

61
Memorandum M-1583

Page 1 of 17

Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: GROUP 61, BI-WEEKLY REPORT, August 1, 1962

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

2.0 EQUIPMENT ENGINEERING

(E. S. Rich)

Work is going ahead to prepare Room 222 for use as a control center for air defense operations. The room has been painted, windows have been sealed with celotex, the G.O.C. display board put up, and a raised floor built over half of the area so cables may be run beneath it to equipment placed on tables. A sliding curtain will be hung next week to divide the room into two sections so that visitor briefing can go on without disturbing operators watching scopes. The curtain can be opened for visitors to watch the control operations.

During the computer shutdown, the control equipment will be set up in Room 222. Initially this equipment will be those control devices now in use in Room 224. The cables and wiring necessary have been planned and are being fabricated by Group 61 technicians. Dave Israel is studying further details of the room layout, and other facilities such as fluorescent display tote boards and accommodations for handling visitors will be added as plans are completed.

Contact has been made with Syntronic Instruments, Inc. of Addison, Ill., to obtain deflection yokes for two more 16" display scopes. It appears that one of their standard designs may be satisfactory for our use. This will be checked from drawings being furnished and if satisfactory, yokes could then be obtained in 6-7 weeks.

(H. J. Kirshner)

The P.P.I. which was formerly used for displaying Rockport data has been returned to us after modification by Group 24. It appears to be working highly satisfactorily.

The second S.D.V. receiver is expected to be delivered during the week of August 4th. It is not known whether it will be installed for operation with the computer prior to the shutdown scheduled for August 11.

The new VHF installation at the Lexington Field Station has been operated for a brief period of time and appears to offer considerable improvement in signal strength both on receiving and transmitting. The remoting unit for this equipment will be installed in the new operation room.

Revised specifications for a 14-track magnetic recorder are almost complete.

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SECURITY INFORMATION

2.0 EQUIPMENT ENGINEERING (Continued)

(B. Morriss)

The assignment of CPO units for the new in-out orders has been completed. Because many of the commands to be performed were new, a large number of units would have been necessary if the present philosophy of using a CPO unit for a single command had been followed. This would have meant the addition of new CPO units and since many of these commands involve IOE and probably would be of little use in future orders, many of the CPO units were used for several commands.

One method of using the buffer drum as a buffer for slow readers and recorders has been worked out and E. P. Farnsworth is investigating the various ways of using Flexowriter equipment for placing information on the drum and removing it to be recorded. A definite proposal will be written up in the near future.

(J. H. Newitt)

A portion of the past period was devoted to the preparation of the 2nd liaison report on WWI new equipment progress. A number of initial schedule revisions were required for reasons outlined in the report. All personnel concerned with the development of WWI new equipment are urged to study the revised schedule carefully and submit criticism or recommendations. Situations have now crystalized to the point where it appears that the tentative schedule can now be "frozen". Any outstanding data which might have an effect upon this intent should be submitted at the earliest possible date.

The air conditioning specification for WWI new equipment has been issued and selected companies in the field are being interviewed for bidding purposes. The specification is to be issued as the subject of an E note.

(C. W. Watt)

Planning and execution of the work in Room 156 are proceeding about as planned last spring. Rack construction is underway, and installation is promised by the vendor during September. Power supply control panels will be laid out during August, and built and installed during September and October. It is expected that November 1 will find all necessary equipment ready to accept the auxiliary drums. A detailed breakdown of this phase of the installation will be found in Memorandum M-1565, "Installation Scheduling".

(F. Sandy)

A circuit schematic has been drawn showing in detail the power distribution scheme for Room 156. It has been decided to use circuit breakers for the protection of all D.C. and for the protection of the filament lines to the terminal equipment racks.

~~CONFIDENTIAL~~

61
Memorandum M-1583

Page 3

2.0 EQUIPMENT ENGINEERING (Continued)

(F. Sandy) (Continued)

Drawings have been completed, but not checked for the wireways to be installed in Room 156. It is planned to send these to Arlex Co. for a bid on installation and construction.

