REPORT "S"

JANUARY 6, 1961

RADIO CORPORATION OF AMERICA

PRODUCT PLANNING

REPORT "S"

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COMPANY CONFIDENTIAL

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INTRODUCTION

The Remington Rand UNIVAC Division of Sperry-Rand Corporation has had among its personnel some of the best professional talent in the electronic data-processing field. Remington Rand was responsible for uniting three separate groups representing the following fields of data processing: the punched-card processing group from Remington Rand, the electronic data-processing group from the Eckert-Mauchly Computer Corporation, and the scientific (and Military) data-processing group from the Electronic Research Associates, Inc. However, neither Remington Rand management, nor the U. S. in general, was prepared for the dynamic nature of this field nor the scope of the management and financial problems posed by the development of a tool that is likely to have an effect in our business environment as the industrial revolution.

Today, ten years after Remington Rand's initial merger with the Eckert-Mauchly Computer Corporation and five years after the last merger of the Sperry Gyroscope Company, Inc. and Remington Rand, the Remington Rand UNIVAC Division is still essentially three distinct data-processing groups who sometimes appear to work against their own interests. A brief history of this Division will serve to provide the background for the picture of UNIVAC today.

At the end of World War II, Remington Rand controlled, as it does now, no more than approximately 10% of the punched card market with IBM controlling the greater part of the remaining market. To obtain a larger segment of this market, Remington Rand embarked, in the very late 40's, on a program to improve their equipment by increasing speeds through the use of electronics as opposed to electro-mechanical techniques. This program resulted in the development of an electronic sorter and the development of two externally programmed punched-card Computers, now known as the UNIVAC 60 and the UNIVAC 120. In 1950, with these developments several years away, Remington Rand recognized a potential market for the UNIVAC I then under development by the Eckert-Mauchly Computer Corporation.

Dr. John Mauchly, professor of Physics at the Moore School of Engineering, University of Pennsylvania, and J. Presper Eckert, a graduate student in engineering had worked together under a government contract to build the ENIAC for the Aberdeen Proving Grounds. After completion of the ENIAC, the first electronic Computer, ideas from Dr. John von Neuman of the Institute of Advanced Study were used in the EDVAC which became the first internally programmed electronic Computer. The concept of being able to operate on instructions with the same facility as operating on data made possible the development of electronic Computers for data processing.

In 1947, Eckert and Mauchly left the Moore School to form the Eckert-Mauchly Computer Corporation to build Computers capable of processing large volumes of data. They built the BINAC and were well along with the development of

the UNIVAC I when their financial resources were suddenly cut as the result of an airplane accident involving their principal financial backers. In 1950 Remington Rand acquired this organization as its Eckert-Mauchly Division (after IBM had turned it down based on the conclusion that there was no future in electronic data processing).

Continuing a project initiated in 1949, the Eckert-Mauchly Division delivered the first UNIVAC to the Bureau of Census in April 1951. This was the first alphanumeric Computer as well as the first commercial product introduced to the data-processing field. The UNIVAC was received with great interest and became a brand name after it was used on television to predict the outcome of the 1952 presidential election based on the returns of a small percentage of the popular vote. The next five UNIVAC Computers were delivered to various government agencies, two of which had been previously sold by the Eckert-Mauchly Computer Corporation.

Early in 1953, Remington Rand acquired another new division, Engineering Research Associates (ERA) of St. Paul. This corporation had been formed in 1946 around a nucleus of engineers that had designed and built electronic equipment for the Navy and NSA. ERA had amassed a group of top technical people and had a salable commercial product in their ERA 1101 and, in addition, produced classified special-purpose equipment for the Department of Defense. At the time of the merger with Remington Rand, ERA was in a fairly sound financial condition. They controlled most U. S. patents on magnetic drums and had delivered more Computers than all other companies together. This bargaining position resulted in John Parker, (ERA) being made Vice-President in charge of the Electronic Computer Division, composed of the Eckert-Mauchly and ERA groups.

A third approach to the EDP field was pursued by Remington Rand's own Advanced Development Lab which produced the 409 series of punched card calculators. These were later named the UNIVAC 60 and 120 Computers in order to captalize on the "UNIVAC" name.

Prior to the merger of Remington Rand and Sperry Gyroscope in 1955 considerable growth had been made. The UNIVAC I had been successfully installed in a number of commercial installations. The UNIVAC II, basically an up-dated UNIVAC I, had been announced and assigned to the ERA Division for development. The ERA Division had announced the 1103A scientific Computer which featured a magnetic-core memory and the UNIVAC File Computer, specifications for which were developed by the Remington Rand tabulating group. The Eckert-Mauchly Division was busy on the development of the Cambridge Air Force Computer (the forerunner of the UNIVAC Solid State) and had also obtained the contract for the development of the LARC. The UNIVAC 60 and 120 were meeting with success. Presper Eckert and William Norris (ERA) had been made Vice Presidents in recognition of their outstanding engineering achievements. Two service bureau centers had been established in New York and Los Angeles. A move to develop multiple sales offices,

staffed with programming and training support, had been initiated to replace the central organization in New York. This in essence, was the situation when Remington Rand and Sperry Gyroscope Inc. merged in 1955 to become the Sperry Rand Corporation. Just prior to the merger, John Parker had resigned from the company leaving the way open for William Norris to be made General Manager of the UNIVAC Division which included engineering developments, manufacturing, and marketing for ERA; Eckert-Mauchly, and the Advanced Research Laboratory at Norwalk. The anticipated merging of interests and exchange of technical know-how was not easy to achieve and William Norris resigned in 1957 to form the Control Data Corporation of Minneapolis.

Affairs at Remington Rand UNIVAC were rather stable after mid-1957 with each group devoting most of its activity to clearing up prior commitments. Minor changes in the organization of UNIVAC were the rule from mid-1957 until the end of 1958 when the present structure began to evolve. After James Rand was retired, Kenneth Herman, who was H. F. Vickers* long time chief assistant, took over as President of the Remington Rand Division, in addition to his duties as Executive Vice President of the Corporation. He then proceeded to recruit a new top management team. His first acquisition was Dause Bibby, formerly Vice President of Manufacturing for IBM and immediately preceding his UNIVAC post, Executive Vice President of Daystrom.

As Executive Vice President of the Remington Rand Division, Bibby took charge and proceeded to set up a new command line in the UNIVAC Division. He hired his former right hand man at IBM, Jay Schnackel, to be the Vice President and General Manager of the UNIVAC Division. Additional management personnel were brought in from IBM and other concerns to augment middle management. A series of transitional reorganizations were undertaken throughout UNIVAC and the rest of the Remington Rand Division until the present organization was established during 1960. The UNIVAC Division presently includes all engineering development, manufacturing, and marketing computer personnel together with other facilities associated with Remington Rand Tabulating and computer product lines. Earlier this year, Dause Bibby took over as President of the Remington Rand Division and Herman moved back to his main job in Corporate Headquarters. This action appears to have signified the completion of the reorganization of Remington Rand and the placing of the division's future in Bibby's hands.

Since 1958, two new commercial and one new scientific systems have been introduced with one or two scientific systems and one commercial system in preparation.

The announced commercial systems have been the Univac Solid State and the Univac III. The Univac Solid State has had wide acceptance in the field with over 300 of all types on order or delivered. The Univac III is a new entry in the field. The Univac Scientific 1105 was introduced in 1958 but less than 10 were delivered. New systems, currently in progress, are the M-490, an updated version of the military M-460, and the

* President of Sperry-Rand Corporation

Univac Solid-State Scientific 1107 from St. Paul, and a new small computer from Norwalk.

The much heralded and much belated LARC system which was initiated in 1955 and delivered in 1960 (three years late) was entered into the commercial market in November 1959 and quietly withdrawn in 1960. Two of these systems were delivered, at an immense loss, to the AEC and the Navy. However, the LARC processor, one of the two computers in a LARC system, served as the basis for the development of the Univac III.

FACILITIES

The following data serves to identify major laboratories, manufacturing plants, and sales locations. All figures given on the approximate floor area in various plants were obtained from the listing statement made to the New York Stock Exchange at the time of the creation of the Sperry-Rand Corporation, June 15, 1955.

Remington-Rand Univac has, in addition to its New York headquarters, four laboratory and manufacturing locations and 224 sales offices located at various points throughout the nation. The sales offices are of varying sizes, from one-salesman district offices to the regional offices which supervise the sales efforts over large areas of the nation. The regional offices cover such areas as the Northeast with headquarters in New York and the Southeast with headquarters in Atlanta. The type of locales for these district and branch offices range from towns such as Asbury Park, N.J. all the way up to New York City.

Three of the manufacturing and research locations are located in the Northeast and the fourth is in the heart of the midwest.

1. The Philadelphia Laboratory, with a floor area of approximately 97,000 square feet, is located in leased quarters in North Philadelphia and serves as the focal point for large and medium scale commercial systems development. Built up on the core of the original Eckert-Mauchly group that developed the Univac I, the Philadelphia Lab has been responsible for the development of the Univac I, the Univac III, the LARC, the Univac High Speed Printer, and the Solid-State series. The Philadelphia Lab has manufactured all of the Univac I and LARC series, most of the Univac IIs, and the pilot group of solid-state machines. This facility is scheduled to move within the next few months to a new plant being built in Whitpain, a suburban town of Philadelphia. This location will have 302,400 square feet of working space.

2. The Norwalk Laboratory is the center for the development of small scale systems. It occupies approximately 163,000 square feet of floor space and is the location of the original Remington-Rand tabulating research group. This lab has been responsible for the development of the Univac 60 and 120 series that has had such excellent reception in past years and has been one of the few UNIVAC computer products to show a profit. Also, this lab has been made responsible for the development of a new small Computer to be announced sometime next year.

3. The St. Paul Laboratory is responsible for the development and manufacture of military and scientific systems. This unit of the company was acquired as the result of the absorption of Engineering Research Associates, Inc. (ERA), developers of classified military Computers and the Scientific 1101 (now Univac 1101). They have been responsible for the development and manufacture of such systems as the Univac 1103, 1103A, 1105, the Univac File Computer series, the M-460, and M-480, and for the development and pilot manufacture of the Univac II. They will also produce the newly announced Univac 1107. St. Paul Lab has about

468,000 square feet of owned-plant facilities and several buildings under lease throughout the twin cities area with an estimated additional area of 170,000 square feet.

4. As a result of a decision made about two years ago, most commercial manufacturing will be and is being conducted at the old Illion, New York plant, that has long housed facilities for building Tabulating equipment. With two plants, this installation covers approximately 1,003,000 square feet of floor space. At the present time, this location is capable of producing 30 Solid-State systems a month and has been operating at that rate until as recently as late spring. The Univac III and the STEP systems are also being put into production at Illion and it is presumed that the new, small "Norwalk" Computer will be built there.

EDP and Tab plants and laboratories are located in Elmira and Utica, New York.

REMINGTON RAND DIVISION ORGANIZATION PERSONNEL

Dause L. Bibby, President of the Remington Rand Division, joined the company in 1959. Just prior to his joining Remington Rand he was Executive Vice President of Daystrom, Inc., a position he held for three years. Before joining Daystrom, Bibby was Vice President of Manufacturing of IBM for the period 1949 - 1954. He had been with IBM since 1934, and worked his way up through various sales positions; he was branch manager in 1937, was made an assistant Vice President in 1941, and General Manager of the Poughkeepsie Plant in 1946, and became a Vice President of IBM in 1949. Bibby was born in Asco, Texas in 1911 and graduated in 1933 from the University of Texas. His office address is 1 Atlantic Street, Stanford, Connecticut and his residence is Irvington-on-Hudson, New York. His salary and other renumeration for fiscal year 1960 was $97,500; after taxes $46,524; annual retirement benefits due at normal retirement age - $21,175.

The key man brought in by Bibby to manage the Remington Rand Univac Division is Jay W. Schnackel, who holds the position of Vice President and General Manager, Remington Rand Univac Division. Schnackel, who joined the company in 1959, was formerly Vice President of Manufacturing Services of IBM, a position he held since 1956. He joined IBM in 1937, and held various sales and management positions within the company during that time. Schnackel was born in Akron, Ohio in 1912 and is a graduate of Western Reserve University.

Two key men under Schnackel are Gordon Smith and William Suchors. Gordon Smith, Director of Marketing, joined Remington Rand in 1959. Prior to his joining the company, Smith was Director of Public Relations for General Foods Corporation. Before that, for 16 years, he was associated with IBM. He held various sales and management positions in IBM, and just prior to his leaving IBM, was Director of Communications. Smith is responsible for the direction and coordination of all marketing activities of the Remington Rand Univac Division.

Under Gordon Smith are John N. Veale, General Sales Manager; Harold Hungerford, Advertising and Sales Promotion Manager; and a group of Product Line Managers. At the present time, the Division is setting up four product line managers, whose names are not yet available. The initial group of four product lines consists of File Computers, Punched Card Equipment, Solid-State Computers, and new products.

John Veale joined the company in 1939, and was Western Regional Manager just prior to his present appointment. Reporting to Veale are V. E. Johnson, Coordinator of Sales, Services and Manufacturing, who joined the company in 1946, and was appointed Branch Manager in Detroit in 1952. Johnson will be primarily concerned with programming and systems analysis and related areas of customer service. Also reporting to Veale is G. W. Helm, Manager of Industrial Marketing, who has reporting to him a group of Industry Specialists. For example, there is a manager of marketing for the transportation industry, a manager of state and local government marketing, a marketing manager to

the rubber industry, and an auto industry marketing manager. Also reporting to Veale are the regional sales managers, and under these, the numerous branch and district managers. Philip S. Vincent, Manager of Customer Services for Maintenance, also reports to John Veale.

William J. Suchors is Coordinating Director of Engineering and Product Planning. Suchors joined the company in 1959 as Executive Assistant to D. L. Bibby. Before joining Remington Rand, he was General Sales Manager of VARCO, Inc. Prior to this he was Manager of Product Planning of the Electric Accounting Machine Division of IBM. Suchors is responsible for the engineering and product planning in the Commercial Engineering Department in Philadelphia, the Military Department in St. Paul, and the Product Planning Department in New York. Reporting to Suchors are Robert T. Blakely, R. E. McDonald, and Chuan Chu.

Robert I. Blakely, head of Product Planning in Philadelphia, is responsible for technical evaluation of all new product planning program and the development of new product specifications. He is also responsible for the division's product planning representatives in the regional sales offices, as well as the product planning in St. Paul and South Norwalk. The implication is that the division is organizing its product planning service group to develop information on customer needs and requirements through the regional sales offices. Before joining Remington Rand, Blakely was Corporate Staff Engineer reporting to the Vice President of Engineering of the Burroughs Corporation, and prior to this position was Manager of Engineering Services at Burroughs' Paoli Research Center. Before joining Burroughs, Blakely was Manager of Development Services of the Military Products Group at IBM, Kingston.

R. E. McDonald is General Manager of the Military Department in St. Paul. Reporting to McDonald are Jim Redding, Military Applications (this is essentially a military sales function); E. C. Thompson, Services and Planning; Noel Stone, Chief Engineer; John Vye, Director of Manufacturing; Larry Reid, Director of Field Maintenance and Training; and Alfred Bode, who is in charge of accounting and related functions.

Dr. Chuan Chu is General Manager at Philadelphia and is responsible for the engineering and development work in the Philadelphia facility. Dr. Chu was mainly responsible for the development of the LARC.

