

61
Memorandum M-1539

Page 1 of 17

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Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: GROUP 61 BI-WEEKLY REPORT June 20, 1952

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

1.0 GENERAL

(C. R. Wieser)

Dick Whelan and I discussed radar sites for Cape Cod and decided on some changes as follows:

1. Eliminate Plymouth and Barnstable sites and substitute a site at Camp Edwards (Falmouth).
2. Use the Truro CPS-6B radar instead of one of the small radars (subject to Air Force Approval).
3. Add sites near Nashua, N. H. and East Killingly, Conn. (on Conn.-Rhode Island state line).

A group from Lincoln visited General Electric to discuss their automatic ground-to-air data link. The G.E. system seems more flexible than we had previously thought. Jack Harrington will write a memo describing the system.

(D. R. Israel)

In order to avoid confusion and to simplify filing problems, a numbering scheme will be used to identify all material originating from a "master copy" -- Ozalid, Hectograph, Multilith -- which does not have an M, E, R, or C number. (For example, material prepared for the training of new members of Group 61.)

For identification, on the top left-hand corner of each "master" the number "61" should be used to identify the Group; this will be followed by a period and then a document number. For example, "61.53" will designate document 53. Document numbers should be obtained from Mrs. Susskind or Mrs. Halpern, who will also maintain a list of assigned document numbers as well as a file of the "masters" plus copies.

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SECURITY INFORMATION

2.0 EQUIPMENT ENGINEERING

(C. R. Wieser)

Work on a new deflection yoke design for WWI 16-inch scopes is reported by Mr. Wells to be under way at AFCRC. The new design, which should reduce deflection distortion, will probably be tested in about a month.

(E. S. Rich)

RADIO DATA LINK

M. Antman and H. Glucksman of AFCRC discussed with me some of the details of the new ground-to-air data link which is to replace the present Blue Coder. The new equipment will be capable of transmitting messages up to about 25 digits in length. Decisions on how this equipment will tie to WWI and how data will be supplied to it were made on May 9 in a meeting of Wieser, Arnow, and myself with representatives of AFCRC.

TERMINAL EQUIPMENT PLANNING

K. McVicar and I visited Engineering Research Associates, St. Paul, on June 10 and 11 to discuss progress on the magnetic drum systems. Several details of circuits and construction were considered. A report on the trip has been written and is being published as an M series memorandum.

(H. J. Kirshner)

A training program is in progress for the purpose of better familiarizing Karlsen and Lucy with the operation of S.D.V. terminal equipment. Upon completion of this program, it is hoped that an operating crew of Hill (see III Bedford Experiments) and Karlsen or Lucy will be present during flight tests and during operation of the terminal equipment in Room 224.

"Scotch" Telemetering Tape is on order for use with the Ampex twin-track recorder. This tape is professed to provide greater freedom from drop-outs than that presently used, and if so, should improve the quality of recorded S.D.V. data.

Parts have been ordered for several amplifiers to be used in conjunction with S.D.V. data. Two pre-amplifiers for the Ampex unit, a phone line repeater amplifier and two general purpose amplifiers are to be constructed.

An attempt will be made to set up an improved operations center in Room 224. This experiment will serve as a model for future construction in Room 222.

Beacon data (see III-Bedford Experiments) was recorded on MT-145

2.0 EQUIPMENT ENGINEERING (Continued)

(H. J. Kirshner) (Continued)

and MT-146 on June 19th. As has been noted by others, a beacon response is a very nice way of identifying aircraft under one's control. It appears that if a beacon reply (including the beacon code signal) could be incorporated with the S.D.V. transmission, a useful adjunct to the Cape Cod System would be provided.

(J. H. Newitt)

The effort in the past bi-weekly period was divided between air conditioning work, preparation of the schedule and the liaison report on WWI new equipment and equipment installation considerations.

A further discussion was carried on with Carrier Corp. with regard to including C. Cordeman's test room in the overall air conditioning provision. Carrier has been working on a proposal but has had some difficulty in putting it into written form due to their present work load. I have examined their drawings and discussed the overall problem with them. They now seem to pretty well understand our needs. Some time was devoted to maintenance considerations on the present air conditioning systems in WWI and Room #224. This work is described in an inter-office correspondence called "AIR CONDITIONING SYSTEM CORRECTION", dated June 16th.