The power supply control circuit for Room 156 seems to be pretty well decided upon. It is planned to break this schematic down into its panels and get the necessary drafting done during August.

(A. V. Shortell, Jr.)

Modification of the video mapper circuitry and the installation of its alignment setup has been postponed until after the installation of display scopes and auxiliary equipment in Room 222.

Most of the past bi-weekly period has been spent planning the movement of equipment into Room 222. Despite the lack of definite information as to the placement of equipment in this room, the planning for cabling and wiring has been completed and all necessary cabling and wiring should be prepared by the time the movement is started. This procedure should minimize the amount of time required to make the changeover.

To maximize the flexibility of the setup in Room 222 all cabling will be sufficiently long to allow for placement of the equipment anywhere within the room with a minimum of effort. All cabling will be concealed under a platform, which has already been constructed, so that a neat appearance will be maintained regardless of the arrangement of equipment.

3.0 BEDFORD EXPERIMENT

(D. R. Israel)

The flight test schedule for August has been revised and now lists 44 aircraft-hours of activity. A number of tests not requiring the use of the computer have been planned for the latter part of the month. Phil Dolan, formerly of Eastern Airlines, has joined the laboratory to assist in flight test and related matters; he will work with Art Hill.

The problem of communication in connection with aircraft being "scrambled" from Grenier is being solved, at least temporarily, through the use of an L-13 liaison aircraft which flies over Grenier and informs us of the time that the desired aircraft left the ground. It has been our hope that if we knew the speed of the "scrambled" aircraft, the heading he was to take, and the time that he left the ground, that the computer could automatically dead-reckon the path of this aircraft until he reached an altitude where he could be seen by the radar. Our recent tests, however, indicate that the success of this procedure depends upon the direction of the runway used by the aircraft during takeoff; extrapolation of the anticipated path of the aircraft from the time the aircraft leaves the ground can lead to considerable errors if, for example,

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3.0 REDFORD EXPERIMENT (Continued)

(D. R. Israel) (Continued)

the runway used is 180° away from the desired (instructed) heading. As a means of correcting for this, the following procedure will now be used:

- a) if the runway direction is within 60° of the desired heading, extrapolation of the path will begin when the aircraft leaves the ground;
- b) if the runway direction is not within 60° of the desired heading, the pilot should pass over the airport before assuming the desired heading -- in this case the extrapolation of the path will begin when the aircraft crosses over the airport.

In an attempt to improve the tracking of high-speed jet interceptors, particularly when they make turns, I have suggested a procedure in which no smoothing, as such, of the interceptor's x and y components of velocity would be attempted; rather, use would be made of the known speed of the interceptor and the heading which it has been asked to fly. Milt Brand is undertaking an investigation of this scheme which would tie in rather closely to the suggested scheme of tracking the heading angle and speed of a target aircraft.

(A. P. Hill)

During the period from July 18 through August 1, a total of forty aircraft hours were scheduled; however only twenty-four aircraft hours were actually flown. Six hours were cancelled due to weather, four hours were cancelled due to aircraft mechanical trouble, two hours were cancelled because of a computer failure, and four hours were cancelled for miscellaneous reasons.

Breakdown of flight test schedule:

DATE	Scheduled Test	Actual Test Held	Reason for Change in Schedule
July 21	1000-1200 (Israel) Two on One Interception Three A/C.	Cancelled	Weather
July 22	1000-1200 (Israel) Take-Off Initiation One A/C	Cancelled	Working in Room #224
July 23	1000-1200 (Israel) Jet on Piston Interception Two A/C.	As scheduled	
	1330-1530 (Arnow) Coverage (Rock & Scit) One A/C.	Cancelled	Aircraft radio receiver inop. -- A/C returned to base.

