CUC

TO: The Technical Staff

FROM: Carl H. Reynolds

DATE: March 16, 1967

One of the two or three principal tenets of operation of CUC is that of decentralization. Each of our offices operates almost as a separate company with only financial and administrative support being given on a centralized headquarters basis. Each office makes and fulfills commitments with occasional assistance from the outside. This philosophy has, I believe, many advantages. In the first place, it should encourage initiative and responsibility at the place where they can most effectively be exercised. Secondly, it should provide a wider range of professional experience and growth to our staff. But, it has some disadvantages. The principal disadvantage is that it makes it difficult for us to bring to bear the maximum possible technical talent at a particular time and place. From the junior staff's point of view, technical advice and direction is not as available as might be desired. From the senior staff's point of view, outstanding talents often go unused because the local situation does not require them. From a company point of view, our proposals and contract work sometimes do not reflect the capability of CUC as an organization but may instead reflect a temporary local weakness.

It is our desire to attempt to alleviate the disadvantages of our approach without contradicting the underlying philosophy. The first step in doing this is the announcement of the positions of Corporate Technical Director and Associate Corporate Technical Director. From time to time, specific appointments will be made to these posts. The incumbents will carry dual responsibilities. First, they will have the normal responsibilities of their rank to the office in which they are located. Secondly, they will have staff responsibilities on a Corporate-wide basis as will be discussed below.

In general, a Corporate Technical Director will be a Principal Analyst with outstanding experience and achievement in specified areas of CUC interest. An Associate Corporate Technical Director will usually be a Staff Analyst or Senior Staff Analyst with outstandi ng experience and achievement in a more limited range of CUC interests.

It is our intention that these positions will reflect honor both on the individuals assigned and on CUC.

It will be the responsibility of these people:

1. to stay knowledgeable and current in their assigned areas of technology.

2. to provide TIS with information concerning their areas of interest which should receive company-wide distribution.

3. to assist the management of CUDC in the assessment of our strength and opportunities in their assigned areas.

4. to provide advice and direction to the sales effort of CUC offices.

5. to assist local and CUDC management in the technical evaluation of projects as desired and necessary.

I believe the creation of these positions offers our technical staff an increased opportunity for effectiveness and growth; our clients better service; and CUC an opportunity for increased growth and profitability.

The first assignments are as follows:

Mr. Charles Sheffield will be Corporate Technical Director responsible for the general area of Scientific Computing.

Mr. George Trimble will be Corporate Technical Director responsible for the general area of Systems Programming.

Mr. Edward Fritz will be Corporate Technical Director responsible for Probability and Statistics.

Dr. Richard Haefner will be Corporate Technical Director of Nuclear and Reactor Physics.

Dr. Kurt Eisemann will be Corporate Technical Director for Mathematical Programming.

Mr. Martin Hopkins will be Corporate Technical Director for Processing Languages.

Resumes of all these men are included so that you will have some idea of the kind of men they are.

Drs. Eisemann, Haefner and Fritz will take direction in the implementation of this Corporate assignment from Mr. Sheffield. Mr. Hopkins will take direction from Mr. Trimble.

Your manager will be pleased to discuss this matter with you in further detail.

CHR:gg
enclosures

Charles Sheffield - Technical Director

Mr. Sheffield was graduated with first-class honors from St. John's College, Cambridge University, in 1958 with an M.A. in Mathematics and Theoretical Physics. He won the distinctions of being a Hoare Exhibitioner in 1955 and a Wrangler in 1957. Special subjects in his post graduate work were theoretical nuclear physics, astrophysics, and the theory of hydrodynamic stability.

From 1958 through 1961 Mr. Sheffield was employed as a Theoretical Physicist with the Atomic Power Division of English Electric Company. His work included nuclear reactor shielding calculations and neutron flux analyses with especial emphasis on fine structure determinations using small source theory.

He was responsible for the development of the GASH series of programs for nuclear shielding studies on the DEUCE computer, the development and programming of a novel method of stress calculations for reactor containment vessels, and the development of a three-dimensional small source theory for neutron flux fine structure calculations. He led a team of mathematicians and physicists in applying and programming the above method for the SKIP reactor code under contract to the United Kingdom Atomic Energy Authority.

