Digital Computer Laboratory
Massachusetts Institute of Technology
Cambridge 39, Massachusetts

SUBJECT: BIWEEKLY REPORT, February 21, 1954

To: Jay W. Forrester

From: Scientific and Engineering Computation Group

1. MATHEMATICS, CODING, AND APPLICATION

1.1 Introduction

During the period covered by this report 306 coded programs were run on the time allocated to the Scientific and Engineering Computation (S&EC) Group. These programs represent part of the work that has been carried on in 25 of the problems that have been accepted by the S&EC Group. Progress on 15 of these problems is given below in terms of programming hours, minutes of computer time, and progress reports as submitted by the programmers in question.

There were no new problems initiated during this period. However, 6 of the students who participated in the CS Introductory Programming Course have begun work on new problems. In addition to these, preliminary work has also been done on three other problems. More complete descriptions of these problems will be given when significant progress has been made. The following table briefly lists the titles and originators of some of these new problems.

#161	Response of Mass-Plastic Spring System to Transient Loading	S.Sidney, Civil Eng.
#162	Determination of Phase Shifts from Experimental Cross-Sections	F.Eppling, Physics
#164	Partial Cross Sections	W.Kleiner, Physics

#165	Numerical Double Integration	H.Schweinler, Physics
#167	Products of Batch Distillations with Holdup	J.O'Donnell, Chem. Eng.
#168	Indicial Downwash Behind a Two-Dimensional Wing	N.Hobbs, Aeronautical Engineering
#169		E.Hoy, DCL

Information concerning the CS Introductory Programming Course, MIT Course 6.537, and pertinent seminars will henceforth be provided in section 2 (Academic Program) of this biweekly report.

1.2 Programs and Computer Operation

The following summary is included as a guide for interpreting the abbreviations used below. A more detailed description of the terms involved can be found in M-2497.

a. The upper case letter following the problem number has the following significance:
A implies the problem is NOT for academic credit, is UNsponsored.
B implies the problem is for academic credit, is UNsponsored.
C implies the problem is NOT for academic credit, IS sponsored.
D implies the problem is for academic credit, IS sponsored.

The absence of a letter indicates that it is an internal S&EC problem.

b. DIC denotes the Division of Industrial Cooperation.
DCL denotes the Digital Computer Laboratory.
CMMC denotes the Committee on Machine Methods of Computation.
DDL denotes the Division of Defense Laboratories.

100. Comprehensive System of Service Routines, developed by the S&EC Group at the Digital Computer Laboratory for the input conversion of suitably prepared punched paper tapes. When so requested, these routines automatically provide a program with suitable programmed arithmetic, cycle-counting, and output facilities.
:DCL Staff: Arden, 52 hours; Best, 60.5 hours; Combelic, 8 hours; Demurjian, 28 hours; Denman, 30 hours; Helwig, 60 hours; Kopley, 24.75 hours; Porter, 8 hours; Siegel, 10.5 hours; WWI, 535 minutes

Work is continuing on the system of S&EC Group utility tapes to be used after March 15. A written description of the system will be issued as soon as possible.

The input program which was described in the previous biweekly report has been written and is being tested.

The new CS is being modified to operate directly from the drum and to provide a direct read-in facility. The PA section has been revised and is being tested. A new PA post-mortem program is being written.

The old CS is being optimized and will be stored on unit 0 temporarily along with the new CS.

The Summer Session Program is being optimized and rewritten to go onto consecutive drum groups.

An automatic computer logging procedure is being discussed and logging programs are being written.

Helwig

The program for conversion of post-mortem request tapes has been run successfully and is undergoing further testing.

Arden

The section of the CS that processes programmer's requests for use of terminal equipment is being revised for inclusion in CS II. The original version of this section was subdivided so that it would fit into one bank of storage. The new version will make use of all of high-speed storage with a resulting simplification and abbreviation of the over-all program. Provision will be included in this new version for processing automatic curve plotting, axis calibration, and interpreted special character output requests.

Porter

The FOR and iFOR blocks were changed to remove the carriage return that had been provided before each initial request for a page layout. This had caused complications because of the deselection of the magnetic tape after each recording. Henceforth, if one wishes to obtain a carriage return before beginning a new layout he must provide for it in his program.

Demurjian

The DCL memorandum Use of the Magnetic Tape and Delayed Output Equipment (M-2269) has been revised to take cognizance of the installation of the core memory (with the resultant increase in computer speed), the change in drum selection relay operation time, the installation of several alarm and indicator circuits with the magnetic tape equipment, the installation of delayed output equipment for magnetic tape unit 2, etc. The revised memorandum is called M-2269-1.