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~~CONFIDENTIAL~~

61
Memorandum M-1583

Page 5

UNCLASSIFIED

3.0 BEDFORD EXPERIMENT (Continued)

(A.P. Hill) (Continued)

Breakdown of flight test schedule (Continued):

DATE	Scheduled Test	Actual Test Held	Reason for Change in Schedule
July 24	1000-1200 (Arnow) Coverage (Rock & Scit)	Test held from 1100-1230	Delayed due to A/C radio trouble
	1330-1530 (Israel) Take-Off Initiation One A/C	A/C returned to base Test cancelled	A/C landing gear trouble
July 25	1000-1200 (Israel) AAA Guidance One A/C	A/C returned to base Test cancelled	Computer inop.
July 28	1000-1200 (Israel) Calibration MPS#4 One A/C	As scheduled	
July 29	1730-1930 (Israel) Groud Observer One A/C	As scheduled	
July 30	1000-1200 (Israel) Two A/C Interception using AI Radar - (APG#33)	Two A/C interception	AI radar inop.
	1330-1530 (Arnow) Coverage (Rock & Scit)	As scheduled	
July 31	1000-1200 (Arnow) Coverage (Rock & Scit)	Cancelled	Duplication of test held 1330-1530, July 30
	1300-1500 (Israel) Take-Off Initiation with Observer A/C Two A/C	As scheduled	
Aug. 1	1000-1200 (Israel) Three-Dimensional Intercep- tion. Two A/C	Test delayed two hours	Radio rec. trouble on both A/C

Results of the flight tests held are as follows:

July 23 1000-1200 (Israel) Jet on Piston Interception. Using an F-80 as the interceptor, and a B-29 as the target. Four runs were made.

Run #1 Interceptor at Bedford with target starting from a point twenty miles east of Sanford. No interception, tracked wrong target.

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3.0 BEDFORD EXPERIMENT (Continued)

(A.P. Hill) (Continued)

- Run #2 Aircraft in same starting position. Closest separation with the F-80 passing about 3/4 of mile in front of target.
- Run #3 Interceptor at Newburyport with target at Concord. No interception. F-80 had to return to base -- out of fuel.
- Run #4 Interceptor at Concord, target at Sanford. No interception -- tracked wrong interceptor.
- Note: Radar data was very poor during all runs, missing interceptor 6 out of 10 scans, same trouble on target.
- July 24 1000-1200 (Arnow) Coverage Rockport and Scituate. See section by J. Arnow.
- July 28 1000-1200 (Israel) Calibration Rockport MPS#4 See section by C. Gaudette
- July 29 1730-1930 (Israel) Ground observer coverage test. See section by C. Gaudette
- July 30 1000-1200 (Israel) Two A/C interception, with A I radar. Three runs using a B-25 as the interceptor and a B-17 as the target.
- Run #1 Cancelled -- radar noise.
- Run #2 Best run with 100 yd. interception.
- Run #3 One-mile final separation -- computer failure near end of run.
- Note: The A. I. radar was inoperative and could not be used during test.
- July 31 1330-1530 (Israel) Take-Off Initiation. Four landings and take-offs with an F-51 from Grenier A.F.B were made. Headings after each take-off were 060°-120°-180°-240°. Radar returns at 060°-120° were good, at 180°-240° poor due to heavy cloud clutter in that sector. An L-13 was used as a liaison plane, relaying times of take-off. This system seems to be the best for take-off initiation tests. The last two take-offs scheduled at 300° and 360° were cancelled due to high winds.
- Aug 1 1000-1200 (Israel) Three-dimensional interception. Flight test was delayed approximately two hours. First the B-17 had to return to base and have the radio retuned to correct frequency. Then the radio on the F-51 failed and it also had to return to Bedford to change aircraft.

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3.0 BEDFORD EXPERIMENT (Continued)

(A. P. Hill) (Continued)

One run was made with the B-17 starting at a point 15 miles east of Rockport, and vectoring 345° . The interceptor (F-51) started at Grenier. Closest separation was six miles. This large error was due to a human error of inserting incorrect interceptor speed and wind velocity components in the computer. Altitude received from Rockport (MPS #4) seemed to be within 500' to 1000' of the actual altitude.

(M. Brand)

Beacon Response. Tapes T-176-6 in conjunction with T-1257-1 and P-1257-3 were run on the computer. This program provides a single beacon response line to a multiple target return on the "S" scope and multiple beacons on the "F" scope. A few bugs must be removed from this program.