With regard to installation work, we have now carried the basic air duct distribution scheme to the point of actual layout in relation to the equipment racks. A compatible arrangement was worked out between duct placement, lighting provision and maintenance access to wireways and rack panels. Layout drawings have been made to check the plan and the scheme seems to be satisfactory from every angle.

The schedule for the fabrication of WWI new equipment has been issued and a liaison report was written to accompany it. The liaison report covers the activities and problems of the various engineering groups involved in the design, construction, test and installation of the equipment. The liaison report is included in this bi-weekly report. Copies of the WWI schedule have been distributed to selected personnel. Other interested parties may obtain a copy by calling the writer.

(F. Sandy)

The design and drawings for the racks for Room 156 have been completed. The order has been written authorizing Arlex Co. to build and install these for us. The construction is to start anytime after July 15, but is to be completed by September 15.

2.0 EQUIPMENT ENGINEERING (Continued)

(A. V. Shortell, Jr.)

Testing of the video mapper with an experimental mask has shown that the equipment when properly aligned will blank every second range increment while passing the intermediate ones. To accomplish this, the length of the spots along the range sweep must be greater than the separation between spots. This is necessitated by the relatively long rise and fall times of the gates produced (approx. 250 μ sec.) and by the finite size of the spot sweeping across the cathode ray tube.

Modification of the Dumont 304H 'scope controls has included the addition of position verniers in both amplifiers and an amplitude vernier in the X-axis amplifier. These vernier controls plus the use of a Tektronix 514 'scope for observing waveforms has greatly facilitated the alignment of the mask with the pattern on the scope.

Some pictures of Scituate radar data, recorded on June 19, have been taken while playing back from tape. The best of these will be made into a mask which will be used by Bob Walquist.

A crude mask made up by Walquist has shown that the device will reject large areas of clutter quite reliably but that widely scattered spots cannot be mapped.

(C. W. Watt)

PLUG IN UNITS

The first 100 plug-in units scheduled to be built in our shop have been finished, and are now being video tested in inspection. The mounting panels for these plug-in units are being assembled. It is expected that these will be completed in about two weeks' time.

Drawings of all the units have been brought up to date, and during the next two-week period a vendor will be selected to assemble the production quantities of the Plug-In Units.

3.0 BEDFORD EXPERIMENTS

(D. R. Israel)

Lack of flight tests still hinders and delays progress.

Arthur Hill, formerly employed by Eastern Airlines, has joined Group 61. He will take over from Kirshner most of the operational aspects of flight tests. Art will also make arrangements for as well as keep records of these tests.

Magnecorder and Ampex Tapes will now be kept in a cabinet in Room 224. Copies of the Magnecorder and Ampex Tape Records and the

3.0 BEDFORD EXPERIMENTS (Continued)

(D. R. Israel)

Flight Test Records will be kept in a file cabinet in Room 224; the "master" records will be kept by Mrs. Susskind as before.

(H. J. Kirshner)

FLIGHT TESTS

Arthur Hill has joined this project and upon completion of indoctrination will assume responsibilities, connected with flight tests, currently shared by Zraket and Kirshner. All requests for flight tests should be made of Hill.

We have been requested to supply Flight Test Wing Operations with weekly estimates of requested flight time for the month of July and monthly estimates through the month of October.

Some confusion arose over flight test scheduling during the past bi-weekly period due to a lack of military pilot personnel. The MIT Instrumentation Lab. was very helpful in providing aircraft for our operations when flying time was unavailable at the Air Force Flight Test Detachment.

A flight test was conducted on June 19th to check the response of a type APN-19 airborne beacon transponder and to record this data for use with a program written by Frank Heart. It was found that triggering of the aircraft's transponder when the aircraft was in a "tail-on" attitude was very poor, whereas "head-on" and "side-on" attitudes produce very good results. Maximum pick-up range appeared to be 75 miles. Lack of "tail-on" response is attributed to the fact that the transponder antenna in the particular aircraft used (B-26 AF262) is well forward in the ship and is shielded during the time the ship presents a "tail-on" attitude. Burak of AFCRC feels that an improvement of maximum range can be obtained by increasing the elevation angle of the beacon receiver (ground station) antenna. He will attempt to improve beacon performance by making the necessary change in elevation angle.