Denman

A revision of M-1624-1 has been made and will soon be available as M-1624-2.

Kopley

101 C. Optical Properties of Thin Metal Films on transparent backings are determined and printed out automatically by this program; the input data consist of the observed reflection and transmission coefficients, the index of the backing, the wavelength, and the sample thickness. The program calculates by means of an iterative procedure and prints out the index of refraction and the absorption coefficient of the film, the rate of variation of these constants with reflection and transmission, and the film's conductivity and dielectric constant.
:for Professor L. Harris, Chemistry Department, Dr. A. L.Loeb
:by Dr. A. Loeb, (DIC), J. Richmond,
:DCL Staff: WWI, 73 minutes

The program for the approximate calculation of film conductivity from infrared reflection and transmission measurements has been used for a first estimate of films whose infrared properties were measured by Woltersdorff. These results are now being evaluated. The long R, T(n,k) program will now be used to improve or at least check on the accuracy of the first estimate.

106 C. MIT Seismic Project is concerned with the development of methods for locating deep reflections from underground strata in seismic prospecting. The basic method is one of prediction by means of an optimum linear operator.
:for Professor P.M. Hurley, Geology and Geophysics;
Professor G. Wadsworth, Mathematics Department
:by E.A. Robinson (Res. Assoc.);
: DCL : WWI, 331 minutes

During the past two weeks the group has virtually completed the computations involved in a year-long experiment in least squares fitting of linear operators. This last part of the computation involved the derivation of 44 variance curves and 118 set of error curves based on deviations between actual values and values predicted by linear operators.

Programming for spectra has been plagued with output problems but 13 power spectra have been obtained.

107 C. (a) Autocorrelation and (b) Fourier Transform, Integral Evaluation. Programs were developed for these operations for the purpose of obtaining power spectra. The problem remains open for people who want to use these programs.
:for J.E.Ward, Project Engineer, Servomechanisms Laboratory
:by D.T.Ross (DIC), 1 hour; Hamilton, 10 hours
:DCL: WWI, 57 minutes

During the last biweekly period, velocity fluctuations of turbulence studies have been successfully correlated using the correlation program of problem #107, now modified for 300 τ -shifts and for removing the bias.

108 C. An Interpretive Program is being developed that will accept algebraic equations, differential equations, etc. expressed on Flexowriter punched paper tape in ordinary mathematical notation (within certain limits imposed by the Flexowriter) as input and automatically provide the desired solution.
:for Dr. J.H.Laning, Jr., Instrumentation Laboratory
:by J.H.Laning,Jr. (DIC)15 hours; Block, 20 hours
:DCL: WWI, 209 minutes

Seven runs were made during this period; five of these runs were successful. As a result of these, an error in the interpreted instruction of the type CP n was found and eliminated, and errors in the exponential and hyperbolic function routines were located.

A test problem for T.Y.Toong, involving an iteration process for solution of a non-linear two-point boundary value problem in compressible flow boundary layer theory, produced one run that was successful from the coding standpoint; however convergence of results was inadequate.

A second test problem, involving the solution of a differential equation for M. M. Sullivan, was found to involve too large a time increment for satisfactory accuracy. Further test runs for Toong and Sullivan are planned in the near future.

The ASSIGN instruction was also tested successfully and now is available for use. It is worth noting that, so far as coding for the interpreted program is concerned, all programs operated satisfactorily on their first trial.

119 C. Spherical Wave Propagation produced by the sudden release of a spherical distribution of compressed air in the atmosphere is being studied by numerical means. This involves replacing a set of non-linear hyperbolic partial differential equations in 2 independent and 2 dependent variables by a set of difference equations written along characteristics. An iterative procedure is used to solve these equations.
:for Professor C.C.Lin, Mathematics Department
:by A. Ralston (CMMC), 10 hours
:DCL: WWI, 101 minutes

The revised program appears to be working correctly. However, the results obtained from a production run have not yet been fully analyzed.

123 C. Earth Resistivity measurements are used to calculate the Slichter kernel function which, in special cases, can be analyzed to give the actual distribution of resistivity. The method involves least-square fitting a set of polynomials to the measured surface-potential function and integrating the product of this set and the zero-order Bessel function.
:for P.M. Hurley, Department of Geology and Geophysics, DIC 5-6915
:by K. Vozoff (Res. Assist. CMMC)
:DCL Staff: Demurjian, .5 hours; WWI, 24 minutes

The integration program for the Slichter Kernel has been rewritten in a slightly more general and more complete form. The first part of the program now fits a sixth order Legendre Polynomial successfully, but has been hanging up on an illegal output order. This has now been corrected.

