

THE TRAVELERS IBM 1401 EXHIBIT
At The Computer Museum, Bay 3, Floor 5

THEMATIC PRESENTATION

Overall

The Travelers IBM 1401 Exhibit will illustrate general aspects of business computing in the mid-sixties. Four primary themes will be presented: the use of computers as information processors by businesses, the characteristics of this kind of computer operation, the rise in higher-level languages, and the replacement of punched cards by magnetic memory as the predominant secondary storage medium. The Travelers 1401 will exemplify these themes. In instances where reality does not quite serve the presentation artistic license will be exercised.

Computers as Business Tools

The use of the 1401 by The Travelers for policy processing and management report compilation will illustrate the general character of problems to which businesses applied computers.

Characteristics of Computer Operation

Batch-processing characterized the operation of computers in the mid-sixties. This reinforced the division between the machine and the programmers. Since only operators were allowed to run programs on the computer, the process of de-bugging a program was long and arduous. This method of operation will be contrasted with the contemporary operation of computers. The 1401 exhibit, by the relative position of the Programmer's Office and the Computer Room, and the contents thereof, will advance this theme.

High-Level Languages

The predominance of COBOL as the programming language for business illustrates the general move towards using higher-level languages which occurred throughout the 1960's. The Travelers 1401 will be presented as being programmed in COBOL.

The Fall of the Punched Card and the Rise of Magnetic Memory

Inflexibility, serial storage, and size will be presented as three of the major problems of punched cards for data storage. Despite these disadvantages, and the availability of magnetic memory, punched-cards were slow to be replaced. The 1401 will be presented as a combination card and magnetic storage machine. This will illustrate the gradual take-over of mass magnetic secondary storage (particularly magnetic tape and discs) which occurred in the 1960's.

THE TRAVELERS IBM 1401 EXHIBIT

At The Computer Museum, Bay 3, Floor 5

DESIGN DESCRIPTION

Exhibit Sections

The 1401 exhibit will be composed of five sections: The Computer Room, The Keypunch Room, The Programmer's Office, The Storage Area, and a Text area. The Computer Room will be across from the entrance of the gallery so that visitors see it from the Vacuum Tube Era Gallery (Bay 4, Floor 5). Other than that, the exact placement of the other sections is not crucial. However, The Programmer's Office should be removed and isolated from The Computer Room - perhaps by placing The Keypunch Room between them. The Text area should be positioned such that visitors can easily connect it with the exhibit, but it does not inhibit their view of the exhibit.

The Computer Room

The Computer Room will be as authentic as possible; meaning, it will be very sparsely decorated, lit with fluorescent lights, have false ceilings and floors, have glass walls, etc. The CPU should be centered along the back wall with the 1311 Mag Disc Unit to one side of it and the 729 Mag Tape Unit to the other. In front of, and to the side of the CPU should be the 1402 Card Reader with the 1403 Printer opposite it. In a forward corner of the room should be a small vintage desk of appropriate styling, positioned in such a way that visitors will be able to read notes strewn on its top. Some place in one of the walls should be a window for the deposit and pick-up of programs and output.

The Keypunch Room

The Keypunch Room will contain two operating IBM 026 Keypunches. In addition, there will be trays for cards, chairs, etc. I will try to get a photo of a large keypunch department to use on the back wall.

The Programmer's Office

The Programmer's Office should just be a small desk with appropriate office paraphenalia from the period. Again, the separation between the programmer and the computer must be emphasized by the distance between the Programmer's Office and the Computer Room. (Travelers actually had the two in separate buildings (two to deliver programs and results.)

The Card Storage Area

The Storage Area will be nothing more than a large photo mural of a card storage warehouse, and perhaps one large file of cards.

The Text Area

The Text Area should be an area where themes can be elaborated upon in both text and additional small artifacts. It should be placed such that visitors can refer easily back to the main body of the exhibit, and yet does not interfere with their initial view of the exhibit, i.e. the Computer Room.

OBJECT/AREATEXT [NOTES]

1401 Computer Room

**THE IBM 1401: A SMALL TRANSISTORIZED
COMPUTER FOR BUSINESS DATA PROCESSING**

The 1401 was geared toward small-scale business data processing. It operated on alphanumeric characters (both letters and numbers) and used a variable word length so that data structures were flexible to the length of entries. While the 1401 was basically intended as a card-based system, it also had the capability of operating magnetic storage in the form of either tape or discs.

Development and History

The 1401 was based on a design developed by Fran Underwood at IBM's General Products Division in Endicott, NY in the mid-1950's. It was a Von Neumann-type computer with the program stored in a central core memory. The 1401 was designed to consolidate all of the functions of IBM's electric punched-card accounting machines, such as: calculation, interpretation, collation, and sorting of data.

IBM announced the 1401 in 1957 and delivered the first unit in 1958. Eventually four models were produced: A, B, C, and D. The 1401 was the second-to-the-smallest of IBM's computers, (the 1620 scientific computer being slightly smaller). Over 12,000 were ultimately installed; more than any other computers: the 1410, the 1440, and the 1460.

Specifications

<computer>IBM 1401
 <manufacturer>IBM
 <persons>Fran Underwood
 <insitution>IBM's Endicott Labs General
 Products Division
 <designed>
 <built>Endicott
 <project start>announced in 1957

OBJECT/AREA

TEXT [NOTES]

<construction begun>
 <first operated>
 <installed>first delivered in 1958
 <number produced>12,000?
 <technology>transistor
 <primary memory>core 1400-16000 chars
 <secondary memory>
 Mag disc: 1405 RAMAC Unit
 Model 1 - 10 million chars on 25 discs
 Model 2 - 20 million chars on 50 discs
 -- rotate @ 1200 rpm's
 -- read/write 22,5500 chars/sec

 Mag disc: 1311 Magnetic Disc Drive
 (six plater removable packs)
 Model 4 controller upto 3 additional
 Model 2.
 Each pack 2-3 million chars (depending
 upon options) cylindrical data structure
 Rotates at 1500 rpm's
 avg access 250 millisecc

 Mag tape:729
 Model II - 75 in/sec
 Model IV - 112.5 in/sec
 Both use 10.5 in reels 2400 ft long 0.5
 in. wd - both can record either 200 or
 556 chars/in. 7 bit code in 7 channels.

 <I/O>
 Card Reader-Punch
 simultaneous I/O - read 800 cards/min
 - write 250 cards/min

 Line Printer
 chain printer w/ 5 sections of 48 chars.
 600 lines/min, 100 pos/line

 <size>80.8 sq ft, 403.8 cu ft,
 <wieght>
 <power>10 kW, 8.0 KVA
 <cost>approx. \$8000
 <architecture>serial
 <number base>BCD
 <word Length>variable
 <CPU>
 <instruction set>1 or 2 address
 <cycle time>synchronous or
 asynch.depending upon operation
 <add time>300 microsec
 <mult. time>needed optional multiply
 feature then 1960microsec
 <mem fetch time>11.5 microsec
 <programming>

OBJECT/AREA	TEXT [NOTES]
Module	<p><use>business data processing, replaced electric card accounting machines.</p> <p><achievements></p> <p><references></p> <p><comments>A unique feature of the 1401 was its ability to "add-to-storage" which increased calculation speed by eliminating the need to read information from memory.</p> <p><></p>
Module	<p>The silver cylinders on this module from the 1401 which were its basic circuit element.</p>

Central area of exhibit

**THE TRAVELER INSURANCE COMPANIES:
Computing in a 1965 Business Environment**

Computers as Business Tools

Like many businesses, insurance companies depend upon vast records of information relating to many aspects of their operation. To service their customers, run their operations, and make valuable decisions it is essential to be able to handle vast amounts of information in such a way that data can be gathered from it and manipulated in an efficient manner. For this the computer is an ideal tool.

Data Processing at The Travelers

The Travelers was an early user of computers for business functions. Its first computer was the vacuum tube IBM 650, a card-based system. Its first magnetic tape system was an RCA BIZMAC. This was upgraded to several RCA 501's. The Travelers brought in several IBM 1401's to improve its card computing operations during 1962-63. Shortly thereafter they built the largest private computer installation of its time. This contained a UNIVAC 490 on which one of the first on-line private computer networks was instituted in 1966. The Travelers' calculation, data processing, and storage needs continued to grow substantially. Today they have 16 of

OBJECT/AREATEXT [NOTES]

IBM's largest 3080 series computers in their home office in Hartford alone.

Generating Reports by Computer

The 1401 was used principally for report generation by The Travelers. Information relating to policies, such as the name and address of the issuee, the coverage, claims filed, modifications, etc. was stored on 80-column punched-cards. Reports would then be generated from these records according to programs directing which information was to be used and how, and how it was finally to be presented. The 1401 by its speed and versatility permitted the condensation and manipulation of vast amounts of information into usable forms. This allowed management to obtain clear pictures of trends in policies and claims and to make informed decisions.

Photo from ad of guy standing beside '65 Corvette, a complete car insurance form, a punched-card, a printed report.

A filed automobile insurance form. Pertinent information from that form encoded on a punched-card. A report print-out.

**OPERATING AND PROGRAMMING THE 1401:
Batch Processing and Machine-Isolation**

In the days before time-sharing (many users on a machine at one time) computer operation and programming was very different from how it is today.