(C. A. Zraket)

FLIGHT TESTS

A 2 a/c Jet Interception was conducted on June 9 employing an F-80 as interceptor and a C-47 as target. The IAS for the F-80 was 320 mph; for the C-47, 135 mph. Two runs were made, each run resulting in the F-80 passing directly beneath the C-47, the respective altitudes being 8,500 and 9,000 feet. The tracking of the jet was successful during both runs. The test was recorded on MT 143.

A 2 a/c Interception employing a B-17 as target and an F-51 as interceptor was held on June 12 for purposes of visitor demonstration.

3.0 BEDFORD EXPERIMENTS (Continued)

(C. A. Zraket) (Continued)

FLIGHT TESTS (Continued)

During the first run the interceptor was not tracked due to initiation on the wrong aircraft. However, the initial vectoring instructions given resulted in a separation of 500 yards. This result was probably due to a combination of correct initial instructions and the straight-line course of the target. The second run was entirely trouble-free, resulting in a separation of 700 yards. This test was recorded on MT 144.

Flight Test activities on June 17 included the testing of the beacon response and height finding experiments in conjunction with the MPS-4 at Rockport. The aircraft employed was a C-47 equipped with a beacon transponder. The results of the beacon experiments were inconclusive.

The height finding experiments were conducted in a manner similar to that discussed in previous bi-weeklies. The Height Finder seemed to be 1000 feet short in most cases as the altitude of the aircraft was varied from 6000 to 10,000 feet. However, the test was moderately successful and indicated that, with practice, the efficiency and speed of operation could be increased considerably. A visit to the Height Finder site at Rockport was made on June 19 and is discussed in another section of this bi-weekly.

Beacon tests were conducted on June 19 using the B-26 equipped with the beacon transponder. Results were excellent except when the aircraft was travelling away from the antenna; the explanation for this being that the aircraft shielded the beacon transponder located in the nose of the ship. Beacon response occurred at 75 miles when the aircraft was travelling "head-on". These tests were recorded on MT 145 and MT 146.

(John J. Cahill, Jr.)

During the past two weeks I have been working on a program to print out the location of a position given in terms of X&Y coordinates from Bedford, with respect to the GOC grid. The program should first print two letters to locate the position within the proper 60mi. x 45mi. box, then four numbers, to locate it within the box to the nearest mile in the E-W direction and to the nearest 3/4 mile in the N-S direction. A program has been prepared and run, but failed to operate on the first attempt, due to a program error and a tape error.

Additionally, I have been working on an analysis to determine the types and sizes of errors encountered when slant range and azimuth information (without height data) from one radar set is used to predict the azimuth and range at which a second set should look for the same a/c. An expression has been derived which gives these errors in terms of two parameters, and graphs will be drawn to determine the nature of the curves obtainable.

3.0 BEDFORD EXPERIMENTS (Continued)

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

During the first week of this period, some time was spent in completing final indoctrination problems.

(P. O. Cioffi)

The basic two a/c tracking-interception program is in the final phases of checking out. It will be completed as soon as the direct methods of interception computation of M1489 - to be published soon - are programmed.

In connection with P. Bagley and B. Lone, such matters as organizing the indoctrination program for Group 61, methods of keeping records, requesting tapes and computer time, and the manner of computer time assignment have been considered.

(F. Heart)

A small amount of time was spent in consideration of: interception equations, jet tracking, and height finder operation.

With Zraket, Cioffi, and Mathiasen a visit was made to Rockport to observe height finder operation. A description of results is indicated by C. Zraket.

(S. Knapp)

The display for the Multiple Aircraft Tracking Program has been changed to indicate misses on the D-scope. Non-linear smoothing (NLS-2c) has also been put into the program.

The modification to MACT-16 to allow for automatic initiation has been written and should be tested in the near future.

(C. A. Zraket)

The following problems have been considered during the past bi-weekly period.

1. Further work is being done on the two explicit solutions for the interception equations. The "lead angle" solution employing an \sin^{-1} approximation has been rehashed with Israel and Cioffi in order that an optimum program will be arrived at. A considerably shorter version of the initial program has been written and will be tried on the computer shortly.

