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Memorandum M-2687

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

SUBJECT: BIWEEKLY REPORT FOR FEBRUARY 12, 1954
To: Jay W. Forrester
From: Division 6 Staff

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Auth: DD 254
By: R. R. EVERETT
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SECTION I - CAPE COD SYSTEM

1.1 Group 61

1.10 General

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

Summary

Operation of the Cape Cod System continues with the emphasis upon evaluation of the various functions and stations. Detailed memos describing the various weapons-control functions are now available as part of the M-1815 series. In connection with System operation, it is interesting to note that in the past month 65 per cent of the down time occurred on Tuesdays (which account for only 30 per cent of the assigned time). This situation probably results from the fact that computer power is turned off all day on Mondays.

Very successful Ground Observer Tests were conducted this period. The northern sector of our surveillance, in which radar returns are poorest, happens to be the sector with the highest density of GOC posts. As many as 33 reports have been received from GOC in a three-hour period.

Assistance in XD-1 programming and equipment continues to be a major activity.

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1.11 Equipment Engineering

(N. Alperin) (CONFIDENTIAL)

Work was continued on the phototube pickup for the radar mapper. The Dumont 6291 photomultiplier will be used because of better quality control during manufacture. Its use necessitates a higher negative potential than is available in Whirlwind. A power supply has been designed to be installed in each mapper to provide the necessary voltage.

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

The illumination problem seems to have been solved quite satisfactorily. Instead of illuminating the surface of the safety glass, the present scheme takes advantage of the semiopaque character of the Flo-Master inks. A circular sheet of edge-lit clear Flexiglas is substituted for the safety glass. The edge-lighting illuminates the ink very brilliantly without considerable background illumination. This edge-lighting has been installed on both gap-filler mappers (Y32 & Y33). The only drawbacks noted so far in the use of these inks are the tendency of the ink to "run" under the influence of electrostatic charge and the lack of persistence due to the slight opacity.

The experimental scan-synchronizer breadboard is being debugged.

One of the new Pathfinder scopes has been disassembled and a set of pictures taken at each step in the disassembly. These pictures will be used by the shops in disassembling the other scopes. The video-amplifier chassis from this scope has been stripped down and has been revised for the IBM sweep circuit. This circuit is now being installed in the Pathfinder located in Room 140 and will be tested with this unit.

(G.A. Young) (CONFIDENTIAL)

An attempt is being made to bring some of the in-out notes and drawings up to date. In particular, during the last biweekly period the drawing of IOC was corrected and completed by the Drafting Room. Engineering note E-466, "Operation of the In-Out Element," is being revised.

Some time was also spent correcting Room 222 test programs to agree with recent changes. The programs now on magnetic tape require supplementary paper tapes to bring them up to date. These programs will soon be corrected on the magnetic tape.

1.12 Data Screening

(D.L. Bailey) (CONFIDENTIAL)

The correlation program has been rewritten for use with the buffer drum. The logic of the program remains essentially unchanged except for the data-transfer section. This provides for the use of Truro, two gap fillers, and Mark X data.

This program will not be fully operative for several weeks pending other changes in the Cape Cod program. These include reallocation of auxiliary-drum-storage space and shifting of the track-sort table.

Some time has been spent helping to evaluate the track-monitor positions.

(H.E. Frachtman) (CONFIDENTIAL)

The trouble-track and monitor-action-sequence statistical program (T-3489) is ready for computer testing.

A few additional errors were found in some of the recording programs.

(J. Ishihara) (CONFIDENTIAL)

Plans for incorporating the use of buffer-drum storage in the Cape Cod program have been completed. No major "logical" changes are to be made at this time. Major program changes to the correlation and data-collection-and-analysis sections are being handled by D. Bailey. Changes to other TWS programs and relocation of these programs on drum are being coordinated by Bailey and myself. More flexibility in incorporating experimental TWS programs will be available after these initial changes are checked out.

(J. Levenson) (CONFIDENTIAL)

The program to generate azimuth pulses to test the IBM mapper was checked out and turned over to E. Rich for his use.

A program has been written to give an assistance display to the TIM 3 station for aid in initiating on interceptors. It will dead-reckon the track from one of the airbases in one of two modes: along the command heading or in the corridor check for that airbase. The dead-reckoned position and vector and command heading will be shown for four minutes, and then the dead-reckoning will cease, but the last position will be shown four minutes longer. Initiation is done by light-gun action on the displayed position. The program will be checked out during the next biweekly period.

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1.12 Data Screening (Continued)

(H. Peterson) (CONFIDENTIAL)

I have spent the last biweekly period rewriting the past-history program, writing a flow diagram for it, instructing and evaluating monitors, and rewriting a track-monitor manual.

(H.H. Seward) (CONFIDENTIAL)

The buffer-drum test program was tested out satisfactorily, and modifications have been made for the Truro set. The north-testing program for the IBM mapper was tested out satisfactorily with the real-time clock but requires some modifications for operation with the 1600-cycle clock.

(E.W. Wolf) (CONFIDENTIAL)

Radar-Network Calibration

All twelve hours of flight time scheduled for this biweekly period were canceled on account of weather and mechanical difficulties. A 1 1/2-hour mission was flown by a jet aircraft on 10 February, but this type of plane is not well suited for calibration operations.

Some time was spent checking electronically generated range circles and azimuth strobes from S. Truro, Chatham, Derry, and Clinton. The one-mile error in the range zero of S. Truro has been corrected. The returns from Chatham and Derry indicated no errors, but this does not establish their calibration. Returns from Clinton seemed all right on the mapping scopes but were badly distorted by the time they got into the computer. This was observed on 5 February and again on 10 February. The cause of this difficulty has not yet been determined.

It has also been learned that data from Scituate cannot at present be introduced into the computer for lack of a demodulator.

(W.M. Wolf) (CONFIDENTIAL)

A complete input-radar-data-analysis program has been started which will incorporate some of the features of the data "filter" program. The input data will be read from the buffer drum onto one of the magnetic-tape units so that it will not be necessary to use data recorded on the Ampex-tape units for each program operation.

Flow diagrams have been completed and are being revised.

The "Flo-Master" inks used in mapping have an unexpected advantage. They are well illuminated by a low amount of edge-lighting.

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1.13 Tracking and Control

(A. Mathiasen) (CONFIDENTIAL)

Data from the Belmont test is being plotted.

The first third of a tracking-analysis program for long-range radars has been written. This section simulates data for as many as eight tracks and stores this information on the drum. This section is not yet checked out. The second third is the tracking program and is flexible enough to permit variation of methods; it includes a parameter-optimization feature. This section is partly written. The third part gives a detailed analysis of the tracking errors.

(H.D. Neumann) (CONFIDENTIAL)

See M-2688 (SECRET) for this entry.

(B. Stahl) (CONFIDENTIAL)

As a result of a fairly successful run of the radar-accuracy test program, a plot is being obtained of gap-filler radar data, upon which data from the M-33 tracking radar will be superimposed to provide a graphic representation of system errors. This plot is being done with assistance from George Harris of Group 22.

Several successful runs were also made with the Raydist program, and, as soon as computer time becomes available, the desired tracks, now stored on Ampex tape, can be transferred to paper tape for processing and comparison with data supplied by Raydist equipment. Consideration is being given the possibility of programming the problem on the Memory Test Computer in order to conserve Whirlwind time.

1.14 Weapons Direction

(D. R. Israel) (CONFIDENTIAL)

With the recent completion of M-notes by Cahill, Nolan, and Rawling, detailed memos on the AA, identification, height, weapons assignment and direction, and intercept direction functions of the Cape Cod System are now available as part of the M-1815 series.

Operation and evaluation of the Weapons Direction stations is continuing in accordance with an as yet unpublished M-note describing the test program for February and March. Intensive effort continues on the preparation of reports covering operation and evaluation of the System through the present date. It is expected that much of this material will first be published as part of the forthcoming Summary Report.

With the completion of the third visit of ADC Controllers (see Section 1.16), work is going ahead rapidly on the plans for the 1954 Cape Cod System. The immediate objective is to outline the over-all operation of the System with sufficient clarity to permit the estimation of the amount of work required to make the equipment changes. To assist in this work, G. Rawling is bringing M-1979 and M-2185 up to date; these two memos describe the frame and panel layouts and wiring as they now exist at the Direction Center. Among the items to which detailed consideration is being given in the plans for the 1954 System are those relating to the Flight Test Umpire station. Improved facilities for flight-test operation, simulation, and evaluation are being planned.

On Thursday and Friday, 4 and 5 February, I attended the joint BTL-Lincoln meeting on the over-all test program for the Cape Cod and Transition System. In this first meeting, discussions of Weapons Direction were chiefly directed towards problems of simulation and the correlation of simulated results with future flight-test programs. A second joint meeting is planned for 25 and 26 February.

(H. D. Benington) (CONFIDENTIAL)

Several sessions were held with the ADC-ADES Group.

The CIC display experiments held by the Naval Research Laboratory in Washington were visited; an inter-office memo describing their work was written with the conclusion that their techniques have limited application in our work.

(M. I. Brand) (CONFIDENTIAL)

Identification. During one last biweekly period evaluation studies of the ID section have been continuing. The lack of correlation between flight plans and tracks which was mentioned last time has been

1.14 Weapons Direction (Continued)

(M. I. Brand) (CONFIDENTIAL) (Continued)

traced for the most part to aircraft which are flying too low for our radar to pick them up.

During this biweekly period we have instituted Ground Observer Tests. These tests have been conducted with remarkable success. This is mostly due to the fact that the northern sector of our surveillance in which radar returns are very poor happens to be the sector which has the highest density of GOC posts. We have had as high as 33 reports from GOC in a three-hour period. The reports have been accurate as judged from their correlation with flight-plan reports and cross-telling reports. We will now run GOC tests with every live-data test we run.