Operation

Whereas today computer users usually sit at a terminal and compose and run programs on the computer virtually at will, the programmers of the 1401 and other computers of its time were very isolated from the machine they were programming. Programs and data were fed into the computer exclusively by an operator in large runs at a time; a process known as batch-processing. The program to be run and the data it was to be run on, were prepared off-line, and at

OBJECT/AREATEXT [NOTES]

an available time entered into the computer and run all at once. Since the computer could only run one program at a time, this was the most cost-effective method for performing large amounts of data processing.

Programming

The batch-processing method of operation made the process of programming very difficult. The programmer rarely got his hands on the computer. Instead, he would encode the program on standardized coding sheets which he would then submit to be punched onto punched-cards. These cards were then delivered to the machine room, along with a batch of test data. The operator would run the program at some convenient time. If there was any problem with the program he would print out the contents of the memory at the point where the program had stopped and send this back to the programmer. The programmer would try to correct his error and then start the whole process over again. To de-debug (correct) a whole program was obviously a long and tedious process.

If the programmer was a good friend of the operator (a desirable thing to be) he might be able to persuade the operator to let him de-debug his program on the machine late at night, or some other time when the computer was not very busy -- which would expedite tremendously the completion of the program. However, as computers began to be operated round-the-clock this became less and less frequent. In the words of one Data Processing V.P. the programmers "drove the operators nuts." In short, the programmers were in competition with running programs for time on the computer to perfect their own programs. Nonetheless, the division between the operator and his machine, and the programmer was as respected as the separation of church and state.

Programming the Generation of a Report

To program the 1401 to generate a report

OBJECT/AREA**TEXT [NOTES]**

<p>A flow chart. Draft code Coding sheet Program cards</p>	<p>on a particular set of data the programmer would start by defining the problem and the desired result. Then he would create a flow chart illustrating all of the necessary operations and their sequence. From this he would begin writing code, ultimately refining it to a standardized code sheet from which it would be punched onto cards. The final step was the long process of de-bugging the program.</p> <p>A flow chart of a programming problem. Preliminary draft of code. Code written on standardized form for punching. A program punched in cards.</p>
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COBOL: The Language of Business Computing

To make programming a more efficient undertaking several efforts were begun in the late 1950's to develop powerful computer languages which would serve this purpose. Among these was the language COBOL, short for **Common Business Oriented Language** which was developed between 1957 and 1960. COBOL is geared towards expediting the programming of the types of problems encountered frequently in business. By the mid-1960's it had become the most-used language for business applications.

Key punch machines

ENCODE YOUR NAME ON A PUNCHED-CARD

To see your name encoded in holes on a punched-card, type it on the keyboard. Observe how if your name is too long it will not all fit on a card. This was a big problem of punched-cards and created many difficulties for companies such as The Travelers. Please feel free to take home your card.

Keypunch room

PUNCHED-CARD COMPUTING: Obsolete Technology With Staying Power

The idea of using punched-cards to store

OBJECT/AREATEXT [NOTES]

Punched Card w/ all 48 characs	<p>and process data dates back to the late 1880's. Herman Hollerith is credited with developing the 80-column punched-card for use on his Hollerith Tabulator and Sorter. Each eighty-column card can store a maximum of 80 characters, or, in its binary equivalent, 640 bits.</p>
	<p>This card shows how characters were encoded by combinations of holes in varying sequences.</p>
	<p>There are several disadvantages to using punched-cards to store and enter information. They are a slow input and output medium. They are inflexible as a data storage unit, and data are not randomly accessible. And, they are bulky and cumbersome. Large amounts of information stored on cards took a long time to enter into the computer and required a substantial space to store. If The Travelers were still to use punched-cards, all of their buildings would not be sufficient to contain all the information they keep.</p>
	<p>Since the amount of information that can be stored on a card is fixed cards were an inefficient storage medium. If an entry was shorter than the space dedicated to it on the card there would be wasted blank space left over. If an entry were too long for the space on the card it would have to be carried over to the next which required program modification.</p>
Card Storage Area	<p>In the age of punched-cards "mass storage" had a different meaning than it does today. Seen here is a storage warehouse containing records on punched-cards. The equivalent amount of information could be stored on ??? magnetic tapes, or ??? 256 K RAM chips.</p>
	<p>Despite the disadvantages many computer users continued to rely heavily on punched-cards even when magnetic tape and discs were available. Even today many people use punched-cards to load programs.</p>

OBJECT/AREA

TEXT [NOTES]

**MAGNETIC SECONDARY MEMORY AND STORAGE:
A Technology Which Matured in the
Transistor Era**

During the Transistor Era of computers magnetic secondary memory devices such as magnetic tapes and discs, which had been developed, but not become predominant, during the Vacuum Tube Era, became the prevalent technology. Magnetic secondary memory offered many advantages over punched-cards and other paper memory technologies. It was far faster and more compact. Information stored on it was modifiable. It also allowed for more efficient storage of data, by permitting flexible data structures which eliminated wasted space or data over-runs and eased the burden of programmers.

Mag Tape

This magnetic tape contains the equivalent amount of information to a 125-foot-high stack of punched-cards.

Diagram of Data Structure on tape.

This diagram illustrates how data is stored represented on a magnetic tape. The rows represent the 7 channels of the tape, each column is an encoded character. The black dots represent spots of magnetized material on the tape.

Tape Head

This is a tape head from the 729 tape drive. If you look carefully you can see the separate channels and read and write areas of the head.

Cut-away of Disc pack w/heads

This cross-sectioned example of the five-disc pack used on the 1311 Disc Drive illustrates how the heads accessed the information on the discs. The heads were shaped such that they literally flew above the surface of the disc on a cushion of air thinner than a human hair. This disc pack has a capacity of 2,000,000 characters.

Diagram of cylindrical data structure

This diagram shows how data was structured on the disc packs. Data was encoded in magnetized spots on "cylinders" of area on the various discs, i.e. information on one disc would be

OBJECT/AREA

TEXT [NOTES]

associated with information on the
corresponding points of the other discs.

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ARTIFACT WISH-LIST

The following items would be useful for The Computer Museum's exhibit of a Travelers 1401 installation.

- a Travelers umbrella
- a Travelers paper weight, wall plaque, photo of worlds fair building, other memorabilia, etc.
- a Travelers pencil holder w/ pencils?
- a 1401 COBOL Manual
- a set of COBOL coding sheets?
- flow charted programs
- a print-out of a report w/ errors
- a print-out of a COBOL program
- two 1965 Travelers wall calanders
- a job schedule sheet from a batch processing installation
- operator's program instructions
- 1401 manuals
- vintage memo pads w/ Travelers logo
- stack of cards w/ program on them
- stack of cards of data

New Entries:

- photo of office
- photo of card storage area,
- 2 small vintage '65 desks
- blank auto insurance form

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COST ESTIMATES

DEVELOPMENT AND DESIGN COSTS

Developer's Salary	\$350.00/week	X 4	= \$1400.00
Travel, Telephone, and Misc Expenses			\$100.00
Architect's Fees	\$40.00/hour	X100	=\$4,000.00
	\$75.00/hour	X 4	= \$300.00
Graphic Designer's Fees			<u>\$360.00</u>
	SUBTOTAL		\$6,160.00

SIGNAGE

Typesetting of Text	\$30.00/page	X 4	= \$120.00
Materials	\$10/sq ft	X 30	= \$300.00
Silk Screen	\$18/screen	X 10	= <u>\$180.00</u>
	SUBTOTAL		\$600.00

CONSTRUCTION

Materials and Labor			\$30,450.00
Contractor's Allowances and Fees			<u>\$9,790.00</u>
	SUBTOTAL		\$40,240.00
	(See attached sheet for itemization)		
	TOTAL		\$47,000.00

Crissman & Solomon Architects Inc

44 Hunt Street Watertown Massachusetts 02172 Telephone 617 924 8200

James H Crissman FAIA

Stuart B Solomon AIA

Lawrence C Bauer AIA

Robert E Olson AIA

Site One
20 July 1984

RE: THE COMPUTER MUSEUM
Travelers 1401 Exhibit
Bay III - 5th floor

20 July 1984

PRELIMINARY BUDGET

CARPENTRY \$1,500

DOOR, FRAME AND HARDWARE

Door w/top and bottom glass lite 900

WOOD/GLASS FRAMES

3-4 lite wood frame 2,500

DEMOLITION 500

PARTITIONS

Type 1 F.H. demising partitions
Type 2 F.H. Chase partition
Type 3 Ceiling height partition
Type 4 Header and sill @ glass partition
Soffit @ entry 4,200

Pipe Rail 300

GLASS AND GLAZING

Door lites
Partitions and sidelites 4,500

FLOORING

Carpet
Base 1,000

ACCESS FLOOR

Floor Panels
Ramp, Railings and Floor Closer
Cutouts
Perforated Panels 4,850

ACOUSTICAL

2 x 2 tile 600

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20 July 1984

RE: THE COMPUTER MUSEUM
Travelers 1401 Exhibit
Bay III - 5th Floor

PRELIMINARY BUDGET CONTINUED

PAINTING

Walls	
Door and Frame	\$ 1,200
Hollow metal at glass	
Pipe rail	

FIRE PROTECTION

Remove and replace sprinkler heads	1,000 Allowance
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HVAC

	1,400 Allowance
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ELECTRICAL

2 x 2 light fixtures	
Outlets	
Switches	
Misc. panels	6,000 Allowance

SUBTOTAL	30,450
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<u>GENERAL CONDITIONS</u>	3,045
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<u>CONTINGENCY</u>	3,045
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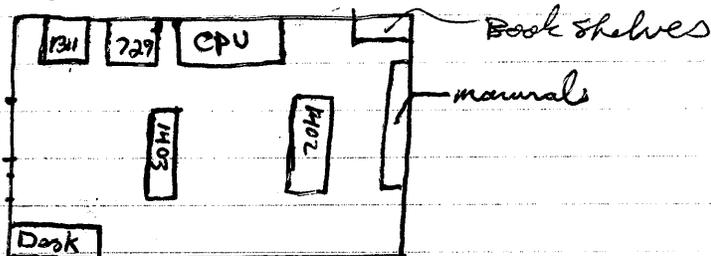
<u>ADMINISTRATIVE AND FEE</u>	3,700
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TOTAL	<u>\$40,240</u>
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1401 Exhibit Text & Info.

