include the high-speed flip-flop, two gate-tube circuits, and the delay unit. Summaries of the buffer amplifier, cathode follower, and diode circuits are being worked on.

The drawings and printing necessary for these summaries will be done by IBM. An initial order has been put in for 22 binders for the manual. As the demand increases, more binders will be ordered.

~~CONFIDENTIAL~~
UNCLASSIFIED

2.12 Arithmetic and Control (Continued)

WWII - Weapon Outputs

(R.C. Hopkins) (CONFIDENTIAL)

A preliminary proposal in very general terms for the output system to take weapon-guidance information off the output buffer drum and distribute it to data-link terminals was presented at the IBM-MIT input-output meeting of 28 May 1953.

On 2 June 1953 at a meeting with Air Force personnel and General Electric representatives it was found that the Air Force has officially adopted the data link developed by Rome ADC in conjunction with the General Electric Company. Since that date, work has been done on filling in the details of the preliminary proposal, with emphasis on flexibility for meeting the problems presented by the USAF data link and yet adaptable to other types of data link and outputs.

(I. Aronson) (CONFIDENTIAL)

The work on marginal checking has continued in the form of a general study because of a lack of more specific information.

To date we have been unable to find out the supply voltages and margins of any of the basic circuits except the high-speed flip-flop.

Also, we previously thought we could obtain from the WWI records definite information on the types of failures that were found by marginal checking and the percentage of total failures predicted by this means. Judging from the comments of the WWI people we spoke to and from our own observations, this information is so heavily buried under reams of other data that it probably cannot be isolated.

The cooperation of the WWI personnel has been of considerable aid to us in drawing up a list of the features that should be included in the marginal-checking system. Further comments and suggestions will be appreciated.

We are expecting a programmer to be assigned to check and diagnostic programs some time soon; meanwhile we will try to learn something about this subject ourselves in order to prevent this phase of the work from falling too far behind.

~~CONFIDENTIAL~~
UNCLASSIFIED

2.12 Arithmetic and Control (Continued)

(Epstein, Gerhardt, Jeffrey) (UNCLASSIFIED)

We have been continuing the in-out equipment study with Jacobs, Mayer, Hopkins and Clark.

2.13 Memory

MTC Memory

(W. Papian) (UNCLASSIFIED)

Only new information which is either extremely fundamental or is directly relevant to the WWII memory problems will be reported here from now on; biweekly reports on operations and tests of the MTC memory will be found in Section 2.16.

WWII Memory

(W. Papian) (UNCLASSIFIED)

It has been settled that the WWII memory core is to be a scaled-down version of the MTC core; D.R. Brown is now writing the procurement orders. This core could be driven by MTC-style drivers using one 5998 vacuum tube for each of the 256 lines or, using 2:1 pulse transformers, one 5998 and transformer for each of 128 lines. Either of these schemes looks like a good bet right now; the contending schemes, such as core matrix switches, still have many hurdles to jump and a good deal of "proving out" to do. Also, as of right now, the MTC sensing technique still looks very attractive; added features which will probably be incorporated are staggered X or Y READ currents and a split (into halves) sensing winding on each plane.

Memory Test Setup I

(S. Fine) (UNCLASSIFIED)

Memorandum M-2186, "Two Methods of Reducing Delta Noise as Tried on Memory Test Setups I and II," is in the print room and will be distributed soon.

A Master's Thesis Proposal on an investigation of readout-noise reduction in a magnetic-core memory is being written.

Core Switches

(R. S. Di Nolfo) (UNCLASSIFIED)

It is possible for a switch core to be biased many times before it is selected. Also, due to the logical design of the switch, this bias NI may be several times the normal set-reset NI. To determine the effect of this asymmetrical driving on the core output, additional logic has been added to the switch-test setup, and experimental data is being obtained.

2.13 Memory (Continued)

Switch Cores

(J. Raffel) (UNCLASSIFIED)

Data on switching time versus ampere-turns for different switch cores was obtained. A procedure for switch-core design and criteria for minimizing power loss have been developed and are being included in a note to be issued shortly.

(A. D. Hughes) (UNCLASSIFIED)

New logic has been built to provide current pulses of the proper wave shape to get an essentially square output from a single switch core. Temperature tests will be run to determine the effects on output wave shape.

Magnetic Matrix Switches

(J. L. Mitchell) (UNCLASSIFIED)

M-2248, "Tests of Some Magnetic-Matrix Switch Operating Modes," has been completed and is now being published.

The investigation of "selection plane" driving problems is being continued.

Memory Test Setup V

(E.A. Guditz) (UNCLASSIFIED)

Memory Test Setup V is again in operation driving three 32 x 32 arrays. One is Plane No. 18 which is a spare for MTC. Another is a dummy plane having fiber washers instead of cores and a third contains MTC cores which were rejected because of low output.

Tests will be run on these planes and data collected on problems which have been submitted by members of this Laboratory and IBM.

A block schematic (SC-55302) has been completed which shows the complete logic of Memory Test Setup V.

M-2225, "The Construction of Memory Planes for the MTC Memory," is being printed.

2.14 Vacuum-Tube Circuits Section

(R. L. Best) (UNCLASSIFIED)

Due to the relatively large current drawn from a flip-flop by the suppressor of a gate tube, it has been decided to use cathode followers between each flip-flop and its gate tubes in WWII plug-gable-unit design.

There are only very limited uses for a 6145 pentode in the machine, so that type will not be made into a reliable tube at this time. For buffer-amplifier applications, a tetrode-connected 7AK7 is capable of delivering more peak power, although it does have less gain.

Liaison continues with IBM, with several trips back and forth involving both MIT and IBM engineers. Liaison has also been established with Group 24 of Lincoln, to enable us to better solve our mutual problems.