The poor success we have experienced with early-warning reports has been reported to Comdr. Hilgedick, Lincoln's Liaison Officer. Investigation on his part uncovered the fact that all Navy EW personnel who were some time ago briefed as to Navy EW liaison with the Cape Cod tests have been transferred. The present crew knows little or nothing about how these tests are to be run with Cape Cod. A meeting has been set up next week with the present Navy people to bring them up to date. We hope that this will allow us to run successful EW tests in the near future.

Meetings were held with D. R. Israel and C. A. Zraket concerning the feasibility of modifying the Cape Cod ID programs to provide a form of automatic identification. In the system discussed various degrees of automaticity will be possible. Each track will be assigned a score on the basis of its location, correlation with flight plans, and heading. The IDO will be able to select a score above which ID will be automatic and below which it will be manual. Ten such levels will be possible.

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

AAA. Two AA-guidance missions were performed during this period. On 4 February the AALO passed 4 tracks to the AAA and all 4 were splashed. In every case TWS had lost the track or switched track numbers before engagement but after lock-on.

On 11 February the AALO passed 5 tracks; all 5 were assigned to AAA but only 4 were splashed. The fifth track was assigned too late for engagement; the late assignment was due to very late lock-on. TWS tracked only 1 of the 5 targets to the completion of the run. This target was equipped with Mark X IFF.

Three simulated AAA missions were also performed this period, using C. Gaudette and S. Knapp's new simulation program. The program is very well suited to test AALO performance, with as many as 14 tracks threatening Boston simultaneously. During the first such exercise, success was very poor, due mainly to confusion in exchanging information

1.14 Weapons Direction (Continued)

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

between the AALO and WD. Many WD assignments were made prematurely. As a result of this test, certain formal operational procedures were arranged between the WD and AALO. The second exercise ended prematurely due to computer trouble. The third exercise ran very smoothly, with all tracks entering gun range being engaged. The new procedures practically eliminated the confusion noted earlier.

The results of the first simulated test and the large number of telephone calls required during the next two tests, from the AALO to the WD, indicate clearly the need for facilities which will enable the AALO to inform the WD about the progress of the battle, from the AAA point of view, through the computer. This need was indicated by the writer before the Cape Cod System was programmed. Such facilities will be provided in 1954 Cape Cod.

An inter-office memo will be written during the next period, outlining the SOP's to be followed during Cape Cod exercises with AAA until such time as the program can be improved to eliminate the necessity for these procedures.

Maj. John DeRosa, 15th Group, AAA, is Cape Cod AALO as of 11 February. He will be available on Tuesdays and Thursdays for consultation on any matter affecting present or future operations with AAA.

H-F. Two suggestions from the third ADC Group regarding height-finding are being given serious attention. The first involves assigning priority automatically to a fighter paired with a hostile-class track near the close of midcourse guidance, so as to find the Δh between the two tracks. This Δh can be determined quite accurately under the conditions mentioned, even when the H-F is out of calibration. The Δh information would then be displayed for the IND. This will certainly be done for KD-1, and it will be done for Cape Cod 1954 if storage limitations permit.

The second suggestion, made additionally by the second ADC Group, involves redesigning present nodding-beam H-F to permit stopping the nod at some exactly chosen elevation, so as to use an A-scope to assist in finding raid size. The possibility of doing this will be explored.

(F. Garth) (CONFIDENTIAL)

Intercept-team training, done with J. Murray and J. Nolan as fellow instructors, has concentrated on the technician. To increase his efficiency, practice sessions on switch assertion have been conducted as well as experimentation with new log forms. The one most favorably

1.14 Weapons Direction (Continued)

(F. Garth) (CONFIDENTIAL) (Continued)

received by the technicians is similar to the old form except that fighters are logged separately in time sequence.

Three-dimensional drawings were prepared to help in explaining collision course, final turn, and foldback to nine-day familiarization groups. Two discussions were attended with the last nine-day group. A memorandum is being prepared with J. Nolan which lists the recommendations and comments of this group pertaining to weapon direction and interception.

Several afternoons were spent in monitoring the IND station during both simulated and live tests of the Cape Cod System. Results show that thought should be given to situations as critical as three interceptors entering phase 3 of their final turns at approximately the same time.

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

An action-analysis program has been written which stores the contents of the intervention registers on magnetic tape once per scan. After the test is complete another section of the program reads and interprets this information. The action information and the action time for the FTU and the IND stations is printed via the delayed printer. When this section is checked out, the print-out of actions from other stations will be added.

A memo describing a method of manual-intervention techniques using the proposed test storage for XD-1 has been written.

(C. Grandy) (CONFIDENTIAL)

As during the last two biweekly periods, considerable time has been spent with the visiting ADC personnel. The third and final group arrived on 1 February and departed 11 February. The program in general was satisfactory, and Group 61 benefited by these visits.

Evaluation work in the height section of Cape Cod has continued; results of operation during January 1954 have been analyzed, and a report is in preparation. It has been decided to issue a report of the height-finder operations after the February 1954 operations are analyzed. The report will cover all height operations for 1953 and 1954 through February. In the interim, information may be obtained from the writer.

Two special flight tests to evaluate the ability of the nodding-beam and v-beam radars to supply raid-size information have been unsuccessful because of equipment limitations and lack of sufficient aircraft. Additional tests of this sort are scheduled.

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1.14 Weapons Direction (Continued)

(S. Hauser) (CONFIDENTIAL)

Evaluation of the identification section continues. Special emphasis is given to accounting for the number of unknowns and the number of uncorrelated flight plans in the System.

To date two tests have been run with the cooperation of GOC center, Manchester, N.H. Although the precise use of these reports from the filter center has not been clearly defined, the reports have been frequent and accurate enough to warrant consideration in the design of future identification systems.

(F. Heart) (CONFIDENTIAL)

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

Part of the last biweekly period was spent participating in discussions with the ADC visitor group.

An inter-office memo was issued summarizing characteristics of various Hughes fire-control systems (E-series). This memo may be perused by contacting F. Heart.

Some consideration is being given to basic simulation problems.

(W. Lemnios) (CONFIDENTIAL)

Two days were spent in conference with the third group of visitors from ADC.

A memo summarizing the results of all the interceptions attempted from 1 October 1953 to 22 January 1954 was written. Some time was spent taking more data for the evaluation of the intercept team.

(L. Murray) (CONFIDENTIAL)

A meeting was held in H. W. Boehmer's office on 4 February 1954 concerning the present status of the Collin's ground-to-air data link (G/A D/L). Those present were S. Reiger and E. Doyle (CRC), H. Boehmer, A. Fullerton and J. O'Brien (Group 22), and R. Davis and L. Murray (Group 61). The results of this meeting were as follows:

1. A receiver is to be installed at the Barta Building to enable direct monitoring of Prospect Hill transmissions;

1.14 Weapons Direction (Continued)

(L. Murray) (CONFIDENTIAL) (Continued)

2. CRC is to consider the desirability of moving the synchronization source from Prospect Hill to the Barta Building;
3. D/L flight test is to be conducted with the F-89's having concentrated maintenance;
4. A program will explore transducer unreliability.

Since this time, a receiver has been installed in the Barta Building. At present, only the digital information can be monitored although the required transducers and dials will be installed during the coming week.

Four D/L tests were conducted with F-89's during the last two weeks, and the results are encouraging. Group 22 is studying the results of these tests and attempting to discover the source of transducer errors. The C-47 tests, described in the last biweekly, will be resumed next week. The testing procedure has been studied and more control will be maintained; this should give better results.

Next week a visit will be made to CRC concerning their use of the G/A D/L in Project Broad Jump. It is hoped that an exchange of information may lead to more fruitful D/L operation in both groups.

(J. Nolan) (CONFIDENTIAL)

In conjunction with F. Garth and L. Murray, training of the Air Force personnel of the Weapons Section has begun at their operating stations. Two 2-hour tests were run in which the Intercept Directors (IND's) and Radio Operators (RO's) maintained simulated radio talk with R. Davis and P. Dolan, who acted as the pilots of the simulated interceptor aircraft. Although the first test was inconclusive due to faulty radio operation, the second was quite successful and indicated that such tests can offer worthwhile training periods. In addition to these tests a "dry-run" drill on switch insertion and log-keeping was given to the Intercept Technicians (INT's).

Some time was spent in discussing the Weapons Section of the CCS with the third group of ADC visitors and in assisting them in operating some of the stations of the section during a live test.

A subroutine has been written and checked out on WWI for displaying a Digital Information Display (DID) character which is formed of four regular characters. It is intended that use of this oversize character may be made for special purposes, particularly where emphasis or easy reading is desired.

1.14 Weapons Direction (Continued)

(G. Rawling) (CONFIDENTIAL)

A portion of the past period has been spent in assisting in the evaluation of the height-finding and anti-aircraft phases of the Cape Cod System.

M-2653, describing the use of the Teleregisters, is in the process of distribution. Potential users are urged to familiarize themselves with this note prior to operation.

A program designed to bring up to date the literature (M-1979-2 and M-2185) on the wiring of push-button panels to data-insertion registers has been commenced, with accompanying modernization of console drawings.

(C. A. Zraket) (CONFIDENTIAL)

An AAICS (Automatic Aircraft Intercept Control System) Steering Committee meeting was attended this week at the Bureau of Aeronautics, Navy Department, Washington, D.C. A summary of the discussions was written in an inter-office memo to C. R. Wieser and D. R. Israel.

The evaluation and training of personnel of the Weapons Direction Section of the Cape Cod System continued during the past biweekly period. Some effort has been put into obtaining a summary of the AI (airborne intercept) radar performance for all of the Cape Cod interceptions conducted to date which utilized AI-radar-equipped interceptors. The pilot reports filed at Hanscom Field were obtained for this purpose. The majority of live tests to date have been affected by radio-communication difficulties, lack of Mark X coverage in certain areas, and unavailability of sufficient aircraft. A brief summary of the operation of the Cape Cod Center during the past biweekly period is given in Section 1.15.

Some time was spent during the past two weeks with the visitors taking the two-week indoctrination program sponsored by Group 61. A summary of the discussions concerning weapons direction has been written in an inter-office memo to D. R. Israel.