Computer Room:

Diagram of layout of room w/ machines labeled



Labels:

- 1401 Central Processing Unit
- 1402 Card Reader
- 1403 Card Line Printer
- 1311 Magnetic Disc Memory unit
- 729 Magnetic Tape
- Operator's desk
- Operating Manuals
- Program

THE TRAVELERS INSURANCE COMPANY

PRESENTS

25 YEARS OF DATA PROCESSING

AT THE TRAVELERS

THE TRAVELERS INSURANCE COMPANY
1 TOWER SQUARE
HARTFORD (CONNECTICUT), U.S.A. 06115

sc/83602-2F/A3
80124-R0

25 YEARS OF DATA PROCESSING AT THE TRAVELERS

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INTRODUCTION

ORIGINALLY:

- * COMPUTERIZED DATA PROCESSING HAS EXISTED AT THE TRAVELERS FOR 25 YEARS.
- * BACK IN 1955, WE GOT OUR FIRST COMPUTER: AN IBM MODEL 650.
- * IN THAT FIRST YEAR, OUR DATA PROCESSING STAFF DOUBLED IN SIZE: FROM 8 TO 16.
- * DATA PROCESSING AT THE TRAVELERS DIDN'T BEGIN FROM NOTHING BACK IN 1955; WE WERE ALREADY HEAVILY INVOLVED WITH TAB (TABULATION) APPLICATIONS, WHICH USED CARD SORTERS, COLLATORS, PRINTERS AND OTHER CARD-MANIPULATING EQUIPMENT. SUBSEQUENTLY, THE TAB OPERATION WAS MERGED WITH DATA PROCESSING.

TODAY:

- * THE DATA PROCESSING DEPARTMENT NOW SUPPORTS 19 USER ORGANIZATIONS, WITH DIVERSE BUSINESS REQUIREMENTS.
- * MORE THAN 2,100 PEOPLE ARE EMPLOYED IN THE DEPARTMENT--DEVELOPING, MANAGING, OPERATING OR ADMINISTERING OVER 7,500 PRODUCTION PATTERNS AND 1,300 DAILY PRODUCTION JOBS.
- * OUR APPLICATIONS ARE VALUED AT APPROXIMATELY \$100 MILLION.
- * OUR COMMUNICATIONS NETWORK IS CONNECTED TO OVER 225 MAJOR CITIES IN THE UNITED STATES, AND PROCESSES OVER 1 MILLION TRANSACTIONS DAILY ON APPROXIMATELY 7,500 ELECTRONIC DEVICES.

D.P. MISSION AND ORGANIZATION

MISSION

- * THE DATA PROCESSING DEPARTMENT'S PRIMARY MISSION IS TO ASSIST USER ORGANIZATIONS IN THE CREATION, PROCUREMENT AND MANAGEMENT OF INFORMATIONAL AND OFFICE AUTOMATION SYSTEMS THAT SUPPORT THEIR STRATEGIC AND OPERATIONAL OBJECTIVES.

- * OUR PREVAILING OBJECTIVES FOR THE 1980-1984 PERIOD ARE BASED ON THE PREMISE THAT THE PLANNING, DECISION-MAKING, AND OPERATING PROCESSES OF OUR USERS WILL BE POSITIVELY IMPACTED BY:
 - BETTER INFORMATION (I.E., BY HAVING ACCURATE DATA AVAILABLE TO MANAGERS AND BUSINESS TECHNICIANS ON ALL LEVELS).
 - IMPROVED SERVICE TO PRODUCERS AND CUSTOMERS THROUGH INTEGRATED HUMAN RESOURCE/MACHINE SYSTEMS SUPPORTING THE DAILY BUSINESS AFFAIRS OF THE CORPORATION.
 - ACHIEVEMENT OF COMPETITIVE PRICE ADVANTAGES THROUGH EFFICIENCIES AND SUSTAINED PRODUCTIVITY IMPROVEMENTS IN WORK PROCESSES.

ORGANIZATION

- * THE DATA PROCESSING DEPARTMENT IS ORGANIZED INTO 4 DIVISIONS:
 - SYSTEMS DIVISION
 - DATA CENTER DIVISION
 - COMPUTER SCIENCE DIVISION
 - GENERAL OPERATIONS DIVISION

EACH DIVISION GENERALLY ADDRESSES DIFFERENT ASPECTS OF OUR BUSINESS, BUT ARE OTHERWISE CLOSELY COORDINATED. DEVELOPMENT ENDEAVORS ARE UNDERTAKEN ON A PROJECT BASIS.

* SYSTEMS DIVISION

- MISSION: THE SYSTEMS DIVISION WORKS JOINTLY WITH VARIOUS CORPORATE PROFIT CENTERS TO DEFINE AND IMPLEMENT THEIR DATA PROCESSING NEEDS, SELECT APPLICATIONS FOR DEVELOPMENT, MANAGE SYSTEM-DEVELOPMENT ACTIVITIES, AND MANAGE THOSE OPERATIONAL SYSTEMS MEETING THE BUSINESS NEEDS OF THEIR USERS.
- GOVERNING PROCEDURES: THE SYSTEMS DIVISION'S ACTIVITIES ARE GOVERNED BY THE PROJECT MANAGEMENT APPROACH, WHICH IS SUPPORTED BY LIFE CYCLE STANDARDS AND THE STRUCTURED ANALYSIS APPROACH.
- STAFF: THE SYSTEMS DIVISION IS CURRENTLY STAFFED BY 767 PEOPLE, PRIMARILY MANAGERS, ANALYSTS AND PROGRAMMERS.

* DATA CENTER DIVISION

- MISSION: THE DATA CENTER DIVISION OPERATES THE DEPARTMENT'S COMPUTER HARDWARE RESOURCES. THEY ALSO SCHEDULE AND PERFORM PRODUCTION WORK, AND MANAGE THOSE SYSTEMS THAT SUPPORT THE INTERNAL OPERATIONS OF THE DATA CENTER.
- GOVERNING PROCEDURES: THE DATA CENTER DIVISION IS GOVERNED BY A SET OF OPERATING PROCEDURES. COMPREHENSIVE GOALS DEFINE THE MEASURE OF PERFORMANCE, TIMELINESS AND AVAILABILITY OF THEIR PRODUCTS AND SERVICES.
- STAFF: THE DATA CENTER IS CURRENTLY STAFFED BY 459 PEOPLE, CONSISTING OF MANAGERS, COORDINATORS, SPECIALISTS, OPERATORS, LIBRARIANS, TAPE HANDLERS AND OTHER SUPPORT PERSONNEL.

* COMPUTER SCIENCE DIVISION

- MISSION: THE COMPUTER SCIENCE DIVISION PROVIDES, THROUGHOUT THE SYSTEMS DEVELOPMENT AND OPERATIONS MANAGEMENT ACTIVITIES, THE TECHNICAL ENVIRONMENT (E.G., HARDWARE/SOFTWARE, METHODOLOGIES, SYSTEMS STANDARDS, QUALITY ASSURANCE, DATA ADMINISTRATION, ETC.) FOR THE CORPORATION TO MEET ITS DATA PROCESSING OBJECTIVES.
- GOVERNING PROCEDURES: THE COMPUTER SCIENCE DIVISION HAS A MIXTURE OF GOVERNING PROCEDURES, QUALITY ASSURANCE GUIDELINES, DEVELOPMENT STANDARDS, STRATEGY FORMATS, AND PLANNING PROCESSES.

- STAFF: THE COMPUTER SCIENCE DIVISION IS CURRENTLY STAFFED BY 288 PEOPLE, CONSISTING OF MANAGERS, TECHNICAL EXPERTS, ANALYSTS, SYSTEMS PROGRAMMERS, AND OTHER TECHNICAL PERSONNEL.