Marginal Checking of Diode-Matrix Switch

(B. Remis) (UNCLASSIFIED)

An eight-position diode matrix driven by cathode followers has been constructed. Two methods of marginal checking to discover diodes of low back resistance are being investigated. The first, a static check, consists of raising the -150-volt supply of each cathode follower in turn, until the output level of the particular cathode follower begins to rise. The amount that the supply can be raised is proportional to the amount of current accepted from the matrix by the cathode follower. By a cross check between the margins of the six cathode followers it is hoped to be able to locate the particular bad diode.

The second, a dynamic check, consists of cycling thru a program in which the numbers 0 to 7 are set consecutively in the flip-flop register, while the negative supplies of all the cathode followers are raised simultaneously. The line at which an error (rise in output level) first occurs together with the number in the flip-flop register at the time of the error should lead to the selection of the poor diode.

Capacity-Driving Cathode Followers

(B. Remis) (UNCLASSIFIED)

Calculations have been made for several models of cathode followers having cathode resistances differing about 10%. The bias buildup as a function of tube age and the capacity the cathode follower can drive have been calculated for each model.

2.14 Vacuum-Tube Circuits (continued)7AK7 as a Buffer-Amplifier Tube

(H. J. Platt, C. Morrison) (UNCLASSIFIED)

Some data was taken attempting to use the 7AK7 as a buffer-amplifier tube. This was tried with the 7AK7 tetrode connected. The connection of the suppressor grid to the plate proved to be better than the connection of the suppressor to the screen. Working from a 3:1 transformer into a 100-ohm load, the 7AK7 circuit had a linear input-output characteristic up to the maximum available input pulse (40 v) and the curve looked as if it were still increasing. Gain was greater than unity for all inputs above 12 volts. An SR 1407 similarly connected performed somewhat better for lower inputs but levelled out at 25 volts with the output below that of the 7AK7.

Magnetic-Core Matrix-Switch Driver

(D. Shansky) (UNCLASSIFIED)

Experiments with a single metallic core seem to indicate the feasibility of using voltage feedback to control the shape of the output-current pulse. A 16-position matrix switch using metallic cores and having the required two extra windings (for the voltage-feedback scheme) will be constructed within the next week.

Buffer Amplifier

(S. Bradspies) (UNCLASSIFIED)

The MTC Gate Tube Panel consisting of 32 gate tubes has been rewired so as to simulate the gate tubes that the buffer amplifier is to drive eventually. The gate-tube panel has the appearance of a transmission line. The best waveforms at the buffer output are obtained when the terminating resistor of this "line" is about 45 ohms. At this load, positive overshoots and the droop in chains of pulses are both close to a minimum.

The tube to be employed in the buffer is a tetrode-connected 7AK7 due to the fact that the 6145 will not be made into a reliable type for WWII. It has been found that, for the 7AK7, with the screen at +90 volts, and the plate at either 150 or 250 volts, the cut-off bias varies very slightly, no matter what voltage the suppressor is connected to. For example, with $E_{bb} = 150$ and suppressor grounded, cut-off bias is -14.0 volts; with $E_{bb} = 250$ and suppressor connected directly to the tube plate, the cut-off bias is -15.8 volts.

2.14 Vacuum-Tube Circuits (continued)Level Inverter and Amplifiers

(J. S. Gillette) (UNCLASSIFIED)

The final design is being held up by the lack of 5965 tube data. We are obtaining this data now experimentally. This data is necessary to get the optimum design and loading characteristics.

High-Speed Gate-Tube Circuit

(H. J. Platt, C. Morrison) (UNCLASSIFIED)

An investigation was undertaken to find the suppressor current taken by the gate tube. This was necessary to see the effect on the Boyd flip-flop. In making measurements, it was difficult to separate the effect of suppressor grid current from capacitive coupling between elements of the tube. However, photographs were taken of the suppressor grid voltage. The negative waveform produced on the flip-flop output showed an initial peak of 7 volts and then a plateau for the rest of the pulse of 3 volts. This was for a 40-volt pulse on the GT input. For 20 volts into the GT, the maximum value of the suppressor pulse was 3 volts. Comparing the flip-flop to a battery with a series resistance feeding the suppressor grid, it was found that the flip-flop compared favorably to an impedance between 100 and 150 ohms.

The current drawn from the flip-flop during the pulse was determined by placing a small resistor in the plate of the cathode follower on the "on" side of the flip-flop. This current was found to be as much as 35 ma.

Investigation of the "off" side of the flip-flop showed that the suppressor grid waveform on the "on" side produced a noise pulse on the "off" side. This noise was as much as 5-volts high when the gate tube was sensed with a 40-volt pulse. However, this should cause no trouble since the "off" side output is clamped to -30 volts.

Some work was done driving a remote flip-flop at the end of a 40-foot video cable. The gate tube was able to trigger and set the flip-flop satisfactorily. When a step-up transformer was used at the end of the line before the pulse entered the flip-flop, more than enough pulse amplitude was available for operating the flip-flop.

2.14 Vacuum Tube Circuits (continued)Flip-Flops

(H. Boyd) (UNCLASSIFIED)

I am writing an IRE article on the Normalized Flip-Flop Chart method of designing flip-flops. The article will consist of four parts as follows: (1) Derivation of Chart, (2) Other considerations and general use of the chart, (3) Sample flip-flop design, and (4) Marginal Checking of flip-flops. The article may also appear as an R-report, or in two sections as two R-reports.

A laboratory procedure for course 6-538 is being postponed until WWII pressure is relieved.

A layout of the WWII High-Speed Flip-Flop was made for packaging in the WWI type pluggable unit. The units will be used in the Memory Test Computer.

A Low-Speed Flip-Flop was recently designed and preliminary tests were executed. Either or both outputs of the flip-flop can be grounded without causing failure of the flip-flop. It employs only one 5965 duo-triode and was designed for reliability. As the unit should operate better with wider pulses (instead of 0.1 μ sec), a special 0.5- μ sec trigger source is now being designed. The maximum prf of the flip-flop is to be 200 kc.