In conjunction with other Group 61 staff, some thought has been given to the type of computer alarms required for XD-1 and to the program-input system.

With D. R. Israel, a proposal for the weapons-direction stations for the 1954 Cape Cod System was drawn up. Also a proposal for the Flight-Test Umpire station for both XD-1 and Cape Cod is under consideration.

1.15 Direction Center Operations

(C.A. Zraket, W.S. Attridge) (CONFIDENTIAL)

The following is a brief summary of the operation of the Cape Cod Direction Center during the past biweekly period. Detailed reports on any of the tests are available from P. Cioffi. Radar-calibration data is available from E. Wolf.

In conjunction with Group 22, testing of the automatic ground/air data link is continuing. L. Murray is serving as Group 61 representative.

Tuesday, 2 February - An interceptor return-to-base test was canceled when all interceptors were made unavailable due to runway conditions. Three B-29's were available for a height-finder raid-size and accuracy test. The FPS-3 was shut down so the B-29 aircraft had to be tracked from Mark X data. The weapons-direction stations used simulated interceptors against these targets for training purposes.

The test was bothered by computer failures, and the System was shut down at 2:45 p.m. The Mark X covering south of Truro was poor. The MPS-4 at Pigeon Hill gave accurate raid-size and height information, while the reports from the MPS-4 at Nantucket were not as good. The V-beam at North Truro was not used.

Wednesday, 3 February - A radar-calibration test was canceled due to aircraft unavailability. A simulated test was run from 1300-1500. From 1500-1700 the ADC visitors operated the TWS stations using live data and simulated interceptions. GOC reports were received from the Manchester Filter Center for the first time.

Thursday, 4 February - A live test utilizing four raids (three B-29's and one B-25) and five F-89 interceptors (seven available) was conducted. The test was hampered by bad weather. Five interceptions were attempted, two on the same target, and three were successful. One interceptor aborted due to trouble with oxygen equipment, and a second was returned to base when it encountered bad weather. An AAA mission run concurrently resulted in four "splashes" out of four assigned targets. Tracking and height information were both satisfactory. Mark X data was used to track interceptors. Some trouble was encountered with radio communications.

From 1500-1700 a simulated test was run for the benefit of the ADC visitors who operated the ID, HT, and FTU stations.

Friday, 5 February - A radar-calibration test was canceled due to unavailability of a B-29. A training mission was run from 1300-1500 using live data and simulated interceptors.

A gap-filler calibration test was run from 1500-1700 using azimuth strobe pulses for reference.

1.15 Direction Center Operations (Continued)

(C.A. Zraket, W.S. Attridge) (CONFIDENTIAL) (Continued)

Tuesday, 9 February - A training mission was conducted from 1300-1500 using simulated data. All aircraft for the live test were canceled. The remaining computer time was used for program analysis.

Wednesday, 10 February - The calibration mission using a B-29 equipped with bombsight was canceled due to unavailability of the aircraft. An F-89 was tracked to get a comparison between the gap fillers and the FPS-3 at Truro.

A simulated mission was run from 1500-1700 for the benefit of the ADC visitors who operated the weapons-direction stations.

Thursday, 11 February - A live test utilizing four raids (two B-29's, one B-17, one C-54) and five interceptors (four F-89's and one F2H) was conducted. The test was hampered by a computer power failure (1/2 hour), radio communications (transmitter), a computer alarm, and bad weather. Winds at 30,000 feet were 230 knots and at 20,000 feet, 190 knots. Five interceptions were attempted but only two were successful.

Friday, February 12 - A radar-calibration test using a B-29 equipped with bombsight was conducted.

(E.W. Wolf) (CONFIDENTIAL)

An analysis of the Cape Cod System equipment-reliability reports for the past month (6 January through 10 February) reveals that although operations on Tuesdays accounted for less than 30 per cent of the Total Assigned Time, 65 per cent of all Down Time experienced during that period occurred on Tuesdays.

This is probably caused by the fact that computer power is turned off all day on Mondays. As a result, the over-all statistics of the equipment reliability of the System have become considerably distorted. These statistics follow.

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1.15 Direction Center Operations (Continued)
(E.W. Wolf) (CONFIDENTIAL) (Continued)

	Last Biweekly Period		Cumulative Period (since 9/29/53)	
	Hours	Per Cent	Hours	Per Cent
Assigned Time for System Operations	23.2	100.0	178.6	100.0
Unrestricted Operating Time	17.1	73.5	95.1	53.3
Limited Operating Time	3.8	16.5	52.8	29.5
Down Time	2.3	10.0	28.9	16.2
Recovery Time	0.0	0.0	1.8	1.0
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Time Lost (Hours)	Limited Operations	Down Time	Limited Operations	Down Time
Computer	0.0	2.3	0.0	26.2
Room 222	0.0	0.0	48.7	2.6
Radar and Input	3.9	0.0	38.2	0.0
Miscellaneous	0.0	0.0	25.3	0.0

(P. Cioffi) (CONFIDENTIAL)

The following table is a summary of the flight-test activity scheduled and held this period. There is additional indication in that summary of the unusually high rate of aircraft cancellation because of the Base's inability to hangar the larger-type aircraft and to provide the necessary services to offset hazardous flight conditions brought about by the weather.

Review of Direction Center data records has continued, and actions have been taken to insure proper recording.

Fighter-pilot intercept reports were obtained from Bedford for the period since commencing the Cape Cod operation. It appears that the data recorded is incomplete in many respects. I expect during this next period to visit Bedford and Weymouth again for a review of intercept procedures in connection with Cape Cod work and with other briefings in general.

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1.15 Direction Center Operations (Continued)

(P. Cioffi) (CONFIDENTIAL) (Continued)

DATE		DAILY FLIGHT TEST SCHEDULE		TEST ACTUALLY		REASONS FOR CHANGES OR COMMENTS	
A/C	Description	A/C	Description	A/C	Description		
2	Data Link	-	Cancelled				Iced runways
12	Combined Mission (Sector Air Surveillance & Intercepts)	3	Flew a tracking mission with 3 aircraft				Cancelled fighters due to runway conditions. Flew with 3 target aircraft due to procurement
2	Data Link	-	Cancelled				Weather
1	Calibration	-	Cancelled				Weather
2	Data Link	-	Cancelled				Weather
17	Combined Mission (Sector Air Surveillance & Intercepts)	10	Flew with four target aircraft & six fighter aircraft				Six of the target aircraft not available, one fighter aircraft cancelled to mechanical
2	Data Link	1	Flew with one F-89				One F-89 cancelled due to procurement
1	Calibration	-	Cancelled				No aircraft available
2	Data Link	-	Cancelled				Iced runways
12	Combined Mission (Sector Air Surveillance & Intercepts)	-	Cancelled				Iced runways
2	Data Link	1	Flew with 1 F-89				Second F-89 cancelled due to weather
1	Calibration	1	A.F. aircraft aborted on take-off. Flew 1/2 of mission with F2H made available by NAS, Weymouth				A.F. aircraft aborted, Navy aircraft cancelled last half of mission due to weather
20	Combined Mission (Sector Air Surveillance & Intercepts)	10	Flew with 5 target aircraft and 5 fighter aircraft				Five of the target aircraft not available

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* Added to Schedule during week of test

1.15 Direction Center Operations (Continued)

(E. Cottier) (CONFIDENTIAL)

Computer Operation

TOTAL ASSIGNED TIME

79 hr

Weapons Direction	2 hr 30 min
Track-While-Scan	17 hr 45 min

Combined Weapons Direction & TWS	25 hr 15 min
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Tracking & Control	11 hr 35 min
Total	<u>57 hr 05 min</u>

Time to Math Group	14 hr 25 min
Lost to Computer	2 hr 30 min
Time to E. Rich	1 hr
Time to Systems	3 hr
Time to Magnetic Drum	1 hr

Total	<u>21 hr 55 min</u>
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	57 hr 05 min
	<u>21 hr 55 min</u>

Grand Total	79 hr
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1.16 AN/FSQ-7 (XD-1) Support

(D. R. Israel) (CONFIDENTIAL)

The third of the three 2-week familiarization programs for ADC personnel was conducted during this biweekly period. In addition to the personnel from the Central Air Defense Force, three civilian personnel from the ADES Group, Colonels Pamplin and Schiebel, and three officers from the Project Group for ADES (Headquarters, ADC) attended. As with previous groups, a number of recommendations were prepared and should be received by Group 61 early next week.

On Wednesday, 10 February, in a meeting with Lincoln personnel, Lou Dorff of Project ADES, General Saville, and members of the Project Group for ADES from Headquarters ADC, the over-all organization of direction and combat centers was discussed. Some fairly interesting proposals were made, and the various groups concerned will look into them as soon as possible. Over-all plans for the Direction Center and recommendations made by previous controllers were reviewed, and it appears that substantial agreement exists. The major items which are of prime interest regarding the Combat Center are those relating to the "large" displays. Progress on the further specifications of these displays was made.

The plans for the test storage and the program element of XD-1 have been reviewed by Group 61. In each case several small changes were recommended.

During recent weeks, as progress has been made in the design of display consoles, it has been possible to make more realistic estimates of push-button panels and side-frame requirements for XD-1. Estimates of the requirements for individual consoles have now been prepared and are available.

(H. D. Benington) (CONFIDENTIAL)

M-2681, "XD-1 Situation Displays," was issued. It describes the major facilities available to programmers, indicates the reasons for the major decisions, and illustrates how the System might be used for situation displays.

(W. Clark, B. Farley) (CONFIDENTIAL)

An "inchworm" has been run successfully on MTC, and a basic octal-constant conversion program checked out. A "checkerboard" testing bootstrap has been tried. The bootstrap part checks satisfactorily, but the checkerboard part has a bug.

Other utility programs are being written for MTC.

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

(P. O. Cioffi) (CONFIDENTIAL)

A proposal for the organization and integration of a test-and-analysis facility in an XD-1 system has been formulated for preliminary discussions. It treats the facility in a general sense, indicating the types of service which should be rendered in an air-defense system and the organizational level of importance to assure its effectiveness. In addition, certain details of its functioning are discussed.

