Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: GROUP 61 BIWEEKLY REPORT, NOVEMBER 12, 1952

1.0 GENERAL

(C.R. Wieser)

I would like to bring your attention to M-1709 which outlines a procedure of assigning computer time nights and week-ends. For most efficient use of computer time it is more important than ever to adhere to proper procedures for requesting time and to keep proper records. Most of these procedures are explained in M-1588 plus Supplement #1. To bring this memo up-to-date, a second supplement will be published during the next biweekly period.

(P.R. Bagley)

A second supplement to M-1588, "Group 61 Records and Procedures," is in preparation, in order to bring the latter up to date.

I am continuing my perusal of reports of outside work in the field of air defense systems.

Among the visitors to Group 61 this period were Messrs. Stoner and Kellogg of Boeing Aircraft, and Captain Baldwin, Lt. Mogan, Lt. Bailey, Lt. Lucas, and M/S Stanistreet of AFCRC.

A general lecture on air defense was delivered to a group from IBM who are associated with Group 62 (WWII).

(R.L. Walquist)

On November 5, a meeting was held to discuss the proposed use of the Truro CPS-6B for height information. Present were: W. Martin and P. Sebring of Group 22; P. Bagley, B. Morriss, E. Rich, and R. Walquist of Group 61.

We were informed that this use of the CPS-6B for height is purely an experiment and no one is at present in a position to know how good the height information will be. We were also informed that the antenna may have to rotate a full 45° before one can be certain that both the vertical and slant beams have swept by the target. This latter situation would indicate that under the worst conditions only eight targets could be checked for altitude in a single revolution of the antenna. It was felt that no definite date could be set as to when altitude information from the 6B would be available at the Whirlwind computer.

2.0 EQUIPMENT ENGINEERING

(J.F. Jacobs, R.C. Jeffrey, Group 62)

Analysis of I.B.M. 701 Arithmetic Element This period was spent checking and revising the arithmetic element block diagram. A preliminary comparison between the I.B.M. 701 and WWI single address order times has been made. On the assumptions that

1. the memory access time is 10 μsec,
2. minor changes in I.B.M. logic and timing can be made,
3. the percentage of times used by the various operations are as reported in M-1325,
4. both machines have a 32-digit word length,

then the single-address order times are:

WWI	18 μsec
IBM	32 μsec

A substantial reduction in the single address order time of the I.B.M. circuits can be effected by the addition of the shift and carry technique. (This would be a major change.) If this were done, the single address order time could be reduced to approximately 23 μsec.

(B. Morriss)

All block diagram work for the integration of the two magnetic drums into the In-Out System has been brought up-to-date and passed on to the appropriate people so that necessary changes may be made. This is reflected in the only up-to-date drawing of IOC, SD 37367-1

The changes in the buffer drum proposed by ERA eliminate the need for 14 gates in each of the MITE units and 8 gates in the unit selector attached to the drum. These changes and several other changes which should eliminate the need for a couple of delays in each MITE Unit have been discussed with A. Werlin who has been preparing wiring and layout drawings for this equipment.

A draft of a note which will revise the sections of E-466, Operation of In-Out Control, which pertain to the block transfer orders has been written.

Considerable time has been spent on the preparation of a note describing the operation of the buffer drum and associated equipment.

2.0 EQUIPMENT ENGINEERING (Continued)

(H.J. Kirshner)

Tests were conducted on a recorder similiar to the one we have been discussing with the Radio Shack and Ampex. These tests gave a measure of linearity, signal-to-noise ratio, and square-wave response.

Since the S.D.V. receiver recently delivered is now operating reasonably well, the original Burroughs S.D.V. receiver has been dismantled and the Burroughs units are to be returned to Group 24.

A replacement H.F. receiver has been received from Group 22 for our H.F. radio installation. This equipment is to be checked with an A.A.A. site on November 13.

(J.H. Newitt)

The past period has been spent in the issuance of the Third Liaison Report (M-1711) for WWI new equipment, preparation of the accompanying schedule sheets, air conditioning installation work (work with contractor and our installation groups) and preliminary considerations for drawing up a specification for tote board display equipment.