Decoder Output Amplifier

(H. E. Zieman) (UNCLASSIFIED)

SB-54415-4 shows the present state of the decoder-output amplifier. The rise time of the amplifier is now 1 μ sec for the range of gain from 3 to 12. For higher gain the rise time is increased considerably, and for lower gains the amplifier goes into oscillation. Since the desired gain is in the vicinity of 10, this should be good enough. The amplifier was designed to operate into a 700-ohm twin-conductor cable, but considerable difficulty is being experienced in getting a cable of this high impedance. It is planned to redesign the output-stage to use the presently available K-111 300-ohm twin cable. An attempt will also be made to use a constant current load in place of the cathode resistors of the first two stages to improve the noise rejection.

Contacts (Single-Pulse Synchronizer)

(C.A. Laspina) (UNCLASSIFIED)

A system has been devised for use with the synchronizer which will allow a jitter of 5 μ sec.

The jitter can be reduced to 1 μ sec by synchronizing on the screen with ± 40 pulses. Work is continuing to try to reduce jitter.

2.14 Vacuum-Tube Circuits (continued)

Sensing Amplifier

(C. A. Laspina) UNCLASSIFIED)

Different coupling systems for use in the WWII sensing amplifier are being investigated. Short time-constant circuits present a recovery problem and also differentiate the "one" outputs more than the noise, degrading the signal-to-noise ratio. Long time-constant circuits, with present timing cycles, need to be as large as 0.5 sec.

Character Generator

(J. Woolf) (UNCLASSIFIED)

An 100-kc oscillator has been designed to test out the feasibility of superimposing portions of sinusoids to generate letters and symbols as was done at Bell Labs at 10 kc. The first letter to be tried will be "C". The system if practical will be very reliable, because only passive elements will be used.

Delay Lines

(J. Woolf) (UNCLASSIFIED)

It has been determined that a Gate Tube is not capable of driving a .5 μ sec delay line and complement a flip-flop and sense a gate. The need of a buffer amplifier is indicated.

2.16 Memory Test Computer

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

The past two weeks have seen the beginning of an operating schedule intended to be as regular as possible in the face of continuing installation work. The basis of this schedule is explained in some detail in an inter-office memo of June 12, "Memory Test Computer - Proposed Outline of Operation, etc.," available through N. H. Taylor's office.

Bernard Widrowitz has joined the MTC crew and has begun a series of measurements of parameters affecting the magnetic memory.

B. G. Farley is also working with us for the time being on logic and programming.

After a week or more of detailed trouble shooting, the Flexowriter in-out system was put into a sort of ad hoc operation, enough to convert tapes and run the programs described below.

The marginal-checking system was extended to include nearly all of Control (but does not yet cover certain components of memory circuits).

To acquaint the members of the group (and any interested outsiders) with various aspects of the computer, it has been agreed to hold weekly lectures of about an hour's duration, presumably at 3:30 on Thursdays in the third-floor conference room. The plan is to transcribe these talks as a series of M- and E-notes and ultimately to organize them or their equivalent into an MTC R-report. Topics considered for early presentation, for example, are Power Supplies, Power Control, Read-In and Conversion Programs, Magnetic Memory, and Alarm System.

(R. E. Garrett) (UNCLASSIFIED)

MTC Air Conditioning

The installation was placed in operation during the last biweekly period, and it was determined that the air-handling unit did not have sufficient capacity to carry the present or projected load. Steps are being taken to correct the situation.

(R. C. Hopkins) (UNCLASSIFIED)

MTC - Power Supply Control

All units of Power Supply Control equipment for MTC have been completed and installed and wiring is now under way. When control wiring is complete, the units will be tested before the system is connected into the computer itself. MTC will continue to use the present temporary power-supply and control arrangement until tests are completed on the alternator and

2.16 Memory Test Computer (Continued)

control and regulation equipment therefor are installed and wired. Memos are being prepared to describe operation of the various units of Power Supply Control. After the system is tested and operating, an E-note will be prepared giving more complete description of the system.

(R. Jahn) (UNCLASSIFIED)

MTC Alternator

I am taking closed-loop frequency runs with various compensation circuits. When the optimum circuit has been determined, I will make final steady-state and transient tests.

(R. G. Farmer) (UNCLASSIFIED)

MTC Power Supplies

Interpanel wiring of the MTC power supplies is near completion. All the panels have been received except the amplifier sections of the regulators. When these are received, the wiring can be completed and testing can begin. The amplifier sections should be received within the next 2 weeks.

(R. Hughes) (UNCLASSIFIED)

Marginal Checking

During the last biweekly period, marginal checking has been added to most of the control element. Over-all margins are still good and are being improved.

(R. Hughes) (UNCLASSIFIED)

Component Failures

No component failures have occurred during the last biweekly period.

(J. Crane) (UNCLASSIFIED)

Marginal Checking

A marginal-check control panel employing push-button switches to select marginal-checking voltages has been installed.

Marginal-checking lines for the Digit Plane Drivers and Memory Address Flip-Flops will be installed during the next biweekly period.

2.16 Memory Test Computer (Continued)

(J. Crane) (UNCLASSIFIED)

Toggle-Switch Storage, MTC

One toggle switch failed during the last biweekly period.

(J. Crane) (UNCLASSIFIED)

Panel Storage, MTC

Block and digit schematics for Panel Storage, MTC, have been made. (Panel Storage includes both 32 registers of toggle-switch storage and 32 registers of plugboard storage.)

(K. H. Olsen) (UNCLASSIFIED)

Sensing Amplifiers

In the MTC memory, the amplitude of the output voltage is sensed to tell if it is a "one" or a "zero." If the slope of the output is sensed, the "one" to "zero" ratio may be greater. A short memo discussing this possibility has been written. It is M-2254, "Sensing the Slope of Magnetic Memory Output."

