I. INTRODUCTION

FOR THE PAST TWO YEARS, IN LINE WITH THE INNOVATION POLICY ADOPTED BY THE BOARD IN JULY 1980, WE HAVE MADE IN-DEPTH REVIEWS OF INNOVATION IN THE COMPANY. YOU HAVE, OF COURSE, SEEN CERTAIN ASPECTS OF THE TOTAL INNOVATION PICTURE IN VARIOUS REPORTS TO THE FULL BOARD, IN THE BUSINESS BOARDS, VARIOUS STRATEGY COMMITTEES, THE CORPORATE RESEARCH ADVISORY COMMITTEE, AND IN THE STRATEGIC PLAN REVIEWS.

THIS EVENING, THEN, I'M PRESENTING THE THIRD ANNUAL REPORT TO TIE TOGETHER THE FULL SCOPE OF INNOVATION ACTIVITIES. THIS REPORT WILL COVER NOT ONLY THE COMPUTER BUSINESS AND SMALL BUSINESS SERVICES AS DID LAST YEAR'S REVIEW, BUT ALSO THE TOTAL CCC PICTURE.

IT'S WORTHWHILE TO REMIND OURSELVES WHAT THIS INNOVATION BUSINESS IS ALL ABOUT AND IN THAT REGARD THIS QUOTATION FROM PETER DRUCKER SAYS IT VERY WELL.

(DRUCKER CHARTS)

THE ONLY THING I WOULD ADD TO THAT IS THAT THE PACE OF OBsolescence IS INCREASING IN EVERY SINGLE ONE OF OUR BUSINESS SEGMENTS -- PERIPHERALS, COMPUTERS, SERVICES AND ABOVE ALL FINANCIAL SERVICES. SO THE NEED FOR RESOURCES IS ENORMOUS. THIS YEAR ONE OF THIRTEEN KEY CORPORATE STRATEGIC ISSUES IS HOW TO IMPROVE AND SHORTEN OUR PRODUCT DEVELOPMENT CYCLES. EACH OF THESE MAJOR ISSUES, INCLUDING THIS ONE, IS BEING WORKED OVER BY A TASK FORCE OF TOP EXECUTIVES. WE ALSO USE TECHNOLOGICAL COOPERATION, COMPUTER-AIDED DESIGN TECHNIQUES, COMPUTER-BASED TRAINING, GREATER USE OF INDEPENDENT SMALL COMPANIES, AND MORE. ALL THAT HELPS BUT THE NET RESULT IS AN EVER GREATER PRESSURE ON PROFITS AS WE MUST SPEND TODAY TO SURVIVE TOMORROW.

AS YOU WILL SEE, IN THE THREE-YEAR PERIOD 1983-1985, WE HAVE PLANNED EXPENDITURES THAT EXCEED LAST YEAR'S THREE-YEAR FORECAST BY 26 PERCENT. THIS DESPITE A CONTINUED CONCERN WITH REGARD TO THE OVERALL BUSINESS CLIMATE. SO OUR COMMITMENT TO INNOVATION IS REAL. NOT HYPOTHETICAL.
THE BOTTOM LINE OBJECTIVE, OF COURSE, IS TO PUT OUR EFFORTS INTO NEW BUSINESS OPPORTUNITIES THAT OFFER THE HIGHEST REWARD, CONSISTENT WITH OUR CAPABILITIES. IN BROAD TERMS, THAT MEANS EMPHASIZING LESS CAPITAL INTENSIVE GROWTH MARKETS -- SERVICES -- WHILE MAINTAINING OUR POSITION IN OUR TRADITIONALLY CAPITAL INTENSIVE MARKETS -- HARDWARE. THE LONG-TERM RESULT SHOULD BE FUNDAMENTALLY BETTER FINANCIAL AND MARKET BALANCE.

ANYWAY, NOW THAT I'VE WHETTED YOUR APPETITE, HERE GOES.

II. OVERVIEW

THE NEXT THREE CHARTS COMPARE OUR INNOVATION SPENDING TO THE TOTAL COSTS AND EXPENSES OF RUNNING THE BUSINESS. BY TOTAL COSTS, I'M INCLUDING THE COST OF GOODS SOLD PLUS THE SELLING, GENERAL, ADMINISTRATIVE, AND TECHNICAL EXPENSES.

(Chart 1A)

THE FIRST CHART IS FOR THE TOTAL CORPORATION INCLUDING FINANCIAL SERVICES. INNOVATION CONSUMES NEARLY ONE-FOURTH OF OUR TOTAL COSTS AND EXPENSES AND IT HAS BEEN INCREASING. THIS YEAR, FOR EXAMPLE, INNOVATION EXPENSES HAVE A PLANNED 14 PERCENT INCREASE EVEN THOUGH REVENUES HAVE A PLANNED 11 PERCENT INCREASE. THE TOTAL EXPENDITURE FOR THIS YEAR -- 1983 -- OF OVER ONE BILLION DOLLARS IS A STRIKING FIGURE -- TO SAY THE LEAST! TO BE SURE THAT NUMBER INCLUDES LARGE SUMS FOR THE DEVELOPMENT OF EXTENSIONS TO AND REPLACEMENTS FOR CURRENT PRODUCTS AND SERVICES BUT IT IS STILL HUGE.

(Chart 1B)

HERE IS THIS SAME CHART FOR FINANCIAL SERVICES. BECAUSE THIS IS THE FIRST GO AT INNOVATION EXPENSE IN FINANCIAL SERVICES, I FEEL THE FIGURES ARE UNDERSTATED BUT EVEN SO, THE RAPID CHANGE IS VERY CLEAR, THOUGH FROM A MUCH SMALLER BASE.