Smoothing Studies. I have been studying the possibility of the modification of present smoothing techniques to improve the tracking of high-speed sharply-turning interceptor aircraft. To this end a smoothing program has been written in which velocity is not smoothed but is computed from a known and preset A/C velocity. The x and y components of velocity are computed from the product of velocity and the sin or cos of the computed interception heading angle of the A/C. Once the \dot{x} and \dot{y} are determined any other smoothing method for x and y may be used. Initial testing will be done on a modification of PWTTT (1032-4) using NLS-2c for x, y smoothing and SIMRADATA tapes for data. The program has been written but not yet tested.

(P. Cioffi)

The basic Two A/C Tracking Program has been completed including the Lead Angle Solution method for an interception computation.

Projects in connection with the "ad hoc" committee continue.

(C. H. Gaudette)

On July 28 a flight test has held to calibrate the Rockport MPS#4. The results were satisfactory. The average error in the altitude reported by Rockport was approximately +600 feet. In two cases a false position was given followed by a true position in order to determine how long it would take Rockport to pick up the target. In both cases the aircraft was located within one and one half minutes.

C. Zraket and I have now completed the analysis of the problems involved in the Final Phase Interception Program. The task of writing the program will be started soon.

3.0 BEDFORD EXPERIMENT (Continued)

(S. Knapp)

It was discovered that the trouble with MACT-16 was the time counters. The error seemed to be that we were sometimes getting 740 pieces of data instead of the 720 assumed. Charlie Gaudette and I have rewritten the program to use an azimuth counter; that is, the program counts every different azimuth coming in making a total of 256 counts per scan. The program works very well now except that trouble arises if the radar stops picking up one of the targets. After 7 or 8 scans the search sector has moved enough so that the program is looking in the wrong place for the target, and an arithmetic overflow may occur. This trouble will be overcome by automatically ceasing any track on which 5 consecutive misses occur.

(C. Zraket)

A final phase interception scheme utilizing the principles of the final phase guidance program has been worked out with C. Gaudette. The method is currently being programmed for the 2 A/C case and should be ready for the computer after the installation of the new in-out system.

Some new tape recordings have been made of take-offs from Grenier using an F-51 for purposes of testing the automatic "take-off" initiation program.

Study of suitable topics for a thesis is continuing.

4.0 DATA SCREENING

(W. S. Attridge, Jr.)

I have devised a method of positional tracking requiring five storage registers per track. A tentative idea for Multiple Tracking Program #2 is to assign all newly-initiated tracks to five-register positional-track positions. After three scans it is possible to get some idea as to the type of track under consideration (noise, clutter, low-velocity, high-velocity). If the track appears to be high velocity it will be transformed to a ten-register velocity track position. (Low velocity tracks might be treated similarly.) Positional and velocity tracks will occupy the same general storage area, there being a possibility of twice as many positional tracks as velocity tracks.

An idea for immediate rejection of tracks on the basis of the number of returns seems worthy of trial in Multiple Tracking Program #2. The rejection would occur if the number of returns correlated with a positional track were greater than some critical value n , n being proportional to the search area used and the number of radar sets seeing this target. We have found that clouds and mountain clutter both give a much larger number of returns than other tracks. The only objection to this method yet voiced is that many-aircraft formations appearing as multiple returns would be rejected also. This rejection is only possible when the track is in a positional track status.

4.0 DATA SCREENING (Continued)

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

I have started to program a display of radar overlap which should be of interest to Division II personnel.

(J. Ishihara)

Analysis of data from Muldar Tracking Program #1 continues. Screening of the data using a color-code has proven to be a time-saver. A report of this study will be written for future reference.

Re-evaluation of correlation methods being investigated for Muldar Tracking Program #2 seems to be in order, now that Muldar coverage information is available (W. Clark). Further ideas, including suggestions from members of this section, will also be coded and studied.

(P. R. Bagley)

Stationary Clutter Rejection. A first draft of a memorandum has been written summarizing the work to date on programmed stationary clutter rejection.

The most recent stationary clutter rejection program (T-1334) has been run once but failed due to a program error.

