

CHARLES BABBAGE INSTITUTE

CENTER FOR THE HISTORY OF INFORMATION TECHNOLOGY

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CBI Completes NSF-Sponsored Software History Project

Project Highlighted by the National Science Foundation

The Charles Babbage Institute has completed its National Science Foundation (NSF)-sponsored project “Building a Future for Software History” (NSF 9979981) and submitted its final report to the NSF last month.

At the end of 2003, the project was chosen by the NSF as one of a small number of the projects funded under the Knowledge and Distributive Intelligence (KDI) Directorate to highlight research outcomes of the KDI initiative. CBI is grateful for this honor, and the NSF’s article on our project can be accessed at:

http://207.238.28.149/nsf/ideas/new_know.html

Some elements of this Web-based project will continue in the future in order to further enhance the infrastructure for the development of the history of software through disseminating scholarship in the field (in the peer-reviewed scholarly software history journal, *Iterations: An Interdisciplinary Journal of Software History*) and updating reference resources (such as the CBI software history online bibliographic resource).

From the founding of CBI more than a quarter century ago, the Institute has had a commitment to the history of software. This has resulted in collecting and providing access to some of the most significant archival resources on the history of software, as well as producing significant scholarship and reference resources in whole or part on software history. Nevertheless, the primary resources and scholarship on the history of software, both within and outside the Institute, lagged behind that on the history of computer hardware.

In 1997 the Charles Babbage Foundation (CBF) formed a task force led by CBF’s George Glaser to examine methods and ideas to advance understanding and resources in the history of software and report back its findings to the Institute. In 1998 Glaser presented the report of his committee (which included: William Coleman, Paul Edwards, Henry Lowood, and Keith Uncapher) at the annual Charles Babbage Foundation Trustees Meeting in Berkeley, California.

CBI Staff drew ideas from and refashioned elements of the CBF Software Task Force Report to produce a proposal to the NSF that was submitted in early 1999. In the Spring of that year the project was awarded in full at \$488,000, and commenced in September 1999. After conducting a national search, Dr. Philip Frana, a recent Ph.D. from the History of Technology and Science Program at Iowa State University, was hired as the post-doctoral fellow and project manager. Jeffrey Yost served as the Principal Investigator/Project Director, and Arthur L. Norberg, Elisabeth Kaplan, and Robert

Seidel were Co-Principal Investigators on the project. The project also benefited from the work of three graduate research assistants from the Program in the History of Science and Technology at the University of Minnesota: Juliet Burba, Karin Matchett, and Elisabeth van Meer.

The project consisted of three primary components: working with the software community to create an online dictionary of software history, initiating an electronic scholarly journal on software history, and conducting 32 research-grade oral histories with pioneers of software history. On top of completing these objectives, CBI developed a major online software history bibliography. A brief description of the results of each of these components is presented below.

Software History Dictionary

Originally the project sought to draw on not only the expertise of the software community, but also volunteer labor in helping to produce the software history dictionary entries. Though committees of experts (five to nine individuals) were assembled in nine fundamental areas of software, these individuals were utilized for expert advice more than the production of dictionary entries. Most of the dictionary entries were researched and written at CBI. The end result is an online reference resource that contains more than 200 one to three page entries that provide not only an explanation of software terminology and technology, but also an historical analysis explicating continuity and change over time. The areas of focus within the software field were carefully chosen to supplement existing reference sources. Thus only a small number of entries were produced on programming languages, while many more focus on software technologies and techniques in graphics, scientific applications, business applications, and databases. The dictionary is available online at <http://www.cbi.umn.edu/shp/entries/dictionaryindex.html> and CBI will likely add to it periodically as time allows.

Iterations: An Interdisciplinary Journal of Software History

The journal *Iterations* was launched in October 2002 and has published a number of scholarly articles on a variety of topics in the history of software. These range from technical, managerial, and legal examinations of the industry, such as James Cortada's article on the history of software applications within the petroleum industry, Arthur L. Norberg's study of early software development at the Eckert-Mauchly Computer Corporation, and Paul Ceruzzi's analysis of the Microsoft anti-trust case to articles concentrated more on the structuring, use, and impact of software technology such as Jeffrey R. Kuester and Ann K. Moceyuna's article on the history of software patents, Julian Kilker's study on the early construction of email use, and Elisabeth van Meer's exploration of PLATO and the commitment to social responsibility demonstrated at the Control Data Corporation. In addition to scholarly articles, the journal has also published a number of reviews on electronic resources in the history of software, including a major review article by Juliet Burba and Philip Frana. Finally, the journal has provided a forum for discussion of issues in software history with contributions from

Robert Kahn, Jonathon Spira, Richard Stallman, and others. As originally planned, CBI is continuing the publication of *Iterations* now that the NSF-funded portion of the project has ended.