With CUC Mr. Sheffield has had complete responsibility for the design and implementation of the GISMO system, a matrix manipulator written for the IBM 7090 computer. This system was used in radio telescope structural analyses, and on this project he found a novel iterative solution to the problem of inelastic beam buckling.

Mr. Sheffield has performed design studies and program definition in air traffic control for the Federal Aviation Agency. Included in this project were fast-time simulation studies using multiple aircraft models, a control error analysis, and a kinematic model for the automatic detection and prediction of mid-air conflict situations.

He has been engaged in applying variational methods to the solution of differential equations in developing analytic and numerical integration methods for earth satellite orbits and in leading a team of mathematicians and programmers in the "GEO STRETCH" program in conjunction with the U. S. Naval Weapons Laboratory, Dahlgren, Virginia. This project uses observations of artificial earth satellites to calculate a detailed picture of the Earth's local gravitational field and surface geometry.

Another project in which Mr. Sheffield participated was with the staff of NASA's Langley Research Center. This involved work on the mathematical models and program design of the "LUNGFISH" project to determine the gravitational field of the moon.

George R. Trimble, Jr. - Principal Analyst

Mr. Trimble received a B. A. from St. John's College, Annapolis, Maryland, in 1948. He subsequently specialized in the study of numerical methods at the University of Delaware and received an M. A. in mathematics in 1951.

In 1949 Mr. Trimble became a member of a pioneer group of mathematicians in the Computing Laboratory of the Ballistics Research Laboratories, Aberdeen Proving Grounds, Maryland. Here his duties included analysis and preparation of numerous types of data reduction and trajectory problems for a variety of the earliest electronic computers, including ENIAC, EDVAC, ORDVAC, the IBM Relay Calculators, the Bell Relay Calculators, and the IBM Card Programmed Electronic Calculators. In this work, Mr. Trimble developed many original techniques from the standpoint of both mathematical analysis and machine applications.

In 1952 Mr. Trimble left Aberdeen to join IBM as a senior staff member in their Applied Science Division. Mr. Trimble spent most of the next three years working on the logical design of equipment on the basis of application requirements. He contributed very heavily to the design and techniques for the use of the IBM 650 computer and for the addition of its magnetic core storage, magnetic tapes, indexing accumulators, RAMAC, and automatic floating decimal attachments. He also contributed to the design of the IBM 608 transistor magnetic core calculator, the 610 Auto-Point computer, the 305, the 704, the 705, the 7070 (STRETCH), and several experimental machines. Mr. Trimble's basic contribution in these areas was in regard to machine requirements from the standpoint of computer application. This work required substantial study of applications both in technical and business data processing areas.

In 1956 Mr. Trimble joined CUC, where he has performed analysis and has supervised major programs for many applications using a wide variety of machines, including IBM 650, 702, 704, 705, 1401, 1410, 7030 (STRETCH), 7070, 7090/94, 7740, System/360, Honeywell 800, G-15, ISI-609, Datatron 205, CDC 1604, CDC 160-A, ASI-420, UNIVAC 1107, UNIVAC SS-80, SDS 920, and Burrough D825, and GE-415.

Apart from heavy contributions in computer design and engineering applications, Mr. Trimble has concentrated his efforts in Large Scale Systems Analysis, Programming Systems, specializing, in the past few years, in Real-Time Systems work.

Mr. Trimble directed the Computer Concept Study for the integrated control of a submarine. This study involved the determination of the optimum architecture of a computing system to perform all the necessary tasks associated with the control of a modern submarine. The allocation of tasks to the various computers, the design of the executive system for controlling each of several possible configurations and the organization of the input/output system, were all major aspects of the problem. The final stage of the study was the evaluation of three possible configurations with respect to vulnerability, reliability, safety, communications, capacity, and cost.