(W. A. Clark)

Preliminary figures have been obtained for the distribution of coverage in a typical muldar system (complete data on radar sites and characteristics were not available at the time the analysis was made). These results indicate that of the total area covered in the system (excluding the long-range Truro radar), approximately one-third is singly covered, one-third doubly covered, and one-third covered by three or more radars, with a maximum coverage of six radars.

In collaboration with J. Ishihara, work has begun on an analysis of the effectiveness of superimposing upon the highly-redundant muldar geometry a non-redundant rectilinear grid of variable spacing, chosen in some optimum manner. This would allow the filing of track records according to grid position or box number and, for a given radar, would require data correlation only with those tracks which fall within boxes accessible to that radar and in which tracks are known to be present. The number of correlations thus decreases as the number of boxes increase, although the bookkeeping problem becomes more severe. It is hoped that a substantial net saving in time will result.

(D. Goldenberg)

Investigation has shown that at the end of one scan (15 seconds), an aircraft can accomplish as much as a 180 degree change in heading without the smoothing formulas for velocity (NLS-2c) indicating a change in

4.0 DATA SCREENING (Continued)

(D. Goldenberg)(Continued)

heading of more than 5 degrees. This results because the differences between the predicted position (straight line flight) and all possible curved paths, D_x and D_y , are smaller than 1.25 miles, and, therefore, the previous velocity, \dot{x}_{n-1} , \dot{y}_{n-1} , is corrected by a factor of $1/16$ of the differences ($\alpha_1 = 1/16$). Therefore, the last pieces of data x_n and y_n of position must be considered to be on some curved path of the aircraft and the search area must be large enough to cover the permissible positions of the aircraft after two scans.

The analysis has been completed to a point where it can be said that the center of the search area and the size of the search area which will include all possible paths must vary with the velocity and heading of the aircraft. The equations for the size and center have been determined and efforts are being made to derive a simple approximation to the complex equations.

(N. S. Potter)

A test of the differential correction heading computation was attempted but no results were obtained because of unsatisfactory computer operations. Work is being continued to construct a more satisfactory method of obtaining initial estimates of the heading.

5.0 TRACKING AND CONTROL

(J. Arnow)

Data on most of the simulated tracking programs has been obtained. An attempt will be made to analyze these results during the next few weeks, and it is hoped that some indication will be obtained of the directions in which we should proceed in connection with the logic of the two-radar tracking programs.

Terminal equipment from Scituate is expected during the next bi-weekly period, and possibly some of the presently-written two-radar tracking programs may be tested prior to the shutdown.

A flight test held during the period indicated that the azimuth calibration of Rockport and Scituate is nearly correct. Further work along these lines will be postponed until September.

(M. Frazier)

The simulated-data two-radar single-aircraft tracking program using separate tracking for the two radars, with a common velocity, has been producing data during the past biweekly period. The results are good, but not better than other methods of data combination requiring less red tape.

5.0 TRACKING AND CONTROL (Continued)

(M. Frazier) (Continued)

Work on other programs has been more or less neglected in this bi-weekly period, as the aforementioned program had to give all its data before computer shutdown.

(W. Lone)

Errors have been found in the TRASACT program which correlates with the closest radar, and have been corrected. The program will be run with the various simulated data tapes and results plotted.

A sub-program is being written which saves up all the data in a search circle of A. Mathiasen's single aircraft tracking program. The data is then correlated with the quantized positions about the best fit and a code letter printed out to indicate that we have a double range, double or triple azimuth, etc.

(A. Mathiasen)

The Rockport tracking program (T-1398) has been modified to print time of best-fit in addition to other information (Also see W. Lone above.)

The two-radar test tracking program for simulated data, noted in the last bi-weekly, has been written but not yet tested on the computer.

The short two-radar tracking program has been coded and takes 149 ES registers in toto.

The flow diagram for a two-radar tracking program which prints the r, θ of the best fit for each radar has been drawn up.

(B. R. Stahl)

The three-radar display program is now working.