(W. Lone) (CONFIDENTIAL)

One day was spent describing the Whirlwind computer, programming, and the Cape Cod simulation program to visitors from ADC, Central ADF, BTL, and Philco.

Meetings on the XD-1 program element and XD-1 test storage were attended.

The three-letter abbreviations of the XD-1 order code have been fixed and will be given in M-2685.

(B. E. Morriss) (CONFIDENTIAL)

The first part of the period was spent studying the specification for the XD-1 magnetic-drum system and attending a sign-off meeting at Poughkeepsie.

The status of Mark X for the Transition System was reviewed with Logemann and Beatley of Group 23, and after additional study a proposal will be written.

An inter-office memo has been written to C. R. Wieser pointing out the usefulness of equipment which facilitates stopping programs at selected instructions and addresses and proposing that such equipment be incorporated in XD-1.

A slight amount of time was spent reviewing the operation of the area discriminators (light cannons) proposed for XD-1.

(J. H. Newitt) (CONFIDENTIAL)

During the past two weeks work has continued on XD-1 console design. Detailed consideration has been given to the following problems: the telephone system as it will affect console design, the service accessibility of units in the console, the layout of the permanent items of the front panel of the display console, and the basic design of the various

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

(J. H. Newitt) (CONFIDENTIAL) (Continued)

types of switching modules to be used. Nothing final has been decided on the above items, but conferences with ADES and IBM personnel have produced some real progress during the above period.

1.2 Group 64

(S. H. Dodd) (UNCLASSIFIED)

There have been several changes in the computer system during the past biweekly period. The buffer-drum system has been permanently connected into the WWI system and is now available, with its own MITE units, to programmers. A new and more reliable and useful timing register has been installed to replace the old real-time clock.

We have decided to replace the relay switching in the auxiliary-drum system with an all-electronic system, and procurement of the added parts has started.

1.21 WWI Systems Operation

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

A transfer-check alarm occurred on Thursday, 11 February, and when analyzed caused suspicions that the 4's flip-flop of the time-pulse-distributor counter had complemented one extra time. This resulted in our checking the panel and locating an intermittent loss of GT bias whenever the power plug was slightly moved. When the plug was examined, it was found that the bias pin was spread, causing poor contact.

The new voltage-interlock panel was placed in service on Monday, 15 February. The panel replaced the bias-interlock panel and the power-interlock-timer panel. The panel has provisions for connection to a power-bus alarm circuit.

All of the digits of the parity register have been converted to d-c coupled flip-flops and cathode followers.

A new time-pulse-distributor output panel has been received and is being tested. It will eventually replace the one now in service which has had several phenolic breakdowns resulting from silver migration.

Core Memory

(N. L. Daggett) (UNCLASSIFIED)

Work is continuing on the new core-memory sensing amplifier. A breadboard version does not have quite enough gain but shows no observable base-line shift or recovery time.

Typewriter and Paper Tape

(L. H. Norcott) (UNCLASSIFIED)

Five FL Flexowriters were given routine inspection and overhaul during the past two weeks. Since 5 January, all of our FL Flexowriters have been overhauled.

1.22 Terminal Equipment

(R. H. Gould) (CONFIDENTIAL)

The new timing register described in memo M-2675 has been installed and is operating correctly. The old timing register will be used as a special counter for another week and will then be removed.

The four modified d-c in-out register panels that comprised the in-out control counter have been replaced by two plug-in unit mounting panels. Margins and pulse amplitudes have not been completely checked, but operation is satisfactory.

There have been several failures in the past month of the deflection yokes in the 16-inch display scopes. The trouble was overheating and resistance change of the damping resistors of the vertical-deflection coil. These resistors were one-half watt in the original construction but have been replaced with one-watt resistors. The repaired yokes operate correctly.

A new panel for inserting speed and heading information using an eight-position rotary switch for the heading has been installed in rack G23 in Room 222. If it proves satisfactory, more will be built.

A persistent trouble with the Fairchild scope camera was cured by an increase in the delay between the camera index and the delivery of a completion pulse to in-out control. There is apparently mechanical oscillation somewhere between the scope face and the film for a short time after the indexing of the film.

A short-time horizontal shift of the photographed display has been noticed a few times recently. The horizontal and vertical deflection-line inputs to the camera scope amplifiers have been interchanged to help determine the source of the shift.

Scope Deflection

(T. Sandy) (UNCLASSIFIED)

Work on a new scope-deflection system for WWI was discontinued in this biweekly period.

A center output, 200-v swing, balanced decoder was designed. However, the problem of a low-power deflection amplifier wasn't solved.

1.22 Terminal Equipment (Continued)Magnetic Drums

(H. L. Ziegler) (UNCLASSIFIED)

Planning for installation of electronic-head switching for writing in the auxiliary drum has begun following the recent decision to proceed as outlined in M-2617. Proposed power and circuit arrangements are nearly complete and ready to submit for approval. If approved, the power wiring can begin almost immediately.

Engineering Research Associates of St. Paul has been requested to quote prices and delivery dates on the necessary pulse transformers. Certain decisions depend upon this information, but, pending its arrival, Production Control has been alerted as to various alternatives being considered.

Construction Requisitions are being prepared for preliminary sheet-metal work in the drum cabinet.

MITE

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

MITE units 0, 1, 2, 3, 5, 6, and 7 in L row of Room 156 have been installed and are operating. MITE 3 is now the special Mark X MITE; MITE 0 is for the long-range radar and is sensed in registers 0 and 4 of the buffer drum. Progress is being made in improving margins on the new MITE system while continuing study is being made of the buffer-drum system.

The inputs to MITE's 1 and 2 with FF buffer storage have been slightly modified, and a switch has been added to accommodate the test equipment which was set up by Ed Rich to program-test the new IBM video mapper.

The new demodulator for MITE 0 to replace the old demodulator in Room 224 has been placed in service in K11, Room 156, and has been operating reliably.

Ferranti Reader

(F. E. Irish) (UNCLASSIFIED)

A test program has been prepared by S. Best of the S&EC Group to measure the tape speed and the distance the tape moves after the command to stop is given. The maximum tape speed at present is about 200 characters/sec. The stopping distance is important in that it gives a measure of the performance of the brake-clutch mechanism. The stopping distance measured at present is 0.04 inch.

1.22 Terminal Equipment (Continued)

Ferranti Reader

(F. E. Irish) (Continued) (UNCLASSIFIED)

The decision has been made to install the two Ferranti readers using only one control. This means that the computer will control only one reader at a time; which reader is to be used is determined by the operator. By pushing a button or throwing a toggle switch he can transfer the control from one reader to the other.

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 29 January - 11 February 1954:

Number of assigned hours	139
Usable percentage of assigned time	95
Usable percentage of assigned time since March 1951	86
Number of transient errors	5
Number of steady-state errors	2
Number of intermittent errors	8

Component Failures in WWI

(L. O. Leighton) (UNCLASSIFIED)

The following failures of electrical components have been reported since January 15, 1954:

<u>Components</u>	<u>No. of Failures</u>	<u>Hours of Operation</u>	<u>Reasons for Failure</u>
<u>Crystal Diodes</u>			
1N34A	3	0 - 1000	Low R _b
	1	2000 - 3000	Low R _b
	4	3000 - 4000	Low R _b
1N38A	1	16000 - 17000	Low R _b
D358	1	11000 - 12000	Drift
	2	19000 - 20000	l-drift, l-shorted
	1	21000 - 22000	Drift
<u>Resistors</u>			
9000-ohm 1/2-watt +1% carbon deposited	1	0 - 1000	Intermittent

1.23 Records of Operation (Continued)

Component Failures in WWI

(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>			
6AG7	1	3000 - 4000	Short
6AS7G	1	16000 - 17000	Low I _b
6AU6	2	2000 - 3000	Short
6BL7	1	2000 - 3000	High cutoff
6L6	1	8000 - 9000	Low I _b
	1	22000 - 23000	Short
6SH7	1	0 - 1000	Low I _b
	1	1000 - 2000	Low I _b
6SN7	1	17000 - 18000	Low I _b
6Y6G	1	22000 - 23000	Low I _b
	3	23000 - 24000	2-short, 1-low I _b
7AD7	1	3000 - 4000	Short
	1	8000 - 9000	Short
	1	12000 - 13000	Short
	4	16000 - 17000	Short
	1	17000 - 18000	Low I _b
	2	18000 - 19000	Short
	4	22000 - 23000	Short
	8	23000 - 24000	7-short, 1-low I _b
7AK7	1	2000 - 3000	Leakage
	1	3000 - 4000	Short
	1	8000 - 9000	Short
	1	21000 - 22000	Short
	2	22000 - 23000	Short
	2	23000 - 24000	1-short, 1-low I _b
12AU7	2	8000 - 9000	1-short, 1-low I _b
5687	1	0 - 1000	Leakage
	2	8000 - 9000	1-low I _b , 1-grid current
	3	9000 - 10000	1-low I _b , 2-short
	1	10000 - 11000	Short
5881	1	0 - 1000	Low I _b
	2	1000 - 2000	Low I _b
5963	1	2000 - 3000	Low I _b
	1	9000 - 10000	Low I _b
5965	1	0 - 1000	Short
	1	2000 - 3000	Leakage

1.23 Records of Operation (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> (Continued)			
5998	2	0 - 1000	Short
	2	2000 - 3000	Short
6080WA	1	2000 - 3000	Short
6145	4	0 - 1000	1-leakage, 2-short, 1-open heater
	6	1000 - 2000	1-open heater, 3- short, 2-leakage
	3	2000 - 3000	2-open cathode, 1-low I _b
715C	2	0 - 1000	1-gassy, 1-short

1.24 General

D-C Power Supplies

(S. T. Coffin) (UNCLASSIFIED)

Construction has been completed on the new WWI +90-v, 25-amp d-c supply, and testing has been started. This supply will be installed in WWI on 1 March.