(Chart 1C)

THE THIRD CHART IS FOR IS&P ONLY. AS YOU WILL RECALL, IS&P INCLUDES ALL OF THE COMPUTER BUSINESS AND TWO PARTS OF COMMERCIAL CREDIT: SMALL BUSINESS SERVICES AND ELECTRONIC REALTY ASSOCIATES. IN THIS PART OF THE BUSINESS THE INNOVATION PROPORTION OF TOTAL COSTS IS HIGHER THAN FINANCIAL SERVICES. INNOVATION EXPENDITURES IN 1982 WERE JUST ABOUT WHAT WE PLANNED EVEN THOUGH WE REDUCED OTHER EXPENSES SOME $75 MILLION BELOW BUDGET. THAT, OF COURSE, MEANS THAT AS A PROPORTION OF TOTAL COSTS, INNOVATION EXPENSE WAS HIGHER THAN PLANNED. I SHOULD ALSO NOTE THAT IN THIS PRESENTATION LAST YEAR THE PROJECTED PERCENTAGES RANGED FROM 24 TO 26 PERCENT. NOW THAT'S UP TO 30 PERCENT.
LET ME NOW GO INTO A LITTLE MORE DETAIL WITH REGARD TO IS&P.

TOTAL INNOVATION EXPENSE, AS WE HAVE DEFINED IT, COMPRISES FIVE CATEGORIES OF EXPENDITURE: ADVANCED TECHNOLOGY, ADVANCED PRODUCT DEVELOPMENT, PRODUCT AND SERVICE DEVELOPMENT, NEW BUSINESS DEVELOPMENT, AND CONTINUING BUSINESS DEVELOPMENT. THE BREAKDOWN BY THESE CATEGORIES IS SHOWN ON THIS NEXT CHART.

(Chart 2)

QUANTIFICATION OF THE FIRST THREE INNOVATION CATEGORIES (ADVANCED TECHNOLOGY, ADVANCED PRODUCT DEVELOPMENT, PRODUCT AND SERVICE DEVELOPMENT) IS STRAIGHT FORWARD -- IT IS THE TECHNICAL EFFORT LINE ITEM OF THE OPERATING STATEMENT.

ADVANCED TECHNOLOGY IS THE EARLY BASIC RESEARCH AIMED AT GAINING FUNDAMENTAL KNOWLEDGE OF A COMPONENT OR PROCESS. ADVANCED PRODUCT DEVELOPMENT IS THE APPLICATION OF TECHNOLOGY TO DEMONSTRATE PRODUCT FEASIBILITY. PRODUCT AND SERVICE DEVELOPMENT IS, OF COURSE, THE FINAL DEVELOPMENT OF THE PRODUCT OR SERVICE.

THE LARGEST PART OF OUR TECHNICAL RESOURCE IS DEVOTED TO THE PRACTICAL IMPLEMENTATION OF OUR STRATEGIES AS SHOWN BY THE PRODUCT AND SERVICE DEVELOPMENT CATEGORY.

CONTINUING ON THIS CHART, YOU WILL SEE THAT THE REMAINDER, WHICH IS OVER HALF, CONSTITUTES THE INNOVATION CATEGORY CALLED BUSINESS DEVELOPMENT. DEVELOPMENT OF A NEW SERVICE BUSINESS IS A DIFFERENT PROCESS THAN THAT OF JUST DEVELOPING A NEW PRODUCT FOR AN EXISTING BUSINESS. SO FOR THESE DEVELOPING BUSINESS CATEGORIES, QUANTIFICATION OF INNOVATION EXPENSE REQUIRES SOME DEFINITION. HERE WE CLASSIFY THE GROSS EXPENDITURES -- THAT IS ALL COSTS AND EXPENSES -- AS THE INNOVATION EXPENDITURE. WE CALL NEW BUSINESSES THOSE GENERALLY UNDER TWO YEARS IN AGE, WHILE BUSINESSES WITH A LONGER GESTATION PERIOD ARE PUT IN THE CATEGORY OF CONTINUING BUSINESS DEVELOPMENT. OBVIOUSLY, THESE DEFINITIONS ARE SOMEWHAT ARBITRARY. ALSO, WE ARE FACED WITH THE PROBLEM OF RE-CATEGORIZING BUSINESS UNITS OVER TIME -- ESSENTIALLY ESTABLISHING ENTRIES IN THE NEW BUSINESS DEVELOPMENT CATEGORY, AND MOVING SELECTED UNITS FROM NEW BUSINESS DEVELOPMENT TO CONTINUING BUSINESS DEVELOPMENT.

IN ORDER TO MAINTAIN COMPARABILITY ANY FIGURES RELATING TO 1982 USE LAST YEAR'S CLASSIFICATIONS. ANY FIGURES RELATING TO 1983 AND BEYOND USE AN UPDATED SET OF BUSINESS UNIT CATEGORY ASSIGNMENTS.

ALSO, FOR SIMPLICITY SAKE, WE DON'T ALLOW CROSS-OVER FROM "NEW" TO "CONTINUING" DURING THE THREE YEAR PERIOD UNDER REVIEW. SO, A NEW BUSINESS DOES NOT MOVE INTO THE CONTINUING CATEGORY, SAY IN 1984 OR 1985, EVEN THOUGH AT THAT FUTURE DATE IT WOULD EXCEED TWO YEARS IN AGE.
THIS NEXT CHART LISTS THE MAJOR NEW AND CONTINUING BUSINESS DEVELOPMENTS. I WILL COVER SOME OF THESE IN A LITTLE MORE DETAIL IN A FEW MINUTES.