(K. H. Olsen) (UNCLASSIFIED)

Toggle-Switch Storage

MTC toggle-switch storage uses 700 crystals to select words and isolate outputs. M-2240, "A Magnetic Core Test Storage," discusses a scheme that would use only 32 cores to do the logical function these 700 crystals do.

(P. R. Bagley) (UNCLASSIFIED)

MTC Records

A filing system for equipment records and drawings has been set up. The engineers responsible for various sections are gradually bringing drawings up to date.

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

New Instructions

Installation of the instruction "multiply" has begun. This

2.16 Memory Test Computer (Continued)

instruction uses the number in the accumulator and the number in the memory register referred to, leaving the product of these two in the accumulator and ER.

A proposal is being considered for the installation of a new instruction ea, "extended add," which corresponds roughly to the sa instruction in WWI. This will enable programmers to perform arithmetic involving "overflow" without the necessity of suppressing the overflow alarm.

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

Programs

Memory. MP28-2 ran for the first time. This program forces the worst pattern into the magnetic memory and checks by use of the double-complement technique. The present program is a revision of an earlier version.

A new bootstrap program which includes the checkerboard and double complement check was run successfully. This program divides the memory into quarters.

General. A problem of determining a certain statistical distribution was programmed by Wes Clark of Group 61 (see 1.16, WWII Support) and run with insignificant interruptions for about 5 hours. This problem, the first "useful" work done by MTC as a computer, was quite gratifying to all concerned, especially since the solutions obtained were in very close agreement with theoretical ones obtained by members of Division 2.

(B. Widrowitz) (UNCLASSIFIED)

MTC Memory

A considerable amount of operating-margin data has been taken in an effort to determine the memory reliability. The sense-gate control-grid margins are now about +14 volts for the several programs tried, nearly twice as wide as when the memory was first installed. This reflects the integrated benefits of many small adjustments. A means of using the marginal data to arrive at "optimum" settings of the many surrounding-equipment parameters is being considered. Frank Durgin and Bob West of IBM are assisting in this work.

~~CONFIDENTIAL~~
UNCLASSIFIED

2.17 Equipment Design and Schedules

(A. P. Kromer) (CONFIDENTIAL)

Active work in determining standards for components, materials, manufacturing processes, and drafting is continuing. Following agreement on proposed standards by the joint IBM-MIT Central Standards Committee, IBM will issue standards sheets for use at both locations.

Consideration is being given to the action necessary to procure sufficient quantities of high-reliability tubes for: (a) the model program, (b) later production. Discussions have been held with GE and Sylvania with respect to the model program and with RCA and Bendix as possible second sources of supply for the twin triode and gate tube, respectively, during the later production phase.

A draft of the Engineering Exhibit prepared by AFCRC for Combat Information Central AN/FSQ-7 has been received and circulated for comment among interested members of the Laboratory. Distribution of this draft has also been made in Division 2 of Lincoln and in IBM. During the next biweekly period it is expected that the comments will be reviewed, and that AFCRC will re-write the exhibit and re-submit it to Lincoln for final approval before releasing it to other Air Force organizations for use in connection with contract negotiations with IBM.

A program for the development and design of the equipment, preparation of the space in the basement of Building A, and other associated activities related to installing and placing into operation the first model of the AN/FSQ-7 equipment has been prepared and mutual agreement upon it has been secured from IBM. This will be written up in the form of an E-note for distribution in the near future.

(J. D. Bassett) (CONFIDENTIAL)

Work is progressing satisfactorily toward the formulation of an Air Force Exhibit on equipment including WWII. A rough draft has been completed and is being circulated for comment by responsible people in Group 62.

Mechanical Components Standards sub-committee work is gaining momentum, and recommendations are being firmed up after circulation of tentative data for comment.

Trips were made to Surprenant and Gavitt wire companies, and to the first conference on basic materials in NYC. Trip reports will be written on the latter in the near future.

(R. Fallows) (UNCLASSIFIED)

Work on tubes has included meetings with GE and RCA on twin triode and a visit to Bendix to inspect facilities. Tentative specs on 5965 and 7AK7 replacements are available, but final negotiations and specs are yet to be accomplished.

UNCLASSIFIED
~~CONFIDENTIAL~~

~~CONFIDENTIAL~~
UNCLASSIFIED

2.17 Equipment Design and Schedules (Continued)

Work on marginal checking has gone slowly. Results to date consist mostly of gaining background and trying to spell out a program to be followed.

(J. Giordano) (UNCLASSIFIED)

Drafting Sub-Committee, IBM-MIT

On June 18, 1953 the first formal meeting of the Drafting Sub-Committee was held at Poughkeepsie, N. Y. Those in attendance were J. Giordano and A. Falcione of MIT and J. Foley, R. C. Henn, and W. Cornett of IBM. Previous drafting proposals and agreements were reviewed, new proposals were discussed, and assignment of Committee members to further investigate the proposals was made.

(P. J. Gray) (CONFIDENTIAL)

The program of planning the work involved to deliver the first prototype of the Transition System by 1 July 1955 is nearing completion. Bar graphs summarizing these plans have been drawn in rough form and are ready for final drafting. These will be distributed shortly as part of an E-note dealing with planning, etc.

2.18 Transistors

(D. J. Eckl) (UNCLASSIFIED)

Accumulator

The transistor accumulator has been operating 5674 hours. It is expected that improved flip-flop circuits will soon be available for incorporation in this unit.

(D. J. Eckl) (UNCLASSIFIED)

Flip-Flop Design

D. A. Esakov has completed a comparison of several types of one- and two-transistor flip-flops as an EE master's thesis. A comparison of the flip-flop in the accumulator with a new design by Ed Cohler gives the following results:

Accumulator FF

Cohler's FF

~ 1.2 mc
10 volts

max. freq.
output ampl.