We are making arrangements through H. Mercer for building alterations for the new air conditioning system. Preliminary layout drawings are prepared by contractor and have been submitted for our approval. Installation work will start in a few weeks.

(E.S. Rich)

Visit to ERA, St. Paul Minnesota. Rich, Morriss and O'Brien visited Engineering Research Associates, St. Paul, on October 20-22 to discuss design and construction problems pertaining to the two Magnetic Drum Systems now on order from ERA. The Auxiliary Drum System has entered its testing phase and McVicar is now on an extended visit there to follow this work to its completion. A few weeks ago ERA discovered a cross-talk problem in the Buffer Drum System which will require substantial circuit changes to be corrected. A satisfactory solution to the technical problems was reached during our visit so ERA can now proceed with further design and layout of the system. An M-series memorandum is being written covering the details of the visit.

Two other items, not involving the drum systems, were covered briefly during our visit. First, descriptive literature on an electro-mechanical indicator manufactured by ERA was obtained for G. Young who is surveying equipment which might be used for a tote-board type of display. Second, we had a brief discussion with Mr. Daniels on the use of magnetic drums for signal-to-noise improvement in radar-type data. He described a system they had developed for use with a sonar installation in which a special drum with multiple heads on a single track was used for this purpose. Daniels expressed the opinion that clutter rejection

2.0 EQUIPMENT ENGINEERING (Continued)

(E.S. Rich) (Continued)

in radar data such as is needed in the Cape Cod System is a much more dificult problem. Since this problem is the responsibility of Group 24 of Project Lincoln and since ERA has published a report on their work, no further details were discussed. This report is:

Final Engineering Report on D/F
Signal-to-Noise Improvement
PX 29752 29 May 1952
Contract No. AF 30 (120)-437
Engineering Research Associates

A series of meetings has been started in which details of the Auxiliary Drum System are being described to engineers and technicians of Group 62 who will be involved in testing and maintenance of the drum systems and their associated equipment. These meetings are planned for one hour every other day until pertinent details of logical operation, circuits, power control, marginal checking facilities, etc., are covered. To date, one meeting has been held. It is intended that these discussions will give systems personnel a firm background on the expected operation of this drum so integration with the WWI system can proceed as fast as practicable.

(A.V. Shortell, Jr.)

The Dumont scope used with the video mapper has been modified using a slight variation of the scheme reported in E-494 by D. Neville. Tests of the new photomultiplier cathode-follower circuitry with the modified scope will be made next week to see if the mapper can be used with a standard gate panel.

The Teletalk units have been received but we are still awaiting the handsets. The handsets are not plug-in units as Hatry and Young had previously informed us, but they are sending an expert to show us how the handsets are installed. The handsets promised for October 31 are already a week overdue. Difficulties in obtaining Jones Fanning Strips and Barrier Strips are still plaguing us but the supplier has informed us that Cinch-Jones is shipping them from their factory today.

(C.W. Watt)

Progress of MITE Installation. Wiring of room 156 is progressing at a steady rate. The changeover of alternators for WWI proper from the old 400A circuit to the new 600A unit was done Friday, November 7. The 400A unit will be integrated with the 156 system Thursday, November 13, if all goes well, at which point the power facilities for the auxiliary driver will be ready. The driver is expected toward the end of November.

2.0 EQUIPMENT ENGINEERING (Continued)

(C.W. Watt) (Continued)

Plug-In Unit Production. A number of minor mechanical problems have beset the Raytheon plug-in unit production, but they have been overcome and everything should go smoothly from now on. A few plug-in units, the first, were delivered Friday, November 7, and Raytheon expects to make up for its slow start during the next few weeks.

(G.A. Young)

During the last biweekly period, representatives from Raytheon visited the laboratory and proposed a decimal display system using cores for buffer storage. The problem of indicators, which is of interest to us, was not discussed.

A test program for the Auxiliary Drum has been written and is ready to be checked and organized into a final form.

A study of the operation of the Punch, Printers, the PETR, and the Mechanical Reader is being conducted in anticipation of bringing block and line diagrams up to date and writing an E-note describing the units.