Iterations is available at <http://www.cbi.umn.edu/iterations/index.html>

Oral History Initiative

The Charles Babbage Institute has a long history of producing research-grade oral histories on the history of information technology. As part of the software history project, 35 oral histories (about 10 percent more than planned in the project proposal) were conducted and transcribed. Most are already available on the Institute's Web site, the remainder soon will be—as they make their way through the final editing process and are loaded onto the oral history database.

Individuals interviewed as part of “Building a Future for Software History” include:

Charles W. Bachman
Laszlo A. Belady
Henry N. Camp
Richard Canning
Don Chamberlin
Stephen Cook
Dick Coupe
John Cullinane
Roger Dahlen
Edsger Dijkstra
Gary Durbin
Scott Gaff
Martin A. Goetz
Jim Gray
Glenn Henry
C. Anthony R. Hoare
Ernest E. Keet
Donald E. Knuth
Kenneth W. Kolence
Larry Lamb
Carl Machover
Harry M. Markowitz
Mark McCahill
William McGee
Donn Parker
Peter C. Patton
Herb Pelnar
Ben Persons
Douglas T. Ross

Vladimir Slamecka
H. Kenneth Walker
Willis Ware
Peter Watson
Gio Wiederhold
Stan Williams

CBI's Oral Histories are available at <http://www.cbi.umn.edu/oh/>

Software History Bibliography

The software history bibliography contains more than 2,500 resources on software history. Citations include books, articles, reports, and archival collections. Some resources predate available online indexes, and others are not searchable or difficult to search in indexes for a variety of reasons. The Institute has received a number of comments from scholars who have found this bibliography useful in their studies of software history. The bibliography is available at:

<http://www.cbi.umn.edu/shp/bibliography.html>

Final Thoughts

The software history project represented an intensified effort to develop new resources (software oral histories, a historical software dictionary, and software bibliography) to advance understanding and research in the history of software, as well as build a continuing source for dissemination of scholarship in the field: *Iterations*. The project fits within and adds to a long existing commitment at CBI in the history of software technology and the software industry, both in terms of research and efforts to advance our collections in this area.

The Institute is grateful for the participation of many individuals on this project, from our interviewees on the oral history initiative, those who served as experts on the various area committees, and those who refereed articles for *Iterations*, to the people who continue to support the project's ongoing initiatives, in particular, the *Iteration's* editorial board and future referees and authors. Your contributions are deeply appreciated.

Jeffrey R. Yost

New Research Grant to CBI

CBI has received an 18-month grant from the National Historical Publications and Records Commission, a division of the National Archives, for the project “Documenting Internet2: A Collaborative Model for Developing Electronic Records Capacities in the Small Archival Repository.” The project is intended to develop feasible methods for selection, description, and long-term preservation of historically significant born-digital records in the subject area of history of information technology.

One of the tenets of electronic records programs is that to be successful, they require collaborative participation from a variety of partners. CBI is fortunate to have for its partners in this project the University of Minnesota Libraries Information Technology division, the University of Michigan School of Information, and Internet2. Each partner brings critical expertise and perspective: CBI’s experience in archival appraisal of records of information technology; the University Libraries’ expertise in digital libraries initiatives; and the School of Information’s experience with research in electronic records appraisal, capture, and transfer.

Internet2 serves as an ideal case for the study of these issues. As a collaborative IT organization whose history is captured in a documentary materials most of which are born digital and dispersed, it provides the content for the project.

Project deliverables include a blueprint for the development of an electronic records component of CBI’s collecting scope and a set of principles for appraisal and acquisition of electronic records, designed to support other small scale repositories seeking to initiate an electronic records program in their own institutional settings.