800 kc
24 volts

UNCLASSIFIED
~~CONFIDENTIAL~~

2.18 Transistors (Continued)

| | | |
|---|----------|--|
| -15-v supply: -13 v to dissipation limit | margins* | -35-v supply: -31 v to limit of dissipation |
| -90-v supply: -60 v to -94 v | | |
| +30-v supply: 0 to +100 v | | |

* These margins will vary with individual transistors.

Trigger Requirements

| | |
|------------------------|----------------------|
| 18 v at 0.2 μ sec | 5 v at 0.2 μ sec |
| 22 v at 0.15 μ sec | |
| 50 v at 0.1 μ sec | |

Transistor Requirements

| | |
|----------------|----------------|
| $\alpha > 1.6$ | $\alpha > 2$ |
| $R_{co} > 9K$ | $R_{co} > 20K$ |

A number of flip-flops using Cohler's design have been constructed for further testing.

Dick Thompson has constructed a nonsaturating flip-flop and is optimizing the circuit for our requirements. A new method of triggering has made this circuit far more satisfactory, and it looks very promising. This circuit is theoretically capable of much higher frequencies.

α vs I_{ξ} Plotter:

Sergio Valdez has completed the original model of a unit to present an oscilloscope picture of α vs I_{ξ} . An E-note will be published on this unit.

(N. T. Jones) (UNCLASSIFIED)

Diode Ratings and Minority Carrier Storage

Experiments were run to determine transient peak-voltage ratings of germanium diodes for H. Platt and B. Paine. Considerable trouble was experienced with the new Rutherford B-2 pulse generator, and finally it had to be sent to Test Equipment for repair. The objectives of these experiments are to determine the electrical causes of diode failure, transient peak-voltage ratings, and reverse recovery characteristics of point diodes. This work is closely related to the minority carrier storage and is done using the same circuits.

2.18 Transistors (Continued)

(N. T. Jones) (UNCLASSIFIED)

Measurements

The paper entitled "Open Circuit Impedance Representation of Transistors" was presented in the Transistor Standardization Forum of the AIEE Summer Convention in Atlantic City on Wednesday, June 17. This paper will be published soon as an E-note.

Twenty-five GE G11A transistors were received and partially measured by D. Smith. These will be completed when the necessary equipment is released from other use.

2.2 Group 63 (Magnetic Materials)

(D. R. Brown) (UNCLASSIFIED)

Samples of a ferrite core satisfactory for the prototype have been received here from General Ceramics. An optimum current for the coincident-current memory is 0.82 ampere and the peak amplitude of the disturbed one is 0.1 volt. The first preproduction batch of 10,000 cores will arrive here early in the week of June 22. Five thousand good cores will be selected from this batch for construction of a 64 x 64 plane. The first draft of the specifications for the prototype core has been written and discussed with IBM. Additional data from the sample and preproduction cores will be required before the specifications can be completed.

Pulse Test of Magnetic Cores

(J. Schallerer) (UNCLASSIFIED)

Pulse tests are continuing on various samples of MF-1326B, F-394, ferrite cores. Two samples of MF-1326B, F-394, ferrite cores look quite similar to the cores used in MTC. These samples have been fired at 2460 F for periods of 8 and 12 hours. I_m is 0.86 ampere and 0.82 ampere, respectively.

Jim Crowe of IBM has spent the last week working here on delta measurements. The necessary standard equipment has been sent to IBM to make these measurements. The purpose of his visit was to become familiar with the measurement technique involved.

Automatic Core Tester

(R. F. Jenney) (UNCLASSIFIED)

The logical design of the automatic tester is nearly complete. The machine will test cores at 3 different currents (optimum current and $\pm 10\%$ margins). The disturbed-one output will be required to be within $\pm 10\%$ of a specified value at the average peaking time. The disturbed-one output will also be required to be less than specified upper limit at strobe times before and after the average peaking time. The disturbed-zero output will be required to be less than some upper limit at a specified time after its peak.

Test time will be of the order of 0.6 sec/core (with no allowance for down time).

(R. Pacl) (UNCLASSIFIED)

A new track has just been completed by the Machine Shop. It should eliminate the jamming of cores and broken particles which the prototype track suffered from.

2.2 Group 63 (continued)

Hysteresigraphs

(R. Pacl) (UNCLASSIFIED)

An amplifier and a 60-cycle power supply for a 60-cycle a-c hysteresigraph are being constructed. They are expected to be in operation by June 24.

An X-Y recorder is expected to be delivered before July 15. Construction of a d-c hysteresigraph will begin as soon as it is received.

Ferrite Synthesis

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

The duplication of General Ceramics process for producing MTC cores has initiated a technique of refiring. The refiring process changes the electrical properties so that the loop tends to obtain a higher degree of squareness and the pulse response in some cases is greatly improved.

Cores synthesized at DCL of a composition similar but not identical with General Ceramics MF-1326B have been refired. The electrical properties of these cores after firing have approached closely the electrical properties of the similar General Ceramics cores.

Cores of MF-1326B material made at General Ceramics but fired and refired here are improved upon refiring. However, the cores' characteristics are not identical with those from General Ceramics firings.

A sample of cores of F-291 size which were made at General Ceramics have been refired here for an increased firing period in order to determine the effect of additional refiring upon the uniformity. Results have indicated that essentially the uniformity remained substantially the same but the voltage outputs were reduced.

(J. Sacco) (UNCLASSIFIED)

Preparation of another $MnO.MgO.Fe_2O_3$ series, in the triaxial diagram has been completed. Cores will be fired and tested the week of June 21.

A batch of General Ceramics MF-1326B composition has also been prepared.