3.0 BEDFORD EXPERIMENT

(M. Brand)

Aided Tracking. The analysis of data from the Printing Analysis Program using guidance tapes (containing R, θ, ψ data) is completed. The results using NLS-2C-CV smoothing have been checked and plotted and checked against the results using NLS-2C data. It turns out that the guidance programs as written now do not lend themselves ideally to use with this smoothing in that there is a discontinuity in heading computation four scans before reaching the guidance off-set point. When, however, my results were extrapolated these four scans, it turned out that this type of smoothing is very successful. Whereas plots of $\bar{x}$ and $\bar{y}$ using NLS-2C yield large overshoots and long settling-out times on turns, NLS-2C-CV yields tight, critically damped tracking of the interceptor course. The smoothing has been written into T-2104-12, the basic single-pair interception program, where it will be used for the interceptor smoothing. Test will be conducted during this period on this program (T-2179).

Interceptor Reattack Analysis. C. Grandy and I have written a memo explaining two possible ways of programming interceptor reattack. We have considered a few other ways of attacking this problem but have not as yet analyzed these methods formally. A conference with Major Baldwin and Lt. Mogan, Air Force AI radar observers, has convinced us that if we can program even an inaccurate reattack course, AI radar would probably take an interceptor to a successful reattack.

3.0 BEDFORD EXPERIMENT (Continued)

(M. Brand) (Continued)

Final-Phase Interception Program. I have been working with C. Zraket, C. Gaudette and C. Grandy on final-phase interception flight tests and the rewriting of this program into a master complete interception operations program.

(C. Gaudette)

The new basic two aircraft interception program (T2104) appears to be operating satisfactorily. The magnetic-tape parameter, which stores data on the target and interceptor once per scan on magnetic tape for delayed printing, is being checked out. When this parameter is working, more conclusive information on the operation of the basic program will be obtained.

Several programs are being continued and rewritten in one program. This new program will contain:

a) basic interception
b) height-finder
c) AAA
d) return-to-base
e) automatic initiation from Grenier
f) final-phase

Garth, Cahill, Grandy, Brand and Gaudette will assist in the writing of this program.

(F. Heart)

Single-pair Program. A meeting of interested parties was held in regard to this program. It was decided that during the next two months, two versions of this program would be available. a) One version would include the main program, certain display sophistications, the height-finder section, the anti-aircraft section, an automatic initiation section, and a return-to-base section. This version is being assembled, standardized, and up-to-date copies of the program distributed; at the same time as it is being given final testing. b) The second version will include only the main program and the final-phase sections.

During the next two months an attempt will be made, by the interested people, to rewrite into one program, the sections of both the above versions. This is largely a question of storage "squeezing."

Four-Pair Program. Effort is continuing on a description of a four-pair program. At the same time, S. Knapp and A. Ward have been writing parts of the program. Request for certain equipment changes have been made to H. Kirshner.

3.0 BEDFORD EXPERIMENT (Continued)

(F.M. Garth)

A flight test, under the direction of Frank Heart, was run using my Automatic Initiation and Return-to-Base Program. From nearly all standpoints, it proved to be operational.

Two F-51 aircraft were used with the plan for one to take off from Grenier Air Base while the other observed. It was hoped that at least three take-off attempts could be tried. However, a delay occurred during the first part of the hour-long flight test due to read-in difficulty at the computer. Also, toward the end of the hour the two aircraft were forced to land to refuel. This resulted in only one real test run. During it, practically all the desired features of the program worked. They were: automatic initiation upon the aircraft as it left Grenier, manual cessation of tracking of either the fighter or some selected target, display of only the aircraft being tracked, and return-to-base.

Besides the above program, I have been working on a display program which will enable a display to be made on any combination of the 16 scope lines, each using different sizes and different positions.

(C. Grandy)

Interceptor Reattack. See remarks by M. Brand under this heading.

Final Phase Interception. Some time has been spent attending flight tests and working with other people in this group rewriting and refining the final-phase interception program for inclusion in the new basic interception program.