Dr. Howard T. Engstrom, a retired Vice President of Remington Rand Univac Division, is now Technical Staff Consultant to Schnackel and is responsible for a group of technical specialists in New York.

J. Presper Eckert, a Vice President in a consultant position for Engineering in Philadelphia, developed, along with Dr. John Mauchly, the Univac I. He was a principal in Eckert-Mauchly when Remington Rand bought it in 1950. Although not in a line position, he exerts considerable influence over Univac Commercial Engineering.

Thomas Kirkland, an Executive Assistant to Schnackel, is concerned with international sales. Before joining Remington Rand he was Director of

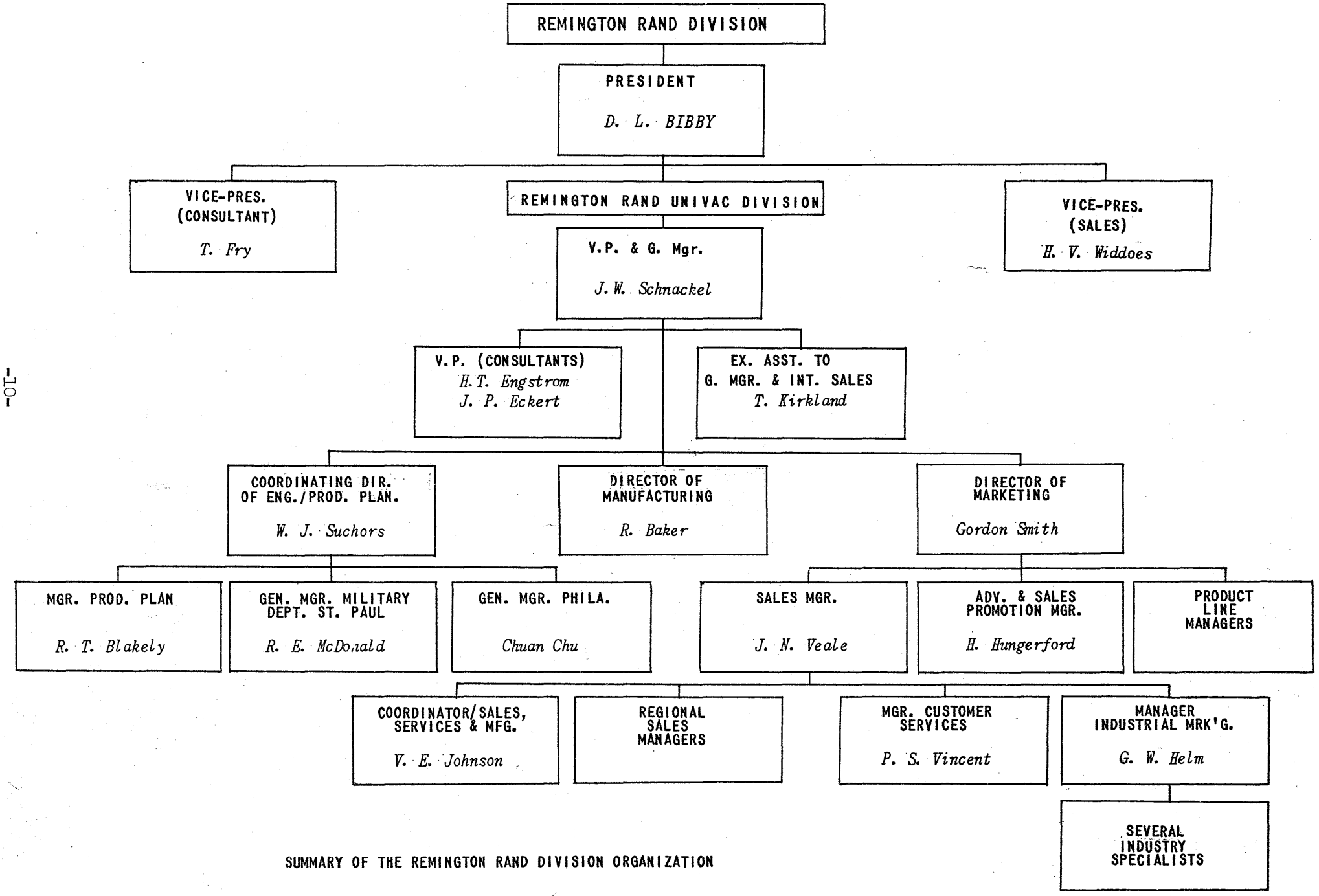
Marketing for Corning Glass; prior to that was a Vice President of IBM World Trade Corporation.

Raymond Baker is Director of Manufacturing; all of the Plant Managers report to him.

Thornton Fry, a retired Vice President of Remington Rand and also a retired Vice President of Bell Laboratories, is on retainer to Remington Rand as a consultant.

Howard V. Widdoes, formerly Vice President of Sales, is now a group executive reporting to Bibby and is concerned with the Systems Division and Accounting Machine Division. His present position is essentially that of a Staff Consultant to Bibby.

It is worthy to know that quite a number of the men who played leading roles in the development of the Remington Rand Univac Division left the company to form companies of their own. Among these are A. N. Sears, Vice President, Remington Rand, who is president of a firm of management consultants; John Parker, former President of ERA and Vice President, Remington Rand, formed his own electronics company; William Norris, Vice President of ERA and Vice President of Sperry Rand, formed the Control Data Corporation, a Computer manufacturing company and Dr. John Mauchly, President of Edward-Mauchly Corporation formed his own consultant firm. From the point of view of the present organization, the key men for overall planning are Bibby and Schnackel; Gordon Smith, John Veale, and William Suchors can be expected to play very significant roles in this activity.



SUMMARY OF THE REMINGTON RAND DIVISION ORGANIZATION

PRODUCTS

INTRODUCTION

The following description of the Remington Rand Univac Division product line includes all the known products that have been manufactured up to the present. Only three data processing systems can be considered as being currently manufactured or being actively sold. Univac III, STEP, and the Univac Solid State 80/90. The 1107 and the 490 were announced at the Eastern Joint Computer Conference and very little data is available on them at the present time.

Work is, of course, being done on new systems some of which are known but not in sufficient detail for inclusion in this description.

Any of the peripheral equipment that is used with the more recent systems is still available. Specifically, the Compatible Printer is a very competitive device even though the basic specifications have changed little since 1953.

Cost-performance charts on the current systems are included to indicate the competitiveness of the latest products.

CURRENT EQUIPMENT EVALUATION

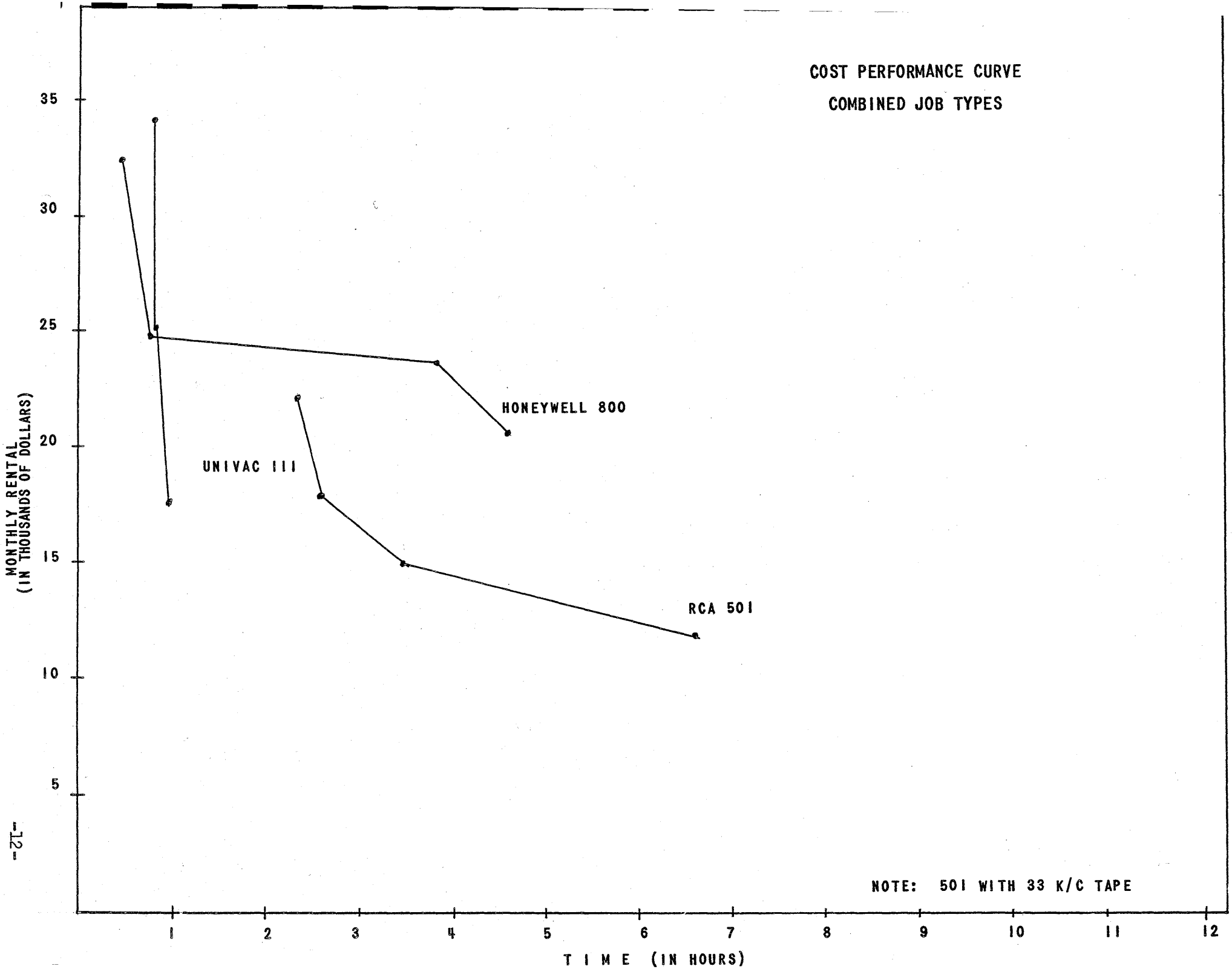
Cost-performance studies have been prepared which include two of Remington Rand's current systems. The Solid State 80 and Univac III have been studied. STEP has not yet been studied.

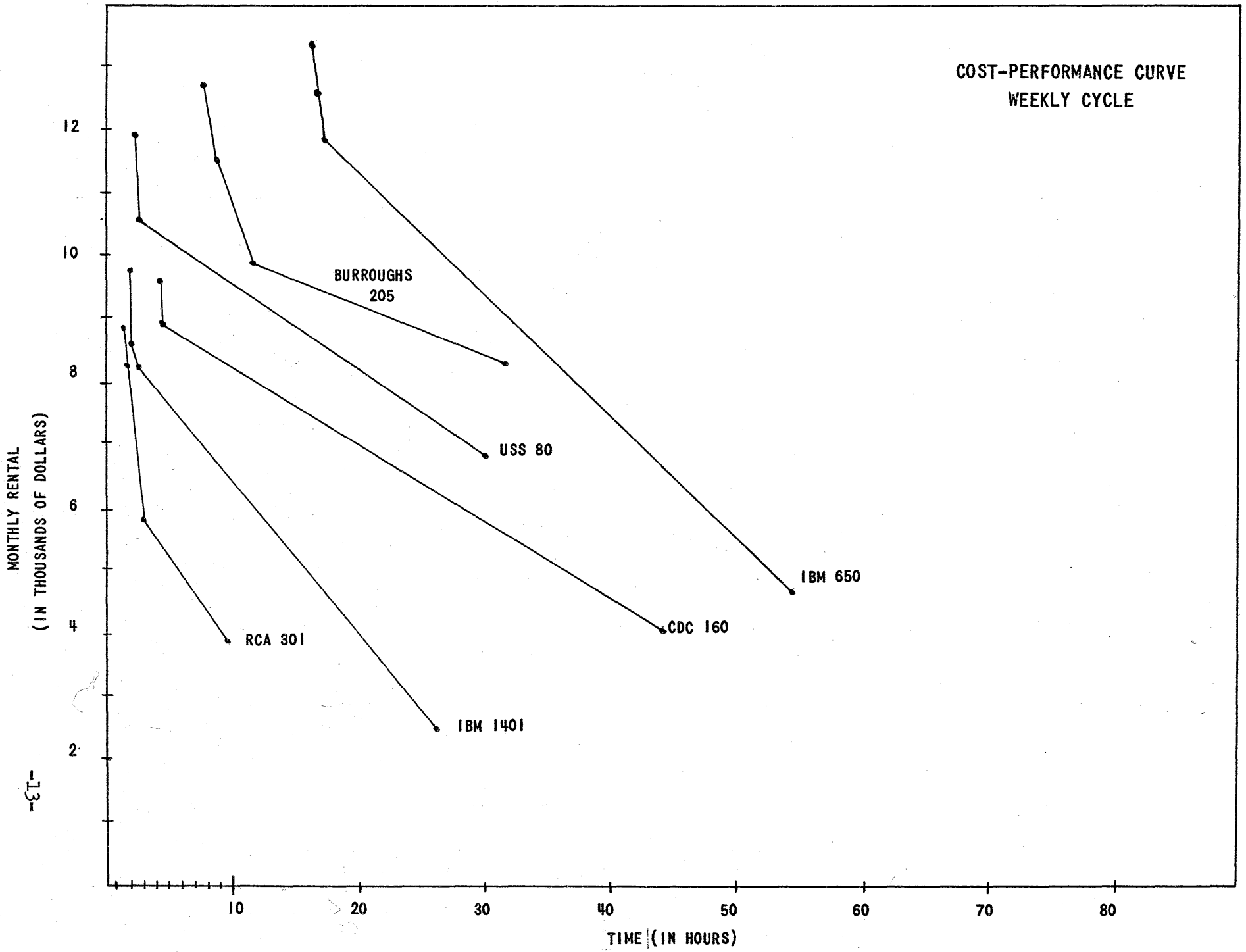
The jobs used to evaluate the USS 80 consisted of a weekly payroll, a daily labor distribution, and a weekly inventory control. In some cases, the USS 80 could do the job in less time than any of the other systems but at a comparatively high cost. For the overall weekly series of problems the USS 80 was generally as fast but more expensive than the RCA 301 and IBM 1401, both of which are more recent developments. There are, however, certain features of the USS 80 which might be very desirable for some applications.

Programs for the Univac III system were timed out and compared with competitive systems. The results for the various job types were combined into a single cost-performance chart. This chart indicates that Univac III is very competitive in its lower price range but as the rental increases the Honeywell 800 has better performance. The Univac III outperforms the RCA 501 for equivalent rental.