A study conducted as part of the MINUTEMAN Reliability Program examined means of utilizing computers to process data obtained from automatic test equipment to reduce the data in real-time. A second study considered use of semi-automatic test and data recording equipment with off-line processing through improvement of existing equipment and procedures.

Another major real-time application led by Mr. Trimble was the use of data processing equipment in Air Traffic Control. Among the assignments undertaken as part of this project were the determination of programming languages to be used, definition of dynamic simulation requirements, development of system simulation techniques, development of management control programs and development of methods for analyzing and evaluating experiments.

Included in his many contributions in the field of programming systems, Mr. Trimble has directed the design and development of several systems to simulate one computer on another. These systems bridge the gap between the incompatible binary vs. decimal, single address vs. multiple address, and word vs. character, natures of the computers involved. The systems developed include simulation of the IBM 650 on the IBM 704, the IBM 650 on the Honeywell-800, the Fleet Ballistic Missle Trainer on the IBM 709, the Control Data DCC Fire Control Computer on the IBM 7030 (STRETCH), and the Control Data Polaris Target Card Computer on the IBM 7030.

Mr. Trimble's most recent activities have been in the area of Data Communications and Time Sharing. He directed the development of the Communications Control Package (CCP) for the IBM 7740. The CCP is a system of programs which can be used to build a message switching system. The extension of the IBM Scientific Terminal Service Program System for the direct coupled 7040/44 - 7090/94 to include the IBM 1974 as a remote terminal is another project which he directed.

A recent undertaking was the Design of the Command Language for the Time Sharing System for the IBM System/360 Model 67. This language provides the means for a user to communicate with the system and construct, debug, and execute programs, as well as enable him to utilize the services available in the system.

Mr. Trimble has directed the design and implementation of programs to utilize graphic display terminals to facilitate communication between a user and on-line real-time systems. These systems include conversational inquiry type communications and general graphic data display and manipulation type systems.

More recently Mr. Trimble has been designing and directing the implementation of on-line management control and information systems. These systems combine the use of special purpose terminals in a time-sharing system oriented toward specific applications.

Mr. Trimble provides wide background in the use of computers for scientific and engineering calculations, programming systems, simulation, real-time and management applications, as well as an intimate familiarity with hardware, its capabilities, and its limitations. Mr. Trimble is one of the foremost contributors in both the design and application of data processing equipment in the United States.

Edward Fritz - Principal Analyst

Mr. Fritz, holder of graduate degrees in Mathematics and Statistics from the University of Michigan, is serving as Technical Director for CUC Washington. He directs the activities of some 30 analysts and programmers in a variety of scientific, operations research, and engineering applications.

Mr. Fritz has had sixteen years experience in systems analysis, reliability studies, and operations research. From 1950 to 1956, while at the Franklin Institute Laboratory, he participated in a series of studies for the Civil Aeronautics Authority. These studies concerned traffic landing patterns, enroute air traffic, and terminal airport communication.

With respect to traffic landing patterns, Mr. Fritz studies and analyzed existing ones, and based on this knowledge, he then proceeded to develop new and improved traffic landing patterns. In addition, he developed and organized simulation experiments, in which people were participants, in order to evaluate alternative landing pattersn. These simulation experiments were conducted at the CAA's Experimental Center in Indianapolis. Concerning enroute air traffic, he investigated the degree of safety associated with various enroute flying patterns. With respect to terminal airport communications, he investigated and evaluated the civil and military procedures for communication between the pilot of an aircraft and the control tower. In particular, he studies the procedures at the Washington National Airport and Langley Airfield.

From 1956 to 1963 Mr. Fritz was a consultant at General Electric, specializing in the area of reliability measurement. He was concerned with investigating and measuring the reliability of many hardward systems and subsystems. He developed new techniques for measuring system reliability and assessing the reliability of complex space vehicles.

From 1963 to 1965 Mr. Fritz headed the Operations Analysis Department at ITT's Information Systems Division. There he developed criteria for measuring the reliability of the U. S. Navy's Tactical Data System.