(R. Maglio) (UNCLASSIFIED)

Our experience with the Stokes press has indicated that the machine was poorly designed for use as a core press. General Ceramics and RCA have encountered somewhat the same problems and have in some instances redesigned the press. As of June 19, 1953, the machine has been subjected to study by Al Smith in an effort to improve the operation.

2.2 Group 63 (continued)Ferrite Synthesis (continued)

Control equipment for the Harper Furnace has been installed and a run has been made to check out the system. This preliminary check run was very satisfactory.

Basic Study of Ferrites

(N. Menyuk, J. B. Goodenough) (UNCLASSIFIED)

Two experiments are under way to determine the effects of temperature and compression on the switching coefficient S_w (defined in Engineering Note E-532).

The values of the relaxation frequency Δ , the anisotropy constant K , and the saturation magnetization I_s as functions of temperature can be obtained for nickel ferrite from the literature. The variation of S_w can therefore be predicted theoretically. The exceptionally high coercive force of nickel ferrite (9.65 oersteds), and the rise time of the current input pulse (0.2 μ sec) makes direct measurement of S_w impossible and makes measurement of switching time as a function of temperature with a constant driving current extremely difficult. It is hoped that further firing of the ferrite sample will reduce the coercive force sufficiently to permit meaningful data to be obtained. If not, a faster rise time of the input current pulse will be required.

According to the above-mentioned E-note, compression of a ferrite with a negative magnetostrictive constant will result in an alignment of the direction of easy magnetization from grain to grain. This will increase the field required to nucleate grains of reverse magnetization and decrease the number of nucleated domains at a given field strength. The distance the domain walls must move to reverse the magnetization of the sample will be increased. The measured value of S_w should, therefore, increase with the compressive strength.

(P. K. Baltzer) (UNCLASSIFIED)

An experiment is being undertaken to study the mechanism contributing to the first maximum observed in the typical core-output waveform and also to study if possible the mechanism involved in the knee of the hysteresis loop. The initial irreversible change in flux can be a nucleation process or motion of existing domain walls. The main purpose of this experiment is to ascertain which mechanism is most prominent.

Preliminary data taken on a sample of MF-1312 indicate that traversal of the 60-cycle hysteresis loop from the remanent state to the knee can occur within 0.1 microsecond.

2.2 Group 63 (continued)

Basic Study of Ferrites (continued)

(D. A. Buck) (UNCLASSIFIED)

Dielectric constants as high as 600,000 have been observed in ferrites, and are believed due to nonuniform electric-field distributions within the ceramic. Most of the field shows up across the grain boundaries at low frequencies. At relatively higher frequencies, the field distribution becomes more nearly uniform, and the dielectric constant drops to about 12. The resulting dispersion region yields information relating boundary thickness to grain thickness. Present goal is to correlate these measurements with microstructure observations on square-loop cores, both with good and bad pulse characteristics.

(F. Maddocks) (UNCLASSIFIED)

Examination of microstructure of ferrite cores has been started with the DCL-3-44 series, which is deficient in ferric oxide. The purpose of this examination is to seek a correlation of magnetic or electrical properties with observed internal structure.

SECTION III - CENTRAL SERVICES

3.1 Publications

(Diana M. Helwig) (UNCLASSIFIED)

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

LABORATORY FILES (UNCLASSIFIED)

| <u>No.</u> | <u>Title</u> | <u>No. of Pages</u> | <u>Date</u> | <u>Author</u> |
|------------|--|-------------------------|-------------|-----------------------------------|
| R-224 | Rudiments of Good Circuit Design | 13 | 5-19-53 | N. Taylor |
| E-542 | Timing Diagrams for MTC Control | 6 | 5-5-53 | R. Hopkins |
| E-545 | Dependence of Coercivity and Stress Hysteresis of Nucleation of Domains of Reverse Magnetization | 19 | 5-14-53 | J. Goodenough |
| E-547 | Proposed High Input-Impedance Trigger Circuitry for High-Speed WWII Flip-Flop | 5 | 5-22-53 | B. Remis |
| E-556 | A Study of a Two Transistor Flip-Flop | 14 | 4-24-53 | E. Cohler |
| M-2149 | A Survey of Time Pulse Distributors | 3 | 5-11-53 | A. Heineck et al. |
| M-2167 | First-Order Cancellation Residue in Rectangular Memory Arrays | 1 | 5-15-53 | D. A. Buck |
| M-2188 | Programming for and Operation of Oscilloscope and Camera | 8 | 6-4-53 | E. S. Kopley |
| M-2192 | Laboratory Personnel | 16 | 6-1-53 | |
| M-2195 | Further Work on Nondestructive Read System | 3 | 5-27-53 | W. Frank |
| M-2197 | Readout and Digit-Plane Driving Systems | 6 | 5-28-53 | (W. Canty S. Fine) |
| M-2202 | Marginal Checking and Trouble Location | 4 | 6-1-53 | R. Fallows |
| M-2203 | S & EC Operator's Check List | 3 | 5-27-53 | K. Campbell |
| M-2204 | MTC Toggle-Switch Storage and Toggle- Switch Storage Switch | 2 | 5-29-53 | J. Crane |
| M-2205 | Some Properties of Cathode Interface Impedance | 6 | 5-29-53 | H. B. Frost |
| M-2209 | Biweekly Report, June 1, 1953, S & EC | 17 | 6-1-53 | |
| M-2210 | May 1953 Storage and Research Tube Summary | 5 | 6-1-53 | D. M. Fisher |
| M-2213 | MIT-IBM Standards Committees | 1 | 6-5-53 | C. W. Watt |
| M-2214 | Estimated Parts List for Scope Deflection Amplifier | 1 | 6-5-53 | H. Zieman |
| M-2215 | Magnetic-Core Matrix Switch Driver | 1 | 6-5-53 | D. Shansky |
| M-2217 | Proposal: Wiring and Construction Practice Specifications for Joint MIT-IBM Use | 5 | 6-5-53 | C. W. Watt |
| M-2218 | Specifications on Improved Intensification Amplifier | 1 | 6-5-53 | H. Zieman |
| M-2219 | Testing of Individual Cores in MTC Memory Planes | 5 | 6-16-53 | A. Hughes |
| M-2224 | The Reduction of Inherited Errors in the Runge-Kutta Solution of Differential Equations | 3 | 6-3-53 | D. Wong |
| M-2226 | Barta Building Personnel Estimate for 1954 | 2 | 6-11-53 | H. Fahnestock |
| M-2227 | Summer Session System, I | 5 | 6-9-53 | (M. Rotenberg, D. Finkelstein) |