UNIVAC III

Univac III is a general purpose data processing system. The LARC Processor is utilized as the central computer. The Univac III is a fixed word,


COST PERFORMANCE CURVE
COMBINED JOB TYPES
MONTHLY RENTAL
(IN THOUSANDS OF DOLLARS)
35
30
25
20
15
10
5
HONEYWELL 800
UNIVAC III
RCA 501
NOTE: 501 WITH 33 K/C TAPE
1
2
3
4
5
6
7
8
9
10
11
12
TIME (IN HOURS)


COST-PERFORMANCE CURVE
WEEKLY CYCLE
MONTHLY RENTAL
(IN THOUSANDS OF DOLLARS)
12
10
8
6
4
2
BURROUGHS
205
USS 80
IBM 650
CDC 160
RCA 301
IBM 1401
10
20
30
40
50
60
70
80
TIME (IN HOURS)

variable block Computer using a 4.5 microsecond magnetic core memory. This storage holds between 8,192 and 32,768 words. A word is 6-decimal digits, 4 alphanumeric characters, or 24 binary bits plus sign and two parity bits. Univac III is a single address machine using one instruction per word. Indirect addressing, field selection, and up to 15 index registers are provided.

Primary input-output media is magnetic tape. Either Uniservo III or II may be used. If two power supplies are used, up to 26 Uniservo III's and 6 Uniservo II's may be attached on-line. If three power supplies are used, each of the two Uniservo III Synchronizers can handle 16 tapes and the Uniservo II Synchronizer can handle up to 6 tapes. The Uniservo II Synchronizer permits reading or writing simultaneously with compute. The Uniservo III Synchronizer permits the reading and writing of magnetic tape simultaneously with compute operations.

Uniservo III has a transfer rate of 200,000 digits per second or 133,300 characters per second. The nine-channel wide tape travels at 100 inches per second and is packed at 1000 pulses per inch. Uniservo II transfers information at a rate up to 20,000 alphanumeric characters per second. The tape has 6 information channels and travels at 100 inches per second. The use of Uniservo II's allows tape compatibility with Univac I, II, Scientific, and Solid State Systems.

A number of 80 or 90 column High-Speed Card Readers may be employed in the system. They read cards at the rate of 700 cpm. A number of 80 or 90 column card punches, operating at 300 cpm, may be used. The High Speed Printer operates at 700 lpm. It prints 130 characters per line with any one of 51 characters possible in each position.

The number of operations that can occur simultaneously is a function of the number of communication lines (maximum of 10) attached to a particular system. Each Uniservo III Synchronizer uses one input and one output communication line. The Uniservo II Synchronizer uses one input-output line as do the Card Readers, Card Punches, High-Speed Printers and Card Punching Printers. Therefore, in a fully expanded system, in addition to compute operations, two Uniservo III's can be reading, two Uniservo III's can be writing, one Uniservo II can be reading or writing, and several of the other peripheral units may be operating.

The Univac III is a new system that won't be delivered for about 18 months. In the $17,000 - $25,000 per month price range, it has a portion of the market practically to itself. In this price range, there is the RCA 501, the IBM 7070, and the Honeywell 800. Only the Honeywell 800 can compete performance-wise with the Univac III but at a slightly higher price.

UNIVAC SOLID STATE 80/90 - STEP SYSTEM

The USS 80/90 is a magnetic drum Computer that functions as a Card Processor and as a Magnetic Tape Processor. The STEP system is a reduced version of the USS 80/90, reduced in ability and reduced in price, that can be built up to a full-fledged USS system. Both the USS 80/90 and

the STEP systems can be obtained in models that will accept 80 column or 90 column punched cards.

The USS system is a fixed word, fixed block system. A word consists of ten digits. Alphabetics must be double digits. It uses a one plus one address instruction in order to save running time in programming the drum memory.

The drum in the USS 80/90 stores 4000 words in fast-access storage with a maximum access time of 3400 microseconds and 1000 words in high speed access storage with a maximum access time of 850 microseconds. The STEP drum holds 2400 words with a maximum access time of 3400 microseconds. This memory can be increased until it has exactly the same capacity as the USS drum. Three index registers are available with either system.

The input-output devices include Punched Card Readers, Punches, Magnetic Tapes, and a Printer. All input-output devices are buffered so that input-output functions can overlap compute time. Since card code, machine code, and tape code can be different and all translation is programmed, most of the overlap time is used for translation and other input-output manipulation. The High Speed Card Reader (80 or 90) reads 450 cards per minute. This speed can be increased to 600 cpm. The Card Read-Punch unit operates at 150 cpm. In the STEP system this unit only punches cards and can become a full read-punch unit with pre and post reading stations as an option. The High Speed Printer prints at the rate of 600 lpm in 130 character positions. In the basic STEP system only 100 positions are available with the additional 30 optional. Up to ten 25 KC magnetic tape units may be used with each system. Up to ten Randex drum units, each storing 24,000,000 digits, may be used with the USS 80/90 or STEP system. The On-Line Card-Punching Printer accepts information from the Computer, punches the card appropriately, and then prints up to 13 lines and 70 columns on each side of the card. Cards can be read, punched, and printed at the rate of 150 cpm.

Over 100 USS 80/90 have been delivered and about 300 are on order both in the U. S. and abroad. Now the RCA 301, the IBM 1401 series, the GE 225, and the Honeywell 400 are providing stiff competition for the Solid State. Only the 1401 has been delivered but the waiting time for 1401 delivery is so great that USS 80/90 are still being sold.

The STEP system is a cost reduced USS 80/90 that was announced so that Remington Rand Univac could compete pricewise with the lower priced RCA 301 and IBM 1401.

UNIVAC 490

This is the Univac Real-Time System. It is capable of handling data-processing problems on a real-time or batched-processing basis. The processor memory is a core-storage device holding 16,384 or 32,768 30-bit computer words. The cycle time is 8 microseconds. There also

is a 16-word bootstrap memory. The processor contains three clocks: a Real-Time Clock, a Delta Clock which counts up to 32,768 ms, and a 24-hour Day Clock for external interruption of computer processing once every minute. Automatic Interrupt of batch processing is also available in order to process high-priority real-time transactions. Seven index registers are included with the system.

Two input and two output channels are available for communication with other Computers. Twelve input and twelve output channels are available for peripheral equipment. The maximum information rate of these channels is 50,000 transmissions per second per channel. All Input/Output is completely buffered for simultaneous read, write, and compute. The Input/Output equipment available includes the following: Uniservo II A's (25 kc), Uniservo III's (133 kc), 600 cpm High-Speed Card Reader, 150 cpm Card Reader-Punch Unit, and a 600 lpm High-Speed Printer. New devices include: a Keyboard Printer which prints information entered via the keyboard and prints directly from the Computer, a Uniset Console which is an inquiry device with visual display, and a Uniset device which is a combination of the Keyboard Printer and the Uniset Console. The Uni-Saver Inquiry device for banking applications can also be used. A Drum Storage System consisting of a channel synchronizer, a control unit, and from 1 to 8 flying-head drums is available. Each drum is capable of storing a 3,800,000 alphanumerical characters with an average access time of 17 ms.

UNIVAC 1105

The 1105 system is a large scale, synchronous data processing system. It is primarily a scientific system but has been used for business data processing. It features, as do all of the 1100 series Computers, a very capable order code. Floating-point arithmetics are available. All of the Univac off-line equipment is also available. Input-output facilities include 16-24 Magnetic Tape Units and Paper Tape devices. The main difference between the 1105 and 1103A (its predecessor) is the presence of two 120-word buffers. This enables the overlapping of magnetic tape reading with magnetic tape writing along with computation. The magnetic core memory is available in two sizes, 8192 words (standard) or 12,288 words. A word is 36 bits. The core storage cycle time is 8 microseconds. The magnetic drum stores 16,384 words and up to two may be used. Average initial access time to the drum is 17 milliseconds.

UNIVAC 1107

The new Univac 1107 is the first announced commercial Computer to use a thin film device for information storage. This thin film device, at present, is used only for the following registers: 15 index registers and 16 arithmetic registers. The cycle time for the film is 0.6 microsecond. The ferrite-core memory contains 8,192 - 65,536 36-bit words. The core memory has a cycle time of 4 microseconds. The Processor contains a Real-Time Clock which functions as automatic incrementation of index

registers, automatic indexing, indirect addressing, partial - word transfers, and floating - point arithmetic. Auxiliary storage may be obtained by using compatible drum discs and tapes. Card punch units, high-speed printers, and real-time devices such as analog to digital converters may be used with the Univac 1107. The Univac 1107 is an updated transistorized version of the Univac 1105 and as such uses the same peripheral equipment.

UNIVAC LARC

A basic LARC system contains a Computer and a Processor both of which are general purpose computers put to specialized functions. The Processor controls all input-output operations including storage for data transfers in an out of the system. The Computer performs rapid calculations. In expanded versions, two Computers can operate with the Processor. These two Computers can operate as a single Computer or as separate units. The Processor, is capable of sorting, merging, editing, et cetera, simultaneously with computer operations. A full complement of Input/Output equipment is available. Up to forty 25-kc magnetic tape units can be used. One Card Reader and two Printers can be attached to the system. Two electronic Page Recorders, each recording 15,000 characters per second are available. When used for graphing, it operates at an average rate of 2,000 points per second. The magnetic core memory operates on a 4-microsecond cycle and stores up to 97,500 12-decimal-digit words. Thirty-nine modules of 2500 words each make up the memory. LARC uses drums for mass storage. Up to 24 drums each storing 250,000 words may be included.

UNIVAC FILE COMPUTER MODEL I

The Univac File Computer Model I is a general-purpose business-oriented data Processor. It has provisions for both an internally stored program and a plugboard program and, if desired, the control of the program can be transferred back and forth between the internal program and the external program under program control. Information is stored in alphanumeric form. It is a fixed-word length Computer with 12 characters to the word. However, special masking features facilitate addressing partial words. Input/output is via the input-output tracks of the drum and consequently multiple input-output functions may be simultaneous with computation. Paper tape, punched card, magnetic tape, and typewriter input/output media are provided. 600 lpm printer is available off-line. A maximum of 10 magnetic tape units with a transfer rate of 10,425 characters per second may be utilized. Block length is 12 words. The main memory consists of a drum storing ten words in each of 87 tracks. Twenty additional tracks are used for input-output storage. Buffer storage of 20 words in magnetic cores is available. Up to ten mass-storage drums, each holding 180,000 characters, are used. The average access time is 17 ms.

UNIVAC FILE COMPUTER MODEL 0

The Univac File Computer Model 0 is basically a plugboard programmed

version of the Model I. A very flexible plugboard is provided and it controls both a large complement of input-output devices and a large amount of storage for a Computer of this type. Since eight tracks are provided on the drum for input/output, up to eight input-output devices may be connected. These are identical to those listed for Model I and include magnetic tape, paper tape, punched card, and typewriter devices.

UNIVAC 60 - UNIVAC 120

This is a small-scale, punched-card, vacuum-tube Computer designed to be supported by Remington Rand tabulating equipment. This Computer is programmed by plugboard, there being no facilities for an internally stored program. A maximum of 20 program steps are allowed per program, however, selectors provide for iterations. The main difference between the two is the amount of data which may be handled from each card. The Univac 60 will read a maximum of 60 card columns while the Univac 120 will read a maximum of 120 card columns. Both the 60 and 120 will read and punch either 125 cpm or 150 cpm. The Model 60 Computer may store a maximum of 120-decimal digits of data for processing while 60 digits may be stored in 6-Accumulator units. There are also 6 intermediate-output storage units. The Model 120 Computer may store a maximum of 240 decimal digits of data for processing while 120 digits may be stored in up to 12 accumulator units. There are also 12 intermediate output storage units.

UNIVAC I

Univac I is a general purpose, stored-program, vacuum-tube machine. It was one of the earliest machines designed to provide special facility for processing business data. This machine utilizes mercury delay lines for its memory. Alphanumeric information is stored and operated upon as fixed words of 12 characters each. Two instructions may be stored in each word. Special input-output buffers permit simultaneous read, write, and compute. Metallic magnetic tape is used as the chief input-output medium. Information, stored in blocks of 60 words, is transferred to the Computer at the rate of 12.8-kc. Typewriter keyboard input is provided at the console as well as typewriter output. Off-line printers, unitypers, paper tape, and card equipment are available. The memory of this Computer has a capacity of 1000 alphanumeric words. These words are individually addressable and circulate in delay lines, 10 words to a line.

UNIVAC II

Univac II is a general-purpose data Processor utilizing an alphanumeric code. It is a fixed-word machine with 12 characters per word. This machine is an updated version of Univac I. Magnetic tape (metallic or plastic) is the chief input-output medium. Transfer rate to and from memory is at 20,000 characters per second. Information is recorded in a block of 60 words. Up to 16 tapes can be connected to a Computer.

Off line equipments listed with Univac I are also available. The console provides typewriter keyboard input. This machine utilizes a magnetic-core memory of 2000 words. A 10,000 word memory is optionally available. Each word is individually addressable.

UNIVAC 1103A

The Univac 1103A Computer is a large-scale, vacuum-tube, binary machine primarily designed for mathematical and scientific calculations. The word size is 36 binary bits including the sign bit. A rather elaborate order code is provided and special instructions for floating-point arithmetic are obtainable (1103B). Two address instructions are used. A word is always operated on in parallel. Many types of input-output media may be used: Paper Tape Readers and Punches, up to 10 magnetic tape units; Electric Typewriter, Card Reader, Card Punch, Teletype circuits, Analog-to-Digital Converters, and various types of graphic displays, etc. Main memory consists of 4,096 words of core storage and 16,384 words of drum storage. The 10 magnetic tapes available on this machine are often used as temporary storage instead of input-output.

NIKE-ZEUS GUIDANCE COMPUTER

This is a missile guidance system delivered in 1960. Input/Output equipment consists of real-time devices including radar. Paper tape, typewriter, and some visual display equipments are probably used. The memory stores about 10,000 24-bit words. It has a 5 microsecond twister memory.

ATHENA

This system is an ultra-reliable missile guidance system delivered in 1957. At least four have been installed for the TITAN intercontinental missile. The prime consideration in designing this Computer was reliability. Input-output devices include paper tape, typewriter, and radar. The main memory is a magnetic drum. A smaller 256 word, 8-microsecond core-storage is also available. Word length is 24 bits. As an experimental project, the drum was replaced with a 1000 word, 1.5 microsecond thin film memory.

AFCRC

The Air Force Cambridge Research Computer was one of the first solid-state Computers developed. It is a small, fast, real-time, drum Computer. Input-output system consists of the external system, paper tape, and a typewriter. The drum memory rotates at 16,500 rpm and stores 22,000 decimal digits. Average access time is 1.8 milliseconds. Four thousand of the 22,000 digits are stored in fast access bands with an average access time of 450 microseconds. This Computer was the predecessor of the USS 80/90.

M460, M480

This Computer is a small powerful fixed-word, variable-block Computer designed to handle many input-output devices with a minimum of synchronization equipment. Six M460's have been built as prototypes. The production model is the M480. The difference is in the basic circuit used. All production at this time is for the U. S. Navy. The basic input-output medium is paper tape. Other devices can include radar, data transmission equipment, and other Computers. Memory consists of 32,768 words of 8-microsecond core storage. Word length is 30 bits and the average instruction execution time is 20 microseconds.

BOGART

Bogart was delivered in 1957. Input-output system includes four IBM 727 tape units. Other input-output data is not available. The memory is a 4,096 word, 20 microsecond core storage. Word length is 24 bits.

ERA 1102

This system was a military version of 1101. Three were produced in the 1952-1953 period.

ERA 1104

The 1104 was a cut down military version of the 1103, delivered in 1955. It is a 30-bit machine used for BOMARC guidance.