The project staff members are Beth Kaplan and Carrie Seib, CBI archives; Professor Margaret Hedstrom and graduate student Dharma Fowler, School of Information; and Eric Celeste, University of Minnesota Libraries. The advisory board, consisting of Arthur Norberg, CBI; Wendy Lougee, University Libraries; Joe Anderson, American Institute of Physics; Phil Bantin, Indiana University; and Barbara Nanzig, Internet2, will provide direction throughout the project.

A project web site will provide grant documents and periodic updates on progress. The site is now under development at <http://www.cbi.umn.edu/documentingi2/index.html>

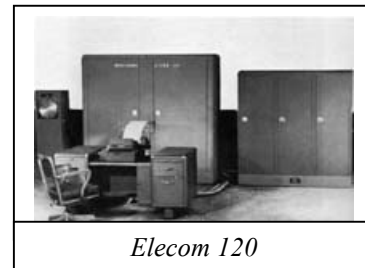
Elisabeth Kaplan

The Emerging Business Market for Computer Systems

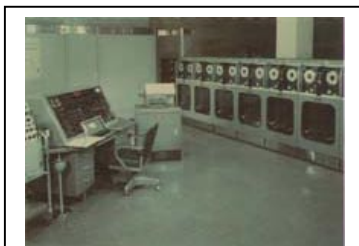
In a sense, 1954 culminated a vigorous effort to convince business people that a computer system would serve their company well. The evidence for this success is that the year became a big one for commercial deliveries of computer systems. A number of companies began to produce systems for this market, including some companies that acquired smaller firms already producing systems. We offer here a snapshot of systems delivered in 1954, from large systems like Univac I, already enjoying good response from government users, to small ones like the Elecom 120, a new machine promoted by the Underwood Corporation.

The Electronic Computer Corporation was founded in about 1950 by former employees of the National Bureau of Standards. After working on a computer for magazine address changes, Elecom designed a general purpose computer using circuitry similar to that of SEAC, the NBS computer. Within two years, Underwood acquired Elecom as their entry into the computer business. This acquisition occurred before Elecom delivered any computers. First came the Elecom 100 in late 1952.

Initially, the Underwood strategy was not to compete with firms like Remington Rand and IBM with large computer systems. In 1954 Underwood began deliveries of its second computer, the Elecom 120. This system was a compact electronic computer for business and industry, which was advertised to be as versatile as its contemporaries, at a fraction of the cost. Manufactured on Long Island, New York, the computer was an alpha-numeric, decimal, two-address machine with a 1,000 word memory drum, and a ten word rapid access re-circulating channel. Built-in floating decimal and an additional 1,000 words of memory were available as extra features. Input/output was by paper tape or typewriter (which could be controlled by paper tape also). Shell Oil, Houston, Texas, received the first Elecom 120 in April 1954. Number two went to the Westinghouse's Aviation Gas Turbine Division in Philadelphia in May. (Underwood did not stay in the computer business long. In 1957, Underwood stopped development of large scale computers, apparently in response to a \$6 million deficit in 1956. The company continued limited production on the models it already had developed.)



Elecom 120

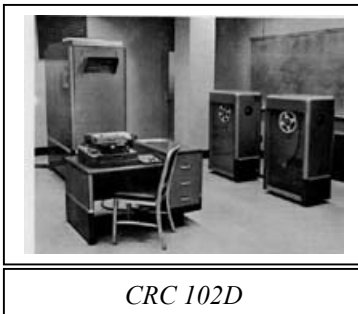


UNIVAC I

1954 was also a big year for Remington Rand. Remington Rand announced the first industrial application of the Univac I, a system that was to go into operation at General Electric's Major Appliance Division in Louisville, Kentucky. After some delays, the system began processing payroll and labor distribution, material

scheduling, and inventory control. The two companies estimated annual savings of \$500,000 at least. General Electric expected to compile sales statistics and prepare market forecasts for division and product department management. Metropolitan Life received a Univac I toward the end of April 1954 at its home office on Madison Avenue in New York City. This insurance company Univac installation dealt with assembling and analyzing actuarial statistics arising from the millions of transactions affecting the company's policyholders.

IBM won the production sweepstakes with its 650 system, which was first delivered in 1954. The IBM 650 was a numeric decimal computer using a self checking bi-quinary code. The system used punched-card input/output and had a magnetic drum memory with a capacity of either 1,000 or 2,000 words (10 decimal digits plus an algebraic sign). The drum dimensions were 4-inch diameter, 12-inches long, and it spun at 12,000 revolutions per minute. The system featured a "Table Look-up" operation which facilitated the automatic searching of rate tables such as occur in the utilities, life and casualty insurance, transportation, and other commercial fields.