The WWI +120-v, 10-amp supply will be rebuilt in March.

Lab Power Supplies

(D. M. Fisher) (UNCLASSIFIED)

The new +250-v, 10-amp Barta Lab power supply has been assembled, tested, and will be installed within the next biweekly period. A maintenance-guide booklet will be prepared to aid in trouble shooting the unit.

WWI Power Supplies

(D. M. Fisher) (UNCLASSIFIED)

Work has begun on the design of a new -450-v, 5-amp power supply to replace the antique unit now in service. This new supply will feature greater reliability and circuit simplicity.

1.3 Group 65

1.31 Activities of Group 65

(P. Youtz) (UNCLASSIFIED)

A detailed description of the activities of the Group on the electron optics of the Charactron and Typotron tubes was given in the last Biweekly Report.

This work was continued with the construction of Cht 14 and Cht 16. Cht 14 was designed to evaluate methods of reducing registration problems in the Charactron and increasing deflection sensitivity in the Typotron. Cht 16 was used to evaluate convergence-coil designs for Charactron tubes.

A program with Joe Klein of Group 25 was inaugurated to evaluate aluminized phosphor screens.

Group 65 is working with George Sponsler of Group 25 to set up an automatic electron trajectory tracer in cooperation with the MIT Dynamic Analysis and Control Laboratory. This will be used to study the relative merits of helical-type vs. multiple-band post-deflection accelerators.

Work on helical coatings continues. A number of tubes with this type of coating went through the complete vacuum process with encouraging results.

One trip was made to RCA to consider them as a second source of improved 5965 and improved 7AK7 tubes.

Another trip was made to DuMont to consider them as a source of Charactron tubes.

1.33 Research and Development

(J. S. Palermo) (UNCLASSIFIED)

In order to evaluate helical coatings six envelopes were coated with helical dag and processed during this period as per schedule. To date the results seem encouraging.

Settling of phosphor screens by means of a tilt table have been tried. We are presently designing a tilt table which is expected to be hydraulically controlled in order to attain closer control on settled screens.

SECTION II - AN/FSQ-7

2.1 Group 62

2.11. Systems

Output Shift Registers

(H. Rising, I. Aronson) (CONFIDENTIAL)

Writing-margin diagrams taken on stage 16 of the array approach the theoretical triangular shape; however, a shift in margin diagrams with writing-pulse width shows that the test setup must be modified to provide more writing disturbs.

Register margins have been improved by using two 7AK7's in parallel for register drivers.

A 25-position switch is being constructed to replace the 8-position switch used in present tests.

A register of the same type as the output shift registers is being hooked up as a counter for comparison with the counters now proposed for the input system.

XD-1 Logic

(R. P. Mayer) (UNCLASSIFIED)

When XD-1 becomes available it may be necessary to test, maintain, and modify it. An understanding of the logical design of the system is required for this work. Consequently, a logical-training group of about a dozen people has been organized and meets two hours a week to study the detailed logical design of XD-1.

Logical diagrams are now available for the program-element frame, instruction frame, and test memory, but they have not been assigned drawing numbers, pending an investigation of the numbering system.

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

A brief meeting was held with Paul Rosen to gather information for an MRD report on the SDV demodulator.

MRD reports are being delayed due to a reorganization of the IBM publications department.

2.11 Systems (Continued)

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

The program-element block schematics were reviewed with Dick Best. Pulse amplifier Model B is being used in many places where Model A is preferred. The use of Model B for light loads can lead to pulses in excess of 40 volts which is undesirable.

Outputs Committee

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

The week of 1 February was devoted to tying up the loose ends of the survey of alternative specifications for the output frame. During the week of 8 February the Outputs Committee completed the writeup of proposed specifications for the outputs frame. A meeting was held with representatives of GE on 8 February.

2.12 Magnetic-Core Memory

Miscellany

(W. Papian) (UNCLASSIFIED)

The 64 x 64 shows signs of operating successfully in MTC as indicated below; detailed operating information will emerge during the next few weeks.

IHM-MIT memory-section meetings were held here on 11 and 12 February in an attempt to lay the groundwork for heavier MIT participation in the XD-1,2 effort. Starting within a week or two our engineers expect to spend more time on memory testing and allied work at Project High.

A new Research Assistant, George Davidson, has joined the section; his first assignment is to help with the investigation into the single-coordinate-read memory proposals and to become familiar with our equipment and techniques.

MTC Core Memory, Mod. II

(W. Canty, J. Mitchell) (UNCLASSIFIED)

The installation of the memory into MTC has been completed, and the system is now operating satisfactorily. First tests indicate that the margins of the memory are as good as they were in Test Setup VI.

Patterns of ONE's and ZERO's, pairs checkerboards (complemented), a new bootstrap program, and a new inchworm program all have run successfully.

2.12 Magnetic-Core Memory (Continued)

64 x 64 Memory

(E. A. Guditz) (UNCLASSIFIED)

The 64 x 64 x 19 (2 spares) memory was installed in MTC on 2 February. After a few hours of adjusting and debugging, the memory operated satisfactorily.

A 64 x 64 plane made of RCA XF-345 cores is undergoing tests in Memory Test Setup VI. Although the plane cannot operate as a replacement for an MTC plane, it does have finite margins. Data is now being taken to determine the optimum operating conditions for this plane.

Switch Cores

(A. D. Hughes) (UNCLASSIFIED)

Determination of the desired metallic switch core, load resistance, and number of turns for the Olsen-switch design is almost complete. Difficulty due to a high equivalent inductance of the memory (18 microhenries for 32 planes), resulting in a long fall time, has been overcome by cutting off the current driver early and using a large load resistance.

(P. K. Baltzer, J. Raffel) (UNCLASSIFIED)

Work continues on evaluating the 2-core-per-bit, "linear-selection" memory system.

Sensing-Amplifier Design

(S. Fine) (UNCLASSIFIED)

An investigation of linear transformers for sensing-amplifier applications is being carried out. A Ferramic-H core (type F-415) has been found to give satisfactory results. At a prf of 110 kilocycles recovery time is good. A single- or two-tube sensing amplifier is being designed in conjunction with the transformer.

(R. S. DiNolfo) (UNCLASSIFIED)

A thesis proposal entitled "Multi-Coordinate Selection Systems for Magnetic Core Storage" was written and issued as M-2634. An investigation of the general theory of selection is now in progress, and the next few weeks will be devoted to completing this study and to testing cores which might be used in schemes necessitating selection ratios of less than 2 to 1.

2.13 Vacuum-Tube CircuitsMagnetic Drum

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

A meeting was held 5 February in Poughkeepsie to decide whether a magnetic or diode drum switch would be used in XD-1. It was decided to use the diode switch, which has been proven to work, unless the magnetic switch can be proven by 1 April. The magnetic switch uses much fewer critical components; development will continue on it at IBM, and at some later time a decision will be made as to whether to use it in AN/FSQ-7 or not.

Digit-Plane Driver

(D. Shansky) (UNCLASSIFIED)

The required test equipment to facilitate the taking of marginal-checking data has been completed. This data is now being taken and will be completed in the next period, when it is expected that the final M-note will be written.

Pulse Transformers

(E. Gates) (UNCLASSIFIED)

A new transformer was sent to M. Zimmerman of Group 25 for the deflection-amplifier power-output stage. The first transformer had unbalanced outputs at 1 megacycle due to unequal winding capacities. The new transformer was wound on a hypersil core instead of a ferrite toroid so that the winding configuration of each half would be more uniform.

Three transformers were delivered to J. Woolf for the vector generator to be used at 20 kilocycles.

I have started work on correlating the response of the memory-driving transformer with that of an equivalent circuit so that a more optimum design may be developed.

Delay Lines

(J. S. Gillette) (UNCLASSIFIED)

Some tests have been made on the 100-ohm lumped delay line designed by IBM. The line has very excellent bandwidth and is easily terminated. It may not be driven with a conventional gate as the safety margins are very small, but it can be driven with a pentode pulse amplifier with reasonable design margins.

2.13 Vacuum-Tube Circuits (Continued)

"C" Flip Flop

(J. S. Gillette) (UNCLASSIFIED)

I have started taking prf for the C flip-flop to determine maximum prf vs. capacity loading.

Cathode-Follower Margins

(B. Remis) (UNCLASSIFIED)

A complete set of marginal data concerning the use of a 5965-type triode (or a 7AK7-type used as triode) as a cathode follower is being taken. This will be included in an M-note covering the supporting material (design procedure, margins, etc.) for the small and medium cathode follower of the MRD Book.

2.14 Memory Test Computer

General

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

The 64 x 64 magnetic-core memory, after a few minor initial difficulties such as 8 bad tubes (5965's), is now operating with margins which seem on preliminary inspection to be satisfactory. This gives MTC 4096 registers of rapid-access memory in addition to the 64 registers of plugboard and toggle-switches and puts it back in business as a working computer.

This of course means that people from Group 61 and elsewhere would like to run programs on MTC, and facilities are shaping up well to permit this: the Ferranti photoelectric tape reader is in operation; an octal-constant conversion program has been written and used to convert several test programs; and a basic conversion program to accommodate alphabetical, decimal, and octal characters in Flexowriter code is nearly finished. Also, to afford more time for running programs and to log more time on the computer, a regular evening shift is operating five days a week. Requests for assigned time on MTC should be brought to the attention of Hosier, Ogden, Louis Sutro, or Betty Kollet. In general, these are more likely to be satisfied during the evening hours because of daytime test commitments. Tapes may be prepared by the Barta Tape Room; for instruction codes and conventions, see Phil Bagley's programming manual, M-2527.

A recent addition which should help in analyzing programs is the facility for programming an alarm and stopping the computer by adding octal 2000 to the address of any sof (select operation field) instruction.

2.14 Memory Test Computer (Continued)

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

A program so written will halt at the designated points of field-switching unless the programmed alarm is suppressed.