(S.C. Knapp, A.B. Ward)

MACT-16 (Multiple Aircraft Tracking) has had a fairly successful run on the computer during this period. The automatic initiation worked very well, discarding those returns which were missed five times in succession and displaying velocity vectors for the tracks it retained. Further work on information displays has been put off until the 2-on-1 Interception Program has been checked out. Correlation difficulties have been encountered in this program, but we hope that the addition of an azimuth examiner and a range gate in the correlation section will solve the problem.

A little more work has been done on the Four-Pair Interception Program. A system of time-sharing of zero ranges has been decided upon to enable us to have desired displays without danger of losing any data.

3.0 BEDFORD EXPERIMENT (Continued)

(G. Rawling)

Study of the Multiple Aircraft Tracking-17 Program was continued, with emphasis on display subprograms. Two short programs, (arrowhead, and dotted line between any 2 points) have been completed.

(C.A. Zraket)

Two final-phase interception flight tests conducted during the past biweekly period have given encouraging results. One run employing a tail attack was attempted on October 29. The results of this test could not be completely evaluated since the interceptor pilot did not receive our instructions to turn (radio trouble) but, knowing they were forthcoming within the minute, made the turn anyway. Although results were excellent, there was some question as to their validity.

Three runs employing a head-on attack were made on November 4. All three runs were quite successful, AI (Airborne Intercept) radar pickup being effected in each case at about 6,000 yards dead-ahead. The interceptor continued on course along the attack angle (head-on) in each case in order to evaluate the accuracy of the calculations. The separations reported by the target aircraft when both aircraft passed one another were one mile to the right and 800 and 400 yards to the left, respectively, for each run. This is about the best one could hope for using a "dead-reckon" procedure from the start of the final phase turn.

Some time was spent rewriting the above program with C. Gaudette, M. Brand, and C. Grandy. This is for the purpose of conserving storage space and for the generation of more sophisticated displays when the program is incorporated into the Single-Pair Intercept Program.

Some thought is being put into the problem that arises when an aircraft comes near or crosses the path of another aircraft being tracked by a computer program. In many cases the wrong track is generated during these situations, necessitating re-initiation upon the correct aircraft. This problem has troubled us during many flight tests. A method proposed by J. Arnow wherein a positional track is maintained upon data falling within a large search circle about the predicted position of the tracked aircraft is being investigated. When such a positional track is recognized as a moving target and comes close to the tracked aircraft, the program would automatically cease attempting to correlate and would "dead reckon" the position of the tracked aircraft. Programming requirements for the use of this method in the 2 a/c Interception Program are being studied.

Major Baldwin and Lt. Mogan, AI radar observers with the Bedford Flight Test Group, visited the laboratory on November 5 to discuss our final-phase methods and procedures. This knowledge will aid them in evaluating results of AI radar pickup during flight tests.

4.0 DATA SCREENING

(R. L. Walquist)

As mentioned in the last biweekly, the velocity of an aircraft can create a difference in the positions at which two radars with overlapping coverage report this target when there is a time difference between these returns. If a correction is not made for this positional difference before attempting correlation, two difficulties arise:

1. The search area or acceptance area used for correlation must be increased in size to allow for the target movement;
2. It will not always be possible to associate a radar return with the closest target.

Serious consideration is being given to the possibility of predicting new target positions about once each four seconds in the Cape Cod System whereas smoothing of target position and velocity would be carried out about once each 16 seconds. For a 450 mph target, predicting every 4 seconds would keep the error between instantaneous position and predicted position to within ± 1/4 mile under steady-state smoothing conditions.

A memo on "Automatic Monitoring of Data Screening for the Cape Cod System" (M-1704) has been issued. Comments are earnestly solicited from those who have ideas differing from the ones set forth in this memo.

In order to obtain some idea about the problems of resolution on the 16 inch scopes and especially how well the new off-centering and magnification controls for the 5 inch scopes operate, a program was written which displays a numbered grid of 256 boxes. This program has not yet been operated.

(W. S. Attridge, Jr.)

Preparation of a flow diagram for the tracking section of Muldar Tracking Program #2 has been delayed while some sections of the program are altered in an attempt to conserve registers.