The time solution program has been reviewed in order that anomalies which occur when $V_t \cong V_1$ will be eliminated. No error has as yet been found.

3.0 BEDFORD EXPERIMENTS (Continued)

(C. A. Zraket) (Continued)

2. Automatic Initiation on an interceptor based at Grenier has been reconsidered. A program written for this purpose will be tried as soon as a Flight Test is scheduled and pertinent data recorded on Magne-corder Tape.

3. The basic 2 a/c Interception Program written by P. Cioffi has been checked, and following a few minor corrections, was run successfully on the computer. Special displays, explicit solution for interception, and final-phase calculations will now be added to this program as soon as they are written.

4. Further work, in the form of Flight Tests and analyzing of results, will be done on the Final-phase Guidance Program. As soon as this program gives satisfactory results, final-phase calculations will be incorporated in the Interception Program. Preliminary work has been started on this.

A visit was made to Rockport on June 19 by Cioffi, Heart, Mathiasen, and myself to look at the Height Finder (MPS-4). The operator of the MPS-4 is afforded two displays from which he can determine the altitude of an aircraft. The first display is a conventional PPI; the second a height (feet) vs. Range (0 - 80 mi.) display. Once the radar has been set at the given azimuth, as determined on the PPI, and the aircraft picked up, an indication is given at the correct range on the second display. The altitude is then read off a dial which is correlated with the correct range by manual means. One improvement on our side would be the transmission of range in miles instead of thousands of yards.

4.0 DATA SCREENING

(R. L. Walquist)

Muldar Program #1 was run successfully during this last bi-weekly period and much useful data has been accumulated. The information processed by the program was taken from MT-140, which had recorded on it the track of a jet. The IAS of the jet was 400 knots. The program automatically initiated tracking of the jet and continued to track successfully until the jet (being used for a flight test by us) made a 540° turn over Sanford. In the middle of the turn, the radar set (MEW) failed to transmit a return and the tracking program lost the target. However, on the following scan, the jet was initiated upon and stored in a different tracking channel. The program continued to track the jet successfully as the new target, subsequently dropping the old track for lack of new data.

The total number of actual aircraft tracked by Muldar Program #1 varied from scan to scan. However, at one time, as many as 12 were being tracked simultaneously, the other 13 tracking channels following stationary clutter or rejecting "noise" returns (returns that appear for 1

~~CONFIDENTIAL~~
UNCLASSIFIED

61

Page 9

Memorandum M-1539

4.0 DATA SCREENING (Continued)

(R.L. Walquist)(Continued)

or 2 scans and then never reappear).

The use of automatic initiation has introduced several unforeseen difficulties. One of these is the tracking of Mt. Monadanock (stationary clutter) as 1 or 2 different targets, each of high-velocity status (velocity in excess of 106 knots). Another is the dropping and reinitiation of targets due to data falling outside the search area for a target. These difficulties are being investigated and it is hoped that a simple solution can be found.

(N.S. Potter)

Investigation of a method of computation of heading angles for interceptions requiring approximately thirty orders has been completed. The results obtained from the use of this procedure should compare favorably with the complete solution of the interception equation. The logic involved is somewhat analogous to that governing smoothing programs in which previously estimated quantities are differentially corrected. A report is now being prepared, and should be available very shortly.

(D. Goldenberg)

In addition to the four methods of sorting listed in the previous bi-weekly, a fifth has been programmed. This method consists of sorting groups of the data whose sizes are successive powers of 2 (1,2,4...), the azimuth and range data having first been combined into 16-digit words. Detailed flow diagrams are now being completed to assist others in checking the programs for errors and in checking whether different parts of the programs have been completed with a minimum of operation time.

(P.R. Bagley)

Muldar Data Recording. Some time was spent assisting Attridge and Ishihara in the operation of their Muldar Tracking Program (T-1288).

Filtered Data Recording (T-909) appears to operate satisfactorily and will be used shortly to record filtered data to be processed by the Muldar Tracking Program.