BECAUSE OF THE NATURE OF INNOVATION IN THE BUSINESS DEVELOPMENT CATEGORIES, WE MUST ALSO LOOK AT WHAT WE CALL "NET" INNOVATION EXPENSE, AS WELL AS "GROSS" EXPENSE. NET INNOVATION EXPENSE IS THE BOTTOM LINE FOR THESE BUSINESSES, I.E., TOTAL COSTS AND EXPENSES LESS REVENUES. WITH SERVICES DEVELOPMENT AS OPPOSED TO HARDWARE DEVELOPMENT, THERE IS EVEN IN THE VERY EARLY STAGES REVENUE GENERATED AS THE SERVICE IS BEING FASHIONED. BECAUSE WE ARE LOOKING AT AN EXTENDED TIME PERIOD IN THIS REVIEW, WITH SOME NEW BUSINESSES REACHING MATURITY AS WELL AS NEW ONES BEING STARTED, THE AMOUNT OF THESE REVENUE OFFSETS BECOMES QUITE SIGNIFICANT.

THIS NEXT CHART THEN, SHOWS NET INNOVATION EXPENSE. IN 1981, NET INNOVATION EXPENDITURE WAS $115 MILLION. LAST YEAR, AS YOU CAN SEE, IT WAS $124 MILLION -- ABOUT THE SAME. TO SOME DEGREE, THIS IS A REFLECTION OF NEW BUSINESSES NOT REACHING PROFITABILITY AS SOON AS THEY SHOULD. THE FIGURES FOR '83, '84, AND '85 SAY WE PLAN TO CHANGE THAT. THE POINT IS, WE STILL HAVE TOO MUCH CONTINUING BUSINESS DEVELOPMENT AND WE ARE GOING TO KICK THOSE BUSINESSES EVEN HARDER -- NOT IN THE LEAST BECAUSE WE NEED TO GET ON WITH FUNDING MORE NEW THINGS.

WHILE GROSS INNOVATION EXPENSE FOR BUSINESS DEVELOPMENT WENT FROM 66 TO 69 TO 72 PERCENT, NOTE THAT NET GOES FROM 13 PERCENT TO 11 PERCENT TO 4 PERCENT. THIS REFLECTS THE PLANNED GROWTH IN REVENUES OF THESE BUSINESSES AS THEY REACH MATURITY. OR SAID MORE SIMPLY, THAT'S THE INTENDED RESULT OF THE KICKING.

THIS IS REFLECTED MORE PRECISELY IN THIS NEXT CHART WHICH JUST COMPARES GROSS AND NET. SMALL BUSINESS SERVICES IS THE MAJOR PIECE OF NEW BUSINESS DEVELOPMENT AND YOU CAN SEE IT'S SIGNIFICANCE COMPARED TO ALL OTHER NEW BUSINESSES (PERCENT OF TOTAL IS ABOUT 40). BY 1985, SMALL BUSINESS SERVICES SHOULD BE OUT OF THE BUSINESS DEVELOPMENT CATEGORY. THAT'S A YEAR LATER THAN THE ORIGINAL PLAN. TO REPEAT, IN ALL OF THE NEW AND CONTINUING BUSINESSES, THE MAJOR TASK FOR THE NEXT TWO YEARS IS TO GET THEM OUT OF DEVELOPMENT AND INTO AN ON-GOING BUSINESS STATUS.
HAVING TAKEN THIS QUICK LOOK AT THE GROSS AND NET ASPECT, IT WILL BE SIMPLER TO JUST USE ONE OF THEM. SO FOR THE REST OF THE PRESENTATION, UNLESS OTHERWISE NOTED, I'LL BE USING THE GROSS EXPENDITURE NUMBERS.

(CHART 6)

ANOTHER PERSPECTIVE IN INNOVATION IS BY MAJOR BUSINESS SEGMENT. IN THE PURE TECHNICAL EXPENSE PORTION OF THE TOTAL, YOU CAN SEE THAT HARDWARE EXPENDITURES CONTINUE TO DOMINATE. (ELABORATE PP & CO -- INCREASE IN '83 -- IN SPITE OF SOFT MARKET, WE HAVE PLANNED LARGE INCREASES -- THE COST OF STAYING COMPETITIVE AND THE EFFECT OF JAPANESE COMPETITION.)

(CHART 7)

HOWEVER, ON THIS NEXT CHART WHICH REFLECTS TOTAL INNOVATION EXPENDITURE, THE DOMINANCE OF SERVICES IS CLEARLY EVIDENT. AGAIN THIS IS LARGELY DUE TO -- AND EVEN somewhat DISTORTED BY -- SMALL BUSINESS SERVICES. ALSO, ONCE AGAIN, REMEMBER WE ARE DEALING WITH GROSS EXPENDITURES FOR DEVELOPING BUSINESSES.

(CHART OFF)

III. MAJOR STRATEGY PERSPECTIVE

WITH THOSE SEVERAL PERSPECTIVES OF THE NUMBERS IN TOTAL, LET ME NOW DISCUSS INNOVATION EXPENDITURES IN THE CONTEXT OF FIVE MAJOR STRATEGIES THAT UNDERPIN OUR BASIC BUSINESS STRATEGY.

SO TO START, LET ME STATE THE STRATEGIES:

(CHART 8)

O AN EMPHASIS ON COMPUTER SERVICES
O DEVELOPING THE POTENTIAL OF THE SMALL BUSINESS MARKET
O FINANCIAL SERVICES MOVE TO NEW MONEY SOURCES, NEW FINANCIAL PRODUCTS AND NEW MARKETING METHODS
O CONTINUING LEADERSHIP IN PERIPHERAL PRODUCTS
O CONCENTRATION ON SIX PRIMARY APPLICATION MARKETS IN THE COMPUTER MAINFRAME BUSINESS --

EDUCATION  ELECTRIC UTILITIES
ENERGY  PETROLEUM/MINING
MANUFACTURING  WEATHER

PRECISELY ASSIGNING A TOTAL DOLLAR FIGURE FOR INNOVATION SPENDING TO EACH STRATEGY WOULD BE MATHEMATICALLY TORTUOUS (SINCE CERTAIN PROGRAMS SUPPORT MORE THAN ONE STRATEGY) AND STRATEGICALLY MISLEADING (SINCE DOLLAR INVESTMENT AT A GIVEN
POINT IN TIME MAY NOT BE INDICATIVE OF STRATEGY PRIORITY. SO, THE DOLLAR AMOUNTS I DISPLAY IN THE STRATEGY DISCUSSION ARE ONLY INTENDED TO PROVIDE SOME DEGREE OF PERSPECTIVE AS TO THE INNOVATION RESOURCE REQUIREMENTS OF THESE MAJOR STRATEGIES.