National Cash Register (NCR) and Computer Research Corporation (CRC) constitute an interesting story of an attempt to enter the computer market the easy way. NCR began a computer project of its own in the early 1950s called NEAM. In 1953 NCR bought a majority interest in CRC, and the following year acquired CRC outright, and began distributing the CRC 102D, primarily for scientific applications, as an NRC product. Earlier, CRC announced the availability of the CRC 102D. CRC was a spin-off from Northrup Aircraft in May 1950, which became a small

producer of computers for the military. CRC was one of the earliest manufacturers of medium-priced, general-purpose computers. CRC maintained the basic design of the 102A for this system, but introduced greater versatility and ease of operation by using the decimal system throughout for input, internal operations, and printing output. Optional equipment included a high-speed Ferranti reader, capable of reading 200 characters per second, and a high-speed tape punch with a punching speed of 60 characters per second. NCR decided to go no further with CRC designs. Instead, it worked on the development of a new computer system: the 303, a system never fully developed, and with the development of transistors for computer systems, NCR turned to the new component technology and developed the 304.

Over the next few years, many other systems joined these, as the companies making such systems engaged in an effort to exploit the new market. For the fuller story of this effort, a good place to start is with the elegant short account by James W. Cortada, *The*

Computer in the United States: From Laboratory to Market, 1930 to 1960. Anyone wishing to examine many of the publications of these companies about their new systems and the “manuals” of operation and programming can consult many of the collections of the Charles Babbage Institute.

Arthur L. Norberg and Carrie A. Seib

News from the Archives

New resources available

The following oral history interviews, conducted during the course of the NSF-sponsored software history project, are now accessible in full text on the CBI web site

<http://www.cbi.umn.edu/oh/>

Kenneth W. Kolence (OH 348)

Stephen Cook (OH 350)

Laszlo A. Belady (OH 352)

Jim Gray (OH 353)

Charles Antony Richard Hoare (OH 357)

Scott Gaff (OH 359)

Peter Watson (OH 351)

Carl Machover (OH 362)

Richard Canning (OH 338)

Collections news

Anthony Mauro, former vice president for marketing of the Redactron Corporation has donated that company's records. The materials include business plans, product marketing materials, salesman handbooks, and financial records and will be integrated into the existing Redactron Corporation materials, now part of the Burroughs Corporation Collection.

Arnold Hochhalter has donated records of the Control Data Photographic Society (also known as Control Data Photo Club), including photographs, club administrative records and a large number of photographs. The Photo Club was a social group formed by CDC members with a shared interest in photography. The materials will be integrated into the Control Data Corporation Records.

Erwin Tomash has donated a microfilm copy of *Papers of Charles Babbage*, the original Babbage manuscripts held in the British Library. The microfilm will be cataloged and added to the CBI reference collection, where researchers throughout the United States will be able to access it through interlibrary loan.

Recent research

Osamu Uda, Nihon University, Tokyo, Japan, visited CBI in March to conduct research on the history of the General Electric Computer Department, specifically regarding its relationship with the Stanford Research Institute and the development of ERMA.

David Hart, Kennedy School of Government, Harvard University, visited CBI in January to conduct research for a book on the high tech industry and public policy.

Other news

On March 5, CBI Project Archivist Maria Plonski presented a paper on images of women in computing at a University Libraries event in celebration of Women's History Month.

The Science Museum of Minnesota's new exhibit, *Robots and Us*, includes materials loaned from the CBI archives. The exhibit is designed to give visitors an inside look at the ways in which real life influences artificial life. CBI's contributions to the exhibit include ENIAC photos, an advertisement for Edmund Berkeley's Geniac, and a pamphlet titled "What every businessman should know about electronic brains." Other institutions contributing content for the exhibit include the California Institute of Technology, the IBM T.J. Watson Research Center, the Metropolitan Museum of Art, the MIT Museum, the National Library of Medicine, the Smithsonian Institution, and Stanford University. This touring exhibition will be at the Science Museum of Minnesota from February to August 2004. For more information, see <http://www.smm.org/>

Frazzini is Named 2004-2005 Tomash Fellow

Ron Frazzini, a doctoral candidate in the Program in the History of Science and Technology at the University of Minnesota is the recipient of the 2004-2005 Adelle and Erwin Tomash Fellowship. Mr. Frazzini is researching and writing a dissertation examining the technical and managerial history of the Italian informatics firm Olivetti S.P.A. in the decade and a half following the end of World War II. With this analysis Frazzini is seeking to elucidate on the origins of, but move beyond, the common "black box" approach to understanding early digital computer technology. In addition to his technical analysis he will study social, public, and economic elements of Olivetti's technology and place this within the context of the more extensive existing secondary literature on U.S. computer firms, particularly I.B.M.