* GENERAL OPERATIONS DIVISION

- MISSION: THE GENERAL OPERATIONS DIVISION IS RESPONSIBLE FOR SUCH MAJOR SUPPORT FUNCTIONS AS ADMINISTRATIVE MANAGEMENT, EXPENSE MANAGEMENT AND CONTROL, DP SECURITY, MANAGEMENT OF TESTING, PROGRAM LIBRARY CONTROL, AND DATA INPUT/OUTPUT CONTROLS FOR THE DEPARTMENT.
- GOVERNING PROCEDURES: THE GENERAL OPERATIONS DIVISION IS GOVERNED BY A NUMBER OF STANDARDS AND PROCEDURES, MOST NOTABLY THE ADMINISTRATIVE STANDARDS, BUDGET PROCEDURES, AND LIBRARY PROCEDURES.
- STAFF: THE GENERAL OPERATIONS DIVISION IS CURRENTLY STAFFED BY 604 PEOPLE, INCLUDING MANAGERS, COORDINATORS, ADMINISTRATORS, TECHNICAL SUPPORT PERSONNEL, CLERICAL SUPPORT PERSONNEL, WORD PROCESSORS, DATA INPUT PERSONNEL, DATA OUTPUT PERSONNEL, AND HANDLERS.

HOW WE GOT HERE

GETTING TO WHERE WE ARE TODAY WAS NOT EASY! OUR FIRST 25 YEARS CAN BE CHARACTERIZED IN THREE WORDS:

GROWTH

CHANGE

LEARNING

- * FOR US, LEARNING IS THE MOST SIGNIFICANT OF THE THREE. WE FEEL WE HAVE PROGRESSED FROM SOLELY LEARNING FROM OUR ERRORS TO LEARNING HOW TO AVOID ERRORS! IN ESSENCE, WE LEARNED TO PLAN.
- * WE ARE REFERRING TO "ERRORS" IN THE SENSE OF "PITFALLS". (WE DON'T MEAN PROGRAMMING ERRORS; WE STILL MAKE PLENTY OF THOSE, AS INDICATED BY THE AMOUNT OF TESTING WE DO!) SOME EXAMPLES OF THESE PITFALLS ARE:
 - TODAY'S "GOOD" PROCEDURE COULD BE TOMORROW'S "BAD" ONE.
 - TODAY'S "GOOD" PRODUCT WILL SOON BE OBSOLETE. THIS IS EXPECTED, BUT BEING PART OF A "DEAD-ENDED" PRODUCT IS TRAGIC. THE EFFORT EXPENDED ON DEVELOPING "DEAD-ENDED" PRODUCTS MUST BE DUPLICATED; THE LOST VALUE CAN BE MEASURED IN TIME AND MONEY.
- * WE WILL TRY TO GIVE YOU SOME INSIGHTS FROM OUR 25 YEARS OF DATA PROCESSING EXPERIENCE. HOWEVER, AN UNDERSTANDING OF THE AMERICAN BUSINESS ENVIRONMENT MAY HELP YOU TO APPRECIATE SOME OF OUR EXPERIENCES. SIMPLY PUT:
 - COMPETITION - MANY AMERICAN COMPANIES COMPETE IN THE SAME BUSINESS OR INDUSTRY. THEY COMPETE FOR INVESTORS, SALES AND PEOPLE.
 - PROFITS MEASURE A COMPANY'S SUCCESS.

- PRODUCTIVITY - IMPROVED PRODUCTIVITY LEADS TO IMPROVED PROFITABILITY.

- PEOPLE - GOOD PEOPLE IMPROVE PRODUCTIVITY.

* THE COMPUTER IS A MEANS OF IMPROVING PRODUCTIVITY.

* WE WILL REVIEW THE PAST 25 YEARS IN 5-YEAR INCREMENTS, SUMMARIZING EACH PERIOD AND DISCUSSING THOSE THINGS WE FEEL ARE PERTINENT TO THE THREE CHARACTERISTICS WE PREVIOUSLY DISCUSSED (I.E., GROWTH, CHANGE AND LEARNING).

EARLY STAGES

	1955	1956	1957	1958	1959
MANPOWER DEVELOPMENT	16	28	63	74	79
NUMBER OF COMPUTERS	1	2	2	5	5
TYPES OF COMPUTERS	1	1	1	2	2
RELATIVE CAPACITY	1	2	2	5.5	5.5
STORAGE MEDIUM					
CARD	Y	Y	Y	Y	Y
TAPE	N	N	N	Y	Y
FUNCTION					
COMPUTE	Y	Y	Y	Y	Y
BATCH PROCESS	N	N	N	Y	Y

EXHIBIT A

EARLY STAGES - 1955-1959

PERIOD SUMMARY

- * COMPUTER PROCESSING CAUGHT ON QUICKLY AT THE TRAVELERS. OUR INITIAL PROGRAMS WERE--BY TODAY'S TECHNOLOGICAL STANDARDS--"BACK OFFICE" FUNCTIONS (I.E., THEY WERE USED TO ASSIST ACCOUNTANTS, STATISTICIANS AND ACTUARIES).
- * COMPUTERS WERE INITIALLY USED TO SPEED UP THE SUMMARY PROCESS IN THE TAB ENVIRONMENT.
 - DETAIL CARDS WERE FED INTO THE IBM 650, AND SUMMARY CARDS WERE PUNCHED OUT.
 - THE REMAINDER OF THE CARD PROCESS WAS SUBSTANTIALLY THE SAME.
- * IN THAT EARLY ENVIRONMENT, OUR PROGRAMMERS USUALLY OPERATED THE COMPUTERS BY THEMSELVES WHILE TESTING THEIR OWN PROGRAMS.
- * IN THE MIDDLE OF THIS PERIOD, WE BEGAN TO FEEL THE LIMITATIONS OF CARDS; THEY COULD, AFTER ALL, ACCOMMODATE ONLY 80 COLUMNS OF DATA.

GROWTH

- * THE DEVELOPMENT STAFF--WHICH INCLUDES PROGRAMMERS, ANALYSTS AND SUPPORT PERSONNEL (BUT EXCLUDES THE COMPUTER OPERATIONS STAFF)-- INCREASED IN SIZE FROM 16 TO 79 PERSONS.
- * THE NUMBER OF COMPUTERS INCREASED FROM 1 TO 5, AND THEIR RELATIVE CAPACITY FROM 1 TO 5.5 .
- * WE ACQUIRED A SECOND TYPE OF COMPUTER.

CHANGE

- * THE MOST SIGNIFICANT CHANGE DURING THIS PERIOD WAS THE DEVELOPMENT OF MAGNETIC TAPE.
 - TAPE DID MORE THAN MERELY ENHANCE THE COMPUTER'S INPUT/ OUTPUT CAPABILITY; IT EXPANDED ITS CAPABILITY. THE COMPUTER COULD NOW SORT, MERGE AND PRINT-FORMAT AS WELL AS COMPUTE.
- * THE ADVENT OF TAPE HERALDED A SHIFT FROM CARD SYSTEMS TO COMPUTER SYSTEMS.
- * WE, ALONG WITH MANY OTHER COMPANIES, MADE THE TRANSITION TO COMPUTER SYSTEMS.
 - OUR FIRST TAPE SYSTEM WAS THE RCA BISMAC. IN ADDITION TO MAGNETIC TAPE, IT HAD PAPER TAPE FOR INITIAL INPUT. THE PAPER TAPE ALLOWED FOR VARIABLE-LENGTH RECORDS.

LEARNING

- * THE PROCESS OF DEFINING REQUIREMENTS WAS SIMPLE, BUT WE SOON REALIZED THAT REQUIREMENTS ARE SUBJECT TO CHANGE, AND DOCUMENTATION OF THESE REQUIREMENTS IS ESSENTIAL.
- * WE ALSO LEARNED THAT TRAINING IS AN EXTREMELY IMPORTANT INGREDIENT IN DATA PROCESSING. WE AUGMENTED VENDOR TRAINING WITH OUR OWN TRAINING PROGRAMS.

PUSH TO AUTOMATE

	1960	1961	1962	1963	1964
MANPOWER DEVELOPMENT	123	133	171	181	199
NUMBER OF COMPUTERS	6	7	8	11	13
TYPES OF COMPUTERS	2	2	3	3	5
RELATIVE CAPACITY	7.5	11.5	17.5	32	57.5
STORAGE					
CARD	Y	Y	Y	Y	Y
TAPE	Y	Y	Y	Y	Y
DRUM	N	N	N	N	Y
FUNCTION					
COMPUTE	Y	Y	Y	Y	Y
BATCH PROCESS	Y	Y	Y	Y	Y
REAL-TIME INQUIRY	N	N	N	N	Y

EXHIBIT B

PUSH TO AUTOMATE - 1960-1964

PERIOD SUMMARY

- * WE DECIDED TO ACQUIRE AN RCA 501 COMPUTER IN 1959. THE FIRST 501 SYSTEM WAS INSTALLED DURING THE SECOND QUARTER OF 1960.
- * PRIOR TO INSTALLATION, THE ENTIRE PROGRAMMING STAFF WAS TRAINED ON THE 501, AND HAD ALREADY BEGUN WRITING PROGRAMS.
- * AN ADDITIONAL 44 PEOPLE (A 50% STAFFING INCREASE) WERE ALSO HIRED AND TRAINED.
- * THE DATA PROCESSING DEPARTMENT WAS ORGANIZED ALONG INSURANCE LINES (I.E., WE HAD A PROGRAMMING SECTION FOR EACH OF THE MAJOR INSURANCE LINE AREAS, SUCH AS CASUALTY-PROPERTY, LIFE AND GROUP). MAJOR DEVELOPMENT PROJECTS WERE SIMULTANEOUSLY PROGRESSING IN EACH OF THESE AREAS.
- * THE PUSH TO AUTOMATE WAS SUCCESSFUL. MANY APPLICATIONS WERE DEVELOPED. THE SECOND AND THIRD RCA 501s WERE ADDED IN 1961, THE FOURTH IN 1962, AND THE FIFTH IN 1964.
- * THE SEEMING SLOWDOWN IN 501 GROWTH IN 1963 WAS DUE TO TWO FACTORS:
 - A SUBSTANTIAL DEVELOPMENT TEAM WAS ORGANIZED TO BEGIN IMPLEMENTATION OF ARTS (AUTOMOBILE REAL-TIME SYSTEM), WHICH WAS OUR FIRST SYSTEM TO REACH OUT INTO THE FIELD OFFICES. IT COMPUTERIZED AUTOMOBILE POLICY ISSUANCE, BILLING AND CHANGE PROCESSING. REAL-TIME INQUIRY CAPABILITY WAS REQUIRED. THIS SYSTEM IMPROVED FIELD OFFICE PRODUCTIVITY.