3.2 Purchasing and Stock

(H.B. Morley) (UNCLASSIFIED)

National sales executives of Ward-Leonard met with Purchasing to discuss poor deliveries of resistors. A second source of similar resistors has recently been developed. With this information in mind, Ward-Leonard promised us improved delivery.

The work load has increased rapidly during the past two weeks. Policies, plans, and systems are being actively considered to create improved working methods.

Critical items continue as reported in the previous biweekly, with the exception of some Ward-Leonard resistors.

3.3 Construction

Outside Vendor

(G.A. Murdoch) (UNCLASSIFIED)

There are 12 orders with vendors now open, totaling 1768 items outstanding. Deliveries in the past biweekly period have totaled 981 items. Information on specific orders may be secured from the writer (Ext. 3476).

Production Control

(F.F. Manning) (UNCLASSIFIED)

There have been 30 Construction Requisitions totaling 124 items satisfied by Group 60 electronic shops since June 5, 1953.

There are 31 Construction Requisitions totaling 550 items under construction by Group 60 electronic shops.

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

3.4 Component Analysis and Standards

3.43 Standards

(H.W. Hodgdon) (UNCLASSIFIED)

An index and cross-reference table is being prepared for use in identifying part numbers and JAN numbers formerly used in the Lab, in terms of the current DCL part numbers used in the Standards Book, stockroom, etc. It is hoped that this will be useful to Drafting Room, Production Control, and Procurement and Stockroom in processing old parts lists, and also as a general index. As the work of preparing the table proceeds, appropriate revisions of the standards sheets are being made.

3.44 Vacuum Tubes

(H.B. Frost) (UNCLASSIFIED)

A questionnaire has been received and completed on the use of and experience with pentodes in WWI. This questionnaire was prepared by the JETEC 5.5 task force on multigrid tubes, of which I am a member. Responses are expected from most of the major computer organizations in the country. Results of the survey are expected to be available sometime this fall.

All life-test racks have been moved from the former location opposite the test-equipment bench to Room 045, the basement air-conditioning room. This move provides more space for benches in Room 138 and removes one major source of heat. The separation of life racks from preburning operations allows more careful supervision of the life tests by engineers.

Recent lots of 7AK7 tubes have been showing a large amount of grid emission. This trouble has been in existence since 1951, but it is only this year that we have purchased any tubes made later than 1948. We have a lot of approximately 2000 tubes which sample studies show to be very bad in this respect. Circuit changes have been made which minimize the importance of grid emission, but changes obscure such trouble as gas. Since this lot of tubes seems to be definitely out of specification for grid current after the 100-hour preburn, engineering inquiries have been made of Sylvania. They know about the trouble, and apparently they are doing something about it. Without promises of quick replacement, the lot of 2000 tubes will be retained. Careful checks will be made to assure that no difficulties arise when they are used.

An objective specification has been written covering the gate tubes for WWII. This tube will be similar to the 7AK7, but will have an octal base. Tighter controls will be written into the spec - in particular, on grid current (see above).

Continued difficulties have been experienced with 715C tubes in the storage-tube deflection amplifiers of WWI. (Recent research makes it seem unusual that this circuit works at all.) Efforts are being made to improve and simplify the tests for drift in 715C tubes so that such tests can be made on a more nearly routine basis. In recent weeks very considerable difficulty was caused by the old amplifier panels containing General Electronics 715C tubes. The troubles seem to have been a mixture of tube and circuit problems. The amplifier panels were replaced by new units with Raytheon tubes. Good operation was obtained initially, but operation rapidly deteriorated. Checks of the Raytheon tubes involved showed that almost all of them had excessive grid emission, which can cause a drift such as that observed. At the present time the new amplifiers are in operation with a new lot of Raytheon tubes. All tubes in service at this time are interims, however, and this condition cannot easily be rectified because of the down time required to change the tubes and adjust the circuits. Units of the new lot of General Electronics tubes are being tested for stability so that tubes known to be good, at least initially, can be installed in an emergency. More on this later as the situation develops.

3.44 Vacuum Tubes (Continued)

Frost, Youtz, and Fallows from this Laboratory and John Geisler (from IBM) visited the Red Bank division of the Bendix Aviation Corporation on June 12. Bendix facilities were examined and found quite excellent in general. Engineering discussions concerning tubes for WWII were held with engineering and management personnel at Bendix.

Thesis Studies

(H.B. Frost) (UNCLASSIFIED)

During the past month the status of my thesis research has changed considerably. I have passed my area examination, and my thesis proposal has been approved. As a consequence, I expect to spend at least half time during the next several months on thesis research.

In the past several weeks I have been running tests on 5687 tubes to determine the cause of drift after long periods of cut-off operation. So far, these tests are inconclusive.

Two special tubes have been built by Group 65 for use in thesis research. These tubes, RT385 and 386, have special cathodes, a grid-cathode distance of 5 mils, and a grid-aperture hole of 5 mils. A retarding potential collector follows the grid. Preliminary tests show that too small a fraction of the total current is transmitted by the grid aperture. My current-measuring equipment goes to about 1×10^{-9} amps for pulsed current, and this current cannot be obtained in some important regions of operation of these two tubes. As a consequence, a new design will be made using electroformed nickel mesh for the Grid 1. Samples of suitable mesh have been obtained, and the design will be drawn up as soon as possible.