(W. A. Clark)

An overlap analysis of the Tridar system has been completed using 32 x 5 mile Rockport and Scituate radars and an 80 x 16 mile Bedford radar. For these parameters, 75% of the system is covered by one radar, 19% by two radars, and 5% by three radars, with 289 square miles of uncovered area inside the Bedford inner range "gate." The utilization of this system is thus 0.78.

A similar analysis of the Cape Cod System has been delayed by an error in the coordinate parameter tape used with the overlap program.

4.0 DATA SCREENING (Continued)

(D. Goldenberg)

a. The multilith master copy of M-1680, "Time Analyses of Various Methods of Sorting Data," has been proofread and forwarded to the Drafting room and Print room.

b. An inter-office correspondence, which will summarize my work to date on determining the optimum conditions for the size, shape and center of the search area for tracking, is being prepared.

c. A subroutine which reads programs from magnetic tape and stores them in ES was completed.

(J. Ishihara)

Checking of Muldar Tracking Program #2 (MTP #2) - correlation section continues. It is now ready to be put into final form for tape preparation.

A preliminary flow diagram and description of a "box" sort program for MTP- correlation have been drawn up.

(J. Levenson)

I am still checking MTP #2 (Muldar Tracking Program #2), and in conjunction with Seward and Ishihara, several refinements have been made, and certain routines have been made more compact. I am also doing some programming for the "boxes" scheme of correlation.

(H. Peterson)

Under Walquist's direction I have written directions for using tape #2128--Block Storage on Magnetic Tape--and copies are available to anyone that desires them. Also I have spent much time in the computer room trying to find computer time to give this and my display program a thorough check.

The display program now works. It is in subprogram form and requires 55 program registers, 22 permanent storage registers, and 5 temporary storage registers, and displays a positive number, 1 to 99 or H, D, or L, above or below any desired point.

Any spare time I have had has been spent on altitude correction. An answer to the following question would be appreciated: Does the h that satisfies

$$\frac{\int_5^{35}\int_0^{3} E\,dx\,dy}{\int_5^{35}\int_0^{3} dx\,dy} = 2\,\frac{\int_5^{35}\int_0^{h} E\,dx\,dy}{\int_5^{35}\int_0^{h} x\,dy}$$

give me a value of h so that E(x,h) is a good average of E(x,y) over the rectangle 5 to 35 and 0 to 3?

4.0 DATA SCREENING (Continued)

(N. S. Potter)

Work was done on the following programs:

1. Magnetic tape recording of special block form, containing a sum check.
2. Numerical display of the contents of a register, with the center and scope intensification of the display specified.
3. Bar graph display of a block of registers.

The first was complete, and the second abandoned because of the existence of a corresponding program by H. Peterson of virtually identical length. Considerable effort was expended in an unsuccessful attempt to affect a marked saving in storage. The last program will be done shortly and will (a) scale the display to the quantity largest in absolute value, (b) display the addresses of the first and last registers involved and the maximum displacement and (c) index the camera.

(H. H. Seward)

J. Levenson and I continued checking the correlation section of Muldar Tracking Program #2 under supervision of J. Ishihara. Particular attention was given to the manually-operated variable-initiation area and the procedure for coding and storing positional tracks. Conclusions are pending.

5.0 TRACKING AND CONTROL

(J. Arnow)

A flight test held on November 5 produced less than ten minutes of usable data from the Rockport and Scituate radars. It appeared that the radars were slightly out of calibration, but the exact amount could not be determined due to small amount of data available from both radars simultaneously. It is expected that this difficulty can be cleaned up by means of another flight test which will be held during the next bi-weekly period.

The data obtained did help to check out a number of programs that had been previously written but not tested due to the lack of data.

It is hoped that data from all programs having to do with simulated data will have completed their function in the very near future.

(M. Frazier)

The Bedford-Rockport Two-Radar Single-Aircraft Tracking Program has been run, with only one minor and obvious error showing. It should be fully operational by next week.