- THE SECOND FACTOR WAS THAT CONSIDERABLE EFFORT WAS PUT INTO UPGRADING OUR CARD ENVIRONMENT; FOUR IBM 1401 COMPUTERS WERE INSTALLED DURING 1962-63 TO IMPROVE THAT AREA.
- OUR DATA CENTER, CONSTRUCTED IN 1964, WAS AT THAT TIME THE LARGEST FREE-STANDING BUILDING OF ITS TYPE IN THE UNITED STATES, WITH APPROXIMATELY 21,000 SQUARE METERS OF FLOOR SPACE.
- * DURING THIS PERIOD, WE BEGAN TO REALIZE THAT EACH NEW APPLICATION WE DEVELOPED ABSORBED A NUMBER OF PEOPLE FOR MAINTENANCE. IT BECAME APPARENT TO US THAT IN ORDER TO DEVELOP NEW APPLICATIONS WE WOULD HAVE TO KEEP GROWING.

GROWTH

- * OUR DEVELOPMENT STAFF INCREASED FROM 79 (IN 1959) TO 199 (IN 1964). THE LARGEST SINGLE INCREASE DURING THIS PERIOD, 44 PERSONS, TOOK PLACE IN 1960.
- * OUR RELATIVE COMPUTER CAPACITY SHOWED THE MOST STARTLING GROWTH RATE BY INCREASING DURING THIS PERIOD FROM 5.5 TO 57.5 (BASED ON 1955 CAPACITY).
- * WE INCREASED OUR NUMBER OF COMPUTERS FROM 5 TO 13, AND TYPES OF COMPUTERS FROM 2 TO 5.

CHANGE

- * TECHNOLOGICAL CHANGES WERE KEENLY FELT DURING THIS PERIOD. THE DEVELOPMENT OF THE RCA 501 COMPUTER MADE THEIR OWN BISMAC OBSOLETE. LATE DURING THIS PERIOD WE ACQUIRED A UNIVAC 490 COMPUTER, WHICH WE USED FOR OUR FIRST REAL-TIME APPLICATION. IN 1964, IBM MADE A VERY SIGNIFICANT ANNOUNCEMENT, INTRODUCING THEIR 360 COMPUTER SERIES.

- * ALTHOUGH MOST OF OUR APPLICATIONS WERE STILL "BACK OFFICE" TYPES, OUR CARD FUNCTIONS (I.E., SORTING, COLLATING, ETC.) WERE ALL BEING DONE ON COMPUTERS, USING MAGNETIC TAPE.
- * BECAUSE WE HAD SO MANY PROGRAMMERS, IT BECAME IMPRACTICAL FOR EACH TO TEST HIS/HER OWN PROGRAMS IN THE COMPUTER ROOM; HENCE, A "TEST PACKAGE" PROCEDURE WAS DEVELOPED.

LEARNING

- * COMPETITION AMONG COMPANIES FOR PROGRAMMERS BEGAN DURING THIS PERIOD. AFTER A FEW PROGRAMMERS LEFT FOR JOBS WITH OTHER COMPANIES IT BECAME APPARENT TO US THAT STANDARD PROGRAMMING DOCUMENTATION IS BOTH DESIRABLE AND NECESSARY IF A NEWLY HIRED PROGRAMMER IS TO BE ABLE TO PICK UP SOMEONE ELSE'S PROGRAMS AND MAKE CHANGES.
- * THE RCA 501 PROVIDED SIGNIFICANTLY GREATER COMPUTE CAPABILITY THAN DID THE IBM 650. SOME OF THIS ADDITIONAL CAPABILITY WAS USED TO EDIT INITIAL DATA. THE NUMBER OF DETAILED ERRORS WAS SIGNIFICANT; ALTHOUGH MOST OF THESE ERRORS REMAINED UNCORRECTED, THEY DID POINT TO THE NEED FOR CAPTURING DATA AT ITS SOURCE; THERE, ERRORS COULD BE RESEARCHED AND CORRECTIONS COULD BE MADE.
- * DURING THIS PERIOD WE CAME TO REALIZE THAT OUR WORKLOAD'S EXPANSION CLOSELY PARALLELED THE AVAILABLE CAPACITY OF OUR COMPUTERS. IN OTHER WORDS, WE WERE USING OUR INCREASED CAPACITY SIMPLY BECAUSE IT WAS AVAILABLE!
- * OUR ABILITY TO DELIVER APPLICATIONS TO USERS ON SCHEDULE HAD BY THIS TIME BECOME A PROBLEM. USERS WERE INCREASINGLY DOUBTING OUR

CREDIBILITY IN THIS AREA. THIS LED TO STUDIES INTO THE SYSTEM-
DEVELOPMENT PROCESS--THE "LIFE CYCLE" CONCEPT--AND TO THE USE OF
PROJECT MANAGEMENT TECHNIQUES.

EXPANDING & UPGRADING

	1965	1966	1967	1968	1969
MANPOWER DEVELOPMENT	250*	300*	400*	495	799
TOTAL					1,680
NUMBER OF COMPUTERS	15	20	28	30	28
TYPES OF COMPUTERS	5	8	8	8	8
RELATIVE CAPACITY	71.5	149.5	682	710	1,032
STORAGE					
CARD	Y	Y	Y	Y	Y
TAPE	Y	Y	Y	Y	Y
DRUM	Y	Y	Y	Y	Y
DISK	Y	Y	Y	Y	Y
FUNCTION					
COMPUTE	Y	Y	Y	Y	-
BATCH PROCESS	Y	Y	Y	Y	Y
REAL-TIME	Y	Y	Y	Y	Y
REMOTE JOB ENTRY	N	N	N	Y	Y

* ESTIMATED

EXHIBIT C

EXPANDING & UPGRADING - 1965-1969

PERIOD SUMMARY

THE MIDDLE FIVE-YEAR PERIOD WAS VERY EXCITING--BUT ALSO TRAUMATIC.

- * TECHNOLOGICAL CHANGE BROUGHT US MANY NEW, IMPROVED PRODUCTS; IT ALSO BROUGHT HOME TO US THE REALITY OF "DEAD-ENDED" PRODUCTS.
 - A DEAD-ENDED PRODUCT IS ONE THAT IS TECHNOLOGICALLY OBSOLETE AND LACKS A COMPATIBLE FOLLOW-ON COMPUTER.
 - IN THESE CASES, THE BUSINESS APPLICATIONS MUST BE REWRITTEN FOR THE NEW COMPUTER.
 - BECAUSE IT IS MORE PRODUCTIVE TO IMPLEMENT NEW SYSTEMS THAN TO REWRITE OLDER APPLICATIONS, THE OLD EQUIPMENT IS PHASED OUT SLOWLY; THESE OLDER APPLICATIONS ARE INCLUDED WHENEVER RELATED NEW APPLICATIONS ARE IMPLEMENTED.

- * EARLY IN THIS PERIOD, WE DEVELOPED SOME VERY SUCCESSFUL LARGE APPLICATIONS:
 - ARTS (AUTOMOBILE REAL-TIME SYSTEM), A POLICY ISSUE AND MAINTENANCE APPLICATION, WAS IMPLEMENTED ON THE UNIVAC 490.
 - MEDICARE, A LARGE-CLAIM SYSTEM, WAS IMPLEMENTED ON THE IBM 360/40.
 - A COMPUTER-CONTROLLED COMMUNICATIONS NETWORK, USING THE UNIVAC 490, WAS ESTABLISHED FOR ARTS. THIS NETWORK CONNECTED ROUGHLY 100 FIELD OFFICES WITH THE HOME OFFICE IN HARTFORD. IT WAS USED FOR DATA COLLECTION, INQUIRIES AND ADMINISTRATIVE TRAFFIC (I.E., ELECTRONIC MAIL).
 - THIS FACILITY WAS ALSO USED BY THE MEDICARE SYSTEM. THE TRANSACTIONS WERE PUT ONTO A TAPE, WHICH WAS THEN USED ON IBM EQUIPMENT.