Clutter Rejection. Clutter Rejection for a single radar (T-1255) was modified slightly to compensate for the fact that two successive returns at the same azimuth may not have numerically increasing range values. The program has been rerun successfully and more photographs taken. The program will be rewritten to accommodate any one of three radars, as outlined in the previous biweekly.

~~CONFIDENTIAL~~
UNCLASSIFIED

~~CONFIDENTIAL~~
UNCLASSIFIED

61
Memorandum M-1539

Page 10

5.0 TRACKING AND CONTROL
(W.S. Attridge, Jr.)

During the past two weeks several parameters have been written for Muldar Tracking Program #1. A more elaborate print out program may be used if desired; the F scope display may be doubled in size and a calibrated grid superimposed; the camera may be made to index automatically after a certain number of scans as determined by a FF setting; the search area size may be enlarged.

It is unreasonable to expect a program to track aircraft of speeds as low as 150 knots and as high as 600 knots using the same size search area for all tracks. Results to date have confirmed this fact. The situation becomes even more difficult when overlapping coverage from two or more radars gives a denser group of returns. A provision for assigning search area sizes as a function of speed is now being contemplated.

UNCLASSIFIED
~~CONFIDENTIAL~~

~~CONFIDENTIAL~~

UNCLASSIFIED

61
Memorandum M-1539

Page 11

5.0 TRACKING AND CONTROL (Continued)

(J. Arnow)

The SCR-584 located at Scituate was tied in to the system during the last bi-weekly period. (Terminal equipment for this set is shared with that used for Rockport.) A few tapes were recorded and later played back through the computer. The results were very encouraging. A large number of tracks were observed, many of these occurring at maximum range. The single radar tracking program was used to obtain a printed record of a few of these tracks.

A constant speed antenna drive was installed on this set, and this appears to be operating very well. The time per scan is between 13.25 and 13.50 seconds.

Calibration of the Rockport and Scituate radars will probably take place during the next bi-weekly period using either an L-13 or H-10 as the target aircraft.

(M. Frazier)

Having finally obtained the indoctrination program from the problem supervisor, a tape is being prepared. It is expected that the indoctrination problem will be finished by the next bi-weekly. The Bedford-Rockport tracking program, modified for Scituate, has been run, with fair results. Now that the clock is available, some modification is in order.

One difficulty in Polysmooth turned out to be a tape preparation error which sometimes gave trouble and sometimes did not. Some of the consistent errors are now being studied in an effort to get the program working.

(W. Lone)

The TRASACT program with times and positions averaged has some program errors which I am trying to find. I have located an error in the NLS parameter of the TRASACT FF(first fit) program and hope to operate it successfully during the coming period.

Together with Bagley and Cioffi, I have spent most of this past week organizing the reading and reference material for the indoctrination program and distributing it to the new members of Group 61.

(A. Mathiasen)

NLS 2~~8~~ has been tried with TRASACT I with excellent results using two data tapes. The velocity was exceeded in two to three "scans" and then fell back gradually to the true value staying within four knots of it (180 knots and 240 knots for the two tapes) from then on. The only perhaps undesirable feature was the amount of overshoot, 17% and

CONFIDENTIAL

~~CONFIDENTIAL~~

UNCLASSIFIED

61

Page 12

Memorandum M-1539

5.0 TRACKING AND CONTROL (Continued)

(A. Mathiasen) (Continued)

25% respectively, and the length of time spent more than 5% above the true velocity, 10 and 6 "scans" respectively.

A run of TRASACT I with live data failed because of trouble with the data input.

Because of the variation in scan time of the Rockport radar from 15 seconds and with time, RUPR has been rewritten to enable the operator to quickly change the scan time or to let the program compute the scan time. Also, the printing sections have been revised to occupy less time and to make printing optional with the operator.

Rockport was visited together with Cioffi, Heart, and Zraket on June 19. It was a most enlightening trip. The difficulties at the other end of the line from Whirlwind are now better appreciated.

(B. H. Stahl)

The Rockport timing program mentioned in the last bi-weekly report (T-1299) is working satisfactorily (both mod 0 & mod 1), and a similar program is being written for the Bedford radar.

The three radar display program is written but has not yet been tested because the necessary equipment is not available at this time.

I am still working on the Rockport north-marker indicator (T-1287 & T-1343) and the indoctrination problem.