5.0 TRACKING AND CONTROL (Continued)

(M. Frazier)(Continued)

The separate-tracking common-velocity two-radar simulated-data tracking program is nearly complete and should be run next week.

Thought is being given to a three-radar single-aircraft tracking program (Bedford-Rockport-Scituate) and to a two- or three-radar two-aircraft tracking program. The "semi-real-time" technique (see biweekly of April 25, 1952) may prove useful for these problems.

(J. Hayase)

The study of methods of obtaining height information when two radars track a single aircraft has been abandoned temporarily. A flow diagram for a system that does not use height information is being drawn.

(W. Lone)

The cause of the display trouble explained in the last biweekly has been found. An rc order is followed by an rd to determine whether to initiate on a displayed position. Since an rd redisplays the point, apparently there is enough of a shift in the deflection to give a double display.

The computer request for the simulated version of the two-radar, single aircraft-tracking program with times and positions averaged was submitted before the position change of the cl order. This tape is being converted again.

Some time has been spent in developing a tracking method which will prevent the loss of an aircraft track and fix on another one which may cross the flight path of the first.

(A. Mathiasen)

TRASACT-3PAD (a two-radar single-aircraft tracking program—three-position average deviation) was run with no gross errors detectable. There was trouble tracking the target through clutter which indicates that a better method of correlating be used than that presently employed. Some minor improvements are being made.

An annoying phenomenon, common to the above program and a tracking program of W. Lone's, that of displaying more points than one ought, a phenomenon which was noticed especially with test patterns, was apparently traced to instability in the deflection system caused by the redisplay of a point when an rd order follows an rc order as happens when initiation is through the in-out register. The exact conditions that aggravate this aberrant display are not known.

A minor error was found in TRASACT-3PBF (a two-radar tracking program using simulated data and taking the best fit data of both radars). Its correction should let the program work as intended.

5.0 TRACKING AND CONTROL (Continued)

(A. Mathiasen) (Continued)

RTPR (a single-radar tracking program) has been retested in conjunction with W. Lone's correlation pattern print parameter and is operating satisfactorily.

SYMULDATA (Synthetic Muldar Data) failed of operation for an as yet undiscovered reason.

(B.R. Stahl)

Most of the biweekly period was spent in putting the TRASACT BF (two-radar single-aircraft tracking, best fit) program into final coded form. Also, the Rockport Azimuth-Examining Program was finally checked out and seems to be working properly.

6.0 AIR DEFENSE CENTER OPERATIONS

(John J. Cahill, Jr.)

Together with F. Heart, and J. Arthur and W. Martin of Group 22, a study of height-finder operations has been undertaken with a view toward improvement in technique and equipment. Flight tests for this purpose were conducted on October 28 and November 6. Results of the tests and of the study will be given in a memo soon to be released.

Computer time finally became available, so that an attempt to check out the Simplified Height-Finder and AAA Program, T 2115, could be made. To date, operation has been fairly successful, save for a peculiarity in angle display. An error has been found to account for this, and another attempt to check the program out will be made in the next day or two. T 2116, the interim height-finder program, is now operative.

The radar equipment at the AAA station at Nahant has been sent away for repairs, so no AAA Guidance tests have been possible.

(P.O. Cioffi)

My visits to the Air Traffic Control Center continued this period but with some interruptions for the purpose of assisting in flight test activities. My main effort at the ATCC, so far, is still familiarization of control procedure and the study of a number of publications, mostly by CAA, on various subjects related to air traffic control.

6.0 AIR DEFENSE CENTER OPERATIONS (Continued)

(F. Heart)

1. As a result of several discussion with members of Group 22, modifications were made in the equipment at the Rockport MPS-4 Radar and in the procedure for using this radar. An inconclusive flight test was held to test these changes, and another test will be held next week. A memorandum containing a description of the changes and an evaluation of the MPS-4 is being written by J. Cahill and will be issued shortly.

2. Several procedural changes have been made in flight-test record keeping. The two forms, "Flight Test Request" and "Flight Test Record" have been combined into one form. Members of Group 61 have been requested to complete an "analysis" or "summary of results" soon after each flight test. A more complete record of troubles is being kept to facilitate summarizations of troubles at regular monthly intervals.