- * THIS SUCCESS LED TO LARGER APPLICATIONS, MANY OF WHICH FAILED TO MATERIALIZE BECAUSE THE IMPLEMENTATION PROCESS TOOK LONGER TO ACCOMPLISH THAN DID THE REQUIREMENTS-CHANGE CYCLE. (THEY WERE SIMPLY TOO CUMBERSOME TO IMPLEMENT BEFORE THE USER'S REQUIREMENTS CHANGED.)

- * IN THOSE DAYS WE HAD DIFFICULTY PERCEIVING A MODULAR STRUCTURE (I.E., ONE THAT IS IMPLEMENTED IN PIECES). OUR INITIAL ATTEMPTS AT MODULAR DESIGN LED TO INTEGRATION PROBLEMS.
- * WE LACKED A STANDARDIZED DESIGN APPROACH THAT WOULD ALLOW FOR FUTURE INTEGRATION.

GROWTH

- * OUR DEVELOPMENTAL MANPOWER SKYROCKETED FROM 199 (IN 1964) TO 799 (IN 1969) IN ORDER TO STAFF OUR LARGE PROJECTS.
- * OUR RELATIVE CAPACITY (BASED ON 1955 CAPACITY) ALSO DRAMATICALLY INCREASED DURING THIS PERIOD FROM 57.5 TO 1,032, UTILIZING 9 DIFFERENT TYPES OF COMPUTERS. BY 1969 WE HAD A TOTAL OF 28 COMPUTERS. IN 1968 WE HAD OUR LARGEST NUMBER OF COMPUTERS, 30.)

CHANGE

- * BOTH ARTS AND THE MEDICARE SYSTEM GENERATED SOURCE INPUT FROM FIELD FACILITIES. THESE TRANSACTIONS WERE COLLECTED DURING THE DAY, THEN EDITED AT NIGHT. ANY EDIT ERRORS WERE THEN RETRANSMITTED TO THE SUBMITTING OFFICE THE NEXT MORNING. THIS IMPROVED THE QUALITY OF OUR DATA.
- * WE UPGRADED OR REPLACED EACH LINE OF COMPUTERS AT LEAST ONCE.
 - THE IBM 650 WAS PHASED OUT, AT THAT MANUFACTURER'S REQUEST. (THEIR WIRES WERE BRITTLE.)
 - OUR TABULATION EQUIPMENT WAS REPLACED BY COMPUTERS.
 - THE BURROUGHS B263 WAS REPLACED BY THEIR B300.
 - THE UNIVAC 490 WAS REPLACED BY THEIR 494.
 - THE RCA 70/45 WAS BROUGHT IN TO EMULATE THEIR 501'S WORKLOAD.
 - WE HAD AT LEAST ONE OF EACH OF THE IBM 360 SERIES OF PROCESSORS (I.E., 360/30, 360/40, 360/50 AND 360/65).

- * IN ADDITION TO CHANGES IN COMPUTERS, MANY NEW COMPUTER-RELATED PRODUCTS WERE BEING INTRODUCED TO THE TRAVELERS:
 - MOST SIGNIFICANT WERE THE ROTATING STORAGE DRUMS AND DISKS.
 - ALSO OF IMPORTANCE WERE THE SCANNER AND COM (COMPUTER-OUTPUT MICROFILM) DEVICES.
- * THE REMOTE PRINTER/CARD DEVICE PROVED BENEFICIAL TO PROGRAMMER PRODUCTIVITY. IT WAS USED FOR RJE (REMOTE JOB ENTRY), SUBSTANTIALLY REDUCING TURNAROUND TIME.
- * THE USE OF COBOL GAINED WIDE GENERAL ACCEPTANCE; ALTHOUGH COBOL WAS PREVIOUSLY CONSIDERED INEFFICIENT, INCREASES IN COMPUTER POWER OFFSET THIS DEFICIENCY.

LEARNING

- * UNCONTROLLED GROWTH IN MANY DIRECTIONS WAS COSTLY IN A NUMBER OF ASPECTS, BUT MOST IMPORTANTLY IT MADE INTEGRATION OF OUR SOFTWARE PRODUCTS VERY DIFFICULT.
 - AFTER MUCH CONSIDERATION, WE DECIDED THAT ALL OF OUR NEW APPLICATIONS WOULD BE DESIGNED FOR THE IBM 360 ARCHITECTURE.
- * THE NEED TO REWRITE APPLICATIONS (BECAUSE OF DEAD-ENDED PRODUCTS) WAS A GREAT CONCERN. REWRITING THESE APPLICATIONS WAS NOT A VERY PRODUCTIVE ENDEAVOR. EVEN THOUGH COBOL WAS CONSIDERED INEFFICIENT, IT WAS MADE THE OFFICIAL PROGRAMMING LANGUAGE AT THE TRAVELERS-- PRIMARILY BECAUSE IT GUARANTEED PORTABILITY.

- * CONCERN ABOUT POTENTIAL COMMUNICATIONS NETWORK PROBLEMS LED TO THE SETTING UP OF ELABORATE CONTROL FACILITIES AND PROCEDURES. THESE FACILITIES, AND THE PEOPLE WHO OPERATED THEM, WERE KNOWN AS COMEX (COMMUNICATION EXPEDITORS). THROUGH CAREFUL PLANNING, WE GAINED MUCH KNOWLEDGE ABOUT COMMUNICATIONS NETWORKS.

- * THE DATA-COLLECTION PROCEDURE NOT ONLY IMPROVED THE QUALITY OF THE DATA, BUT ALSO IMPROVED OUR CONCEPT ABOUT DATA ENTRY. (FOR EXAMPLE, EDITING SHOULD BE PERFORMED IN REAL-TIME SO THAT ERRORS CAN BE CORRECTED ON THE SPOT.)

CONSOLIDATION

	1970	1971	1972	1973	1974
MANPOWER DEVELOPMENT	979	1,073	1,114	1,012	1,024
TOTAL	1,738	1,815	1,867	1,791	1,757
NUMBER OF COMPUTERS	25	23	20	18	18
TYPES OF COMPUTERS	9	9	7	5	5
RELATIVE CAPACITY	1,498	2,192	2,959	2,920	4,278
STORAGE					
DISK (BILLIONS OF BYTES)	0.5	0.7	6	10	16
CARD	Y	Y	Y	Y	Y
TAPE	Y	Y	Y	Y	Y
DRUM	Y	Y	Y	Y	Y
FUNCTION					
BATCH PROCESSING	Y	Y	Y	Y	Y
REAL-TIME	Y	Y	Y	Y	Y
REMOTE JOB ENTRY					
INTERACTIVE					
DEBUG/PERS COMPUTE	Y	Y	Y	Y	Y
A.P.L.	-	-	-	-	Y

EXHIBIT D

CONSOLIDATION - 1970-1974

PERIOD SUMMARY

WE BEGAN THE '70s WITH TWO BIG PLUSSES:

- * COBOL - A PROGRAMMING LANGUAGE THAT GUARANTEED PORTABILITY AND, THUS, PROTECTION FOR OUR APPLICATION INVENTORY.
- * IBM 360 SERIES - A COMPUTER SYSTEM TO WHICH WE WOULD DIRECT ALL NEW APPLICATIONS.

OUR CONSOLIDATION WAS PRIMARILY A DIRECTIONAL DECISION THAT NEW APPLICATIONS WOULD BE WRITTEN FOR THE 360 AND THAT OUR OLDER SYSTEMS WOULD BE PHASED OUT. AS PREVIOUSLY STATED, THERE IS AT MOST ONLY A MARGINAL PRODUCTIVITY GAIN FROM REWRITING AN APPLICATION. THEREFORE, THE PHASING-OUT PROCESS HAS BEEN VERY SLOW. OUR ATTENTION HAS ALWAYS BEEN FOCUSED ON NEWER APPLICATIONS WITH HIGHER PAYOFFS.

THE '70 ALSO BROUGHT SOLUTIONS TO TWO OF OUR OTHER PROBLEMS. WE DEVELOPED APPROACHES TO DEVELOPING APPLICATIONS THAT ALLOWED US TO GET THEM OPERATIONAL SOONER. THIS PROCESS ALLOWED US TO AVOID THE HIATUS WITH REQUIREMENTS CHANGES. SYSTEMS WERE DEVELOPED IN PHASES, EACH BECOMING OPERATIONAL BEFORE THE NEXT ONE BEGAN.

THE OTHER SOLUTION WAS IN OBTAINING USER SUPPORT ON PROJECTS. THE SIMPLE SOLUTION WAS TO HAVE THE USER ORGANIZATION SUPPLY THE PROJECT LEADER. WE CURRENTLY WILL NOT UNDERTAKE A PROJECT UNLESS IT IS HEADED BY THE USER. WE SUPPLY PROJECT MANAGERS FOR OUR ROLES IN THE SYSTEM DEVELOPMENT AND OPERATIONAL MANAGEMENT PROCESSES.

THE EARLY '70s ALSO BROUGHT A NEW GROWTH ITEM: THE DISK. DISKS HAVE BEEN VERY INSTRUMENTAL IN STRUCTURING APPLICATIONS, ALLOWING US TO CREATE DATA BASES FOR THEM.