Mr. Fritz's published papers include "Information Theory in Air Traffic Control"; "Empirical Entropy-A Study of Information Flow", Control Systems Laboratory, University of Illinois; "Transient vs. Steady State Delays"; "Bayesian Reliability Estimates", plus a large number of internal working papers and analysis reports at Franklin Institute and General Electric.

Mr. Fritz holds graduate degress in Mathematics and Statistics from the University of Michigan. He joined CUC in 1965 as Technical Director of the Washington Office.

Richard R. Haefner, Ph. D.

Technical Director

Dr. Haefner obtained his academic degrees from the University of Minnesota with a Physics Major and a Math Minor. He received his A. B. in 1947, M. S. in 1948, and Ph. D. in 1951. The Ph. D. thesis in mathematical nuclear physics derived the properties of energy levels of nuclei composed of clusters of alpha particules. Since his graduate work, he has specialized in nuclear reactor physics, celestial mechanics, geodesy, and in the solution of problems in these fields by computer programs.

Dr. Haefner joined the staff of the Atomic Energy Division of the Du Pont Company in 1951 as a theoretical physicist, and participated in the design of the reactors for the Savannah River Plant. He was loaned to Princeton University for Project Matterhorn to assist in development of computer programs with the SEAC. From 1953 to 1961, Dr. Haefner was in charge of applied mathematics and computing at the Du Pont Savannah River Laboratory. In addition to supervisory duties, he developed multidimension neutron diffusion programs for the UNIVAC I, IBM 650 and IBM 704; neutron transport and kinetics program for the IBM 650; a non-divergent Milne predictor-corrector routine to solve simultaneous differential equations; numerous programs in the fields of heat transfer, crystal diffraction, solvent extraction, steam power plant optimization, etc. and associated mathematical and trigonometric subroutines to implement the programs above.

In 1960, he was a U. S. representative to the Seminar on Reactor Computation of the International Atomic Energy Agency in Vienna and was a session chairman.

Dr. Haefner was a staff physicist at SRL from 1961-1964 and directed the development of computer programs to (a) calculate the production characteristics of varieties of reactor fuel designs and for isotopes heavier than plutonium; and (b) to create a computer model for the nuclear inventory control of the plant. He also developed a program to automate the procurement and distribution of library journals.

Richard R. Haefner, Ph. D. - Technical Director

In 1964, Dr. Haefner joined the Smithsonian Astrophysical Observatory to become Manager of the Data Processing Department. The functions of this department were to determine orbits for dozens of satellites of interest to SAO and NASA; to develop predictions for the twelve Baker-Nunn satellite tracking cameras of SAO, to process the cameras' data from the field, to assist in the determination of orbits; to measure precisely the satellite position on the films; to process this data through numerous computer programs to extract the scientific content from the precise position data; and to develop all computer programs needed to carry out the functions just described. Dr. Haefner also participated in the Geodesy Program of SAO and was a delegate to the Second Symposium on the Uses of Satellites for Geodesy - Athens, Greece in April 1964. Numerous accounting programs for SAO were developed under his direction also.

Dr. Haefner joined CUDC as manager of its Houston office in October, 1965. Since he arrived, Dr. Haefner has been involved on the Maritime Statistical System, the Time Sharing System, Medical Billing Package, and the On-line Order-Entry System. During the same period, the Houston office has expanded from nine technical personnel to the present level of twenty-five. He recently assumed the position of Technical Director.

DR. KURT EISEMANN - TECHNICAL DIRECTOR

Dr. Eisemann graduated summa-cum-laude from Yeshiva University in 1950 with a B. A. in Mathematics and Chemistry and with prizes "for excellence in Mathematics" and "for scholarship, ethics and character." He obtained an M. S. in Applied Mathematics from M. I. T. in 1952. After several years of industrial experience, he obtained a Ph. D. in Applied Mathematics from Harvard University in 1962.

Dr. Eisemann has been active in the fields of Applied Mathematics and Numerical Computation for 20 years. He is the author of more than 20 scientific papers and has pioneered the application of computers to complex new problem areas.