6.0 AIR DEFENSE CENTER OPERATIONS

(M. Brand)

A detailed program and flow diagram have been written which processes GOC reports and scores them with reference to an initial track report for the first score and to the immediately preceding report thereafter. These reports are scored with reference to change in heading, type of aircraft, number of aircraft, altitude of aircraft and velocity. These scores are weighted and totaled. Initial tests on the computer take groups of data of known tracks in which the reports are read into the computer in chronological order. The program scores, weights and prints the time of report, each of the scores and the weighted total. Weighting constants can be set in the flip-flops. Tests are now proceeding on the computer.

A detailed flow diagram has been drawn incorporating many ideas for a single a/c tracking program using GOC data. Work has started on a GOC single a/c tracking program.

~~CONFIDENTIAL~~

CONFIDENTIAL
UNCLASSIFIED

61
Memorandum M-1539

Page 13

6.0 AIR DEFENSE CENTER OPERATIONS (Continued)

(C. Gaudette)

A GOC conversion program which converts a standard tape of data pertaining to a particular track to a 5-5-6 tape has been operated successfully and data for eight tracks has been processed. The converted tapes are used by M. Brand's GOC Data Analysis Program.

A program which displays all the observer posts of the White Plains area has been written and will be tested during the next period.

(F. A. Webster)

The first week of this period was spent in further computation on ground observer data and revision of report on problems of manual tracking by the ground observer system.

The second week was mostly spent at the M. I. T. conference on analysis of speech communication and in moving to Whittemore.

7.0 ASSOCIATED STUDIES

(P. R. Bagley)

Magnetic Tape. An investigation was made at the computer of some of the minimum timings necessary for successful use of the magnetic tape unit. Multilith masters of magnetic tape subroutines written some weeks ago were proofread.

Ad Hoc Committee. Lone, Cioffi, and myself have been appointed to assist in the indoctrination program (see item under Cioffi's bi-weekly report). The Whirlwind Order Code has been brought up to date and will be published. Notes on Coding are in the process of being rewritten.

Industrial Liaison. An afternoon was spent at an Industrial Liaison Symposium at M. I. T.

(G. Cooper)

Some numerical examples for the filter with delay have been worked out. While it is a complicated process, it is not quite as bad as was first feared.

More detailed thought is being given to some of the bare theory of the thesis research. Another viewpoint has been discovered and is being investigated to determine whether it leads to the same results.

CONFIDENTIAL
UNCLASSIFIED

~~CONFIDENTIAL~~

UNCLASSIFIED

61
Memorandum M-1539

Page 14

7.0 ASSOCIATED STUDIES (Continued)

(F. Heart)

Much of the last bi-weekly period was spent in consideration of in-out equipment, and the writing and rewriting of a preliminary memo about new in-out system operation.

Time was spent assisting in the short indoctrination program.

Some consideration was given to: decimal printing routines, and routines for magnetic tape print and punch operation.

(W. Linvill)

Most of the last two-weeks' period was spent in evaluating the quality of various smoothing procedures. The objective was to establish an upper limit to the quality with which quantized data could be smoothed. The results indicate that the present smoothing is fairly close to optimum. In general it is hard to smooth position to closer than 0.2 of a quantization interval and velocity smoothing errors vary inversely with smoothing time.

A report by Walter Wells derives and summarizes these results.

(A. Perlis)

1. A report, involving an analysis of, and a code for, the differential correction scheme for interception is being prepared (with N. Potter).

2. During the coming week a meeting of the Air Defense Group will be held to discuss the new block coding techniques.

3. Some results using the linear smoothing procedure, in x and y separately, have been obtained on the asymptotic solutions of the linear difference equations having random forcing functions. The quantization error is being treated as a uniformly-distributed random variable on $(-1/2, 1/2)$ mile.

(W. I. Wells)

During the last bi-weekly period the project of analysis of quantization effects has been completed. A method has been discovered that allows one to combine all pertinent factors of the "straight line smoothing" problem into one graph. From the graph, all of the distributions of the variables may be obtained by inspection.