In the earlier tape, it was intended to add the remainder term necessary (for the integral over the infinite range) by hand. However, this was found to have a simple analytic expression and so is now added automatically.

126 C. A Data Reduction Program for use in the Servomechanisms Laboratory is being developed in separate stages to be combined at a later date. The first stage is concerned with devising a program to fit polynomials to arbitrary empirical functions using a least squared error criterion. The procedure makes use of Legendre polynomials and matrix multiplication.
:for J.E. Ward, Servomechanisms Laboratory, DIC No. 7138, AF33(616)2038
:by D.T. Ross (DIC);
:DCL : WWI, 116 minutes

The operation of the Polynomial Fit Program is now felt to be satisfactory. Five tabulated functions to be used in the Data Reduction Program have been fitted with maximum errors of 0.001, 0.008, 0.031, 0.026, and 0.003%. One further test is in progress to determine whether or not the highest degree polynomial which can be fitted to a set of data is determined by roughness in the corresponding differences in the data.

The Post-Mortem is being further revised to include fairly comprehensive format both in selecting numbers from storage and drum and in typing format.

It will now be possible to type several functions stored serially (with or without blanks in between) in separate columns or to type several functions stored in parallel (again sandwiched among blocks of extra registers) in separate columns. All of these operations are specified by an easily prepared, mnemonically coded Flexo Tape.

132 C. Subroutines for the Numerically Controlled Milling Machine are being revised and tested. The set of subroutines facilitates programming of the computations involved in the preparation of numerical data used to control the milling machine. The subroutines involve routine numerical and logical operations.
:for J.O. McDonough, Servomechanisms Laboratory, DIC Project 6873
:by J.H. Runyon (E.E. Res. Assist.),
:DCL : WWI, 47 minutes

Coordinates of points for a symmetrical Series 16 wing template spaced for constant arc to chord distance were computed.

An attempt to make a corresponding computation for an asymmetrical section has, so far, been unsuccessful. Satisfactory operation of a cut spacing routine is also still to be obtained. Error diagnosis is continuing.

140. Summer Session System consists of a conversion program, an interpretive routine, and mistake diagnostic routines stored in WWI. A special mnemonic instruction code has been developed for use with this system thus simulating a computer with characteristics quite different from those of WWI. This Summer Session (SS) computer was developed for the use of students participating in the MIT 1953 summer session course on Digital Computers and Their Applications. The SS computer is being used by the E.E. Department courses 6.537 and 6.25 and is available to programmers with suitable problems.
:DCL Staff: Best, 6 hours; Combelic, 3 hours; Siegel, 49 hours; WWI, 244 minutes

The rewritten conversion post-mortem is now operating properly. Conversion of an improperly written program is carried out as far as possible, and all mistakes dicovered are indicated in the post-mortem print-out.

The SS programmed arithmetic routines are new stored on one drum group. This makes it unneccessary to change drum groups during the execution of a program (except for in-out instructions) and results in considerably faster operation of the system.

The Summer Session computer has been modified to include a new feature; pressing the upper activate button during a computation will cause a post-mortem during execution of the next "jump" (transfer of control) instruction.

This provides a convenient method of manually obtaining a post-mortem during a loop. The resulting print-out, since it indicated that the computer stopped on a jump instruction, shows clearly that the computer was stopped manually by the operator.

The drum groups occupied by the SS computer have been rearranged so that they form a single consecutive block. This will permit making a sum-check to determine whether the computer is intact on the drum, and will facilitate the automatic read-in of the SS programs ffom magnetic tape to the drum. Preliminary tests indicate that the computer operates satisfactorily in the new drum locations.

The SS 556 tape has been completely optimized. A version of the programs suitable for recording on a magnetic tape unit will be prepared shortly, and the automatic read-in will be tested.

All the SS instructions, except input-output instructions, have been timed. A memorandum on the speed of operation of the computer will be issued in the near future.