MANY NEW APPLICATIONS WERE IMPLEMENTED DURING THIS PERIOD, AS CAN BE SEEN BY THE GROWTH IN OUR COMPUTER CAPACITY.

- * THE RELATIVELY LOW COST OF DISK STORAGE HELPED SPEED THE TRANSITION FROM BATCH TO INTERACTIVE PROCESSING.
- * REAL-TIME AND INTERACTIVE APPLICATIONS FLOURISHED.

GROWTH

- * OUR DEVELOPMENT MANPOWER GREW BY A MODEST 225 PEOPLE (TO 1,024) WHILE OUR TOTAL STAFF GREW BY ONLY 77. THIS WAS IN PART A BENEFIT OF CONSOLIDATION, BECAUSE FEWER OPERATIONAL PEOPLE WERE THEN REQUIRED.
- * WE ENJOYED A FOUR-FOLD INCREASE IN RELATIVE CAPACITY (BASED ON 1955 CAPACITY), FROM 1,032 TO 4,278. WE REDUCED OUR NUMBER OF COMPUTERS FROM 28 TO 18. INSTEAD OF HAVING 9 DIFFERENT TYPES OF COMPUTERS, WE REDUCED THAT FIGURE TO 5.
- * OUR DISK STORAGE CAPACITY GREW FROM ABOUT 500 MILLION BYTES TO 16 BILLION.

CHANGE

- * OUR DATA-ENTRY PROCESS WAS IMPROVED. KEY-TO-DISK FACILITIES WERE INSTALLED, REPLACING KEYPUNCH AND PAPER TAPE EQUIPMENT AT THE DATA CENTER. IN THE FIELD OFFICES, CRTs REPLACED PAPER TAPE EQUIPMENT. BOTH FACILITIES HAD FORMAT AND EDIT CAPABILITIES.

- * A COMMUNICATIONS LINK WAS SET UP BETWEEN OUR IBM EQUIPMENT AND THE UNIVAC 494. THIS PROVIDED ACCESS TO THE NETWORK FOR APPLICATIONS USING IBM EQUIPMENT.
- * SIGNIFICANT IMPROVEMENTS IN PROGRAMMER PRODUCTIVITY WERE GAINED THROUGH THE USE OF INTERACTIVE DEBUGGING, FIRST IN THE RCA 70/46 (AN IBM 360-COMPATIBLE SYSTEM), THEN WITH TSO ON THE IBM 360/370 SYSTEM.
- * CONSOLIDATION LED US TO THE PATH OF UPGRADING TO LARGER, MORE COMPLEX SYSTEMS AND BUILDING LARGE HOST ENVIRONMENTS. DURING THIS PERIOD, WE BECAME INCREASINGLY INVOLVED WITH PERFORMANCE AND CAPACITY PLANNING. THESE ENDEAVORS EVENTUALLY LED TO THE DEVELOPMENT OF A HOST PLANNING PROCESS THAT MATCHED HARDWARE CONFIGURATIONS TO PROCESSING AND SERVICE REQUIREMENTS.

LEARNING

- * DURING THIS PERIOD A NUMBER OF PRODUCTS THAT WE USED PROVED LESS THAN SATISFACTORY. VENDORS OFTEN RELEASED PRODUCTS BEFORE THEY WERE FREE FROM "BUGS" (DEFECTS). WE WERE EARLY USERS OF MANY PRODUCTS, AND HAD THEREFORE TO LIVE WITH THEIR UPS AND DOWNS. AFTER THIS EXPERIENCE, WE DECIDED TO USE ONLY STABLE PRODUCTS (I.E., THOSE THAT HAD BEEN PROVEN IN USER ENVIRONMENTS FOR A SIGNIFICANT TIME). WE ALSO ESTABLISHED SOFTWARE MIGRATION PROCEDURES, WHICH LIMITED OUR EXPOSURE.
- * THE TEMPTATION TO USE PRODUCTS EARLY IS GREAT, BECAUSE THEY USUALLY OFFER THE POTENTIAL FOR BETTER PRICE/PERFORMANCE. WE HAVE BEEN VERY (BUT NOT COMPLETELY) SUCCESSFUL IN AVOIDING THIS TEMPTATION.

- * WE ALSO FOUND THAT WE COULD BE MORE PRODUCTIVE THROUGH BUYING VENDOR APPLICATIONS RATHER THAN BY WRITING THEM OURSELVES. WE PURCHASED MANY SOFTWARE PACKAGES AND APPLICATIONS PRODUCTS DURING THIS PERIOD.

COMMUNICATIONS BOOM

	1975	1976	1977	1978	1979
MANPOWER					
DEVELOPMENT	1,089	1,204	892*	920	972
TOTAL	1,685	1,856	1,960	2,036	2,080
NUMBER OF COMPUTERS					
3RD GENERATION	4	5	6	6	6
2ND GENERATION	13	11	9	8	7
RELATIVE CAPACITY	5,523	6,754	9,310	10,988	14,444
STORAGE					
DISK (BILLION BYTES)	24	44	79	125	143
MSS	-	-	-	15	61
CARD	Y	Y	Y	Y	Y
TAPE DRIVES	269	293	279	254	219
DRUM	Y	Y	Y	Y	Y
FUNCTION					
BATCH PROCESSING	Y	Y	Y	Y	Y
REAL-TIME	Y	Y	Y	Y	Y
REMOTE JOB ENTRY	Y	Y	Y	Y	Y
INTERACTIVE					
DEBUG/PERS. COMPUTE	Y	Y	Y	Y	Y
APL	Y	Y	Y	Y	Y
TSO	Y	Y	Y	Y	Y
PERS. COMPUTE (VSPC)	-	-	-	-	Y

* ADMINISTRATIVE AND CLERICAL SUPPORT FUNCTIONS WERE SHIFTED TO THE GENERAL OPERATIONS DIVISION.

EXHIBIT E

COMMUNICATIONS BOOM - 1975-1979

PERIOD SUMMARY

- * DURING PRIOR PERIODS, COMPUTERS WERE USUALLY USED IN AN AFTER-THE-FACT MANNER (I.E., NEW PRODUCTS AND SERVICES WERE IMPLEMENTED INDEPENDENT OF THE DATA PROCESSING ENVIRONMENT; PIECES OF THOSE PRODUCTS AND SERVICES WERE LATER AUTOMATED). DURING THIS PERIOD, PEOPLE BEGAN TO "THINK COMPUTER" (I.E., THEY CONSIDERED, DURING DEVELOPMENT, HOW COMPUTERS COULD BE USED TO ENHANCE THEIR PRODUCTS AND SERVICES).
- * OUR GROUP DENTAL INSURANCE IS AN EXCELLENT EXAMPLE OF THIS THINKING.
- * WE REFER TO THIS PERIOD AS THE "COMMUNICATIONS BOOM" LARGELY BECAUSE MOST OF OUR APPLICATIONS CENTERED AROUND THE COMMUNICATION TIE-IN WITH COMPUTERS. TERMINALS BECAME COMMONPLACE THROUGHOUT THE COMPANY.
- * THIS PERIOD COULD ALSO REFERRED TO AS THE "FUNCTION BOOM," SINCE MANY NEW FUNCTIONS WERE ADDED TO OUR REPERTOIRE.
- * IN 1977 THE VARIOUS COMPONENTS THAT COMPRISED THE TRAVELERS DATA PROCESSING COMMUNITY WERE CONSOLIDATED AND RESTRUCTURED INTO OUR PRESENT DATA PROCESSING DEPARTMENT.
- * THE "PROJECT MANAGEMENT APPROACH" WAS FORMALIZED.
 - IT ENSURES USER LEADERSHIP, COMMITMENT AND CONTROL.
 - IT TRANSGRESSES ORGANIZATIONAL BOUNDARIES.
 - IT WORKS!

- * THE DEVELOPMENTAL LIFE CYCLE STANDARDS WERE UPDATED AND CONSOLIDATED, AND STRUCTURED ANALYSIS METHODOLOGIES WERE FORMULATED. BOTH OF THESE SUPPORT THE PROJECT MANAGEMENT APPROACH.

GROWTH

THE NEW ORGANIZATIONAL STRUCTURE OBSCURES OUR TRUE MANPOWER DISTRIBUTION. ESTIMATED DEVELOPMENT MANPOWER, QUOTED ON THE SAME BASIS AS BEFORE, STOOD AT 1,290 IN 1979. TOTAL DATA PROCESSING DEPARTMENT MANPOWER IN THAT YEAR WAS 2,080.

- * OUR RELATIVE COMPUTER CAPACITY (BASED ON 1955 CAPACITY) INCREASED FROM 4,278 (IN 1974) TO 14,444 (IN 1979).
 - WE AGAIN REDUCED OUR TOTAL NUMBER OF COMPUTERS, THIS TIME FROM 18 TO 13.
 - WE CONTINUED TO MAINTAIN 5 DIFFERENT TYPES OF COMPUTERS.
- * WE SET UP A SECOND COMMUNICATIONS NETWORK, USING IBM'S IMS/DC, WHICH SERVED THE RAILROAD MEDICARE SYSTEM AND THE GROUP DENTAL SYSTEM.
- * OUR DISK CAPACITY INCREASED, THIS TIME FROM 16 BILLION BYTES TO 143 BILLION.
 - DISK GROWTH HAS SLOWED SLIGHTLY DURING THE PAST TWO YEARS BECAUSE WE INSTALLED TWO MASS STORAGE UNITS, EACH CAPABLE OF STORING 235 BILLION BYTES. BUT, IN 1979, THEY HELD ONLY 61 BILLION BYTES.
- * WE NOW HAVE OVER 6,000 TERMINALS, A TEN-FOLD INCREASE FROM THE NUMBER WE HAD IN 1974. WITH A 20% PENETRATION RATE, WE NOW HAVE 1 TERMINAL FOR EVERY 5 TRAVELERS EMPLOYEES!