In 1952, Dr. Eisemann joined IBM as a Senior Mathematician and was later promoted to Research Mathematician. In 1961 he became Manager of Mathematical Research and Mathematical Staff Consultant at the Univac Division of Sperry Rand Corporation, Advanced Systems Research, and in 1963 was appointed Director of the Computing Center and Associate Professor at Catholic University of America. He joined the Boston office of CUC in 1966 as Technical Director to handle the Company's regional services in the scientific fields.

Dr. Eisemann has conducted individual as well as collaborative research, and has developed mathematical methods of solution for problems in Engineering, Applied Physics, Operations Research and Numerical Analysis. He has designed and directed large-scale scientific computing projects resulting in powerful and efficient computer programs. Some of these projects are:

1. Numerical solution of a system of Partial Differential Equations with ill-conditioned Initial Conditions for the study of performance and yields of underground oil fields.

2. Numerical solution of the general Linear Programming problem by the Simplex method, for application to many fields. The resulting program, written for IBM in 1953, was the first computer program made available to American industry for the computer solution of industrial problems expressible in Linear Programming form.

3. Efficient solution of the Transportation Problem (a classical mathematical model in the field of Linear Programming), prepared simultaneously for several types of large-scale computers and involving complicated topological considerations. The resulting programs, written in 1954, were the first such programs made available to American industry for a wide range of problems.

4. Research to make computers recognize, trace and alter complex geometrical patterns of varying topological structure with maximal efficiency.

5. Efficient computer solution of the Machine Loading problem (a fundamental mathematical model in the field of Linear Programming). Efficient execution of the solution algorithm (the "Generalized Stepping Stone Method") entailed substantial complexity. The resulting program was the only one of its kind ever written and is now used nationwide.

6. Development of methods to employ a computer for efficiently executing complete elastic analyses of framed engineering structures with an arbitrary configuration of joints; arbitrary orientation of members; arbitrary sets and types of loads; rigid, pinned or flexible joints; arbitrary types of normal or oblique reactions; permanent settlement of foundations; temperature effects; including axial, transverse and shear stresses and deformations in 3 dimensions. Staff included engineers, mathematicians and programmers. The resulting program (IBM "FRAN") is the most powerful program for frame analysis in existence today.

7. Formulation of decision criteria for computer strategies to beat human opponents in a geometrically oriented man-vs.-machine board game.

8. Development of a battery of demonstration programs to exhibit the versatility of computers and to generate enthusiasm in groups of students, scientists and lay spectators.

9. Development of solution methods for dozens of advanced problems, the programming of which was assigned to engineering students as individual term projects.

10. Extensive consulting services on the efficient application of computers to the solution of scientific problems.

As a University faculty member, Dr. Eisemann has conducted lectures and courses for undergraduate and graduate students on Linear Programming, Matrix Theory, Programming Computers, Statistics for Engineers, Numerical Analysis, and various topics of Applied Mathematics.