147 C. Energy Bands in Crystals are being studied by finding solutions of the corresponding second order linear differential equation satisfying boundary conditions at the origin. The solutions are found approximately by using the Gauss-Jackson formula for forward integration. The solutions and their first derivatives are to be combined in a sum, the weighting factors being functions of an independent parameter.
:for Professor J.C. Slater, Physics Department, DIC No. 6853
:by Dr. D.J. Howarth (DIC),
:DCL: WWI, 821 minutes

Various special cases which arose in the previous results have been considered in more detail and have shown results of extreme interest. Except for the possibility of further detail being required in certain ranges, production work on the first part of this problem has now been completed.

Testing of the last part of the problem as described in the last biweekly report has proceeded slowly. Particular attention is being paid to simplifying the input requirements and yet conserving working space in the machine. To this end, subroutines have been designed to process the initial data into the smallest possible storage space.

152 D. Diffusion in an Oxide-Coated Cathode is a program to calculate the effects of combined thermal and electrolytic diffusion that occur in an oxide-coated cathode when current is caused to flow through the cathode.
:for W.B. Nottingham, Physics Department, DIC No. 6345
:by H.B. Frost (Res. Assist. E.E. Dept.)
:DCL Staff: Demurjian, 3.5 hours; Denman, 3 hours; WWI, 129 minutes

During this period two sets of results have been calculated, and sufficient information to define the functions originally needed has been obtained. This completes the "constant current" section of the calculations. Experimental work shows that "variable current" results are needed, and program modifications for this result are being made. γ now varies as $\sqrt{n_o}$.

Difficulties with the "format" routine cost some time this period. An original logical error in the routine combined with an electronic logical omission in WWI to make this routine erratic. Both errors have been corrected.

153 C. Gust Response of a Flexible Swept-Wing Airplane is to be determined for various values of wing loading functions, aircraft configuration and dynamic condition parameters, as input data, giving dynamic output data determining the effect of wing flexibility on gust response. The solution involves the calculation of forcing functions and the evaluation of Duhamel integrals by numerical methods. Approximately 120 pairs of linear integro-differential equations are to be solved.

:for Professor T.H.H. Pian, Aeronautical Engineering Department
DIC No. 6691
:by K. Foss (DIC)
:DCL Staff: Denman, 1 hour; WWI, 73 minutes

Special functions for this study have all been programmed and tested successfully giving results to 3 and in some cases to 4 significant figures. The functions will now be calculated for various parameters and punched out. The sets of punched functions will be used to obtain complete solutions.

155 B. Synoptic Climatology. A multiple regression formula is used to predict temperatures from pressure distributions described by Tschebycheff polynomials. The matrix of scalar products which is used in the calculation of the coefficients of the multiple-regression system is being calculated on WWI.

:for Professor T.F. Malone, Meteorology Department
:by R. Miller (DIC)
:DCL Staff: Arden, 10 hours; Denman, 6 hours; Kopley, .5 hours; WWI, 377 minutes

The high-speed computation technique has been applied to several aspects of the general problem of an objective classification of the surface weather elements based upon the large-scale features of the atmospheric circulation near the surface and aloft.

(1) The characterization of the upper-air flow patterns is made difficult by the inherent south to north slope of the pressure surface. Consequently, important changes in the circulation are not fully emphasized when the pressure surface is approximated by an ensemble of orthogonal polynomials. Alternative methods of representation are obtained when the pressure units are standardized*, $\left(\frac{P-\bar{P}}{\sigma}\right)$, or converted into, the most general case, cumulative probability units.

*This implies an assumption of normality.

To test the relative amount of information in each of these representations applicable to the specification and prediction of temperature and precipitation, a Whirlwind program has been written with which orthogonal polynomials have been fitted to each of the three surfaces and also the sea-level pressure surface (for reference purposes) for a sample of five Januaries. Another program has been written to obtain the cross-products of the coefficients of these orthogonal polynomials, Z, which are to be used as independent variables in a multiple regression analysis on temperature and precipitation at a number of stations.

Little difficulty has been encountered and about 75% of the above mentioned work has been completed. Future plans involve obtaining the cross-products of the Z's and the dependent variables.

(2) A program for fitting a surface, using orthogonal polynomials to the pressure pattern of the western half of the Northern Hemisphere has also been set up.

163 C. Ferrite Phase Shifters in Rectangular Wave Guide; transcendental equation. The electromagnetic boundary value problem dealing with the nonreciprocal ferrite phase shifter in rectangular wave guide has been solved. Special cases (assuming negligible magnetic losses) of the resulting complicated transcendental equation have been computed by hand. Additional computations by machine are required to investigate other ferrite materials and to establish a frequency dependence. Since magnetic loss is a figure of merit for the system described it is essential that some investigation be made. For cases in which the losses are significant the system will be a nonreciprocal ferrite attenuator. The numerical solution will be obtained by operating on two simultaneous transcendental equations.