Four memory test programs have been written and satisfactorily run, and more are in preparation. Automatic memory display, the facility enabling one to inspect the contents of any memory digit plane by turning a switch at the console, is available on a 5-inch scope, and work is going on to make it available on a 12-inch scope.

Drum testing has continued with six digits active in each of two fields; it is hoped that the next fortnight will see all 17 digits installed in one or both of these fields.

Magnetic Drum

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

Pending the arrival of the necessary transformers on 15 February, two drum fields, each having 17 digits, will be made available for use by 19 February.

A final design of the circuits and the panels will be made in the near future. This will include a new drum stand with the diode switch mounted on the stand itself. In one month or so, the final equipment will be installed.

Automatic Memory Display

(J. Crane) (UNCLASSIFIED)

Automatic memory display is now operating in MTC. With this display it is possible to view the contents of all the memory planes. Selection of any one of the 17 planes is accomplished by placing the digit-selection switch in the desired position.

Automatic-Memory-Display Scope

(J. Crane) (UNCLASSIFIED)

The mechanical mounting and scope amplifiers for the 12 1/2-inch scope to be used in MTC have been designed.

2.14 Memory Test Computer (Continued)

MTC Plug-In Units

(R. A. Hughes) (UNCLASSIFIED)

Testers are being built for the following MTC plug-in units:

Hi-speed flip-flop, Mod. II

Lo-speed flip-flop, Mod. III

Drum-read amplifier

Cathode follower, Mod. I

Dual gate, Mod. II

Dual buffer

Sensing amplifier

Digit-plane driver

Core Memory

(R. A. Hughes) (UNCLASSIFIED)

Several 5965 tubes have "gone to air" in the memory equipment. Bonnell Frost is attempting to ascertain the cause.

In some digits of the core-memory sense amplifiers, the first stage is microphonic. Tapping such tubes lightly is enough to cause errors due to "picking up ONE's." Selected nonmicrophonic tubes are being installed in the troublesome digits.

Two fuses have blown in the lines connecting the core-address register to the address crystal matrix. The reason is unknown.

MTC Drawings and Records

(L. Sutro, B. Kollet) (UNCLASSIFIED)

The Drafting Room has been working since December to bring MTC drawings up to date and is now past the halfway mark. Most of the panels in the arithmetic element are being renamed to indicate the function of the panel. In addition, the drawing for every panel in MTC is to carry in its title block the abbreviation of the division of the computer in which it is classed. In this way all the drawings for one logical division of the computer will be filed together. M-2678 lists these divisions.

2.14 Memory Test Computer (Continued)

(L. Sutro, B. Kollet) (UNCLASSIFIED) (Continued)

Elinor Albanese and Phyllis Nickerson have joined the section and are now preparing a set of cards to record the history of the electron tubes in each panel, and another set to record the entire history of each panel.

2.15 Equipment Design and Schedules

(A. P. Kromer) (CONFIDENTIAL)

IBM has submitted to AMC-Rome a definitive proposal for the contract which will cover the development engineering and construction of XD-1 and XD-2. This proposal is based on scope work, cost estimate, list of equipment, and description of the system which has been reviewed and agreed to by Lincoln.

Further, IBM has signed the letter contract authorizing the construction of the first two duplex systems (these are in addition to the prototypes) and returned this to AMC. Work on preparation of a definitive proposal for the duplex systems will start shortly at IBM. M-2622, an equipment list for a typical duplex central, has been prepared and issued.

Discussions were held with ADC and ADES people regarding operational organization of the AN/FSQ-7 and the Transition System as applied to the over-all tactical air-defense organization. Further consideration of these proposals is now under way. A proposal for physical arrangement of the equipment in the several operational areas of an AN/FSQ-7 central was offered by ADES and has been distributed to Division 2 and Group 61 for study and discussion in the near future.

(W. H. Ayer) (UNCLASSIFIED)

Equipment layouts and floor plans for the basement and first floor of the XD-1 building are now substantially complete and have been approved by EDO-SO as drawings numbered 5001-31005 and 5001-31004. A breakdown of the equipment on the second floor into separate rooms, with personnel requirements and heat loads, has also been approved as M-2658.

A design specification for the XD-1 cooling equipment has been approved as M-2660. This spec will be released to Francis Assoc. by IBM to allow them to go ahead with the final design.

(P. J. Gray) (UNCLASSIFIED)

M-2622, the duplex-central equipment list, has been published.

2.15 Equipment Design and Schedules (Continued)

(P. J. Gray) (UNCLASSIFIED) (Continued)

A revision of M-2495, including an up-to-date list for XD-1 and XD-2, will be published in the near future.

Agreement has been reached among the Air Force, Lincoln, and IBM on the contents of Amendment 1 (covering test requirements for XD-1 system) to Exhibit AFCRC-1. Final copies should be received from CRC shortly.

A draft of Amendment 2 (covering description of XD-1 system) has been completed and will be turned over to the systems office for MIT-IBM concurrence.

(J. D. Bassett) (UNCLASSIFIED)

Because of difficulties with delamination of copper conductors from epoxy-glass laminate during dip-soldering, a study has been undertaken to determine the advisability of using this material for XD-1. M-2683 is a recommendation for a change to paper-based phenolic, as a result of a joint MIT-IBM tour of laminate manufacturing plants.

IBM has agreed to change to XXXP paper-phenolic at least until more is known about the characteristics of epoxy-glass. Also, some method of through-connecting conductors on opposite sides of etch-circuit cards is being sought which will eliminate the use of silver. It is felt at this time that the only assurance against silver migration is to avoid using silver in any form.

Tests are continuing on etched test patterns to determine how various materials behave with accelerated aging in a temperature-humidity chamber.

2.16. Transistors

Power Supply

(D. J. Eckl) (UNCLASSIFIED)

Plans are going ahead satisfactorily for the elimination of the battery power supply which is now being used by the transistor section. The necessary 6-v supplies are to be obtained from a Raytheon supply by tapping a bleeder resistor. This should be satisfactory for our purposes and require far less maintenance.

2.16 Transistors (Continued)

Semiconductor Physics

(D. J. Eckl) (UNCLASSIFIED)

A report on the crystal diode is in preparation but will take some time to complete.

Counters and Flip-Flops

(E. U. Cohler) (UNCLASSIFIED)

The future feasibility of incorporating a transistor counter into the drum control of MTC was examined. Various practicable designs are being projected and their respective advantages and disadvantages resolved. When a particular counter is chosen it is proposed that it be run in parallel with the existing angular-position counter, through drum pulses provided through present cabling to the transistor section. The transistor system will have independent checking circuitry which will provide a separate check on both the transistor counter and the angular-position counter. Extant data indicate that optimum systems will use pulse stretchers between the transistor system and the drum timing pulse. Factors of reliability, size, and equipment are being weighed relative to a final decision on the type of counter to be used.

Several projected reports have gotten under way recently, of which the report on the junction flip-flop will appear next.

Setting and clearing methods for the transformer-coupled flip-flop have been assayed, and the simplest method seems to be the best (parsimoniously). This circuit will appear in completion in one of the aforementioned reports.

Diode Construction

(N. T. Jones) (UNCLASSIFIED)

The current source and limiter have been set up and operated in 22A-040 in preparation for actual construction of the special minimum-hole-storage bonded diodes. Samples of the Taylor-process wire have been soldered into a special jig for the purpose of gaining experience in handling and for determining the current-carrying capacity of the wire.

Three of the wire samples have been returned to the company for replacement because of discontinuities reported in the last Biweekly Report.

2.16 Transistors (Continued)

Transistor Storage

(N. T. Jones) (UNCLASSIFIED)

Special experiments with a wide variety of transistors have been started by D. Smith. These will include the complete storage characteristics of these transistors when concluded.

Diode Storage

(N. T. Jones) (UNCLASSIFIED)

Diodes from the five-digit multiplier are now being measured for their storage characteristics. Sylvania 5647 vacuum diodes have been purchased for test in point-diode storage measuring circuits.

Transistor Gates

(C. T. Kirk) (UNCLASSIFIED)

A final design of a high-speed transistor gate has been completed and a breadboard model constructed. It was found that the gate would operate satisfactorily up to a pulse repetition frequency of 600 kilocycles. At 500 kilocycles the gate will deliver an output pulse 12.0 volts in amplitude and 0.25 microsecond in width to a 750-ohm load, when triggered by the output of an identical gate.

The only requirements on the transistor that are critical are

1. Rise time ≤ 0.10 microsecond,
2. $\alpha \geq 2.0$.

A rough draft of a memorandum describing this gate has just been completed.

Transistor Core Drivers

(S. Oken) (UNCLASSIFIED)

Selection System for Memory. The diode-gate system was found to be satisfactory for this purpose. A four-core array with a selection system is being constructed. A delay in this construction has been encountered due to the lack of transformer winding facilities.

"Power" Transistors. The npn junction power transistor mentioned previously works well at 200 milliwatts. The point-contact-type

2.16 Transistors (Continued)

(S. Oken) (UNCLASSIFIED) (Continued)

power transistors, on the other hand, did not work well; the R_{co} dropped appreciably.

Recently a pnp junction power transistor was obtained from S. Schwartz of Group 35. When driven by the delay-line-type driver it produced a 12-ma output current with 0.5- μ sec rise time. There was no visible change in output current as V_{cc} varied from 20 to 5 volts.

2.17 Display

(C. Corderman) (CONFIDENTIAL)

Four Typotron tubes are now on life test under conditions reasonably close to their proposed use in the AN/FSQ-7 display. The Typotron test with MTC has been delayed somewhat because of illness but should be ready during the second week of March. Discussions were held this period concerning DID message selection and the facilities which will be needed for erasing Typotrons if they are used for DID.

A visit was made to the DuMont Research Tube Laboratory for the purpose of evaluating their facilities as a possible supplier of Charactron tubes.

(L. B. Martin) (UNCLASSIFIED)

The Typotron life tester is now in operation with provisions for running four tubes. Facilities for testing four additional tubes are under construction.

Life-test log has been started as per Memorandum M-2672. Tube mounts have been modified to take transfer and ion currents as specified in above memorandum.