Mr. Frazzini holds undergraduate degrees in mechanical and electrical engineering from the University of Colorado, a MS in Systems engineering from California State College at Fullerton, and a M.A. in Liberal Studies from Hamline University . He has worked in the missile controls area, and at Honeywell, where he designed computerized vehicle control systems for both military and commercial applications. It is through this work that Frazzini became particularly interested in the history of design and entered the Program in the History of Science and Technology at the University of Minnesota to work on his doctoral degree. Frazzini has also long had an interest in the people, history, and language of Italy. He has already made a research trip to Italy to research the Olivetti Corporate Records and will use the fellowship to support travel to conduct further research on this rich resource on the history of computing. He will also make selective use of a number of collections at the Charles Babbage Institute to provide comparative analysis of developments at other computer firms.

The Adelle and Erwin Tomash Fellowship is granted each year to a doctoral student researching and writing a dissertation on the history of computing, software, or networking technology. It is made possible by the generous support of Adelle and Erwin Tomash, the founders of the Charles Babbage Institute.

Jeffrey R. Yost

Book Awards

Editor's note: The following recognizes the recent AIAA book awards to two individuals associated with the Institute. One through working under the CBI Director for his doctorate in the Program in the History of Science and Technology at the University of Minnesota, and the other through serving as a past CBI Tomash Fellow

Dr. Erik M. Conway was the co-recipient of the American Institute of Aeronautics and Astronautics 2004 History Manuscript Award for his book manuscript *High Speed Dreams: NASA and the Technopolitics of Supersonic Transportation, 1945-1999*. Dr. Conway received his Ph.D. in 1998 from the University of Minnesota. Arthur L. Norberg served as his dissertation advisor. *High Speed Dreams* is a detailed study of the various attempts in the United States to design and construct a supersonic transport plane. The long SST (Supersonic Transport) stage reveals how national politics and business interests interact in the realm of high technology. All three American SST programs were products of state-sponsored drives to achieve and sustain dominance in the commercial aircraft industry. All three collapsed when their political alliances disintegrated. Conway shows how technical hurdles became too high and environmental

concerns overwhelmed the desire for a super plane. The manuscript is under consideration by the Johns Hopkins University Press for publication.

The other co-recipient(s) of the 2004 American Institute of Aeronautics and Astronautics History Manuscript Award were **Dr. Virginia P. Dawson** and **Dr. Mark D. Bowles** for their book manuscript *Taming Liquid Hydrogen: The Centaur Upper Stage Rocket, 1958-2002*. Bowles was the 1997-1998 CBI Tomash Fellow. Dr. Dawson and Dr. Bowles are president and vice-president, respectively, of History Enterprises, a history and archive management consulting firm located in Cleveland, Ohio. Their book chronicles the history of Centaur, the world's first liquid hydrogen rocket. Although never identified with the dream of landing human beings on the moon or the product of a massive military program like Atlas, Centaur has enjoyed an unusually long and sometimes controversial career as an upper stage rocket. Today, liquid hydrogen is routinely used in many of the world's launch vehicles, including the Space Shuttle. The authors argue that the development of liquid hydrogen for space propulsion can be considered one of the significant technical achievements of twentieth-century American rocketry.

Recent Publications

Abbate, Janet. "Guest Editor's Introduction: Women and Gender in the History of Computing" *IEEE Annals of the History of Computing* 25:4 (Oct.-Dec. 2003): 4-8.

Ambacher, Bruce. *Thirty Years of Electronic Records* (Lanham, MD: Scarecrow Press, 2003).

Campbell, Scott M. "Beatrice Helen Worsley: Canada's Female Computer Pioneer" *IEEE Annals of the History of Computing* 25:4 (Oct.-Dec. 2003): 51-63.