:for Dr. Benjamin Lax (DDL)
:by K. J. Button (DDL)
:DCL Staff: Demurjian, .5 hours; Kopley, 1 hours; WWI, 11 minutes

The first half of the program was written and submitted for a test run. However, the run was unsuccessful because of a programming error. This error has been corrected and another run will be made.

The second half of the program has been submitted for a test run. Both parts should reproduce results which have been calculated by hand. If successful, the two halves will be combined using parameters which are slightly different but of significance. If the appropriate tendencies are observed in the results, the primary scientific investigation will be undertaken.

1.3 Operating Statistics

1.31 Computer Time

The following indicates the distribution of WWI time allocated to the S+EC Group.

Programs	51 hours, 17 minutes
Conversion	19 hours, 55 minutes
Magnetic Drum Test	29 minutes
Magnetic Tape Test	47 minutes
Scope Calibration	59 minutes
Demonstrations (#131)	08 minutes
Total Time Used	73 hours, 35 minutes
Total Time Assigned	78 hours, 51 minutes
Usable Time, Percentage	93.2%
Number of Programs	306

1.32 Program Time Distribution

The following table attempts to show how the WWI time expended on S+EC programs was distributed with respect to machine runs that gave meaningful results (productive computer time) and runs that gave unsatisfactory results (lost computer time). Productive computer time is subdivided to indicate the time involved in actual computations as contrasted with the time expended getting information out of WWI. Computer time lost is subdivided to show the portion of time lost due to errors in the programmer's formulation of his problem (logical errors); due to errors in the programmer's use of the WWI code, CS Conventions, etc. (technical errors); due to tape preparation errors; due to errors by the S+EC computer operators in running the program; due to malfunctioning of terminal equipment; and finally due to miscellaneous causes.

These times are determined as percentages of the time listed above in section 1.31 for programs. The times used in computing these figures are extracted from the biweekly report forms submitted by the various programmers who have used S+EC allocated WWI time.

1. Productive Computer Time
   - Computation 67.4%
   - Output 8.6%
2. Computer Time Lost Due to Programmers Errors
   - Technical 14.5%
   - Logical .7%
3. Computer Time Lost Due to Other Difficulties
   - Tape Preparation .9%
   - Operator's Errors 2.5%
   - Terminal Equipment Malfunction 1.2%
   - Miscellaneous 4.2%

1.33 Tape Preparation (M. Mackey)

An attempt is being made to obtain some idea of the time expended in the preparation of tapes. During the past biweekly period a check was made on the tapes processed

Due to the variations in procedures involved we have distinguished among original complete tapes and the following three types: typed modifications - changes of 11 or more registers which must be typed, converted, then attached to the main program or changes which must be made in the body of a Flexowriter tape; manual modifications - changes punched directly in 556 form and attached to a converted tape; combined tapes - which require duplication of two or more complete tapes.

The following information was compiled:

	Complete Tapes	Typed Mods	Manual Mods	Combined Tapes
No. of Tapes	138	45	66	16
No. of Registers	35982	593	423	
Time Consumed	90 hrs. 46 min.	19 hrs. 26 min.	12hrs. 31 min.	9 hrs. 2 min.

Thus, it may be seen that the average length of an original complete tape is 260.7 registers requiring 39.5 minutes to prepare. A typed modification averages 13.2 registers in length and requires 25.9 minutes to prepare while Manual Modifications average 6.4 registers and require 11.4 minutes for preparation.

2. ACADEMIC PROGRAM

DCL Course. The second half of the CS introductory programming course scheduled in February was given during this biweekly period. This part of the course revealed the philosophy of the CS "simulated" computer and the manner in which the following CS provisions are handled by the conversion program and the programmed arithmetic: cycle control, buffer storage, floating addresses, floating point arithmetic, temporary storage, preset parameters, relative addresses, and the means by which the programmer may go from Whirlwind programming to CS programming and vice versa.

MIT Course. Twelve students are enrolled in the MIT course, "Digital Computer Applications Practice" (6.537). All of these students have taken the prerequisite course, "Introduction to Digital Computer Coding and Logic" (6.535). Half of the 6.537 course will consist of research in and programming of a term problem using Whirlwind and/or Comprehensive System Code. The remaining half of the course will consider: advanced treatment of the preparation of coded programs; techniques for handling various forms of storage and terminal equipment; detection of errors and mistakes in programs; use of scale factors; use of subroutines.