Most of this bi-weekly period has been spent on the two-radar single-aircraft tracking, best fit program described in the last report. Also, in addition to having been modified to smooth only at constant intervals, Mathiasen's programs have been further modified to track with only one radar. These latest modifications have yet to be tested, and it is hoped that some conclusive results will be obtained before the computer is shutdown this month.

6.0 AIR DEFENSE CENTER OPERATIONS

(D. R. Israel)

The period July 23 - 28 was spent at North Truro, observing the GCI station during the scheduled air defense exercises. This visit was of extreme assistance in understanding some of the problems associated

6.0 AIR DEFENSE CENTER OPERATIONS (Continued)

(D. R. Israel) (Continued)

with air defense center operations. A memo describing this trip has been prepared and distributed to interested parties.

Activity in connection with Room 222 continues along several different channels: a) the memo describing three air defense center programs and their equipment requirements is still in preparation, b) planning continues on the remodeling of Room 222 and the disposition and arrangement of equipment presently in Room 224, and c) investigation of means of data presentation on tote boards in Room 22 is under way.

In connection with c) above, a talk with Dr. William Gardner of Group 21 has proved to be extremely helpful. Dr. Gardner has lent me some equipment which will permit us to make some experiments on the use of fluorescent materials -- crayons, paints, etc -- for use with "dark-light" illumination.

Howard Kirshner and I will visit the quick-fix installation at North Truro during the forthcoming bi-weekly period to obtain some ideas on an inter-communication system for Room 222.

Our previous schedule for flight tests in cooperation with local AAA batteries has been for tests on alternate Fridays. Because of several difficulties which have slowed-up this activity, portions of each flight test period will be devoted to the AAA next week.

(M. Brand)

The GOC single-aircraft tracking program is almost completed but work has slowed in this project due to other jobs.

I worked the Barta end of the 7/29/52 Manchester Filter Center--MIT GOC exercise. The results of this test and the previous one were plotted up on Georef grid paper and correlation curves between GOC reports of target aircraft and the aircrafts own reports were drawn. These plots indicate that whereas the number of stations participating in the exercises on 7/29/52 was no greater than that of 7/15/52, the distribution was so much better that the target aircraft could possibly have been tracked throughout its entire course.

(J. Cahill, Jr.)

Approximately 10 hours were spent in the computer room during the past two weeks assisting at flight tests. Additionally, approximately 5 hours were spent at the AA installation, supervising an AA Guidance test. This test was reported on separately.

A memo has been prepared and submitted to D. R. Israel outlining a proposal for using the WWI computer as a Target-& Battery Evaluator in an AAA defense system. This proposal is presently under consideration.

6.0 AIR DEFENSE CENTER OPERATIONS (Continued)

(J. Cahill, Jr.)(Continued)

At the moment, thought is being given to the Height-Finder Program, T-1100, in an effort to make a modification work that is designed to print out range from Rockport in miles, rather than in thousands of yards.

(C. H. Gaudette)

A flight test in conjunction with the Manchester Filter Center was held on July 29. The observer reports were received at Manchester on the B-29 and were then transferred by direct telephone line to the Barta Bldg. Milton Brand is now correlating these reports with the true positions of the aircraft as reported by the pilot. The results show a definite improvement over the results of the previous test on July 15.

7.0 ASSOCIATED STUDIES

(W. Linvill)

Most of the exploratory work on interceptor guidance is complete. The function of this work is to set limits on the accuracy of guidance possible on the basis of samples and quantized radar data. Reports on this work will be written. Then we hope to look into the problem of correlation of radar returns and to study mechanization of simple guidance schemes.

During this period summary reports for 6782 were written.

(P. R. Bagley)

Program forms. The C-size octal program form (Form DL-481) has been completed and is ready for the printer. Sepia copies are available until the printed copies are delivered. A B-size octal form and a C-size decimal form are under consideration. Multilithed (non-reproducible) A-size block programming forms (DL-475-1 and DL-476) are available on a trial basis; if there is a sufficient demand, they will be printed on paper suitable for making ozalid reproductions.