Papers by Kurt Eisemann

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2. pH and Hydrolysis of a Doubly Weak Salt. J.Chem.Educ. vol.26 (Nov. 1949) p.607.
3. Factor Analysis. IBM Sci.Comp.Cntr.Publ. 1953.
4. Linear Programming. Quart.Appl.Math. vol.13 (Oct. 1955) pp.209-232.
5. Modified "Square-root" Matrix Inversion Ensuring Real Values. IBM Sci.Comp.Cntr. Publ. 1954.
6. The Integrating Vector. IBM Sci.Comp.Cntr.Publ. 1954.
7. Recursive Generation of Vectors for the Modified Simplex Method. IBM Sci.Comp. Cntr.Publ. 1955.
8. Linear Programming. Riron Keizaigaku (The Economic Studies Quarterly, Tokyo, Japan), vol.7 (Oct. 1956) pp.199-215.
9. Simplified Treatment of Degeneracy in Transportation Problems. Quart.Appl.Math. vol.14 (Jan. 1957) p.399.
10. Removal of Ill-conditioning for Matrices. Quart.Appl.Math. vol.15 (Oct. 1957) p.225.
11. The Trim Problem. Management Science, vol.3 (Apr. 1957) p.279.
12. Study of a Textile Mill with the Aid of Linear Programming. (Co-author Wm.M.Young). Management Technology, Monograph No. 1 of the Institute of Management Sciences, 1960, pp.52-63.
13. The Machine Loading Problem. (Co-author J.R.Lourie). IBM Corp., Data Systems Div. Publ. 1959.
14. Harnessing the Computer for Special Structures. (Co-authors S.Namyet and L. Woo). Architectural Record, May 1960, p.232.
15. Optimal Inversion of Symmetric Matrices. IBM Corp., Mathematics and Applications Dept., 1960.
16. L'Horloge Celeste (The Firmament as Clock), Orion (Bull.Soc.Astron.de Suisse) No.77 (July 1962) p.192.
17. Space Frame Analysis by Matrices and Computer. (Co-authors S.Namyet and L. Woo). J.Am.Soc.Civil Eng., Dec. 1962 (vol. ST. 6), pp.245-277.
18. Higher Yields through Linear Programming. Remington Rand Univac, Advanced Systems Research, 1962.
19. The Generalized Stepping Stone Method for the Machine Loading Model. Management Science, vol.11 No.1 (Sept. 1964) pp.154-176.
20. The Primal-Dual Method for Bounded Variables. Operations Research, vol.12 No.1 (Jan.-Feb. 1964) pp.110-121.
21. A New System of Perfect Duality for Networks. Recently completed.

Martin E. Hopkins - Principal Analyst

Mr. Hopkins has been in the computing field since 1957. He joined CUC in 1959. His primary interest has been in the development of large scale software systems and adaptation of such systems to applications. He frequently acts as a consultant and makes studies of computing problems as well as conducting seminars.

He has worked with a wide range of hardware and software. Specifically he has programmed the following computers: IBM/360 (including the Models 44 and 67) 7010, 7030 (STRETCH), 7040, 7090, 650 and 705, RCA Spectra/70, 301, 501 and BIZMAC, CDC, 1604 and DCC, and Honeywell 400 and 800. On all of the above computers assembly language was used. In addition he is familiar with COBOL, FORTRAN, PL/I and LISP.

Below are brief synopses of some of the projects in which Mr. Hopkins has participated.

Working with the IBM software designers for the 360/67 Time Sharing System Mr. Hopkins was responsible for several areas of design development. Among these were the terminal Command Language, Command Language Graphics, the sort merge and areas of data management.

He assisted RCA in the specification of Spectra/70 software including the operating system, teleprocessing, and language processors. He also helped design the Report Generator implemented by CUC.

Mr. Hopkins designed a COBOL compiler which compiles and executes more rapidly than current IBM compilers. The source language is a subset of IBM COBOL.

The basic specifications and internal design for the IBM/360 Model 44 Programming Support were developed with the assistance of Mr. Hopkins. He worked as a general advisor on most areas of the system.

He supervised the modification of 7040.IBSYS to allow it to handle unusual experimental I/O equipment.

Martin E. Hopkins

During the development of the design and implementation of the IBM 360/9020 JOVIAL operating system Mr. Hopkins had responsibility in many areas. He helped design the JOVIAL compiler especially the Syntax tables. He supervised the design and implementation of the Assembler, Loader, Check out System, I/O package and the Operating System.

Working on a research project in file reorganization he supervised the writing of programs which manipulated very large incidence matrices.

Mr. Hopkins has worked on several FORTRAN Compilers. He developed the storage allocation and register usage system for the H 800 FORTRAN II compiler. He was in charge of the last half of a FORTRAN compiler developed for the 1410/7010. On this project he also supervised the integration and check out of the entire system. In addition he has assisted in the design of an ultra fast FORTRAN IV compiler for a computer manufacturer.

He designed and supervised the implementation of a simulator of the DCC, a real time computer, on STRETCH. The simulator simulates the asynchronous operation of that computer.

Other software projects include detailed designs of a COBOL compiler for the H 400 and H 800, the design and implementation of a recursive macro system for the H 800 and a sort for the IBM 1410.