IIIA. SERVICES

THE FIRST STRATEGY IS THE EMPHASIS ON COMPUTER SERVICES. I WILL HIGHLIGHT SEVERAL OF THE KEY PROGRAMS THAT ARE EXPECTED TO CONTRIBUTE SIGNIFICANTLY TO OUR SERVICES STRATEGY.

(CHART 9)

1) TRANSMATIC

AS WE'VE DISCUSSED SEVERAL TIMES, WE HAVE A MAJOR EFFORT IN INTERNATIONAL SERVICES TO DEVELOP PRODUCT OFFERINGS THAT ARE UNIQUELY SUITABLE TO INTERNATIONAL MARKETS. OUR TOTAL INNOVATION EXPENSE IN THIS REGARD IS ABOUT $24 MILLION OVER THE 1983-1985 PERIOD.

LAST YEAR, ALPS (AUTOMATED LANGUAGE TRANSLATION SYSTEM) WAS DISCUSSED. THIS PACKAGE, NOW MARKETED WITH THE NAME TRANSMATIC, HAS COMPLETED DEVELOPMENT AND THE FIRST EXTERNAL INSTALLATION HAS BEEN COMPLETED IN FRANCE. MARKETING PROGRAMS ARE BEING ESTABLISHED FOR GERMANY, SWITZERLAND AND BELGIUM. WE ARE NOW EVALUATING EXTENDING THE PROGRAM TO INCLUDE OTHER LANGUAGES, SUCH AS ARABIC AND JAPANESE.

(CONSULTING PRODUCTS)

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2) CYBERCASH

A SOPHISTICATED CASH MANAGEMENT SYSTEM CALLED CYBERCASH HAS BEEN DEVELOPED IN CONJUNCTION WITH TWELVE MAJOR BANKS IN FRANCE. DAILY ACCOUNT INFORMATION FROM THE BANKS IS MADE AVAILABLE ON THE CALL SYSTEM IN BRUSSELS. THE CYBERCASH SYSTEM THEN PROVIDES DAILY CASH POSITION REPORTING, SHORT TO LONG-TERM CASH BUDGET PLANNING, FLOAT MANAGEMENT AND A VARIETY OF STATISTICAL AND FINANCIAL ANALYSIS TOOLS. CURRENTLY, TEN MAJOR CUSTOMERS ARE USING THE SERVICE, AND THE PRODUCT'S REPUTATION AND ACCEPTANCE ARE GROWING RAPIDLY. I MENTION THIS PRODUCT NOT BECAUSE IT IS A MAJOR INNOVATION PER SE, BUT TO POINT OUT THAT WE ARE TAKING A MORE LOCAL MARKET VIEW WITH REGARD TO INTERNATIONAL SERVICES AND THIS IS ABSOLUTELY NECESSARY IF WE ARE TO GROW THOSE SERVICES.
3) DISTRIBUTED APPLICATION FACILITY

Among the challenges for innovative problem solving is to leverage existing technologies. One example is a distributed application capability being developed in Australia. It consists of Cybernet to provide communication between microprocessors and cyber mainframes, a highly flexible user control system from one of our PSD technology centers and Plato. The result is a user friendly front end for key Cybernet applications delivered on a CD-110 terminal.

4) GERMANY CAD CENTER

A total computer-aided design center has been initiated in Germany to provide prospective clients with capabilities ranging from information seminars to complete systems. Using consulting, Cybernet services, large computers and small computers, the total requirements of customers of any size or maturity can be accommodated.

5) PLATO STAYWELL

I won't elaborate on Staywell since it has had good visibility to most of you before. But I should mention that the project to "Platoize" Staywell is pretty well complete and we've begun to deliver Staywell via Plato.

6) HELP

Progress continues in Medlab on our project to develop a computer assisted medical decision system called "Help." Help is history driven and assists the physician in selecting and verifying the most appropriate diagnosis and treatments. The system allows medical experts to easily encode their decision logic. Later when enough information on a patient is available, the Help system will automatically offer advice to the physician. Using both statistical and artificial intelligence techniques, Help will improve quality of care. It's currently in use at Latter Day Saints Hospital. A second system is now being installed in New York. We expect to start two more Help systems projects late this year.

7) AGRICULTURE SERVICES

The Agriculture Products and Services Program has evolved to the point where delivery will be via entrepreneur owned and operated local dealerships known as "Advantage" dealers. The program was launched in 1982 and is a major undertaking in 1983. Gross expenditures for AG products and services this year will be $4.3 million -- revenues will be about a million dollars -- from essentially zero in 1982.
FOURTEEN APPLICATIONS ARE BEING RELEASED IN 1983, AND THE NUMBER OF ADVANTAGE DEALERS IS PLANNED TO INCREASE FROM 10 CURRENTLY TO APPROXIMATELY 80 BY THE END OF THE YEAR.