(S. Twicken) (UNCLASSIFIED)

The second 5963 life test has completed 2000 hours and has been discontinued. This life test was conducted at a heater voltage 10% greater than rated because the tube cathode runs cool under rated conditions and a high interface impedance was found on the conducting sides on the first test. The results of the second test show no conclusive difference. The 5963's have been replaced on the life rack by 5965's.

The life test of 5687's has also completed 2000 hours at a reduced heater voltage of about 12 volts. No significant interface impedance has been found on either side. A considerable current decay amounting to about 40% in some cases has been observed in the normally off side upon application of d-c voltage. The life test will be continued with forced air cooling of the bulbs since the tubes normally run rather hot. Previous life tests have shown that forced cooling of 5687's markedly improves stability.

Ten 7AK7's have been placed on life test with heater voltage only. Samples of a recent rather larger shipment of 7AK7's have shown some grid emission after burn-in.

Coordination of the drafting and construction of the new tube tester continues to take a considerable amount of time.

3.5 Test Equipment

Test Equipment Committee

(L. Sutro) (UNCLASSIFIED)

The Committee decided that the +120-v supply in Whittemore Building should be removed as soon as all test equipment using +120 volts has been modified to use +150 volts. This modification is expected to be finished September 1. The Committee decided further that a +10-v supply be installed in place of the +120 to provide the clamping voltage required for WWII circuits. The +10 volts will be on pin 5 of the 12-pin Jones plug. There will be no change in the Barta Building supplies.

The Committee approved for purchase:

| <u>Item</u> | <u>User</u> |
|------------------------------------|-----------------------------|
| 3 Oscillograph Record Cameras | 2 for Group 63 1 for MTC |
| Esterline Angus Operation Recorder | Components Laboratory |
| GR 667A Inductance Bridge | " " |
| GR 716C Capacitance Bridge | " " |
| 20 Rack-Power Indicator Panels | Test Equipment |

Test Equipment Headquarters

(L. Sutro) (UNCLASSIFIED)

All of the Rack-Power Controls in the Laboratory are being modified. Thirty nine will have 2 new relays added. One relay will parallel the -15-v, -30-v, and +10-v(+120-v in Barta) contacts of the main contactor which does not close reliably for low voltages. The second relay will short series resistors in the +150 and +250 lines after a delay of approximately 10 seconds. The series resistors will limit the surge of current into units like the Whirlwind Gate and Delay Unit which contain large capacitors between B+ and ground. Forty two Rack-Power Control Units will receive only the first kind of relay.

During the past two weeks 27 units of standard test equipment and 13 scopes were repaired and video checked, and 97 units of standard test equipment were only video checked.

Whittemore D-C Supplies

(J.J. Gano) (UNCLASSIFIED)

The -150-v, 25-amp supply removed from WWI will replace the 10-amp supply within the next week. The latter supply will be converted to a 250-v unit and will be substituted for the 50-amp supply upon which Coffin will operate to improve the performance.

3.6 Drafting

MTC Drawings

(A.M. Falcione) (UNCLASSIFIED)

The memory test computer was built mainly from standard panels of various kinds which, after construction, were modified for specific functions and were assigned specific names. The only drawings which exist for these units are a set of marked-up prints located in MTC. I have discussed this matter with Ken Olsen who has agreed that reproducible drawings should be made for all the units in MTC as soon as possible. At the present time there exists no control on proper recording of modifications to MTC units.

MIT-IBM Drafting Committee

(A.M. Falcione) (UNCLASSIFIED)

The first meeting of the MIT-IBM Drafting Committee at Poughkeepsie, N.Y., on Thursday, June 18th, started the work of the Committee. Different phases of the work to be done were assigned to members of the Committee for preliminary proposals. Previous proposals were reviewed.

3.7 Administration and Personnel

New Staff

(J.C. Proctor) (UNCLASSIFIED)

Arnold Siegel, a new DIC Staff member assigned to Adams' group, received an AB and BS in EE from Columbia and his MS in EE from Rutgers this month. Siegel has been a research assistant at Rutgers for the past two years, working on electronic circuit design.

Stanley Gill of the University Mathematical Laboratory, Cambridge, England, is working with Adams' group for the summer.

Alfred Zacharias is a Research Assistant assigned to Youtz' group. He received his BS in EE this month from Cooper Union School of Engineering.

Lewis Martin is a Research Assistant also assigned to Youtz' group. Martin received his BS in EE from Colorado A&M this month.

Edward J. Stevens has completed his academic program at Northeastern University and is now a DDL Staff member with Youtz' group.

Terminated Staff

(J.C. Proctor) (UNCLASSIFIED)

Morrison, C.D.

3.7 Administration and Personnel (Continued)

New Non-Staff

(R.A. Osborne) (UNCLASSIFIED)

Barbara Clouther is a new messenger girl.

Group. Arlene Hoffman is a new member of the Telephone Operator-Receptionist

Mary Keefe is a new clerk in the Print Room for the summer.

summer. Wilfred Klemperer is a Cornell student working in Group 63 for the

Robert Lurvey is a Tufts student who has joined Group 63 for the summer.

Eleanor Margolis is a new secretary in Group 65.

summer. Kaye Richey is an MIT student helping out in the Photo Lab for the

Milton Toorans has returned once more to work for the summer in the Sheet Metal Shop.

Gertrude Sanderson has joined Group 64 as a secretary.

Group 63. Alfred Switendick is an MIT student who will work this summer in

Terminated Non-Staff

(R.A. Osborne) (UNCLASSIFIED)

Patricia Brogan
Werner Frank
Lucy MacFarland
Walter Majkowski
Hilda Mesnick
Harlan Noyes
Robert Schultz
John Shea