UNISERVO III

Uniservo III has an alphanumeric transfer rate of 133.3 kc, a packing density of 1000 characters per inch, a tape speed of 100 inches per second for reading and writing, a rewind speed of 150 inches per second, and a gap of 0.75 inches. This Uniservo, used by Univac III, reads forward and backward on a 2400 foot Mylar tape.

UNISERVO II

Uniservo II has a transfer rate of 25 kc, a packing density of 250 characters per inch, a tape speed of 100 inches per second, and a one inch gap. Uniservo II uses a 2400 foot Mylar tape reel or a 1500 foot reel of Unitape. Tape can be read in a forward or reverse direction. Uniservo II is used by Univac II, Univac III, STEP, USS 80/90, LARC, 1105, 1103A, and the Tape Search-Write Unit.

FILE COMPUTER TAPE STATION

The File Computer Tape Station has a 10.4 kc transfer rate, a packing

density of 139 characters per inch, a tape speed of 75 inches per second, and a 0.5 inch gap. Mylar tape in 2400 foot reels can be read in either a forward or reverse direction. The File Computer and Sorting Collator use this tape unit.

UNISERVO I

UNISERVO I has a transfer rate of 12.8 kc, a packing density of 128 characters per inch, a single tape speed of 100 inches per second, and a gap length of one inch. Only metal tape can be used and is available in 1500, 500, and 250 foot reels. Reading in both directions is possible. Uniservo I is used by the 1103 and Univac I systems.

MAGNETIC TAPE SORTING COLLATOR

The Magnetic Tape Sorting Collator is a special-purpose magnetic tape File processing device which performs a wide variety of collating operations including a "Sort-by-Collation" and a "Sequence-check" operation. The programs are wired in and four magnetic tapes are controlled. It may operate either off-line or on-line with the Univac File Computer.

UNITYPER II

Unityper II is a modified Remington Electric Typewriter with a tape panel and a power supply in one assembly. In addition to typed "hard copy" it records alphanumeric information on 200 ft. reels of magnetic tape in Univac code. Tape format is blockette. Sixty-three characters are available in the Unityper II code.

UNITYPER I

Unityper I is composed of two units - the keyboard unit and the tape recorder unit. It records alphanumeric information in Univac code on magnetic tape and every key stroke (even space) produces a typed character. Tape format is blockette. Sixty-three characters are available in the Unityper I code.

UNIVAC INPUT VERIFIER

The Univac Input Verifier may either record information on magnetic tape as Unityper II, or check the accuracy of a magnetic tape previously prepared by Unityper, or operate as an electric typewriter. Verifying is performed by mounting a recorded tape and retyping the information. If the information typed the second time is not identical with that originally typed, the keyboard locks. The error may be erased and correctly recorded and then verification may proceed.

UNIVAC OFF-LINE HIGH-SPEED PRINTER

This was the first successful high-speed printer system. There are four units interconnected in the system: tape reader, control unit, Memory Unit, and Printer Unit. This was the basic printer system that was used and is still being used on Univac I's and 1103A's. When the Tape Reader was changed from a Uniservo I to a Uniservo II, an extra memory unit was also added which permitted printing from tapes that were written at a higher packing density. Previously tapes had to be in blockette format but now normal block format is accepted. Also water-cooling was changed to air-cooling. This updated version of the printer is used with any Univac computing system. Recently the units have been slightly redesigned and called the Univac Compatible Printer which can be used with any tape unit in any computing system.

The print unit contains the printing and paper feeding mechanisms. The characters (51) are on wheels which are attached to a rotating shaft. There are 65 wheels 2 character wide off set, for 130 print positions. When the proper character in the proper position is lined up, a hammer pushes the paper and the ribbon onto the character. There is one hammer for each wheel. The 51 printable characters include 26 letters of the alphabet, 10 decimal digits and 15 special symbols. Printing speed is 600 lpm with a maximum of 120 characters per line in 130 print positions. Paper advance is at the rate of 20 inches per second. Print spacing is 6 lines per inch vertically and 10 characters per inch horizontally. Print format is controlled by an extremely versatile plugboard, a punched paper tape loop, and special editing symbols on magnetic tape.

UNIVAC ON-LINE PRINTER

The on-line printer is the printing unit from the off-line print system dressed up differently. Printing format is the same but editing is accomplished by a computer program. The print speed and the number of characters per line varies with the Computer as per the following chart:

Computer	LPM	Characters/Line
USS 80/90	600	130
STEP	600	100, 110, 120, 130
UNIVAC III	700	130
UFC Model 0	300	130
UFC Model I	400	130
LARC	600	130

ELECTRONIC PAGE RECORDER

The Computer (LARC) output is displayed on the face of a cathode ray

tube and is recorded by means of a program controlled high-speed 35 mm camera. The device operates at an average character rate per film frame of approximately 15,000 characters per second. The operator can advance the film and develop a paper print in approximately one minute. A transparency may be developed in approximately two minutes. For recording numeric or alphanumeric characters the format consists of a maximum of 65 lines of 130 character positions each. Any one of 64 characters or symbols may be used. The recorder is also capable of graphing and can plot at the rate of 2000 points per second. Various other features for graphing are available.

UNIPRINTER

The Uniprinter, composed of two units, the tape reader and the printing unit, is capable of preparing typewritten copy from recorded information on magnetic tape. The information must be completely edited and packed at 20 characters per inch from the Univac Computer. The print format is typewriter style, 10 characters/inch, 6 lines/inch. Most upper and lower case characters are available with a maximum speed of 10 characters per second. All editing must be on the Computer.

ADDING MACHINE PRINTER

An on-line unit to the Model-0 File Computer. It prints numeric information only at the rate of 180 lpm. Each line contains 11 digits plus the sign.

UNIVAC HIGH SPEED CARD READERS

Both 80 and 90 column High Speed Card Readers are offered. These devices have one input stacker, two card sensing stations, one for original reading and one for checking; and three output stackers. Selection of output stacker is under the control of the equipment being used.

The following chart shows the systems which may use these devices as on-line equipment, the model, and maximum operating speeds obtainable with each system.

System	Model	Speed
USS 80	80	450 or 600 cpm
USS 90	90	450 or 600 cpm
STEP 80	80	450 or 600 cpm
STEP 90	90	450 or 600 cpm
UNIVAC III	80 or 90	700 cpm
LARC	80	450 or 600 cpm

UNIVAC 90 COLUMN CARD SENSING-PUNCHING UNIT

This unit is the input-output device for the Univac 60 and Univac 120 systems. It may also be used as an on-line input-output device for the Univac File Computer System. The 90 Column Card Sensing-Punching Unit can read and/or punch the Remington Rand Card Code in all 90 columns of the card at the maximum rate of 150 cards per minute. It has one input stacker, one read station, one punch station, and two output stackers. Information calculated by the Computer can thus be punched into the same card from which the source data came. Output stacker selection is under the control of the Computer.

UNIVAC CARD PUNCH

This unit consists of one input stacker, a punch station, a read station for accuracy control, and two output stackers. Cards can be punched at the maximum rate of 300 cards per minute. Output stacker selection is under the control of the Computer. This unit is an on-line output unit of the Univac III system.

UNIVAC CARD-PUNCHING PRINTER

The Univac Card Punching Printer is offered as an off-line and on-line model. The on-line model may only be used with the Univac III System. The off-line model may be used with any Univac Tape System. In one pass, this device punches a standard 80 column card, senses the punching for verification, prints on both sides of the card, and delivers the card to one of the three output stackers.

UNIVAC CARD-TO-MAGNETIC TAPE CONVERTER

This is an off-line input device which can be used with any Univac Tape System. It is offered in both an 80 and 90 column model. It reads information from punched cards, translates the information to Univac code, and records the translated data on Univac Magnetic Tape. Editing may be done during transcription via a plugboard program. The conversion rate is 240 cards per minute.

UNIVAC MAGNETIC TAPE-TO-CARD CONVERTER

This is an off-line device which can be used with any Univac Tape System. It is offered in both an 80 and 90 column model. It reads information from magnetic tape, translates the information into card code, and punches the data into cards. Editing may be done during transcription via a plugboard program. The conversion rate is 120 cards per minute.

UNIVAC CARD PUNCH SCANNING UNIT

This device reads an optically marked 90 column card and punches appropriate code holes into the card. Up to 40 columns of the 90 column card can be converted by this device at the rate of 150 cards per minute.

UNIVAC 90 COLUMN CARD SENSING-PUNCHING UNIT (WITH POST READ CHECKING)

This unit is similar to the Univac Card Punch Scanning Unit, except that it embodies a post-read station; i.e., as a card travels through the device, it can be read, punched, and re-read for accuracy control. This unit may only be used with the UFC-I.

UNIVAC 80 COLUMN CARD SENSING-PUNCHING UNIT (BULL)

This device is used as a UFC, 1103A, and 1105 system card input unit, as a card output unit, or as a combined input-output unit. The device has two input stackers, each of which feed cards through a separate channel to a corresponding output stacker. The channels are called the "punch" and "read" channels, respectively. The two channels work simultaneously each performing three parallel sequenced operations. A card passing through the punch channel is read, punched, re-read for accuracy control, and deposited in the punch output stakcer. A card passing through the read channel is read, re-read for accuracy control, and deposited in the read output stacker. Operation of the two channels is synchronized so that the processing of corresponding cards from two stacks may be co-ordinated. The unit uses standard 80 column card code and processes either or both stacks at a maximum speed of 150 cards per minute.

UNIVAC READ-PUNCH UNIT

This unit is offered as both a 90 column and 80 column model. Both models consist of one input stacker, a read station, a punch station, a second read station for accuracy control, and two output stackers. Output stacker selection is under control of the Computer. This device processes cards at the rate of 150 cards per minute. The Read-Punch Unit-80 may act as an on-line, input-output device for the USS 80 and the STEP 80. The Read-Punch Unit-90 can operate as an on-line input-output device for the USS 90 and the STEP 90.

PAPER TAPE PREPARATION UNIT MODEL II

The Paper Tape Preparation Unit Model II is utilized for punching two binary coded octal characters with parity per frame of paper tape. It produces a printed record and also duplicates paper tapes. It consists

of three units:

1) the auxiliary keyboard with tape reader, printer, and power supply,
2) the main keyboard,
3) the Punch.

The auxiliary keyboard prints without punching.

THE HIGH SPEED PAPER TAPE PUNCH

The High Speed Paper Tape Punch is an on-line device used by the 1103A and 1105 Computer. It punches 60 characters per second.

THE FERRANTI PHOTOELECTRIC PAPER TAPE READER

The Ferranti Photoelectric Paper Tape Reader is used on-line with the 1103A and 1105 Computers to read 5 and 7 level tape at 200 characters per second. It will stop on a character.

UNIVAC PTM CONVERTER

The Univac PTM Converter reads 5 level paper tape (a special version reads 7 level paper tape) at 200 characters per second and translates magnetic tape in either binary or Univac code. The converter utilizes a Ferranti paper tape reader and punch for paper tape, and a transistorized magnetic core buffer of 120 characters. Magnetic tape information must be on Mylar tape in blockette format. Magnetic tape is read in reverse for error checking and correction. Paper tape to magnetic tape speed is 200 characters per second and magnetic tape to paper tape speed is 60 characters per second.

THE SYNCHRO-TAPE TYPEWRITER

This machine consists of a Remington Rand Electric Typewriter and a paper tape read-punch unit. It can prepare typewritten copy and at the same time punch this information in paper tape. It may also read paper tape and produce typed copy. This unit may be adapted to 5, 6, 7, or 8 level paper-tape systems. Special versions are available that: read paper tape and type only, punch paper tape and type only, utilize remote paper tape read-punch stations. Read-punch units for handling edge punched cards are also available.

THE MONITORING ELECTRIC TYPEWRITER

The Monitoring Electric Typewriter is a modified Flexowriter used on-line with the 1103A and 1105 to monitor programs. It will type alphanumeric information in any format and has a punch attachment.

308-5 TAPE-TO-CARD CONVERTER

The Type 308-5, Tape-to-Card Converter is capable of preparing 90 column punched cards from information perforated in 5 channel paper to 7-level Univac code. The translated code is then written to Univac Tape at 128 characters per inch. Blockette format is used on magnetic tape and up to 1500 foot metal tape reels or 2400 foot plastic base tape reels may be used. Paper tape spooling devices are optional.

UNIVAC MTP CONVERTER

The Univac MTP reads Univac tape (either metal or plastic base) in blockette format and translates the information to 5-level teletypewriter code. The teletypewriter code with control codes are punched into paper tape at the rate of 60 characters per second. Modification of this device to produce 7-level paper tape is also offered.

BIDIRECTIONAL PAPER TAPE SYSTEM

The File Computer Paper Tape System is an on-line device consisting of a read-punch unit, a translation and format control unit, and an input-output control unit. It may be used for paper tape input, paper tape output, and paper input-output for the File Computer: or as an off-line paper tape to paper tape converter. Five, six, seven, or eight-level paper tape may be handled. Read rate is 240 characters per second. Punch rate is 60 characters per second. Code translation is accomplished by means of a programmer wired plugboard. The input-output control unit is the communication link between the File Computer and the translation and format control system.

PTM-MTP

The PTM-MTP translates 5, 6 or 7-level paper tape to or from Mylar tape. The telegraphic coded information on the paper tape is translated into 3 hole alphabetic and numeric codes with the subsequent punching of these codes into cards, or translated into operation signals to cause the functioning of the major features of a card punch.

318 CARD-TO-TAPE CONVERTER

The Type 318, Card-to-Tape Converter, prepares chadless paper tape from 90 column cards. By means of panel wiring and control punches in the cards, the data is edited from card to tape. Five-level telegraphs code paper tape is produced.

POINT O'SALE RECORDER

The Point O'Sale Recorder consists of three units: cash register, tag

reader, and tape perforator. It records sales information on multi-copy sales checks and 7-channel paper tape.

PUNCHED PAPER TAPE COMPARATOR UNIT

The Punched Paper Tape Comparator unit reads two 7-level paper tapes in synchronism at 30 characters per second. It stops whenever corresponding characters on the two tapes differ.

RANDEX SYSTEM

Each drum of the Randex System Model 1 can store 3 million 7-bit characters with two drums per unit. The average random access time is of the order of 0.5 seconds. The system contains a 120 character magnetic core buffer so that information can be selected without stopping the Computer. Transfer rate of the drum in bits is 356 kc. The Model 1 unit is used by File Computers. The Modle 1 File Computer may have up to 10 drum units for each of 10 demand stations and the Model 0 may have up to 10 drum units for each of 8 demand stations. The Randex Model 2 stores 24,000,000 digits on each drum unit. Up to 10 of these units may be connected to a tape synchronizer of either Univac Solid State or STEP System Computers.

UNIVAC LARC DRUMS

The Univac Larc Computer utilizes up to 24 drums storage with a capacity of 3 million decimal digits each. The random access time is on the order of 1.3 seconds. The transfer rate is 370,000 decimal digits per second.

UNIVAC FILE COMPUTER GENERAL STORAGE SYSTEM

The Univac File Computer general-storage system consists of random-access frums each storing 180,000 characters with an average access time of 34 milliseconds for File Computer Model 0 and 17 milliseconds for Model 1. Each Model 0 may have up to 10 drums and each Model 1 up to 33 drums.