8) NETWORK LINKAGE

ACCOMMODATING THE GROWING POPULATION OF MICRO-PROCESSORS TO THE NETWORK IS AN OBVIOUS MUST. LIKewise, APPLICATIONS MUST BE DESIGNED SO THAT WE CAN TAKE FULL ADVANTAGE OF THEIR CAPABILITIES. KEY TO THIS STRATEGY IS TO MAKE NETWORK ACCESS VERY SIMPLE FROM THE USER'S POINT OF VIEW.

TODAY WE ARE TESTING OVER 200 IBM, ZENITH AND APPLE PERSONAL COMPUTERS IN ACCESSING THE PLATO NETWORK. WE PLAN TO ANNOUNCE A SERVICE FOR THESE COMPUTERS.

9) COMPUTER-AIDED DESIGN

WE HAVE A JOINT RESEARCH PROJECT WITH PURDUE TO INTEGRATE THE MECHANICAL DESIGN PROCESS INTO THE CYBER ENVIRONMENT. THE PROGRAM GIVES CONTROL DATA HIGH VISIBILITY IN THE PROFESSIONAL COMMUNITY INCLUDING INTERNATIONAL JOURNALS AND THE NATIONAL SCIENCE FOUNDATION. PROGRESS HAS BEEN MADE IN DEVELOPING AN INTELLIGENT WORKSTATION TO GENERATE INPUT FOR SOLID MODELING IN AN INTELLIGENT WORK STATION; IN PROVIDING HIGH-QUALITY KINEMATIC ANALYSIS AND ANIMATION OF SOLID PARTS; AND IN ROBOTICS PROGRAMMING AND SIMULATION.

ALSO, CONTROL DATA AND MIT ARE CONTINUING AN ADVANCED RESEARCH PROJECT IN MECHANICAL COMPUTER AIDED DESIGN WHICH HAS THE POTENTIAL FOR RADICAL IMPROVEMENT OF CAD/CAM.

THUS FAR WE HAVE ACHIEVED THE CONSTRUCTION OF SOLID GEOMETRIC MODELS FROM STANDARD THREE VIEW DRAWINGS AND THE MODIFICATION OF SOLID MODEL GEOMETRY THROUGH AUTOMATIC CREATION AND SOLUTION OF EQUATIONS.


PLATO COMPUTER-BASED EDUCATION IS A MAJOR PART OF THE OVERALL SERVICES THURST. THESE NEXT EXAMPLES HAVE TO DO WITH PLATO. AS YOU KNOW, WE HAVE THREE DISTINCT EDUCATION MARKET SEGMENTS: BUSINESS AND INDUSTRY.... ACADEMIC.... AND VOCATIONAL EDUCATION. PROGRESS IS BEING MADE IN ALL THREE AREAS -- IN 1982 WE SAW A REVENUE INCREASE OF 35 PERCENT IN PLATO COMPUTER-BASED EDUCATION.
EFFORTS IN SUPPORT OF THE EDUCATION STRATEGY TAKE PLACE IN SEVERAL ORGANIZATIONS. THERE ARE FIVE PROJECTS WITHIN TOM MILLER'S BUSINESS DEVELOPMENT GROUP THAT SHOULD BE MENTIONED.

10) ARTIFICIAL INTELLIGENCE

ARTIFICIAL INTELLIGENCE IS THE FIELD OF COMPUTER SCIENCE THAT INVESTIGATES THE EMULATION OF HUMAN BEHAVIOR BY MACHINES. IT IS AN EXAMPLE OF ADVANCED TECHNOLOGY EXPENDITURE SPECIFICALLY AIMED AT FUTURE PRODUCTS AND SERVICES.

I COVERED A-I IN LAST YEAR'S REPORT, INCLUDING SOME VERY MODEST EFFORTS WITHIN CONTROL DATA.

WITH THE FORMATION OF MCC, WE WILL EXPERIENCE A SIGNIFICANT LEVERAGING OF OUR TECHNOLOGY. ARTIFICIAL INTELLIGENCE IS A PART OF ONE OF THE FOUR MAJOR PROGRAMS THAT WILL BE STARTED IN MCC THIS YEAR.


11) LDEC

OUR ACADEMIC PRODUCTS ARE FOCUSED TO MEET THE NEEDS IN MATH, SCIENCE, COMPUTER LITERACY AND LANGUAGE. AS MOST OF YOU KNOW, THE LDEC IS A BROAD COOPERATION AIMED AT ALLEVIATING THE NATIONWIDE SHORTAGE OF ENGINEERS, AND FIVE UNIVERSITIES HAVE COMMITTED FACULTY TO ASSIST IN DEFINING AND TESTING THIS CURRICULUM. THE FIRST THREE COURSES--FORTRAN, CHEMISTRY, AND PHYSICS--HAVE BEEN ANNOUNCED AND ARE IN UNIVERSITIES TODAY. SIX ADDITIONAL COURSES ARE IN DEVELOPMENT AND EVENTUALLY SOME 64 CREDIT HOURS WILL BE AVAILABLE THROUGH LDEC.

THESE COURSES ARE ALSO OF VALUE BEYOND THE UNIVERSITY MARKET. HIGH SCHOOLS, COLLEGE PREP PROGRAMS, COMMUNITY COLLEGES, AND INDUSTRIAL RETRAINING MARKETS ALSO USE CERTAIN LESSONS. TAKE INDUSTRIAL RETRAINING. THIRTY-FIVE CONTROL DATA PERIPHERAL PRODUCTS ENGINEERS ARE CURRENTLY TAKING FORTRAN AT FOUR TWIN CITY PLANTS FOR COLLEGE CREDIT. THE UNIVERSITY OF MINNESOTA IS DELIVERING THIS ON-SITE PROGRAM WITH THE PROFESSOR REMOTELY INTERFACING WITH THE STUDENTS.