Cortada, James W. "How Did Computing Go Global? The Need for an Answer and a Research Agenda" *IEEE Annals of the History of Computing* 26:1 (Jan.-March 2004): 53-58.

Croarken, Mary. "Mary Edwards: Computing for a Living in 18th Century England" *IEEE Annals of the History of Computing* 25:4 (Oct.-Dec. 2003): 9-15.

Ensmenger, Nathan. "Think Piece: Power to the People: Toward a Social History of Computing" *IEEE Annals of the History of Computing* 26:1 (Jan.-March 2004): 96+.

Fuegi, John and Jo Francis. "Lovelace and Babbage and the Creation of the 1843 'Notes'" *IEEE Annals of the History of Computing* 25:4 (Oct.-Dec. 2003): 16-26.

- Frana, Philip L. "Before the Web There Was Gopher" *IEEE Annals of the History of Computing* 26:1 (Jan.-March 2004): 20-41.
- Galler, Bernard A. "Annals: How the First Issue Came to Be" *IEEE Annals of the History of Computing* 26:1 (Jan.-March 2004): 4-7.
- Grier, David Alan. "Think Piece: The Computer: From John von Neumann to Irma S. Rombauer" *IEEE Annals of the History of Computing* 25:4 (Oct.-Dec. 2003): 104+.
- Hsu, Feng-hsiung. *Behind Deep Blue: Building the Computer that defeated the World Chess Champion* (Princeton, NJ: Princeton University Press, 2002).
- Koss, Adele Mildred. "Programming at Burroughs and Philco in the 1950s" *IEEE Annals of the History of Computing* 25:4 (Oct.-Dec. 2003): 40-50.
- Macduff, Valerie A.G. "Half a Lifetime in Computing: Experiences in Zambia, Britain, and Australia" *IEEE Annals of the History of Computing* 25:4 (Oct.-Dec. 2003): 64-66.
- Mahoney, Michael S. "Finding a History for Software Engineering" *IEEE Annals of the History of Computing* 26:1 (Jan.-March 2004): 8-19.
- Mitchell, John, C. *Concepts in Programming Languages* (Cambridge, UK: Cambridge University Press, 2003).
- Murphy, Brian Martin. "Mapping the Pre-History of Cyberspace and the Making of Social Movement Computer Networks, 1973-1993." Ph.D. Dissertation: Univ. of Mass. Amherst, 2001.
- Ralston, Anthony. "Four Editions and Eight Publishers: A History of the *Encyclopedia of Computer Science*" *IEEE Annals of the History of Computing* 26:1 (Jan.-March 2004): 42-52.
- Stepulevage, Linda. "Computer-Based Office Work: Stories of Gender, Design, and Use" *IEEE Annals of the History of Computing* 25:4 (Oct.-Dec. 2003): 67-72.
- Taylor, E. Suzanne and Kathy Schroeder. *Inside Intuit: How The Makers of Quicken Beat Microsoft and Revolutionized an Entire Industry* (Boston, MA: Harvard Business School Press, 2003).
- Williams, Elizabeth Phillips. "A Systems Analyst's Computer Watch: 1943-2003" *IEEE Annals of the History of Computing* 25:4 (Oct.-Dec. 2003): 27-39.
- Compiled by Jeffrey R. Yost*

Featured Photograph



"Use it even in a phone booth."
-publicity photo for the TOTELCOM display terminal, ca. 1971.

Computer Communications, Inc., demonstrated its new portable TOTELCOM display terminal unit (CC-335) at the 1971 Spring Joint Computer Conference. The TOTELCOM unit was designed as a replacement for Teletypes in communications networks and had two modes of operation: on-line mode, during which the unit served as a teletypewriter replacement, and off-line mode, during which an operator could perform off-line editing and output. It was completely self-contained and included a keyboard, CRT, communication interface, acoustic coupler and power supply - everything except a phone line. The TOTELCOM could be used with any

ordinary telephone, "even in a phone booth" as noted in press materials. Product literature for the unit stressed the

terminal's portability, noting that it weighed twenty-five pounds, came in its own carrying case, and that it fit "anywhere, including under an airplane seat."

Computer Communications, Inc., was formed in 1966 by a small group of former Control Data Corporation employees. The company introduced its first product, the CC-30 Communications Station, in 1967.

Carrie Seib