INQUIRY TYPEWRITER UNIVAC FILE COMPUTER

The Univac File Computer Inquiry Typewriter is a Remington Encoding/ Decoding Typewriter for two way on-line communication with the memory of a File Computer. It may 1) address a File Computer memory manually for insertion or receipt of data or 2) seek permission via a button to enter or automatically print information under program control.

KEYBOARD PRINTER

The Keyboard Printer permits remote keyboard insertion of transaction data and printed-page output of Computer responses. Telegraphic or voice-grade communication lines may be used. The keyborad contains 10 numeric keys, 26 alphabetic keys, 10 special character keys, and a space bar. The printer unit prints all the data that is inserted via the keyboard in addition to printing directly from the Computer.

UNISET CONSOLE

The Uniset Console is a remote inquiry keyboard device designed to meet point-of-sale operating requirements. Indicator lamps display requested information as well as the Computer reply. Relevant information is stored on transparent cards which are identified to the Computer when inserted into the Uniset Console.

UNISET

This unit is a combination of the Keyboard Printer and the Uniset Console. It has the combined features of both units.

UNI-SAVER

This is the remote tellers' inquiry unit for the Univac 490 Real-Time System. It is an input keyboard device with printer output. It prints on a bank pass book and on an adding machine tape.

AGENTS SET

This is used with the Univac Airlines Reservation System to inquire of a File Computer as to information on specific flights. It has keyboard entry and has visual display for output. These are remote inquiry devices operating from various ticket offices.

UNIVAC TAPE SEARCH-WRITER

This is a transistorized magnetic tape searching device composed of a Synchro-Tape typewriter, and a Uniservo II linked by a control unit. Only one Uniservo is available for searching. The desired information can either be typed in on the typewriter or read-in from paper tape. When the item is located on the magnetic tape it can be printed on the typewriter or punched on the paper tape or both. A TMI transistorized magnetic core buffer serves as the memory for the system.

UNIVAC AIRLINES RESERVATION SYSTEM

This system is a Univac File Computer adapted to handle inquiries from remote devices at the various airlines ticket offices. All of the File Computer input and output devices can be used. The remote agent set is an input and output device by which the agent pushes buttons indicating flight information and the Computer returns proper information that is visually displayed on the set. The memory is the same as the File Computer memory.

FERRACTORS

These are subminiature solid-state power amplifiers used in Univac systems and devices.

UNITAPE

This is Remington Rand's metal tape used with the Uniservo's I & II, Unityper II, and other peripheral devices that used Uniservo I's. This tape is a phosphorous bronze tape coated with ferrous oxide so that it will retain a magnetic charge. It is produced in three reel sizes, 200 ft, 1500 ft, and an intermediate size.

PUNCH CARD EQUIPMENT

A complete line of basic punched card equipment has been offered for sale or lease for many years. A brief list of some of the equipment is given below. All of the equipments mentioned use 90 column cards and have many variations and special features which are not listed. Alphabetical Punch - punches information from a keyboard onto a 90 column card. Information is stored in the keyboard and the whole card is punched at one time. All 26 letters of the alphabet and 10 decimal digits can be punched. Multi-Control Reproducing Punch - 1) punches a new set of cards from an original set 2) punches many copies of a single card 3) verifies that two files of cards are in order 4) collates two files. Summary Card Punch - attaches to the alphabetic tabulator. Summarizes a group of cards while they are being run through the tabulator and punches summary cards. Sorters - sorts cards punched with numerical data in one pass per column and those with alphabetic data in two passes per column. Alphabetic Tabulator - tabulates and prints information recorded on punched cards. Alphabetic Interpreter - reads a punched card and prints the information on the face of the same card at the rate of 90 cards per minute. Calculating Punch - performs the arithmetical operations of addition, subtraction, multiplication, and division from values sensed on punched cards and punches the result into the same card or any desired following cards. Synchromatic - accounting machine synchronized with an alphabetical card punch so that information entered on accounting cards is also punched on cards for further processing.

FINANCIAL DATA*

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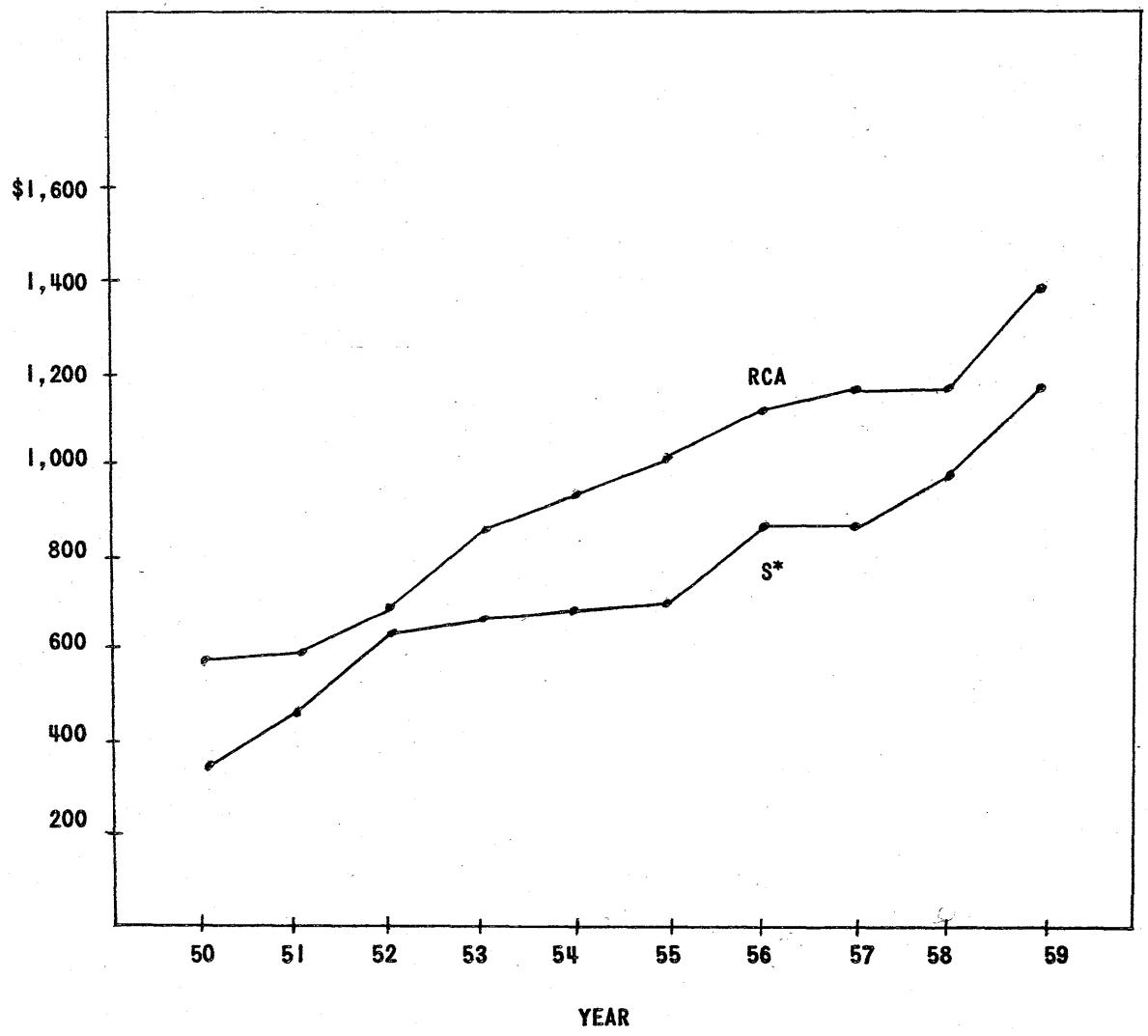
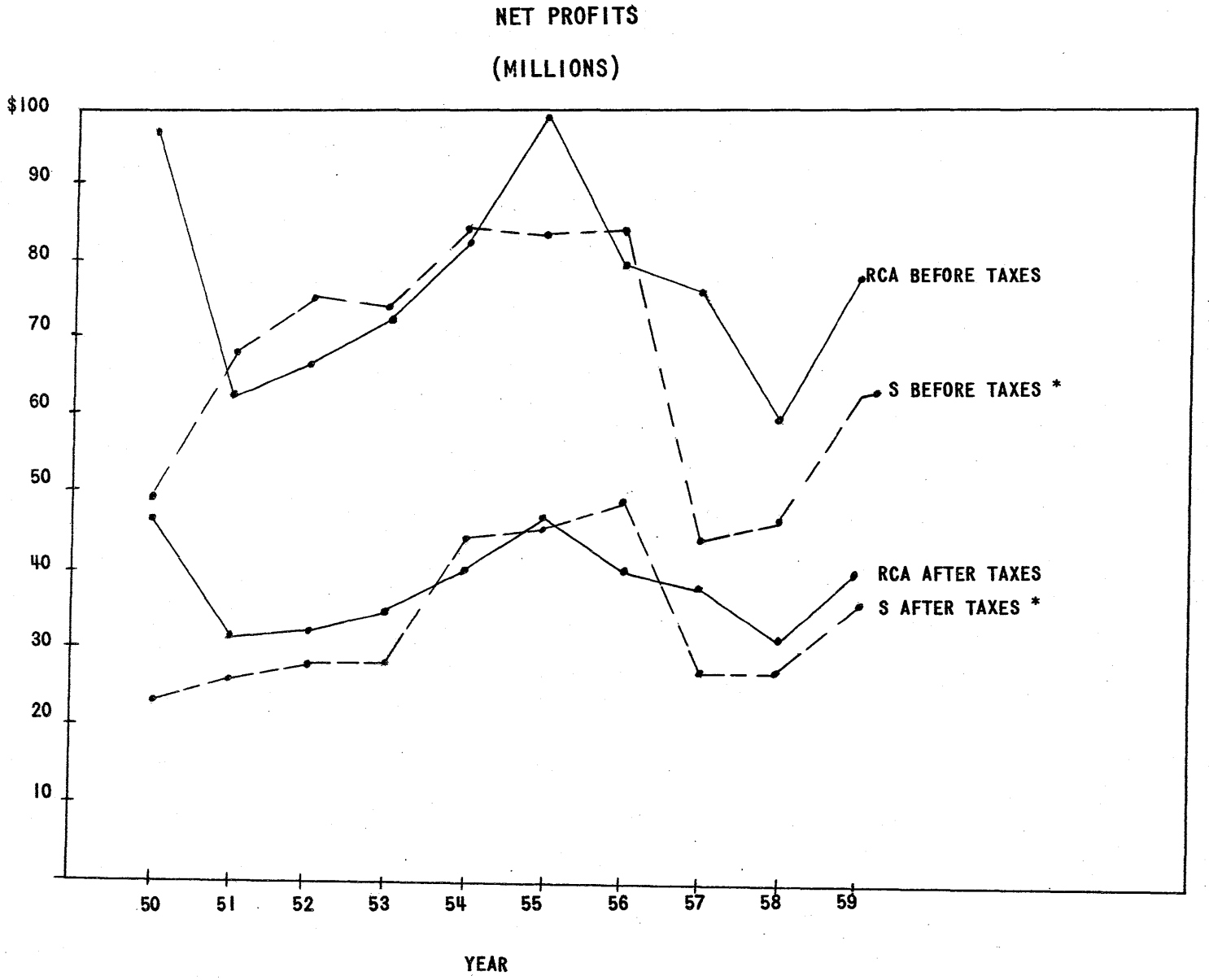
*NOTE: All Company "S" Financial Data Based on Fiscal Year Ending 31 March and Dated by the Calendar Year ending on the prior 31 December.

NET SALES

(MILLIONS)



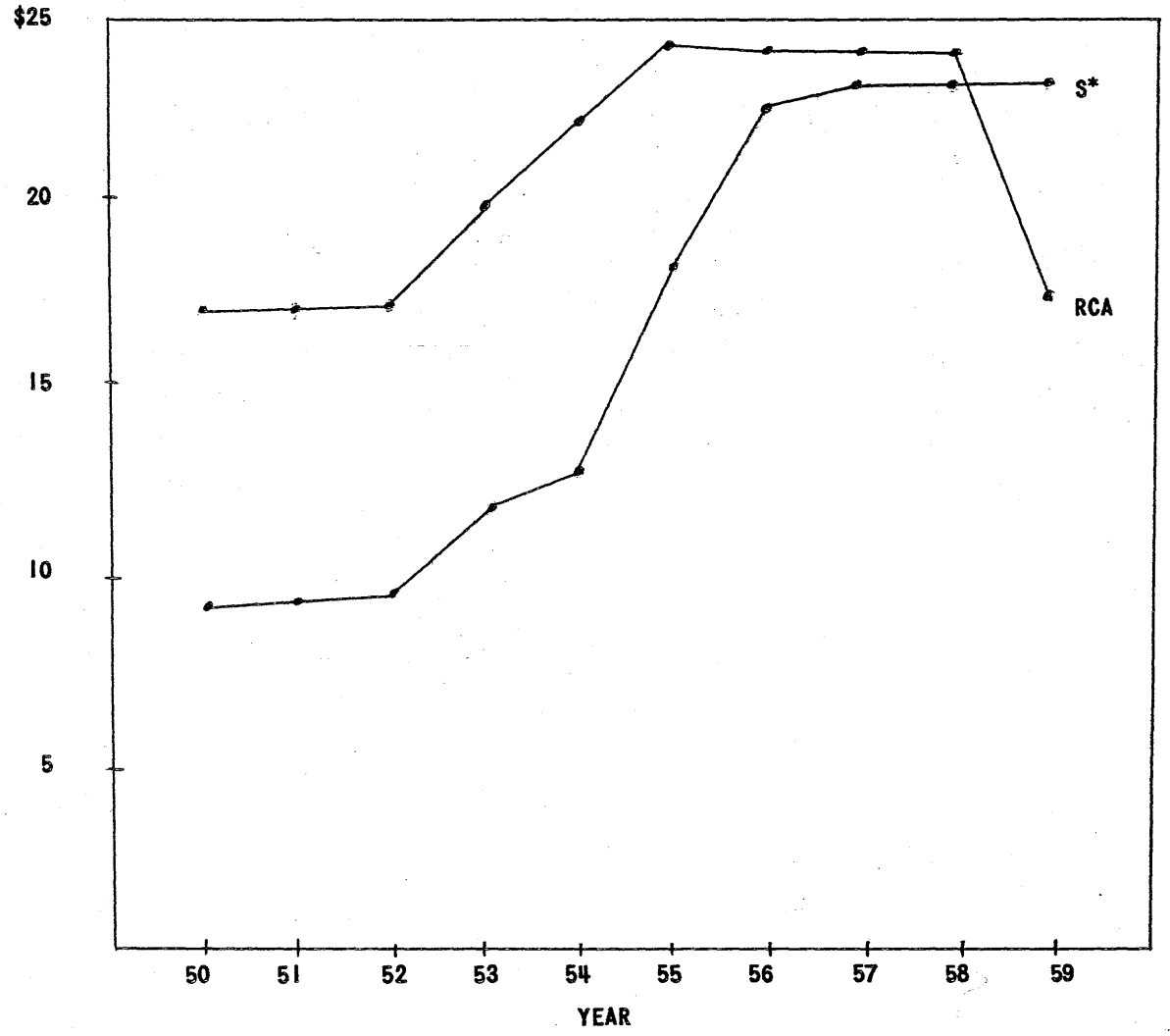
* CO. S FYE 3/31


NET PROFITS
(MILLIONS)
$100
90
80
70
60
50
40
30
20
10
50
51
52
53
54
55
56
57
58
59
YEAR
RCA BEFORE TAXES
S BEFORE TAXES *
RCA AFTER TAXES
S AFTER TAXES *