ALSO, THE MARKETING OF THE ENGINEERING CURRICULUM IS BEING REINFORCED BY THE PLAN TO PROVIDE CD-110 MICROCOMPUTERS TO 110 COLLEGES AND UNIVERSITIES WITH ENGINEERING DEPARTMENTS. EACH OF THESE SCHOOLS WILL BECOME IN EFFECT A RESEARCH PARTNER
IN HELPING TO ENRICH THE LDEC OFFERING BY PROVIDING BOTH SOFTWARE AND CURRICULUM EVALUATION (PRE-TAX COST 2.7; AFTER TAX COST .8).

12) PLATO HOME DELIVERY

SELECTED EDUCATION COURSEWARE FROM THE PLATO LIBRARY WAS MADE AVAILABLE LAST YEAR FOR DELIVERY ON TI, APPLE AND ATARI HOME COMPUTERS. RESULTS TO DATE HAVE EXCEEDED OUR EXPECTATIONS. WE HAVE OVER 10,000 ORDERS FOR OUR INITIAL ANNOUNCEMENT OF NINE COURSES. IN 1983, WE ARE PLANNING TO RELEASE AN ADDITIONAL 160 COURSES.

13) NUCLEAR SCIENCE AND ENGINEERING PROGRAM

A CONSORTIUM OF ELECTRIC UTILITIES HAS BEEN FORMED TO DELIVER NUCLEAR SCIENCE AND ENGINEERING COURSES TO REMOTE UTILITY SITES. THE PROGRAM IS UTILITY DIRECTED AND FUNDED; CONTROL DATA IS PROVIDING PROGRAM MANAGEMENT AND COORDINATION.

THE DESIGN PHASE WAS COMPLETED LAST YEAR AND THE DEVELOPMENT PHASE BEGAN IN JANUARY 1983. THE INITIAL COURSEWARE OFFERINGS WILL LEVERAGE AND CONTRIBUTE TO FURTHER ENRICHMENT OF OUR ENGINEERING CURRICULUM. THIS IS NO BIG DEAL LIKE MCC, BUT ANOTHER SMALL EXAMPLE OF HOW COOPERATION CAN LEVERAGE OUR INNOVATION EXPENDITURES.

14) COURSEWARE DEVELOPMENT

BUSINESS COURSEWARE CONTINUES TO BE TARGETED FOR SIX KEY INDUSTRIES: MANUFACTURING, ELECTRIC UTILITIES, PETROCHEMICAL, HEALTHCARE, DATA PROCESSING AND TELECOMMUNICATIONS. THE LARGEST EXPENDITURE IS IN MANUFACTURING WHERE THE PRIORITY COURSES ARE: FUNDAMENTALS OF ELECTRONICS, MICROPRICESSORS, HYDRAULICS, PNEUMATICS AND ROBOTS. PRODUCTIVITY COURSES ARE PLANNED, SPECIFICALLY STATISTICAL QUALITY CONTROL AND EMPLOYEE INVOLVEMENT PROGRAMS. TODAY THERE ARE OVER 700 COURSEWARE HOURS AVAILABLE, TARGETED TO SKILLED WORKERS.

VOCATIONAL COURSEWARE IS AIMED AT BOTH REMEDIAL TECHNICAL TRAINING IN INDUSTRY AND AT ENTRY LEVEL VOCATIONAL TRAINING FOR CONSUMERS AND AGENCIES. FOR EXAMPLE, THE TRAINING NEEDS RESULTING FROM PLANT AUTOMATION ARE ADDRESSED BY A MAINTENANCE TRAINING PACKAGE. INCLUDED ARE LEARNING-TO-LEARN, BLUEPRINT READING COURSES, MATH, AND BASIC ELECTRONICS. FURTHER, THE ENTIRE CONTROL DATA INSTITUTE COMPUTER PROGRAMMING AND OPERATIONS CURRICULUM IS NOW AVAILABLE IN DISK FORM.

WHILE THESE FEW PROJECTS IN EDUCATION OFFER SOME INSIGHT INTO COURSEWARE ACTIVITIES, I CAN'T POSSIBLY COVER ALL OF THEM. I SHOULD NOTE, HOWEVER, THAT TOTAL COURSEWARE SPENDING FOR THE CURRENT YEAR COMPANY-WIDE IS EXPECTED TO EXCEED $15 MILLION.
IIIB. SMALL BUSINESS SERVICES

(Chart 10)

The second major strategy is developing the potential of the small business market. In a very real sense, this is but one more extension of the basic services strategy but because of the potential, the magnitude of the effort and its relation to financial services we include it as a separate innovation category. The following are a few of the developments in small business services.

1) COURSEWARE

Stand-alone small business courseware has been in development through internal programs and with a grant to Georgia State University. Georgia State is working on a curriculum called "Grow Your Own Small Business." Also a graduate business school study at the University of Chicago, Stanford and Wharton will provide direction for other courses to serve the small business community.

More new courses are becoming available all the time -- from such time honored subjects as "How to Write Better Business Letters" to "A Graphic Approach to Financial Management".

Generic courses applicable to most small businesses are also being prepared to familiarize people with microcomputers, application software, and business activities such as the export side of their business. This courseware will be offered initially on the CDC-110, with later releases for the CD-114 and other micro-computer systems.

Business centers' primary emphasis in 1983 is the implementation of the "Solutions" approach to the needs of small businesses. The core of the strategy revolves around education -- knowledge -- so courseware is a key item in our allocation of technical expenditures for small business.