Indoctrination Program. The present series of indoctrination lectures is complete. One complete set of indoctrination material is kept at my desk. It contains -- in addition to the regular material -- unpublished and recently published memoranda, corrections and notes.

New In-Out System. Some thought has been devoted to the adaptation of Group 61's activities to the new input-output system to be installed in August: bringing the order code up to date, planning for conversion of programs to conform to the new in-out orders, and considering possible new orders.

Subroutine Library. Jointly with Cioffi and Lone an inter-office memo has been sent to Israel recommending that our "subroutine

7.0 ASSOCIATED STUDIES (Continued)

(P. R. Bagley)(Continued)

library[#] consist of memoranda containing, in basic form, subroutines of interest to Group 61 programmers, and suggesting that specific adaptation of a subroutine to a job be the task of the programmer.

Record-Handling Procedures. Jointly with Cioffi and Lone, an up-to-date revision of M-2101 "Record-Handling Procedures" has been written. It will be issued shortly.

(G. Cooper)

Some examples of the use of the recursion formula technique have been worked out. For straight-line flight, this method turns out to be equivalent to that developed by Walter Wells (M-1536) and may be approximated by Limit-Mean Smoothing. An example of curved-line flight has been started, and while it is much more complicated than straight-line flight there appears to be some approximation which will probably simplify the work. Such approximations have been obtained, but have not been used as yet, so that it is not known how much simplification they will provide.

(J. W. Craig)

During the past two weeks, the study of the Mark 65 reports has been completed.

(W. Lone)

I have begun compilation of a library of subroutines for use of Group 61. At a meeting of the Ad Hoc Committee it was decided to write the subroutines in the normal programming manner, perhaps reserving the 200 series of registers for constants. Adaptation of a subroutine for a particular program should be simple. It was decided not to have tapes of the subroutines prepared for a library.

Suggestions for subroutines to be included in the library are welcome.

(I. Mann)

The special input program of the last period worked in a test on the computer. A new program uses 34 registers. It is likely that with the new input orders, the program will use only 32 registers.

(W. Wells & R. W. Sittler)

The past two weeks have been spent in making an evaluation of the effect of airborne radar upon the objectives of the computer-controlled interception. It is felt that this investigation has great significance and should be completed before an overall report on quantization and sampling effects is presented.

~~CONFIDENTIAL~~
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61
Memorandum M-1583

Page 15

8.0 COMPUTER OPERATIONS

(J. Arnow)

The following is a summary of the computer time used by Group 61 during the past bi-weekly period.

Equipment Characteristics	4.75	
MEW Tracking and Control	6.75	
Data Screening	5.0	
Multiple Radar Tracking and Control	22.0	
Air Defense Center Operations	0.25	
Indoctrination Programs	1.5	
Miscellaneous	4.5	
Sub Total		44.75
Flight Tests		5.5
Conversion		0.25
Not Used		8.25
Lost		<u>10.25</u>
Total		69.0

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9.0 PUBLICATIONS

(E. F. Halpern)

The following material has been received in the Library, Whittemore Building, and is available to Laboratory personnel:

LABORATORY REPORTS

1. "Whirlwind II Meeting of July 18, 1952", M-1562, pp. 1-8

CONFIDENTIAL

2. "Group 61, Bi-Weekly Report, July 18, 1952", M-1563, pp. 1-17

CONFIDENTIAL

3. "Whirlwind II Meeting of July 25, 1952", M-1570, pp. 1-7

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TECHNICAL REPORTS

1. "Interception and Escape Techniques at High Speed and High Altitude (Model 416)", W.B.Lklemperer, Office of Scientific Research and Development, NDRC, Division Applied Mathematics Panel, Douglas Aircraft Co., Inc., Santa Monica, Calif., July 24, 1941, Lib. No. 1978

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2. "Heat Transfer in Aircraft Electronic Equipment", D.T.Drake, North American Aviation, Inc., Downey, Calif., March 31, 1952, Lib. No. 1973

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3. "Auxiliary Power Package Solid Fuel Type", Hamilton Standard, Division of United Aircraft Corp., East Hartford, Conn., July 15, 1952, Lib. No. 1972

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