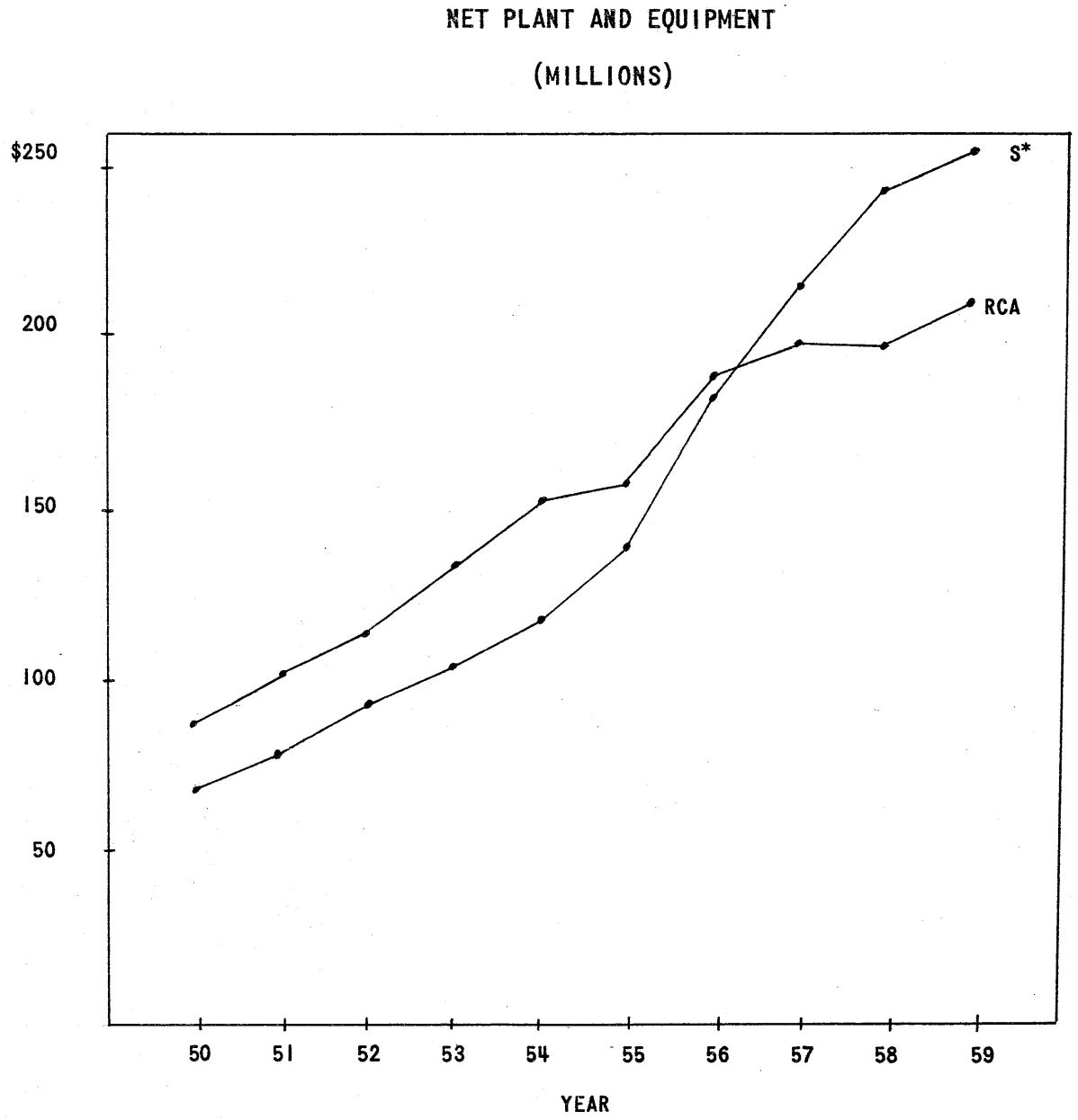
* CO. S FYE 3/31

TOTAL CASH DIVIDENDS

(MILLIONS)