2) APPLICATIONS

Total expenditures for small business applications in 1982 was $4.8 million. In 1983, that number will grow to $5.0 million. Most of this expenditure is to bring some powerful data base software to the small business market and to tailor generic applications for specific industries such as small discrete manufacturers. Beyond that, by offering widely used operating systems, our small business customers have access to a broad base of applications.
3) MID-RANGE MICROCOMPUTER SYSTEM


4) VERY SMALL BUSINESS COMPUTER SYSTEM

VERY SMALL BUSINESS COMPUTERS, PRICED UNDER THE CDC-110, WERE ANNOUNCED LATE IN 1982. YOU ARE ALREADY AWARE OF THE ZENITH, HEWLETT-PACKARD AND WANG WORD PROCESSOR SYSTEMS BEING OFFERED IN THE BUSINESS CENTERS. THESE PRODUCTS ARE OFFERED SUBSTANTIALLY "AS IS" FROM THE VENDOR, WITH MAXIMUM UTILIZATION OF VENDOR SUPPLIED SERVICES, APPLICATIONS AND SALES AIDS. I MENTION THESE COMPUTERS BECAUSE THERE IS NO TECHNICAL EXPENSE INVOLVED. RATHER IT IS A WAY TO LEVERAGE THE ALREADY LARGE INNOVATION COST INVOLVED IN PUTTING THE BUSINESS CENTERS IN OPERATION.

5) MARKETING AND DISTRIBUTION

BY FAR THE BULK OF THE INNOVATION EXPENDITURE FOR SMALL BUSINESS IS THE DEVELOPMENT OF THE MARKETING AND DISTRIBUTION NETWORK ITSELF.

LAST YEAR WE COMPLETED THE INTEGRATION OF THREE SEparate BUSINESS CENTER OPERATIONS INTO A SINGLE CONTROL DATA BUSINESS CENTER DISTRIBUTION NETWORK. A GROUP HAS BEEN ESTABLISHED TO DEVELOP AND MANAGE MARKETING PROGRAMS FOR ALL PRODUCTS AND SERVICES SO THEY ARE INTEGRATED AND MARKETED THROUGH THE BUSINESS CENTERS. A MAJOR PART OF THEIR RESPONSIBILITY WILL BE DEVELOPING AND IMPLEMENTING TRAINING PROGRAMS WHICH ALLOW US TO EXECUTE THE SALES STRATEGY. ALL IN ALL, DEVELOPING AN EFFECTIVE MARKETING AND DISTRIBUTION FORCE FOR THE BUSINESS CENTERS WILL COST SOME $280 MILLION. EXPANDING AND ENRICHING THE PRODUCT AND SERVICE OFFERINGS WILL REQUIRE SOME $33 MILLION OF EXPENSE OVER THE PERIOD.

IIIC. CCC FINANCIAL SERVICES

(CHART 11)

CCC IS EMBARKED ON NEW STRATEGIES IN EVERY DIMENSION OF ITS BUSINESS. THESE CENTER AROUND THE DEVELOPMENT AND EXPANSION OF DISTRIBUTION NETWORKS TO BRING NEW FINANCIAL AND REALTY PRODUCTS TO THE MARKETPLACE -- AND A MORE EFFECTIVE WAY TO FUND THE BUSINESS.
THESE NEW PROGRAMS, WHEN ADDED TO OUR MAJOR COMMITMENT TO THE SMALL BUSINESS MARKET, WILL POSITION CCC FOR THE OPPORTUNITIES NOW OPEN IN FINANCIAL SERVICES.

FOR THE PURPOSES OF THIS DISCUSSION, I HAVE INCLUDED ERA, ALTHOUGH IN THE EARLIER CHARTS (AND IN OUR PUBLISHED REPORTS) THE ERA NUMBERS APPEAR IN INFORMATION SERVICES AND PRODUCTS.

THE FOUR MAJOR DEVELOPMENTS INVOLVED ARE LISTED ON THE CHART. EACH OF THEM HAS BEEN DISCUSSED IN OUR STRATEGIC PLAN PRESENTATIONS AND AT OTHER TIMES SO I'M NOT GOING TO REPEAT ALL THAT HERE.

BUT I DO WANT TO POINT OUT THAT THE $266 MILLION EXPENDITURE INVOLVED IN THESE FOUR DEVELOPMENTS EXCEEDS THE PRODUCT DEVELOPMENT EXPENDITURE WHICH WE WILL HAVE MADE IN COMPUTER SYSTEMS IN THE 1981-1983 TIME FRAME -- AND THE RISKS AND COMPETITIVE PRESSURES ARE EVERY BIT AS GREAT AS WELL. WE ARE PLOWING NEW GROUND AND THE NEED FOR CREATIVE PEOPLE IS JUST AS GREAT -- MAYBE GREATER -- AT ST. PAUL PLACE AS IT IS IN ARDEN HILLS.

[$266 MILLION: 24 HOMEOWNER, 104 ERA, 77 MORTGAGE BANKING, 61 THRIFT]

IIID. PERIPHERALS

(Chart 12)

LET'S TURN TO THE FOURTH STRATEGY....CONTINUING LEADERSHIP IN THE PERIPHERAL PRODUCTS MARKET.

THIS IS PROBABLY A GOOD POINT TO REMIND YOU AGAIN THAT THE CATEGORIZATION OF INNOVATION EXPENDITURES IS SOMEWHAT SUBJECTIVE AND A BIT ARBITRARY. THUS, HERE MOST OPTICAL RECORDING DEVELOPMENTS ARE TREATED AS ADVANCED TECHNOLOGY AND MOST MAGNETIC RECORDING DEVELOPMENTS AS ADVANCED PRODUCT DEVELOPMENT OR PRODUCT AND SERVICE DEVELOPMENT. SO THE $90 MILLION, $57 MILLION SPLIT MAY NOT BE PRECISE BUT IT IS ROUGHLY CORRECT AND WHAT IS TRUE IS NEARLY $150 MILLION OF TECHNICAL EFFORT IS BEING PUT INTO ADVANCED WORK OF ONE KIND OR ANOTHER OVER THE THREE YEAR PERIOD.