(M. A. Epstein) (CONFIDENTIAL)

I attended an IBM-MIT meeting at which agreement was reached to limit consideration of DID selection to two possible arrangements.

Work was started on a memo on Typotron erasing in the digital-display system.

(R. H. Gerhardt) (CONFIDENTIAL)

During the past biweekly period some time was spent going over

~~CONFIDENTIAL~~

2.17 Display (Continued)

(R. H. Gerhardt) (CONFIDENTIAL) (Continued)

the logic of the console selection units. With the possibility of having a single track selected for display (i.e., by display assignment, basic category, or mixed category), it is possible to have both bright and dim intensity levels. The planned input to the intensification amplifier will not allow this.

An effort has been made to simplify the switching needed for digital expansion; at present 14 relays are required for each console. It is hoped to reduce the number of relays but not greatly increase the number of diodes required.

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

A critical study of the requirements of a universal amplifier has been undertaken. As presently proposed this amplifier will serve four separate jobs: (1) electrostatic character selection for Charactron and Typotron, (2) electrostatic character positioning (and vector sweep) for Charactron and Typotron, (3) driver for a magnetic-deflection stage in Charactron, (4) driver for cathode-follower line-driver stages in the main display generator.

This amplifier is to be built in a standard six-tube plug-in unit with arrangement for plug-board patching of various feedback circuits and plate loads that may be required to fulfill the needs of these various jobs.

Due to the uncertainty of the final form of the electron optics in Charactrons, the following numbers are only approximate. For character selection the amplifier will receive a 200-v push-pull signal and must supply a 150-v push-pull signal centered around a quiescent 150 volts using only standard supply voltages. A rise time of 2 microseconds to within 90 per cent of its final value is desired. The linearity must be accurate to 5 per cent. It must drive an output capacity of 20 micro-microfarads.

For character positioning the amplifier will receive a 200-v push-pull signal and must supply a 400-800-v push-pull signal centered around the same quiescent voltage as above and also using standard voltages. A rise time of 2 microseconds to within 99 per cent of its final value is desired. The linearity must be accurate to 1 per cent. It must drive an output capacity of 15 micromicrofarads.

For magnetic deflection the amplifier together with the coil-driver stage will receive single-ended signal of 15 volts and must supply 800-ma push-pull to the deflection coil from a 600-v supply (only standard voltages to be used in the universal amplifier). A rise time of 30 microseconds to within 99.9 per cent of the final value is desired. The

Memorandum M-2687

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2.17 Display (Continued)

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

linearity must be accurate to 0.1 per cent.

For line driving the amplifier together with the necessary cathode-follower stages will receive a 40-v push-pull signal and will deliver a 200-v push-pull signal from standard supply voltages. A rise time of 2 microseconds to within 99 per cent of its final value is desired. The load will be determined by the amount and type of cable that will be used (yet undetermined).

In these last two jobs the driver stages will have to be designed before the output specifications on the universal amplifier can be accurately stated. Since the feedback will come from these output stages, considerable care will be required to prevent oscillation. These output stages will add additional phase shift to the feedback at high frequencies so that if the universal amplifier is a three-stage amplifier, the output stage will add a fourth stage making the limiting phase shift 360° . The loop gain must be reduced to less than unity before 180° phase shift is reached. Since 60 db of loop gain is desirable in the magnetic-deflection amplifier to maintain 0.1 per cent linearity, this poses quite a problem.

~~CONFIDENTIAL~~

2.2 Group 63 (Magnetic Materials)

(D. R. Brown) (UNCLASSIFIED)

Enough tested cores for the first memory bank of XD-1 have been obtained. IBM expects to carry the entire core-testing program for the additional memory banks.

General Ceramics batch 3 has been checked at MIT and IBM and found satisfactory. The next step toward resuming core production will be a series of trial firing in the recently modified gas tunnel kiln at General Ceramics.

Results of the operation of the 64 x 64 memory plane made from RCA Victor cores are promising. Margins exist but are not as wide as those obtained with General Ceramics cores.

A series of 2000-core lots is being fired in the electric batch furnace here to determine an optimum firing cycle.

Effect of Current-Pulse Waveshape on Half-Select Signals

(J. D. Childress) (UNCLASSIFIED)

A study is being made of the effect of current-pulse waveshape on the half-select signals. Results so far show that the delta noises are essentially functions of the current waveforms.

Magnetic-Core Pulse Tests

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

Elaborate logic has been assembled which will utilize several new pieces of driving, control, and detecting equipment. This test setup will be used to evaluate the usefulness of the new components, after which measurements of magnetic-core pulse responses will be carried forward to an extent not previously possible. Preliminary work is extremely promising.

60-Cycle Hysteresigraph

(R. Pacl) (UNCLASSIFIED)

The new 60-cycle hysteresigraph is being revised to accommodate changes in the requirements of the test. It will involve a minimum of manual manipulation, with reference to the controls involved.

2.2 Group 63 (Continued)Initial Memory Tests

(J. Schallerer) (UNCLASSIFIED)

The major portion of the last biweekly period was spent in making some preliminary tests on the MTC memory. A low core at register 2551 (octal) digit 16 was discovered. This core peaked early and therefore was sensed late. A check was made with the plane-test results, and that core was found to be bad. The core that was taken out was tested on the semiautomatic tester and proved to be good. It seems that when the replacement was carried out the wrong core was removed.

Pulse-Test Evaluation

(P. Fergus) (UNCLASSIFIED)

Several lots of General Ceramics cores (batch 3) were evaluated to determine whether specifications could be met. All lots indicated good squareness ratios, and delta values on pulse-test equipment were within limits at currents of 740, 820, and 900 milliamperes. Delta measurements were consistently low on all lots. Cores that were fired at low temperatures had peak output voltages below specified values; cores that were fired at the higher temperatures met specified limits. Variations within lots were fairly high, 20 to 30 millivolts.

The Role of Covalence in Spinel

(J. B. Goodenough, A. L. Loeb) (UNCLASSIFIED)

A study of covalent bonding and its influence on the spinel lattice has led to a better understanding of the mechanism responsible for cation ordering. It has also led to a theory of lattice distortion to tetragonal symmetry in CuFe_2O_4 , Mn_2O_4 , ZnMn_2O_4 , and $\gamma\text{-Mn}_2\text{O}_3$. Finally it has led to a theory of covalent exchange as the important antiferromagnetic coupling mechanism in ferrites. Predictions which were made concerning the electrical conductivity through the phase-transition temperature in these materials have been verified by recent experiments done in Holland. Abstracts of two papers which are to be given in Washington, D.C., have been submitted.

Silver Migration

(A. L. Loeb, B. B. Paine) (UNCLASSIFIED)

Memorandum M-2669 has been written on the use of silver in etched-wiring cards. It has been found that silver migration occurs easily through and across the surface of a variety of materials in the presence of moisture

2.2 Group 63 (Continued)Silver Migration (Continued)

and unipolar potentials. Silver migrates more easily than any other metal, so it has been recommended that no silver be used in contact with laminated-plastic materials in equipment which is intended to operate dependably for long periods of time.

Ferrite Synthesis

(F. E. Vinal) (UNCLASSIFIED)

The 36,000 cores prepared in the Harper furnace two weeks ago have been tested and were not found suitable for memory cores at the specified current. Principal fault lay with insecurity in temperature measurements. These matters have now been corrected.

Experimental work has been started toward the production of memory cores from a new chemical system. If our hunches are correct, it would be possible to make memory cores to the present specs, with a large simplification in processing as no refiring process would be required. The new system would not be atmosphere sensitive.

A trip to the Arthur Colton Co., Detroit, was made to discuss specifications for a new core press. This press is to be precisely engineered and capable of greater production than with our Stockes press. It is apparent that the Colton Company can supply us with a good basic mechanism but has not tackled a tolerance problem in tooling such as we require. It seems advisable to obtain the tooling from another source.

(J. Sacco) (UNCLASSIFIED)

Another series in the $MgO.MnO.Fe_2O_3$ ternary system is nearing completion. These batches will serve as a final check on the validity of the low-squareness area previously observed in the diagram.

A number of samples have been prepared to determine the optimum reaction period for our memory-core material. As soon as this data is compiled, two 1-kg batches will be prepared for the production of F-394 cores.

Production of Ferrite Cores

(F. S. Maddocks) (UNCLASSIFIED)

Using special care in recording temperatures, a test firing of DCL-1-180 material in the Harper furnace has been completed. When results of this firing are known, a duplicate firing will be made. Several such

2.2 Group 63 (Continued)

Production of Ferrite Cores (Continued)

firings of test lots of DCL-1-180 memory-core material are planned for the immediate future in order to determine exactly the proper firing conditions for memory cores meeting the present specs.

(R. A. Maglio) (UNCLASSIFIED)

The thermocouple setups used with the Harper furnace have been entirely replaced and revised. The revised arrangements will employ an ice-reference junction instead of the temperature-compensator adjustments supplied with the recording instruments.

The furnace has been loaded lightly (2,000 cores) for another run. It is probable that batches of not over 2,000 cores will be used until it is certain that the proper firing conditions are well known.

SECTION III - CENTRAL SERVICES

3.1 Purchasing and Stock

(H. B. Morley) (UNCLASSIFIED)

A complete inventory of all numbered equipment and components with respective project numbers and locations has been completed as requested by the DDL Property Office. A project has been initiated to renumber all equipment with the new decals which are clearer and easier to read.

A procedure is being developed to identify property on loan from IBM to MIT. This procedure will be formalized after a pending visit to IBM.

In the Stock Room, nonstandard items have been condensed and reduced to minimum in anticipation of the coming move.

3.2 Construction

Production Control

(F. F. Manning) (UNCLASSIFIED)

There have been 36 Construction Requisitions totaling 311 items satisfied since 29 January 1954, and there are 20 Construction Requisitions totaling 1549 items under construction by the Group 60 Electronic Shops.