* CO. S FYE 3/31

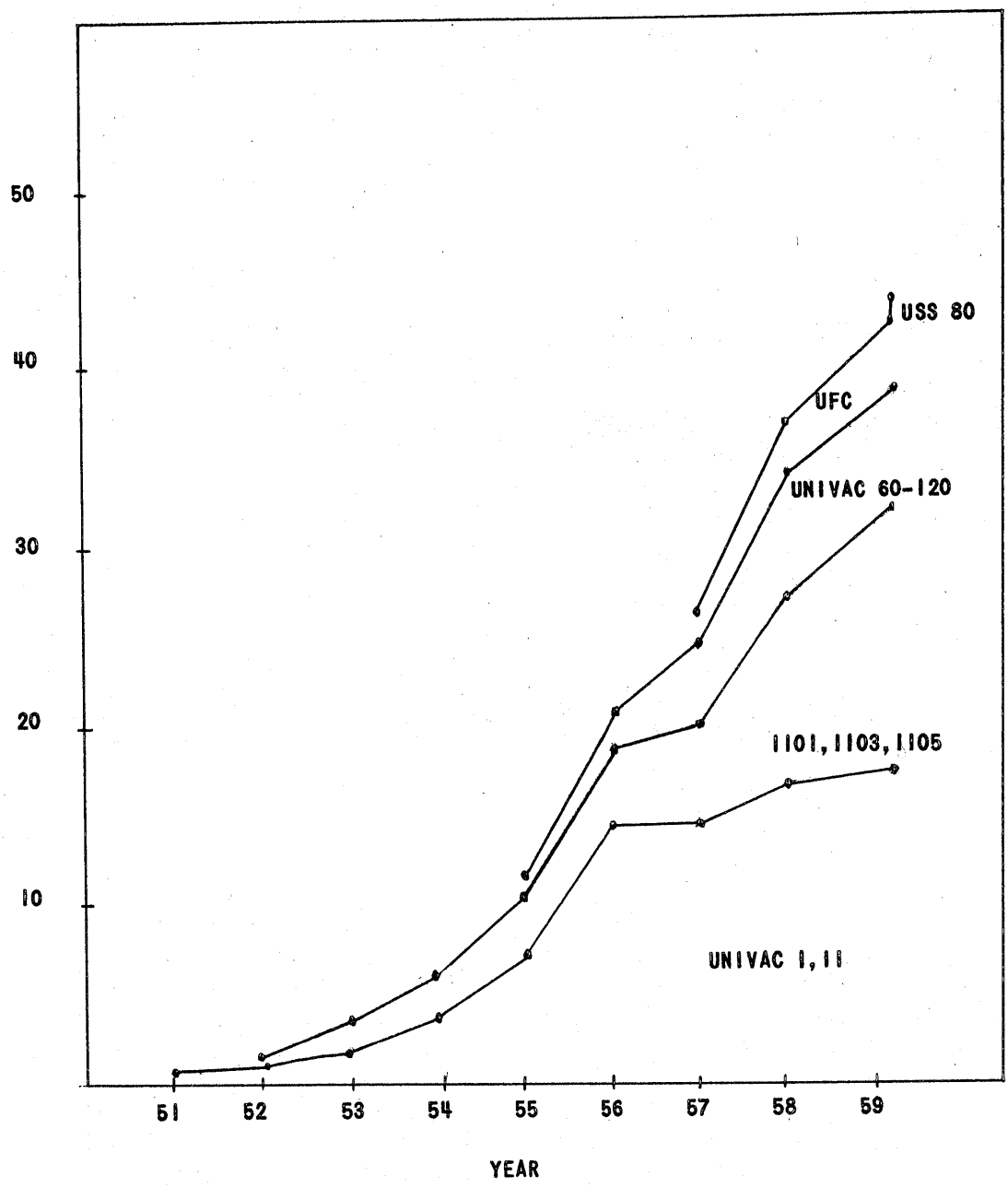


*CO. S FYE 3/31, INCLUDES RENTED EQUIPMENT

SPERRY RAND

RENTAL REVENUE BY

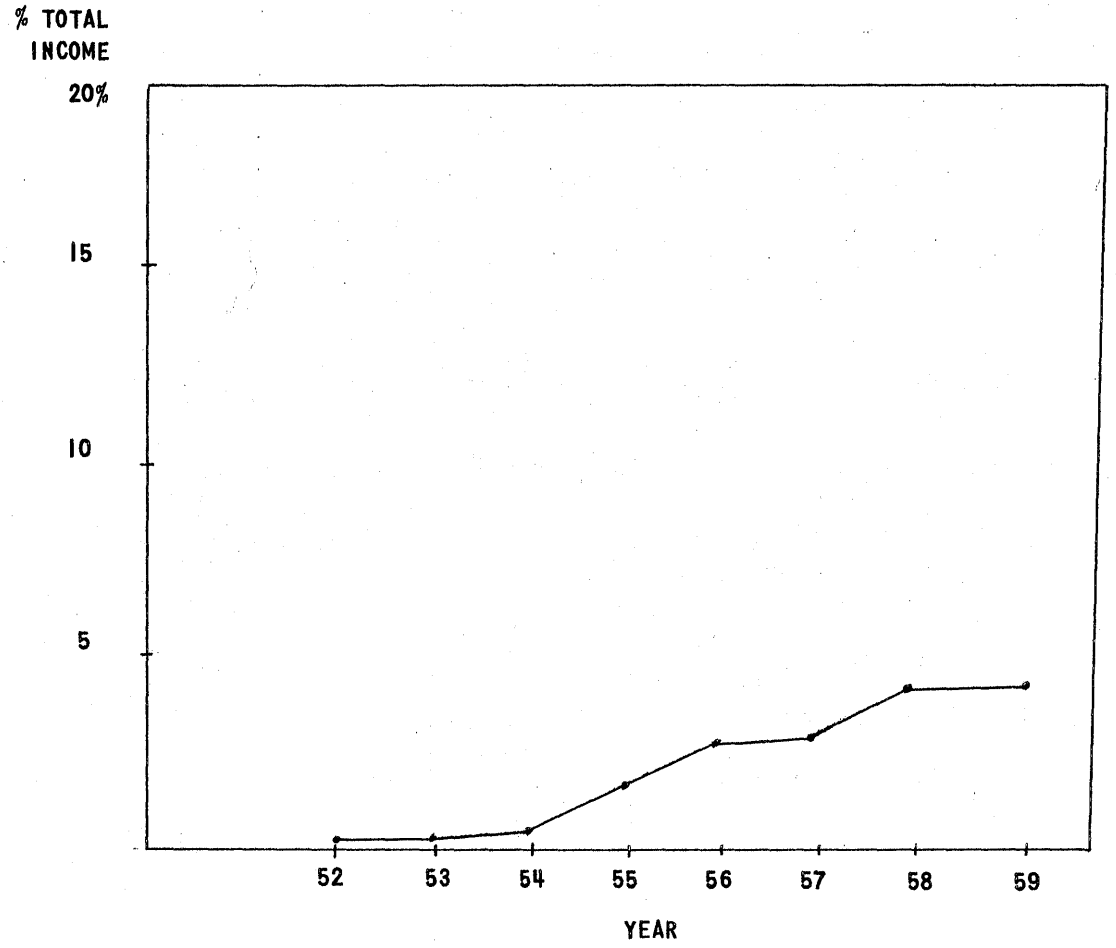
PRODUCT LINE - EDP EQUIPMENT



SPERRY RAND

IMPORTANCE OF REVENUE FROM EDP

RENTALS AS A SOURCE OF INCOME

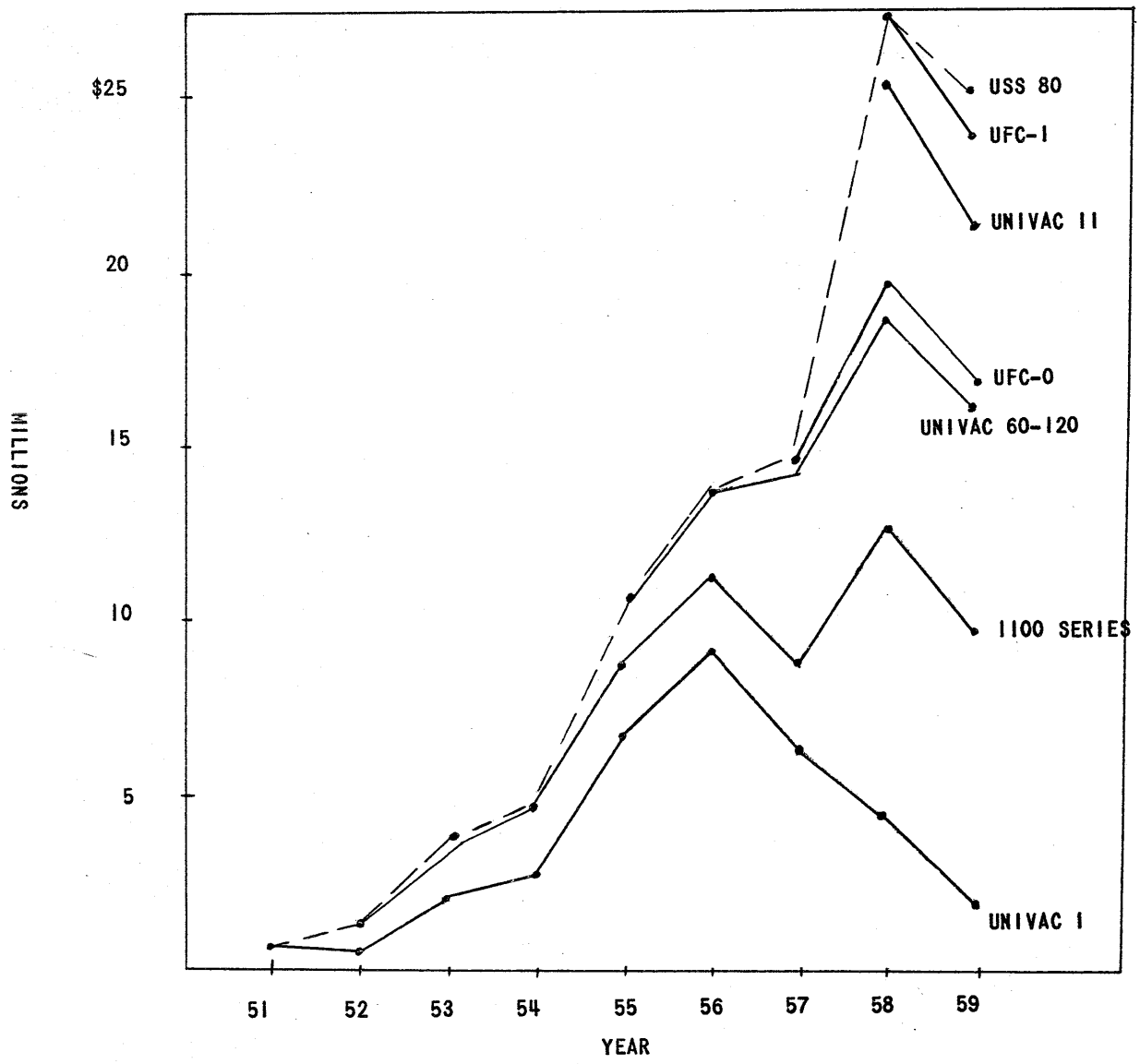


Co. S

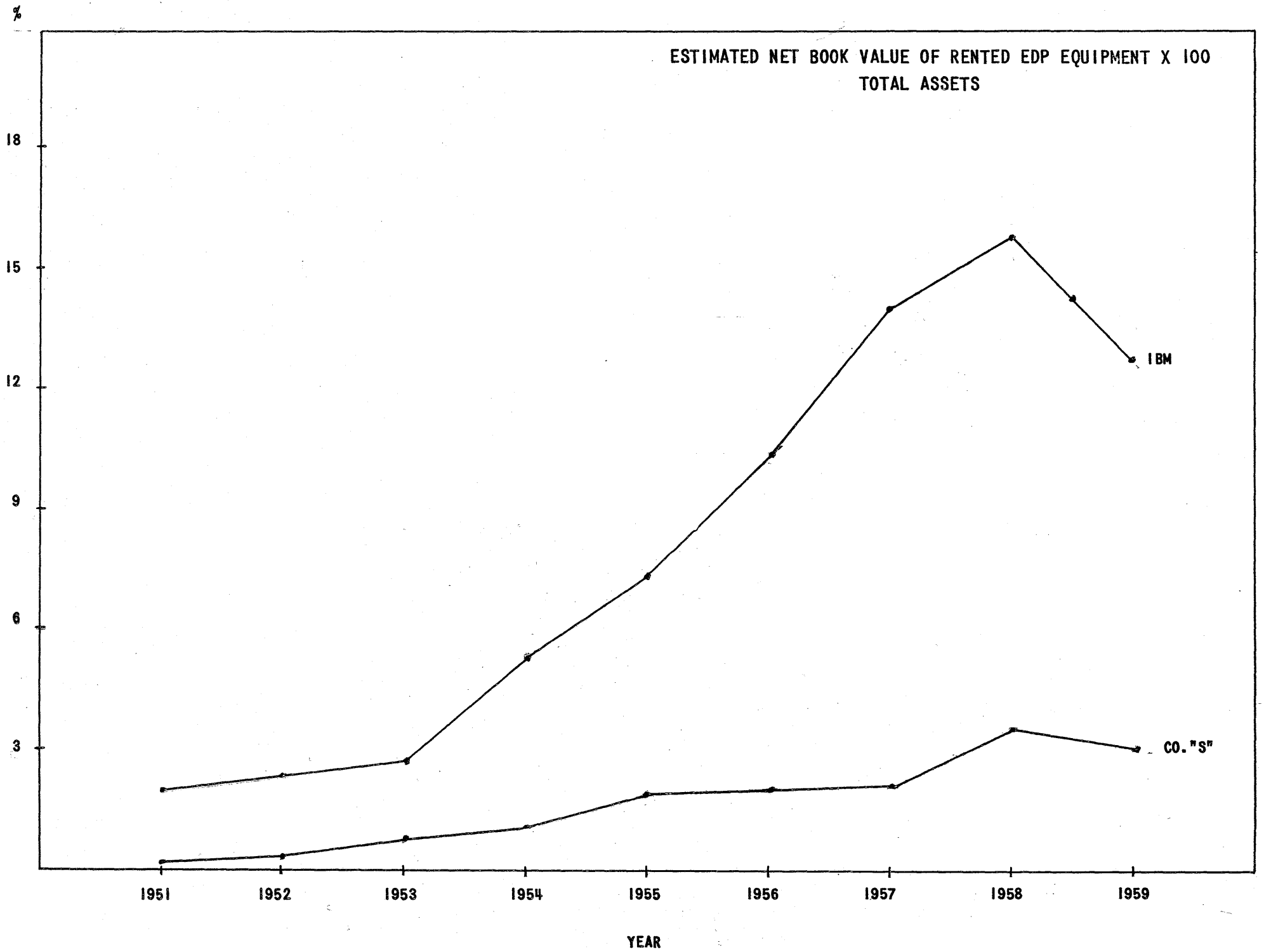
ESTIMATED NET BOOK VALUE

OF RENTED EDP EQUIPMENT

(MILLIONS)



BASED ON: SALES VALUE = 45 MTHS RENT,
COST = 1/3 SALES VALUE, 5 YR ST. LINE DEPRECIATION


%
ESTIMATED NET BOOK VALUE OF RENTED EDP EQUIPMENT X 100
TOTAL ASSETS
18
15
12
9
6
3
IBM
CO."S"
1951
1952
1953
1954
1955
1956
1957
1958
1959
YEAR

MARKET DATA*

1. Share of Market by Major Competition Based on Annual Sales Value of EDP Equipment Delivered. - The development of the EDP Market by total sales value from 1954 through 1960. (Page 41)

2. Percent Share of EDP Market by Major Competition Based on Annual Sales Value of Equipment Installed. - The development of the percentage share of the EDP market by the major competitors from 1954 through 1960. (Page 42)

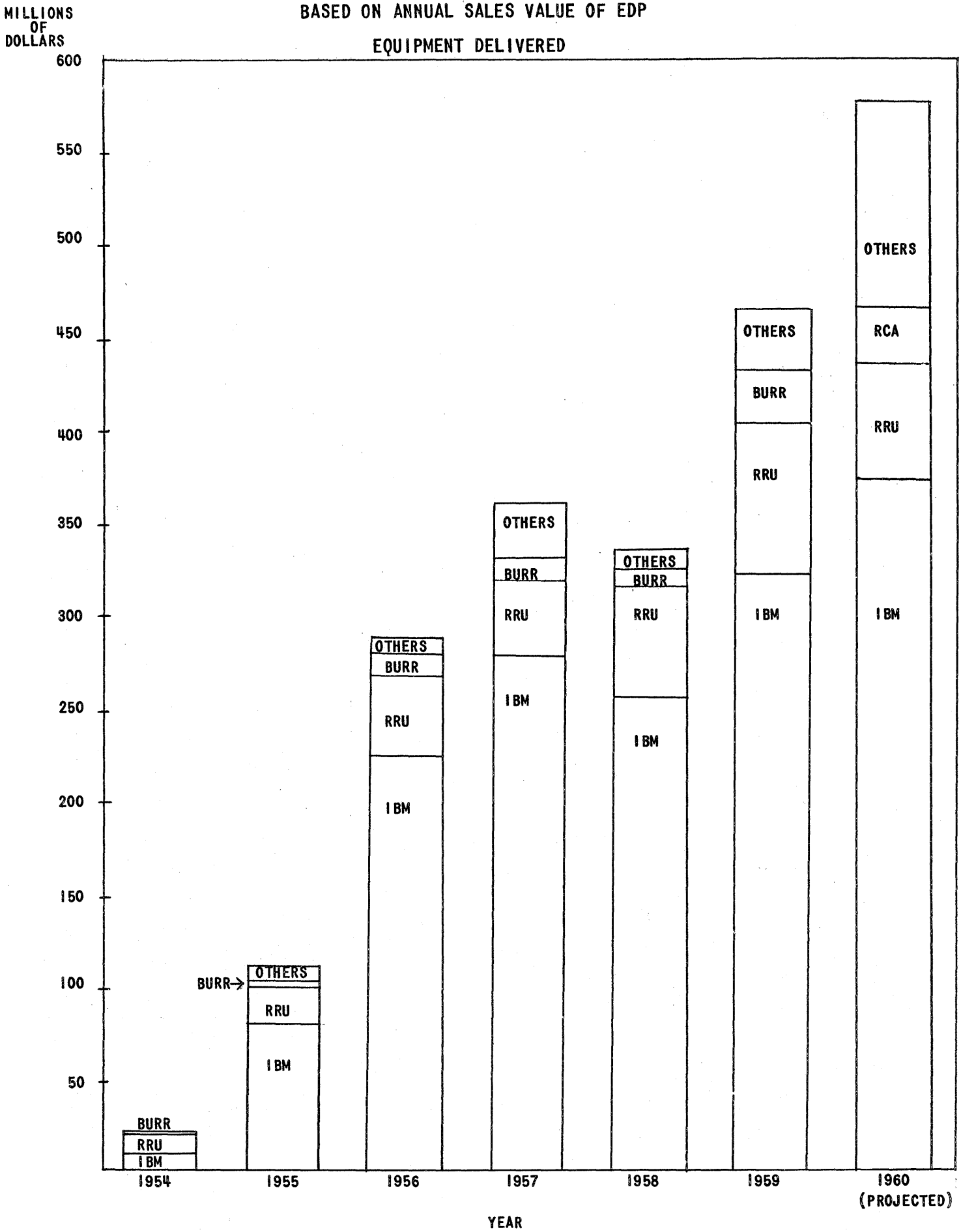
3. Share of Market by Major Manufacturers of All General Purpose Digital Computers Shipped Through 1960. - The share of the total EDP Market held by the major manufacturer based on the sales value of all equipment shipped through 1960. (Page 43)

4. Breakdown of Sales by Number of Computers Shipped through 1960. - The total EDP Market broken down into large, medium, and small types and by computers within these groups. (Page 44)

*NOTE: All data for the year 1960 is projected based upon incomplete data for the first three quarters of the year.

SHARE OF MARKET BY MAJOR COMPETITION

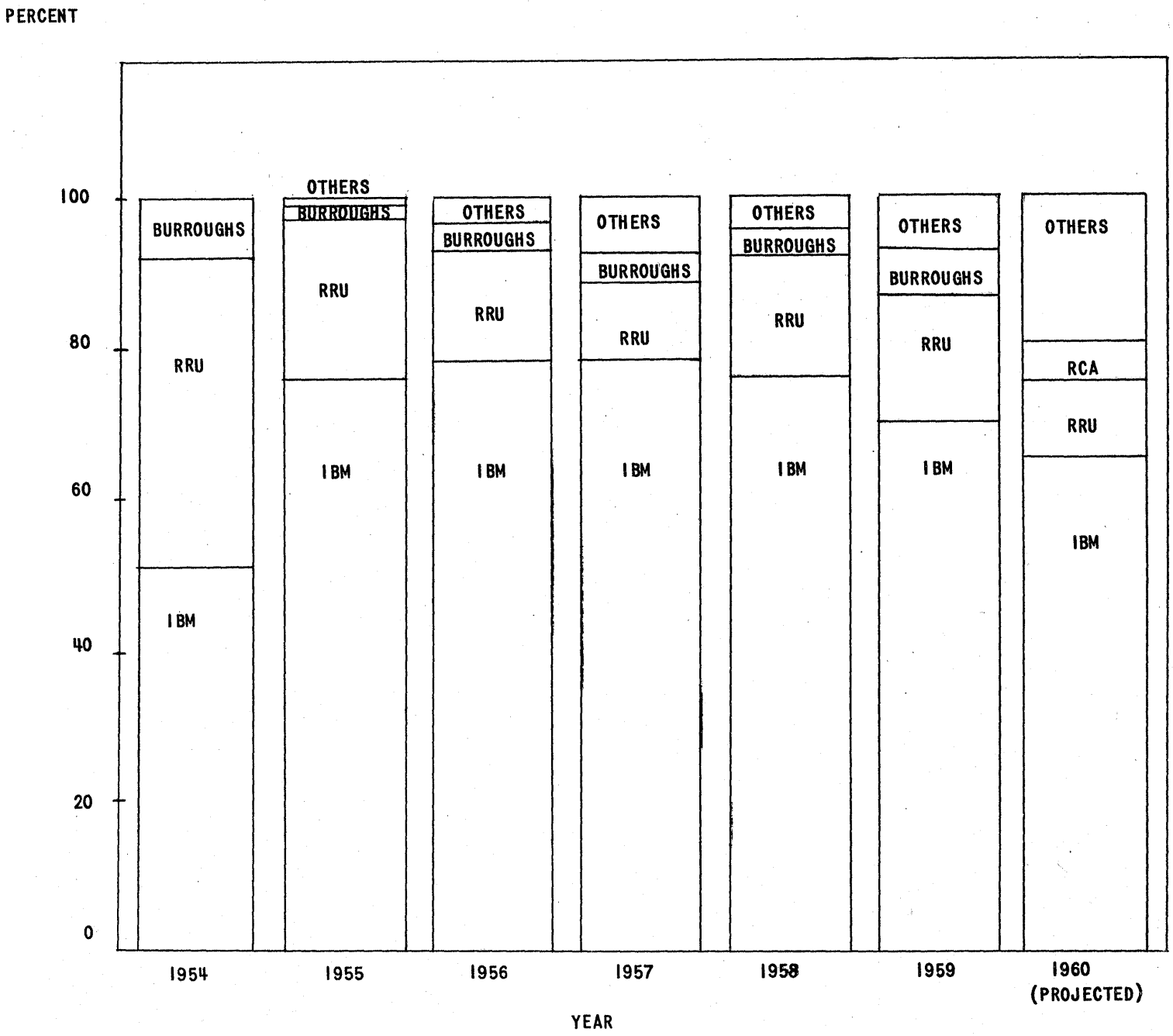
BASED ON ANNUAL SALES VALUE OF EDP EQUIPMENT DELIVERED



PERCENT SHARE OF EDP MARKET

BY MAJOR COMPETITION BASED ON ANNUAL

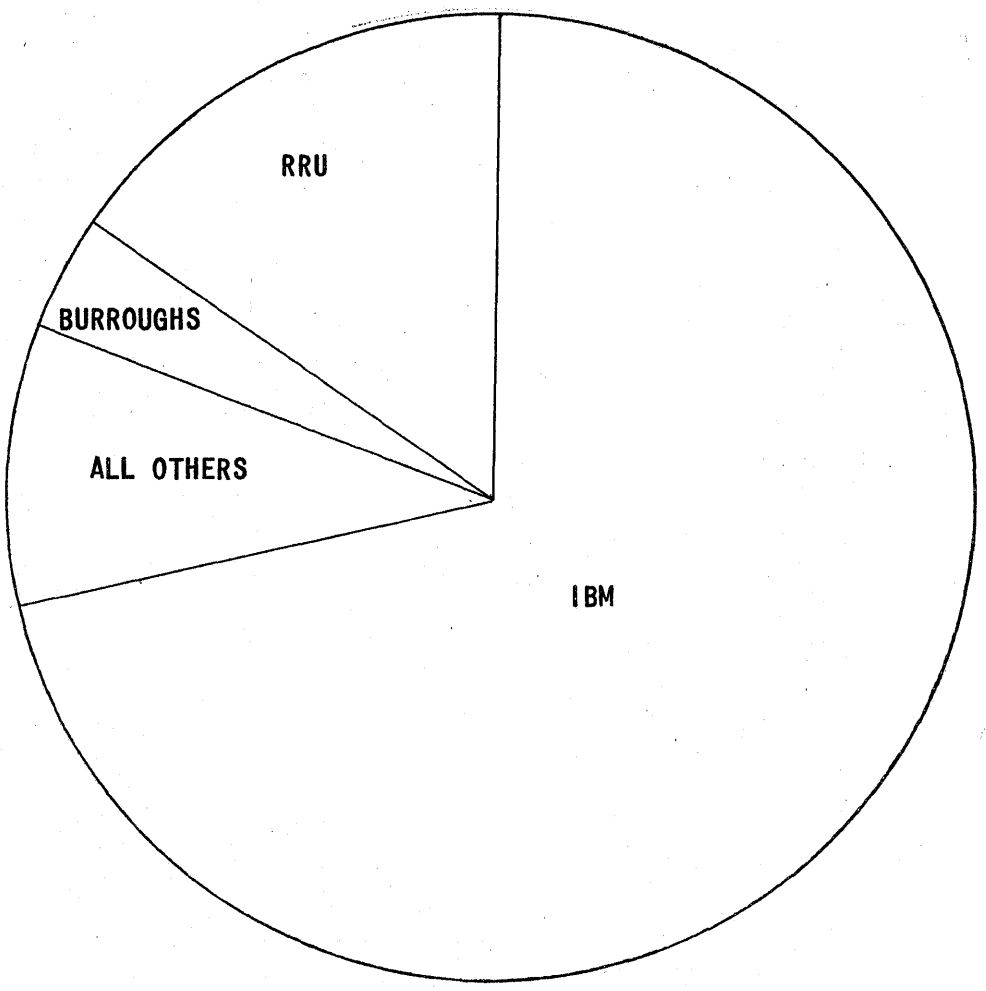
SALES VALUE OF EQUIPMENT INSTALLED



SHARE OF MARKET BY MAJOR MANUFACTURERS OF

ALL GENERAL PURPOSE DIGITAL COMPUTERS SHIPPED THROUGH 1960 (PROJECTED)