CHANGE

- * OUR TERMINAL ORIENTATION CHANGED FROM "DUMB" TO "INTELLIGENT". WE PHYSICALLY CONVERTED FROM THE UNISCOPE TO THE RAYTHEON 1200.
- * WE CONVERTED 200 MODEL 3330 DISK SPINDLES TO A LIKE AMOUNT OF 3350 DISK SPINDLES. (THIS WAS A MAJOR CONVERSION.)
- * WE CONVERTED FROM IBM'S SVS OPERATING SYSTEM TO ITS MVS.
- * CONTROL FOR THE ORIGINAL COMMUNICATIONS NETWORK WAS SHIFTED FROM THE UNIVAC 494 TO THE IBM SYSTEM. HOWEVER, A LINK WAS MAINTAINED FOR 494 ACCESS.
- * WE DEVELOPED A DISTRIBUTED NETWORK USING IBM'S 3790/8100s FOR OUR GHCP (GROUP HEALTH CLAIM PROCESSING) SYSTEM.
- * WE BEGAN USING THE MASS STORAGE UNIT (OUR PRIMARY EMPHASIS BEING TO ELIMINATE TAPE MOUNTERS).
- * WE SWITCHED FROM THE IBM 370/168 TO ITS 3033

LEARNING

- * OUR APPROACH TO TECHNOLOGICAL IMPACT HAS BEEN TO TAKE A STRATEGIC 5-YEAR OUTLOOK, WHERE WE DETERMINE THE DIRECTION IN WHICH WE SHOULD HEAD, AND DEFINE THE ACTIVITIES THAT WILL BE REQUIRED--WITH PARTICULAR EMPHASIS ON "ENABLING" ACTIVITIES. THIS IS TYPIFIED BY OUR "COMMUNICATIONS STRATEGY" (FIRST DEVELOPED IN 1975) AND BY OUR "DATA STRATEGY" (DEVELOPED IN 1979).
- * THE COMMUNICATIONS STRATEGY OUTLINES THE PROCESS FOR UPGRADING THE NETWORKS TO IBM'S SYSTEMS NETWORK ARCHITECTURE (SNA), AND ESTABLISHES THE STEPS FOR THE NETWORK'S EVENTUAL CONSOLIDATION.

SUMMARY

IN SUMMARY, WE HAVE FOUND THAT:

- * WE MUST HAVE AN ENVIRONMENT THAT IS CONDUCIVE TO DEVELOPMENT. IN SUCH AN ENVIRONMENT, IT IS MANDATORY THAT THE USERS ARE FULLY COMMITTED TO THE DEVELOPMENT PROJECT. WITH OUR PROJECT MANAGEMENT APPROACH, THE USERS MUST SUPPLY THE PROJECT LEADER. OUR STAFF PARTICIPATES IN THESE PROJECTS UNDER THE DIRECTION OF PROJECT MANAGERS, WHO REPORT TO THE PROJECT LEADER WHILE ON THE PROJECT.

THE DEVELOPMENT LIFE CYCLE STANDARDS SET THE FRAMEWORK FOR OUR PARTICIPATION. THEY DEFINE THE PHASES, ACCOUNTABILITY, RESPONSIBILITY AND DELIVERABLES FOR EACH PHASE. THEY ALSO SPELL OUT OUR DELIVERABLE DOCUMENTATION REQUIREMENTS.
- * THE APPLICATIONS WE HAVE DEVELOPED ARE CONSIDERED AN ASSET; BOTH THEY AND THEIR OPERATING ENVIRONMENTS MUST BE PROTECTED. PORTABILITY IS A KEY FACTOR.
- * THE OBJECTIVE OF AN APPLICATION IS TO FULFILL A USER'S NEEDS. DATA PROCESSING SERVICES HAVE ASSUMED MASSIVE AND CRITICAL PROPORTIONS IN TERMS OF THEIR IMPACT ON THE DAILY OPERATIONS OF THE COMPANY. ROUGHLY 5,500 PEOPLE INTERACT WITH OUR COMPUTER FACILITIES, VIA TERMINAL, ON A DAILY BASIS. THEIR SALARY COSTS ARE ABOUT THREE TIMES AS GREAT AS OUR HARDWARE AND COMMUNICATIONS COSTS. THEIR PRODUCTIVITY IS DEPENDENT UPON FOUR MAJOR SERVICE COMPONENTS:
 - AVAILABILITY
 - RESPONSE TIME
 - TIMELINESS
 - HUMAN ENGINEERING

GOALS IN THESE AREAS MUST BE ESTABLISHED AND ACHIEVED.

- * WE HAVE BEGUN TO REALIZE THAT THERE IS NO "ULTIMATE ENVIRONMENT," THAT CHANGE IS A FACT OF LIFE. WE HAVE LEARNED TO TAKE A BROAD, LONG-TERM OUTLOOK--AS REPRESENTED BY OUR 5-YEAR STRATEGIES--ON TECHNOLOGICAL ISSUES. THESE ENCOMPASS A UNIFIED AND INTEGRATED APPROACH, A REALIZATION THAT THERE IS A CORPORATE LEARNING CURVE, THAT A PHASED APPROACH IS (IN MOST CASES) NECESSARY AND DESIRABLE, THAT (IN MOST CASES) ENABLING ACTIVITIES MUST BE ACCOMPLISHED BEFORE A FUNCTION CAN BECOME A REALITY.

PLANS AND SCHEDULES ARE REQUIRED IN ORDER FOR OUR OBJECTIVE TO MATERIALIZE. IN ADDITION, THESE PLANS MUST BE PERIODICALLY UPDATED.

- * TACTICAL PLANNING IS ALSO AN INTEGRAL PART OF A SUCCESSFUL OPERATION. OUR PLANNING PROCESS TAKES A 2-YEAR VIEW OF OUR REQUIREMENTS, AND DEFINES CONFIGURATIONS TO SATISFY THESE REQUIREMENTS.

REQUIREMENTS-GATHERING IS A FORMAL PROCESS THAT USES A COMPUTER SYSTEM TO SUMMARIZE REQUIREMENTS.

THE CONFIGURING PROCESS IS ALSO FORMALIZED, WITH MANY FACTORS AND RELATIONSHIPS. OUR EXPERIENCE IS TRACKED ON A MONTHLY BASIS. THE DEPARTMENT'S BUDGET IS SUBSTANTIALLY DERIVED FROM THIS PROCESS, WHICH IS DONE TWICE EACH YEAR.

- * THE PRODUCTIVITY GAINED FROM DATA PROCESSING IS A KEY FACTOR IN KEEPING THE TRAVELERS COMPETITIVE AS AN INSURANCE AND FINANCIAL INSTITUTION. OUR PRESENTATION DID NOT COVER THE INCREASED DEMAND FOR THE KINDS OF PROCESSING AND INFORMATION THAT IS BASED ON GOVERNMENT, ECONOMIC AND SOCIOLOGICAL PRESSURES--WHICH HAVE BEEN TREMENDOUS! FOR EXAMPLE, TO KEEP PACE WITH INFLATION, THE

HOMEOWNER POLICY HAS PROGRESSIVELY BEEN REDUCED TO A SIX-MONTH TERM FROM AN ORIGINAL THREE-YEAR TERM--A SIX-FOLD INCREASE IN RATING AND POLICY ISSUANCE REQUIREMENTS. SIMILAR ACTIONS HAVE OCCURRED WITH OTHER FORMS OF INSURANCE.

THESE INCREASES HAVE BEEN ABSORBED BY THE COMPUTER, WHICH SHOWS A NET PRODUCTIVITY INCREASE. WE DO NOT SEE AN END IN THE NEAR FUTURE TO OUR USE OF COMPUTERS AS OUR CHIEF PRODUCTIVITY TOOLS.

* PROGRAMMER PRODUCTIVITY HAS BEEN ADDRESSED IN EACH OF OUR STAGES, WITH SIGNIFICANT GAINS. OUR PROGRAMMERS CURRENTLY WRITE AND TEST THEIR OWN PROGRAMS INTERACTIVELY, USING TERMINALS.

WE ARE ADDRESSING TOTAL SYSTEM IMPROVEMENTS THROUGH MORE SOFTWARE TOOLS (SUCH AS A DATA DICTIONARY) AND THROUGH THE ACQUISITION OF PACKAGED APPLICATIONS.

PROGRAMMER PRODUCTIVITY PROVIDES US WITH A DOUBLE GAIN: PROGRAMMERS ARE NOT ONLY MORE PRODUCTIVE; THEY ALSO PRODUCE MORE APPLICATIONS THAT IN TURN HELP IMPROVE THE COMPANY'S OVERALL PRODUCTIVITY.