(F.A. Webster)

Work is continuing on a memo that discusses the general problems of information transfer between human operators and computing equipment. Mention was previously made of the critical transfer-out problem that relates to displays in an air defense system. An essential question here is: How should displays be categorized and manipulated to enable different groups of personnel to make decisions that are coordinated with the operation of the system as a whole and are suitable for all load conditions? It was also suggested that for certain command applications the transfer-in (to the computer system) of special command instructions might be made more direct. The problem of information transfer is, however, closely linked to the methods by which the computer itself selects and processes data. Discussion of this aspect of the problem will also be included.

7.0 ASSOCIATED STUDIES

(E.J. Craig)

Some success in representing convergence of an iteration process by analogy with a step response of a servo has been achieved. Limitations on convergence as well as an entirely new viewpoint is achieved. The method shows promise.

Future plans involve application of such methods to other forms of iteration and relaxation procedures.

The review of the entire field of Numerical Methods is substantially complete.

7.0 ASSOCIATED STUDIES (Continued)

(J. Hayase)

1. An attempt to establish rigorous definitions of terms arising in WWII Air Defense System is in progress.

2. Coordinates of radar sites in the Cape Cod System were transformed onto a tangent plane situated at a chosen point within the system. The new coordinates of the sites on the tangent plane have been computed.

(J. Levenson)

During the early part of the biweekly period, a study was undertaken of the nature of the correlation process. This did not prove to be too valuable, and has been dropped for the present.

(W. Linvill)

The past two-week period has been spent in preparation of a report on sampled-data servos. A start is being made by Ed Craig on looking at simple iteration procedures as feedback systems. While a couple of simple cases have been worked out, no completely definitive results are available yet.

(G. Rawling)

Study of the Von Neumann memorandum on air defense was continued, with a view towards presentation at a conference meeting.

A complete bibliography of reports and documents (concerning such topics as air defense, interceptor control systems, track-while-scan programs, comprehensive display systems, etc.) available from Lincoln Laboratory Library is available on cards in my possession.

(W.I. Wells)

Work is continuing on a general method of separating noise from signals. Quite general relations have been obtained which allow optimum smoothing of those types of signals where the first probability distribution of the second derivative is stationary, and the second derivative is constant over very small intervals in time. This type of wave has the property that it closely resembles many "practical" situations of interest.

8.0 COMPUTER OPERATIONS

(J. Arnow)

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

Equipment Characteristics	1.25
MEW Tracking and Control	12.00
Data Screening	1.50
Multiple Radar Tracking and Control	3.75
Air Defense Center Operations	1.50
Library of Subroutines	0.50
Indoctrination Programs	0.25
Miscellaneous	4.25
Subtotal	25.00
Flight Tests	6.00
Calibration	0.50
Demonstration	1.50
Equipment	1.00
Time lost	7.25
Time not used	13.75
Total	55.00

9.0 FLIGHT TESTS

(A.P. Hill)

BREAKDOWN OF FLIGHT TEST SCHEDULE

Date	Scheduled Test	Test Held	Reasons for Changes in Schedule
Oct 27	1000-1200 Gaudette Three Dim. Intercepts Two Aircraft 4	Height-Finder Test one aircraft 2	No fighter aircraft available
	1400-1600 Heart Take-off Initiation Two Aircraft 6	Cancelled	Weather
Oct 29	1000-1200 Zraket Final-phase Intercepts Two Aircraft 4	As Scheduled 4	Note: unable to obtain B-25 with A.I. from 6520th; used JD#1 from Project Meteor
	1400-1500 Gaudette Two A/C Intercepts 4	As Scheduled 4	Used Inst. Lab. B-26, unable to obtain fighter a/c from 6520th
Oct 30	1000-1200 Arnow Coverage Rockport & Scituate One A/C 2	Cancelled	No aircraft available
Oct 31	1000-1200 Zraket Final-phase Intercepts Two aircraft 4	Cancelled	Computer Schedule revised Installation Day
Nov 3	1400-1600 Heart Jet Coverage Two Aircraft 4	Cancelled	Weather
Nov 4	1000-1200 Zraket Final-phase Intercepts Two Aircraft 4	As Scheduled 4	
Nov 5	1000-1100 Cahill AAA Test One A/C 1	Cancelled	AAA Battery not available
	1100-1200 Garth Take-off Initiation Three Aircraft 3	Held with two aircraft 3	Only one fighter a/c available, & one observer a/c
	1400-1600 Arnow Coverage Rock. & Scit. One Aircraft 2	As Scheduled 2	
Nov 6	1000-1100 Gaudette Three Dim. Intercepts Two Aircraft 2	Held: Height-Finder test, three aircraft 3	Needed Height-Finder data
	1100-1200 Knapp Two-on-One Intercepts Three Aircraft 3	Held: Two A/C Intercepts 2	Two-on-One Program Not Ready