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

Outside Vendor

(J. V. Mazza) (UNCLASSIFIED)

There are 5 orders now open with vendors totaling 203 items. Deliveries in the past biweekly period have totaled 52 items. Information on specific orders may be obtained from the writer (Ext. 3492).

3.3 Component Analysis and Standards

3.31 Component Analysis

XD-1 Marginal-Checking Relays

(R. Jahn) (UNCLASSIFIED)

The Magnetic Devices marginal-checking relay has been bench tested for time of operation, overlap (make-before-break), and reliability during life. Many of the samples have an undesirable break-before-make condition. High-speed motion pictures taken at 2000 frames per second show that the cam bounces when coil current is cut off. The result is a momentary reopening of the closing contacts. Vibration of the contact springs is also very evident. Allen Smith is working on dampers to prevent reopening of the contacts.

3.33 Standards

(H. W. Hodgdon) (UNCLASSIFIED)

About 75 extra copies of the MRD Circuit Applications Manual have been printed from IBM masters and will be distributed to persons who have requested them.

A Lincoln Laboratory standard on fixed mica capacitors (silvered) has been approved and issued. This item will not be stocked or used in Division 6 for the time being, since the possibility of trouble with silver-ion migration exists. Foil-type mica capacitors will continue to be standard stock in this lab.

Etched Circuits

(C. W. Watt) (UNCLASSIFIED)

Trips were made to Squier Signal Laboratories at Fort Monmouth and to Bell Telephone Laboratories to discuss the writing of specifications for etched-circuit base material and fabrication. The results of these visits confirmed in large measure our previously taken decision (IBM & MIT) to use high-insulation resistance-grade paper-based XXXP phenolic for the cards in XD-1 & XD-2, and to eliminate the use of silver and all plating processes in the card fabrication.

3.34 Vacuum Tubes

(H. B. Frost) (UNCLASSIFIED)

During the past two weeks additional analyses have been made of the tubes removed from the five-digit multiplier. The electrical characteristics of these tubes have changed surprisingly little. Only one out of thirty tubes was more than 30 per cent below the initial values. Three tubes were slightly gassy.

Initial results obtained on the ASTM interface resistance round-robin test were quite consistent for many tubes and quite inconsistent for others. The agreement was better than previous round-robin tests, however. These results are now being analyzed statistically by Bell Telephone Lab statisticians.

A meeting of JETEC 5.5 was held on 10 February in Newark, New Jersey. This was a productive meeting. Objectives for short-testing task force were discussed, and a round-robin test for correlation studies was arranged. There are now four models of our short-testing equipment at other laboratories--IBM, GE, Sylvania, and RCA. A manual to accompany the twin triode and multigrid formats is being written. This manual will be a valuable aid in applications work.

Thesis Research

(H. B. Frost) (UNCLASSIFIED)

Tests on RT 414 have been completed for the time being. This tube checks quite closely with my theory. The final results, which will allow measurement of the donor diffusion constant, are on film which is being processed now.

Additional tests on RT 413 are now in progress. This tube shows some definite anomalies not covered by theory. Sufficient data will be taken to determine the donor diffusion constant and to check the theory relating resistance with emission change. Tests so far have shown that the emission of this tube is too low relative to the coating resistance to give good data on the resistance change during the passage of current.

(T. F. Clough) (UNCLASSIFIED)

A recent shipment of 4X150A's had high leakage currents after the 100-hour burning period. In some cases this resistance path was as low as 50,000 to 200,000 ohms.

S. Twicken and I made an analysis of this condition and found that the leakage resulted from a film which was on the inside of the

3.34 Vacuum Tubes (Continued)

(T. F. Clough) (UNCLASSIFIED)

button-type stem. The condition was emphasized by the burning-in period and appeared to be caused by a silver-solder flux residue which had been left there by the factory during fabrication. The data concerning these tubes is being prepared for presentation to the vendor.

Together with J. Klein of Group 25 and J. Palermo of Group 65, I attended a conference on aluminizing at CBS-Hytron. A detailed discussion of the methods and limitations took place.

Some time has been spent with Groups 25 and 65 on problems associated with the setting up of a proposed automatic electron-trajectory tracer.

(S. Twicken) (UNCLASSIFIED)

During this past period an amplifier was completed to use in conjunction with the General Radio vacuum-tube bridge on Tube Tester, Mod. III. The null detector is a 3-inch scope which is less cumbersome than earphones to operate.

A preliminary test of the feasibility of simulating "down" 7AK7's by reducing the heater voltage of new tubes indicates that whereas screen currents are reasonable in the old tube, they are extremely low in the new tube at reduced heater voltage. More work is to be done on this problem.

Ten 4X150A's were found to have considerable interelectrode leakage after the 100-hour stabilization burning, in some cases as low as 50,000 and 200,000 ohms. Coupled with glass cracks and grid emission on life, this tube type seems to have more than its share of troubles.

A 7AK7 from the buffer drum was found to have a bad case of sublimation. Investigation revealed a wide variation in heater voltage of the units in the drum equipment. This situation is being rectified. A reminder is in order that when new panels or equipment are placed in service, heater voltage at the tube pins should be checked.

A meeting of the JETEC 5.5 Task Force on Pulse Testing was attended on 11 February. A recommendation will be made to the Computer Tube Subcommittee that the maximum pulse ratings be established for 10- μ sec pulses at a 1-per cent duty factor and that a derating curve of peak current vs. duty factor be included in the tube-characteristic data whenever possible.

3.34 Vacuum Tubes (Continued)

(A. Zacharias) (UNCLASSIFIED)

The construction of the Z-2177 life rack was completed.

All pulse characteristics of the 7AK7 were taken and compared with data from a bogie SR-1782A. The SR-1782A data was found to be the same as that of the 7AK7, both pentode and triode connected. The 7AK7 data was then sent to Sylvania as SR-1782A characteristics.

The General Radio vacuum-tube bridge was completely incorporated into the Mod. III Console Tube Tester by the completion of the null detector with associated filters and amplifiers.

3.4 Test Equipment

Test Equipment Committee

(L. Sutro) (UNCLASSIFIED)

The Committee is considering construction of the type of plug-ins now used in MTC, particularly the high-speed flip-flop, Model II, and the gate-tube unit, Model II. These plug-ins differ from those now made available as test equipment in having different pin connections, i.e., the power input to these plug-ins comes in on different pins than it does on the WW units. The advantage of this new line of test equipment would be to make available in plug-in form the circuits to be used in XD-1. Twenty-eight of the plug-in high-speed flip-flops have already been ordered by the Committee for the use of the display section of Group 62. More will be ordered if this type of test equipment is to be made generally available.

Test Equipment Headquarters

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

Requests for Tektronix 514AD oscilloscopes have been hard to meet since there are only 12 in the Division. The 514AD has only one advantage over the 514D, namely, it has a better preamplifier. In all other respects it is the same. We are asking those who use 514AD's and do not need the preamplifier to swap their scopes for 514D's. If this does not relieve the pressure we will convert some of the 60 514D's into 514AD's.

3.5 Drafting

IBM Drawings

(A. M. Falcione) (UNCLASSIFIED)

The Drafting Room has received several complaints from engineers, who believe that there is a considerable delay in receipt of drawings from IBM, due to the fact that the brown-line copies received at MIT have changes dated three to four weeks previous to the date of receipt. The matter was taken up with the IBM personnel, and it was found that the date of the latest change on the drawing is the date that the marked-up print originated at IBM. After that, there are approved procedures required by engineering personnel and Drafting. Therefore, the date on the drawing is not the date on which it was completed by Drafting but merely the date that the marked-up print originated.

AN/FSQ-7 Drawing Number Assignments for MIT

(A. M. Falcione) (UNCLASSIFIED)

We have been requested by IBM to release back to them all drawing numbers previously assigned to MIT for AN/FSQ-7. In the event that drawings for XD-1 are made at MIT it will be necessary to send a teletype to IBM to requisition a number for the particular drawing. The master original will be sent to IBM for Central Control, and MIT will be furnished with a brown-line copy.

AN/FSQ-7 Bill of Materials

(A. M. Falcione) (UNCLASSIFIED)

Due to a recent change in the method of reproducing Bills of Materials at IBM, we will no longer be furnished with a brown-line reproducible copy, but instead we will receive a carbon copy of a Bill of Materials which is not reproducible; consequently, only one copy will be available and held in the Print Room for reference. It may be necessary at some later date to change this procedure; however, for the time being it may be adequate.

Division 6 Document Room

(A. M. Falcione) (UNCLASSIFIED)

All personnel are advised that the Document Room and Library have been separated in accordance with Administrative Memorandum A-157. The administration of the Document Room is now carried out by the Drafting Room Supervisor.

3.6 Administration and Personnel

New Staff

(J. C. Proctor) (UNCLASSIFIED)

Leonard D. Healy is working as a DDL Staff Member and has been assigned to Group 64. Mr. Healy received his B.S. in EE from Georgia Inst. of Tech. and until recently was associated with the Chase Bag Co. of New Orleans, La.

George A. Davidson is working as a Research Assistant and has been assigned to Group 62. Mr. Davidson received his B.S. in EE from the University of Michigan.

Peter C. Tandy is working as a Research Assistant and has been assigned to Group 65. Mr. Tandy received his B. S. in EE from the University of Maine and until recently was employed by RCA Victor Div. in Lancaster, Pa.

Staff Transfers

(J. C. Proctor) (UNCLASSIFIED)

Jerome Stirman has transferred from Group 65 to Group 32 of Div. 3.

Joshua Hayase of Group 61 has transferred to Research Lab of Electronics.

Staff Termination

(J. C. Proctor) (UNCLASSIFIED)

Robert R. Rathbone.

Terminated Non-Staff

(R. A. Osborne) (UNCLASSIFIED)

Robert Beckett
Bessie Cachauni
Richard Heimer
Eugenia Patterson
Allan Sanville
James Ahlgren

3.6 Administration and Personnel (Continued)

Open Non-Staff Requisitions

(R. A. Osborne) (UNCLASSIFIED)

Secretary or Senior Clerk
Senior Detailer