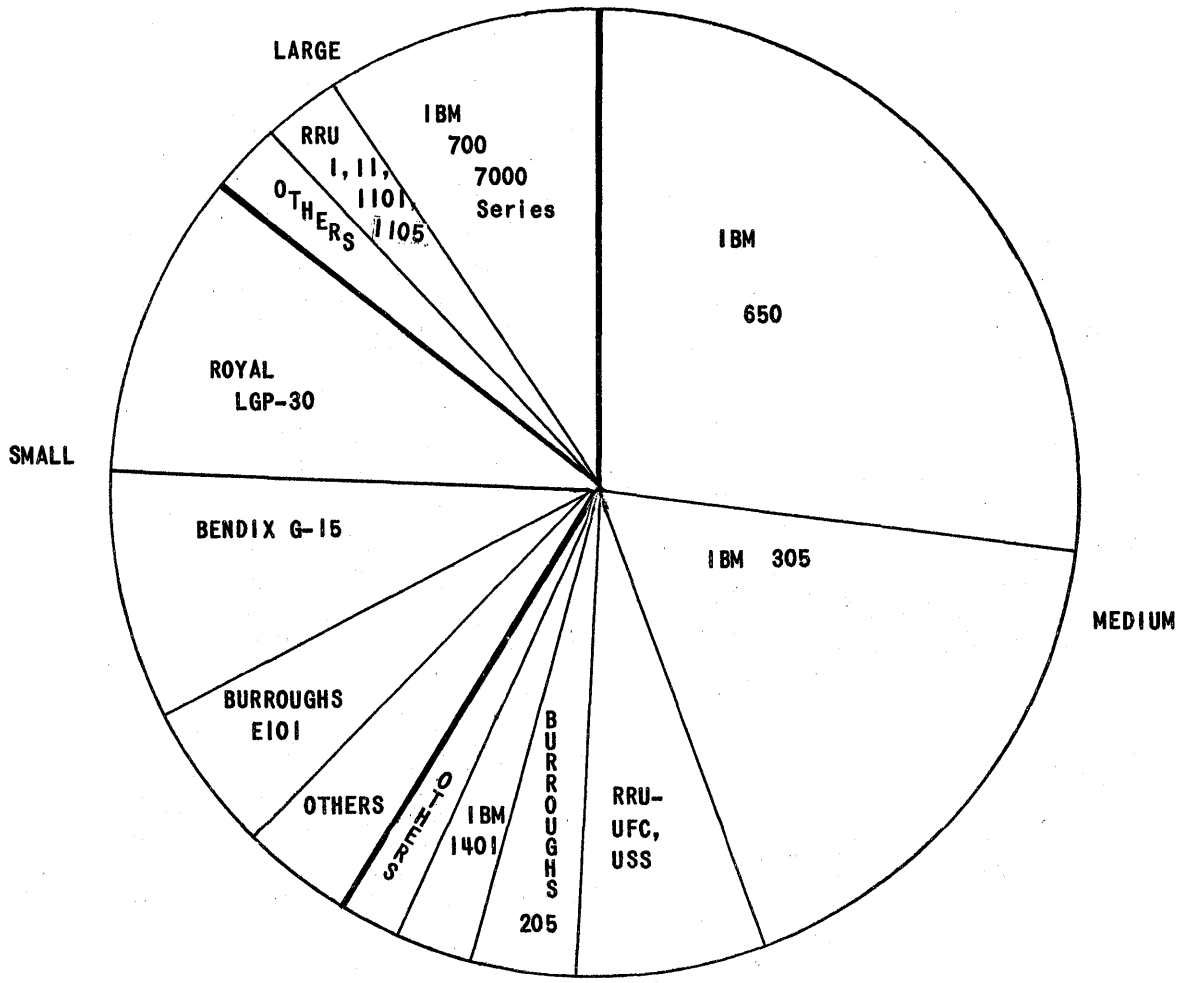
(BASED ON EQUIPMENT SALES VALUE)



TOTAL VALUE	$ 2,018,250,000
IBM	71.2 %
RRU	14.7 %
BURROUGHS	4.5 %
ALL OTHERS	9.6 %
	100.0 %

BREAKDOWN OF SALES BY NUMBER OF COMPUTERS

SHIPPED THROUGH 1960 (PROJECTED)



TOTAL COMPUTERS 4846

Large	14.26%
Medium	58.77%
Small	26.97%
	100.0 %

AREAS OF COMPETITIVE STRENGTH

A. Marketing

Remington Rand Univac (RRU), while not endowed with a sales force comparable to IBM's, possesses certain assets not to be overlooked. First, RRU has a reputation for excellence stemming from the Univac I and the military system developed at St. Paul. The pioneering work done at all levels in the period 1951 through 1954 will continue to open doors for future products.

One of the other businesses of RRU is office equipment, including adding machines and calculators. Still another business is the manufacturing of punched-card tabulating equipment. A third business is office systems, such as KARDEX and filing systems. Each of these auxilliary tie-ins serves to keep the RRU name in the eye of the buying public and makes EDP marketing, especially for small systems, somewhat easier.

RRU is stronger in certain government circles than its present product position would indicate. Many factors contribute to this situation. First, the government is generally interested in encouraging a buildup of EDP manufacturing resources. Second, anti-trust regulations fosters a sentiment of which RRU is the main beneficiary. Last, but not least, RRU has government installations which include such agencies as the Bureau of the Census, Bureau of Ships (David Taylor Model Basin), National Security Agency, Air Materiel Command, Livermore Radiation Laboratory, etc.

B. Technical

RRU has pioneered in reducing programming costs. The A-O scientific compiler series was the initial phase of problem-oriented compilers. Flowmatic, a computer system for data-processing problems, was the first of its kind in actual use. While Flowmatic leaves much to be desired, the Air Materics Command used it as the basis for its own common language system AIMACO. Their GP System for programmers met with great success. RRU has proven its ability in the area of automatic programming and has helped train many of the technical people in this area throughout the Computer world. More recently a COBOL system has been developed for the Univac II and all future commercial UNIVACS will include a COBOL system.

Reliability has been an essential ingredient of RRU's reputation. Inherent in the design of much of their EDP equipment are self-checking features. In Univac I for example, the entire Arithmetic Unit is duplicated solely for the purpose of checking. In general, users of RRU's equipment have little complaint about unscheduled down time.

RRU has taken part in development of character recognition peripheral equipment principally through contracts with outside firms. For example,

the 1105 installations going to the Bureau of Census will feature FOSDIC equipment designed and constructed by IMR. Another example is the recently announced optical card punch scanning unit which is analagous to mark sensing. It is cited as operating at 150 cards per minute.

C. Managerial

Credit must be given to RRU management for initial successes in straightening out some of the problem areas in the EDP activity. Notable is the elimination of duplicated functions by the designation of the St. Paul, Minnesota activity for government work only. Commercial activity is centered in the East with the main Computer engineering facility in Philadelphia. This move may stop the internal competition between the St. Paul and Philadelphia groups.

A buildup in coordination of product planning has been noted recently although the proposed movement of this group to New York has not been well accepted by the personnel.

D. Service

RRU has a large group of service personnel experienced in the servicing of Computers and associated equipments. Service costs amount to 30% of monthly rental for tube machines, such as the Univacs, down to an estimated 15% for the transistorized Univac Solid-State. These service personnel work directly for the Univac Division and are assigned to on-site groups, with back-up personnel and management located in branch and regional offices. Training of these service engineers is accomplished by formal courses and on-the-job training assignments at the Philadelphia and St. Paul laboratories.

AREAS OF COMPETITIVE WEAKNESS

A. Marketing

The Remington Rand Univac (RRU) sales force is not as extensive, well trained or effective as that of IBM. RRU's sales compensation plan does not feature a reasonable salary plus commission. A draw against commission earnings is permitted, placing new salesmen in the position of financial obligation to the Company. This account is not collectable in cases where sales personnel leave the Company. A recent reduction in the sales force caused the sales offices to let go an average of two salesmen in each office. These have generally been the less-experienced juniors. A selective-hiring program is now under way to strengthen weak spots.

A dearth of salable products is a major weakness. Only the Univac Solid State 80 (including STEP) can be cited as marketable, although Univac III may yet prove to be successful. New systems such as the 1206 and Univac 1107 although having limited applications may improve the picture somewhat. One traditional merketing problem is the dilemma posed by Sperry-Rand's competition with IBM in the punched card market. In order for Sperry-Rand to lead in the EDP market, its equipment must be capable of accepting and producing IBM punched cards. At the same time, they are required to produce equipment to handle Remington Rand cards for their own customers. The Sperry-Rand Salesman finds himself most often, however, in the position of selling the type of equipment which tends to perpetuate his chief competitor in another type of equipment.

B. Technical

One of the weaknesses is the lack of communication within the technical organization. Product developments are generally not well coordinated between product planning, programming, sales, and engineering activities. Only a few of the top people can be considered as having broad perspectives.

At best the term "applied" research can be used to designate computer-related research activities. However, government contracts in fields such as thin film memories for the Lightning Project have helped somewhat.

The inability to bring products quickly to market must, at least, partially be ascribed to technical weakness. One of the cases in point is the LARC program. It is believed that this tendency cannot easily be overcome. Apparently an aura of indecisiveness has permeated all levels of the otherwise competent engineering activity. Decisions which are never easily forthcoming have often been noted to be dictatorial in nature and not always based on the sound advice of the working level personnel. This will be further developed in the next section.

C. Managerial

A new top management team has been working for approximately one year to correct deficiencies in the organization. It is still too early to assess the results of this activity. Some of the problems, however, still exist. Citation of a few problem areas will serve to illustrate the magnitude of the overall task.

First, duplicated efforts at geographically remote facilities caused internal competition resulting in high costs, fast personnel turnover, and chaotic product development. To some extent this has been corrected by reassigning the roles of St. Paul, Philadelphia, Norwalk, and New York such that a minimum of overlapping responsibility exists. However, the role of the Product Planning activity is still very much in question. The main group located in Philadelphia still does not have the scope needed to produce product lines. Proposals to move the group to New York from Philadelphia have met with employee resistance and have resulted in a poor morale situation.

Failure to produce a workable business plan is a tradition in the EDP activity and there is no evidence to indicate that this has been corrected. For example, in late 1957 a plan was developed for the LARC system calling for an eventual production of ten systems. Deliveries were to ensue in late 1959 with one system to be installed per quarter. To date, only two systems have been installed and the LARC was withdrawn from the product line early in 1960.

The Univac Solid-State System is another case in point. At the time plans for marketing this equipment on the American market were firmed, cost estimates and sales forcasts were developed. Initial factory cost estimates were pegged at $67,000 per system. On this basis, a sales forecast of 1,500 systems was established. However, actual factory costs are approximately $100,000 per system. In 1957 the sales forecast was reduced to 700 - 800 systems.

Present figures indicate that over 100 systems have been delivered. Approximately 300 systems have been ordered in addition to those already delivered. Cost-performance ratios and other studies indicate that the USS 80/90 is no longer as salable as it was two years ago. Hence, final delivery figures are likely to be no more than half of the figure included in the revised sales forecast of 1957.

Note that in both of the cases cited above, initial actions were taken prior to the installation of the present management team. The fact remains that the problems were inherited and, in the absence of proof to the contrary, still exist.

In the process of assessing management weaknesses, mention must be made of the personnel situation. Top management alone cannot reverse the inertia generated within the EDP organization since the 1956 merger. There must be a revitalized middle and first line management team, the existence of which has not yet been noted.

PROSPECTS FOR THE UNIVAC DIVISION

A. Sales

It is likely that reorganization of the Sales activity will take place. Typical of the steps to be taken are the following three: first, as many IBM personnel as possible will be hired and given license to institute some of the more successful IBM techniques; second, the Salesman's compensation plan will be changed to provide better incentives and to permit greater selectivity in hiring; third, shrinkages will take place to eliminate "dead wood". This last move is now in progress.

Pressure will be put on sales activities to hold the line until new products can be introduced. This may result in stalling tactics and in attempts to market combinations of small Computers for large installations. It is also likely that products will be announced earlier in the design cycle, as was the case with the 1107 and 1206.

B. Technical

RRU is likely to try to recapture its position in medium - large data processing. The Univac III is a typical move in this direction. One feature of this effort may be attempts to replace IBM equipment in a concerted way. Some possibilities for accomplishing this include development of common language programming systems to free users from a single supplier and to enable preservation of users' investments in libraries, and the construction of marriage circuitry to enable transcription of data files.

With the delivery of LARC to the Atomic Energy Commission, a substantial portion of RRU's technical resources will be freed for other tasks. Renewed interest in pioneering government-sponsored programs will probably be evinced. Attempts will be made to incorporate LARC features into commercial products. For example, Univac III is related closely to the Larc Processor.

C. Managerial

A great deal is needed by way of additional investment and a substantial period of time will be required to enable RRU to capture much more than its present share of the market. The rate of progress possible will depend greatly on the availability of funds and the determination of management. In the former case, the financial showing of other divisions of RRU, such as the Shaver and Typewriter divisions, may drastically affect the extent to which management is willing to risk capital in EDP.

Management is presently proceeding at a high level of activity to improve the position of EDP. Organization changes are being made which will have a long range beneficial effect. A new plant is being constructed outside

of Philadelphia to provide sorely needed physical facilities. Product Planning is working to improve the product line offerings.

It is likely that management will foster a "hold the line" policy for marketing during the period of reconstruction. At the same time, every effort will be made to improve the present state of affairs within the internal organization.

Cost reduction programs are likely featuring further personnel shrinkages to both improve the profit picture and to eliminate weaker personnel.

Strengthening of the other six divisions of Remington Rand has already taken place and it seems likely that Mr. Bibby and his staff will concentrate all their efforts in the future in solving the Univac Division problems either through curative methods or major surgery. If is is decided that the division can or must be put on a strongly profitable basis it can be expected that a success will be made of this effort, based upon the major assets of experienced engineering and programming personnel, good manufacturing ability, and efficient top management.