The actual results of this process tend to show that any type of smoothing which considers only 6 sequential samples is not capable of smoothing position coordinates to an appreciable degree,

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7.0 ASSOCIATED STUDIES (Continued)

(W. I. Wells) (Continued)

so as to increase the precision of the data over the precision of the raw data. Velocity components may be smoothed, however, with the result that a substantial increase in precision may be obtained over that of the raw data alone. However, this accuracy obtained with the "ideal" smoothing method is not appreciably greater than that being obtained with the present smoothing processes.

A report will be presented in the near future giving the method used and the actual results obtained.

(W. A. Clark)

A program for the evaluation of the radar coverage distribution in the Cape Cod System has been written and is now undergoing modifications. The coordinates of the radars are introduced by means of a parameter tape; the maximum and minimum ranges of the radar equipment to be used at all sites are introduced by means of FF settings. The presence or absence of any member of the radar system is indicated by a "1" or a "0" in successive digit positions of another FF.

The program is designed to compute the relative amount of area which is covered by p radars (p = 0,1, ... 10) and print out this information for each radar in the system and for the system as a whole.

8.0 COMPUTER OPERATIONS

(J. Arnow)

Radar & Relay Link	1.25
Data Screening	6.75
Tracking & Smoothing	15.5
Aircraft Control	1.0
Miscellaneous	<u>17.25</u>
Sub Total	41.75
Flight Tests	5.5
Calibration	2.75
Conversion	0.75
Not Used	1.5
To Math Group	7.75
Lost	<u>9.5</u>
TOTAL	69.5

UNCLASSIFIED
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Memorandum M-

Page 16

9.0 PUBLICATIONS

(M.R. Susskind)

The following material has been received in the Library, Rm. 217, and is available to Laboratory personnel:

LABORATORY REPORTS

1. "WWII Block Diagrams Group Meetings of May 20 & 22, 1952," Hosier, W.A., M-1506, May 29, 1952, pp. 1-5.
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2. "WWII Block Diagrams Group Meetings of May 27 & 29 and June 3, 1952, Hosier, W.A., M-1511, June 4, 1952, pp. 1-4.
CONFIDENTIAL
3. "Interception Experiments with Bedford MEW," Israel, D.R., M-1515, June 11, 1952, pp. 1-5.
CONFIDENTIAL
4. "A Description of Smoothing Methods Developed in Connection With the Bedford Experiments," Gaudette, C., Israel, D.R., M-1521, June 13, 1952, pp. 1-8.
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TECHNICAL REPORTS

1. "Technical Data Digest," Armed Services Technical Information Agency, January-June 1952, Document Service Center, U.B. Building, Dayton 2, Ohio, Lib. 1690.
RESTRICTED
2. "Miss Distance Determination by Means of Radiation Detection Techniques," Leeder, J., Ordnance Corps, Ballistic Research Laboratories, Aberdeen Proving Ground, Md., October 1951, Lib. No. 1873.
CONFIDENTIAL
3. "Demand Bibliography," BTI-2188, Selected Listing of ASTIA Holdings, Subject: Division (31) Operating Problems; Section (1) Icing, The Armed Services Technical Information Agency, Document Service Center, U.B. Building, Dayton 2, Ohio, May 26, 1952, Lib. No. 253/S.
SECRET
4. "Demand Bibliography," (information same as No. 3 above), Lib. No. 1882
CONFIDENTIAL
5. "Demand Bibliography," (information same as No. 3 above), Lib. No. 1881
RESTRICTED
6. "Project Lincoln Quarterly Progress Report," Division 1 Business Administration; Division 5 Intelligence and Reconnaissance, MIT, Cambridge, Mass., May 1, 1952, Lib. No. 1884.
CONFIDENTIAL

~~CONFIDENTIAL~~
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~~CONFIDENTIAL~~

UNCLASSIFIED

Memorandum M-

Page 17

9.0 PUBLICATIONS (Continued)

(M.R. Susskind) (Continued)

7. "Survey of Simulation Facilities," Advisory Board on Simulation for the Control Systems Dynamic Analysis Facility, The University of Chicago, Museum of Science and Industry, Chicago, 37, Illinois, January 15, 1952, Lib. No. 255/S.

SECRET

8. "Combined Bimonthly Summary No. 29A," (Supplement to Combined Bimonthly Summary No. 29), Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, May 31, 1952, Lib. No. 254/S

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