Seminars. On 19 February, J. D. Porter of the Digital Computer Laboratory Staff spoke at the seminar on advanced programming techniques for Whirlwind I. Porter described the procedure used in CS for handling automatically programmer's requests for use of terminal equipment.

The spring series of seminars on computing machine methods will begin on 23 February and meet biweekly thereafter. Advanced notices of these meetings may be obtained from Miss Marean, MIT Ext. 3762.

3. COMPUTER ENGINEERING

3.1 WWI Systems Operation
(L. L. Holmes, A. J. Roberts)

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

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

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

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

3.11 Core Memory
(N. L. Daggett)

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

3.12 Typewriter and Paper Tape
(L. H. Norcott)

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

3.2 Terminal Equipment
(R. H. Gould)

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

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

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

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

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

3.21 Scope Deflection
(T. Sandy)

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

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

3.22 Magnetic Drums
(H.L.Ziegler)

Planning for installation of electronic-head switching for writing in the auxiliary drum has begun following the recent decision to proceed as outlined in M2617. Proposed power and circuit arrangements are nearly complete and ready to submit for approval. If approved, the power wiring can begin almost immediately.

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

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

3.23 Magnetic Tape
(M.S.Demurjian)

The spare magnetic tape unit will be connected to the spare Flexowriter to relieve some of the output congestion. Farnsworth is handling the circuitry and control paneling needed to exchange units 2 and 3A/3B whenever desired.

A new soundproofing box is being designed to provide better access for utility and maintenance. The paper feed and chad disposal is being specially considered. This box, when constructed, will house the Flexowriter connected to units 3A/3B. The box now in use will then house the spare.

3.24 Ferranti Reader
(F. E. Irish)

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

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

4. ADMINISTRATION AND PERSONNEL

Staff Termination

Robert R. Rathbone

Terminated Non-Staff

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

5. LIBRARY ACCESSIONS LIST

The following material has been received in the S&EC Library, Barta 109.

Library Files

No.	Author	Title
B-58	N. Minorsky	Non-Linear Mechanics
B-189		Proceedings of the Symposium on Spectral Theory and Differential Problems
B-190	Cuthbert C. Hurd (Ed.)	Proceedings - Computation Seminar 1949
B-214	Cuthbert C. Hurd (Ed.)	Industrial Computation Seminar 1950
B-215	Cuthbert C. Hurd (Ed.)	Proceedings - Computation Seminar 1951
B-225	R. Zurmühl	Matrizen
B-282	Natl. Bur. of Standards	Simultaneous Linear Equations and the Determination of Eigenvalues

5. Library Accessions (cont.)

No.	Author	Title
C-25	Wadsworth, Robinson, Bryan, and Hurley	Detection of Reflections on Seismic Records by Linear Operators (Reprint from GEOPHYSICS)
C-74	Office of Naval Research	The Belgian Computer
C-95	David P. Perry	Minimum Access Programming
D-36	Natl. Bur. of Standards	SEAC Operating and Programming Notes III

The following material has been received in the Library, Barta 009.

Library Files

No.	Source	Title
2635	MIT	Iteration Procedures for Simultaneous Equations (Sc.D. Thesis, E. Craig)
2640	MIT	A Comparison between Numerical and Differential Analyzer Methods of Solving Differential Equations (MS Thesis, H. Neumann)
2641	Ballistic Rsch. Labs.	Coding for the Bell Relay Computers, Model 5-MR #725
2643	Argonne Nat. Lab.	Proceedings of a Symposium on Large-Sclae Digital Computing Machines
2644	Brick and Clay Record	Cybernetics in Our Day--our second Industrial Revolution--the age of automatics
2660	Lincoln	A Class of Multiple-Error-Correcting Codes and The Decoding Scheme (TR#44)
2663	Servo Lab.	A Mistake Diagnosis Routine for Whirlwind I Programs
2667	ONR/London	French Work in the Field of Digital Computers
2684	NBS	The Diode-Capacitor Memory
2685	BRL	Analysis of a Relay Servo Mechanism
2686	Servo Lab.	A Simple Method for Calculating the Time Response of a System to an Arbitrary Input
2690	Remington Rand	The Programmer

Laboratory Reports

No.	Author	Title
M-2498	E. Wolf	Storage of Programs on Magnetic Tape
M-2540	N.Daggett	Revision of Test Control
M-2560	D.Arden F.Helwig	Proposed Change in Operation Timing for the Instruction "CP"