Total Hours Scheduled = 44 Total Hours Held = 23

10.0 PUBLICATIONS

(M.R. Susskind)

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

LABORATORY REPORTS

1. "Discussion of Group 61 GOC Tests of October 14, 1952 and October 21, 1952, M. Brand, October 28, 1952, M-1695, pp. 1-2.
   CONFIDENTIAL

2. "Automatic Digital Indicator Display Units," D.R. Israel, October 20, 1952, M-1683, pp. 1-11. (FOR INTERNAL DISTRIBUTION ONLY)
   CONFIDENTIAL

3. "Flight Test Schedule for Month of November," A.P. Hill, October 30, 1952, M-1702, pp. 1-2.
   CONFIDENTIAL

4. "Automatic Monitoring of Data Screening for the Cape Cod System," R.L. Walquist, October 30, 1952, M-1704, pp. 1-10.
   CONFIDENTIAL

5. "Group 61 Air Defense Biweekly, October 24, 1952," M-1698, pp. 1-17.
   CONFIDENTIAL

TECHNICAL REPORTS

1. "Errors in Angle Radar Systems Caused by Complex Targets," J.B. Angell, Meteor Report No. 77, M.I.T. Guided Missiles Program, Research Laboratory of Electronics, October 15, 1951, Lib. No. 2120C.
   CONFIDENTIAL

2. "A Near-Infrared Contrast Study of Aircraft Against Day Sky Backgrounds," T.R. Whitney, L.W. Nichols, NAVORD Report 1957, U.S. Naval Ordnance Test Station, Inyokern, China Lake, California, April 7, 1952, Lib. No. 2121C.
   CONFIDENTIAL

3. "Index of Air Force Electronic Components Under Development," (This issue supersedes all previous issues which should be destroyed), Components & Systems Laboratory, Weapons Components Division, Wright-Patterson Air Force Base, Ohio, June 30, 1952, Lib. No. 2122R.
   RESTRICTED

10.0 PUBLICATIONS (Continued)

(M.R. Susskind) (Continued)

4. "Computer Control of 100 Aircraft," Report No. R9, Control Systems Laboratory, University of Illinois, Urbana, Illinois, August 1952, Lib. No. 2119C.

CONFIDENTIAL

5. "Quarterly Progress Report, Division 2-Aircraft Control and Warning, Division 6-Digital Computer," Lincoln Laboratory, M.I.T., June 1, 1952, Lib. No. 2135. (Downgraded to CONFIDENTIAL by reason of removal of SECRET material included in pages V-XVIII inclusive.)

CONFIDENTIAL

6. "Progress Report No. 5, XSSM-A-14 (REDSTONE) Missile," Ordnance Corps, Department of the Army, Redstone Arsenal, Huntsville, Alabama, July 1-September 30, 1952, Lib. No. 277/S.

SECRET

7. "The CORPORAL Guided Missile XSSM-A-17," Bimonthly Summary Report No. 31a, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, July 1-September 1, 1952, Lib. No. 278/S.

SECRET

8. "A Simple Optical Technique for Filtering and Displaying Radar Data," Preliminary Report, Report R-25, Control Systems Laboratory, University of Illinois, Urbana, Illinois, September 23, 1952, Lib. No. 276/S.

SECRET