1) PRINTER TECHNOLOGIES

SINCE THE INNOVATION SPEECH LAST YEAR THE PRINTER DIVISION OF CPI HAS BEEN MERGED INTO CENTRONICS. CONTROL DATA NOW OWNS APPROXIMATELY 35 PERCENT OF CENTRONICS.
SINCE THE CLOSING, THE TWO PRODUCT LINES HAVE BEEN RATIONALIZED AND A NEW TECH EFFORT PLAN IS IN PLACE. THE RESULT IS THAT CENTRONICS NOW HAS THE BROADEST PRINTER PRODUCT LINE IN THE OEM INDUSTRY. 1983 SPENDING WILL SHOW ABOUT A 50 PERCENT INCREASE FROM LAST YEAR'S BUDGET. THERE'S NO WAY WE COULD HAVE AFFORDED THAT ON OUR OWN SO ONCE AGAIN THE ADVANTAGES OF COOPERATION ARE CLEAR.

2) THIN FILM HEADS AND MEDIA

LAST YEAR I STRESSED THAT SIGNIFICANT EFFORT WAS BEING EXPENDED TO BRING THIN FILM HEADS AND MEDIA FORWARD INTO NEW DISK PRODUCTS. PPCO SUCCEEDED IN DELIVERING THE FIRST NON-IBM THIN-FILM-HEAD DISK SYSTEM TO A CUSTOMER IN CHICAGO ON NEW YEAR'S EVE 1982.

THIN FILM HEADS ARE CURRENTLY BEING PRODUCED IN LIMITED PRODUCTION AT A RATE OF 200 MULTI-HEAD ASSEMBLIES PER WEEK. PERIPHERAL COMPONENTS INC., OUR JOINT VENTURE WITH MEMOREX, WILL BE STARTING PRODUCTION IN THE THIRD QUARTER. PCI CAPACITY WILL EVENTUALLY REACH SEVERAL MILLION HEADS PER YEAR.

3) PLATED MEDIA

OUR FIRST PRODUCT UTILIZING PLATED MEDIA, THE 3 1/2-INCH CRICKET DISK DRIVE, WILL BE INTRODUCED AT THE NCC IN MAY. A START-UP PRODUCTION LINE IS UNDER CONSTRUCTION AT NORMANDALE WITH VOLUME MANUFACTURING PLANNED FOR OKLAHOMA CITY NEXT YEAR.

OUR STRATEGY IS TO EVENTUALLY MIGRATE THIS NEW PLATED MEDIA THROUGHOUT THE ENTIRE DISK PRODUCT LINE OVER THE NEXT SEVERAL YEARS.

4. VERTICAL RECORDING

I MENTIONED LAST YEAR THAT VERTICAL RECORDING TECHNOLOGY WOULD TAKE OUR DISK PRODUCTS BEYOND AN AREAL DENSITY OF 5 MILLION BITS PER SQUARE INCH IN 1990. UNFORTUNATELY, FROM A P & L POINT OF VIEW, IT APPEARS THAT THE TIME FRAME TO ACHIEVE THAT GOAL IS CONSIDERABLY SHORTER. THE JAPANESE HAVE A CLEAR TECHNOLOGICAL LEAD IN VERTICAL RECORDING. ALTHOUGH THE ULTRA HIGH DENSITIES ARE A WAYS OFF, IT IS CLEAR THAT THE JAPANESE CAN HAVE PRODUCTS WITH AT LEAST A TEN-FOLD DENSITY INCREASE WITHIN TWO YEARS.

SO THIS YEAR WE ARE LAUNCHING A MAJOR TECHNICAL PROGRAM CALLED "PROJECT LEAPFROG" TO BRING THIS TECHNOLOGY FORWARD. A DEDICATED TEAM OF ENGINEERS AND SCIENTISTS ARE WORKING TO DEMONSTRATE PRODUCT FEASIBILITY WITHIN THE NEXT 12-18 MONTHS.
5) **OPTICAL RECORDING**

Optical recording was strictly an advanced technology program last year. We have now progressed to the initial product stage with first prototypes presently under development and test.

Twelve customers, such as Wang, DEC, and Honeywell, are planning to evaluate prototype hardware and start early systems development and device integration this year. Production is scheduled to begin in 1984.

IIIE. **COMPUTER SYSTEMS**

(Chart 13)

As you see, the bulk of the expenditure in computer systems is for product development. Much of this expenditure benefits the other products, services and their associated strategies but it is included here.

There is a significant amount of advanced technology and advanced product development work also. The bulk -- about 70 percent actually -- of the advanced product development is for successor products to current product lines -- that is to the 170-800 series and the Cyber 205. But it is worth noting that over the three years nearly $10 million will be spent in developing advanced computer-aided design software -- and this number would have to be much greater if it were not for the CAD project in MCC. I won't take the time to cover all of the other advanced projects, but here are a few of them.

1) **VLSI ON-CHIP TESTING**

An exhaustive test of complex high density LSI chips is prohibitively expensive and time consuming. Therefore, the technology requires its users to become skilled in the use of "statistical" testing, that is, incomplete testing.

We have a technique to place a "personalized" self-test capability on each chip. The test algorithms are derived using information theory techniques. These can be modified as we learn which failure modes are of the most concern.

Several test chips have been fabricated which demonstrate the on chip testing approach. One contains 8700 CMOS gates, of which 2700 gates are used for on board maintenance and testing.

2) **LSI-HIGH DENSITY CAD**

Several chips have now been laid out using the LSI-high density CAD system that I described last year. This system allows rapid turn around by creatively matching our design resources
TO THE SUPPLIERS NEEDS. CHIPS HAVE BEEN FABRICATED FOR
ARITHMETIC, REGISTER AND CONTROL FUNCTIONS. A NOVEL CONTROL
ARRAY CHIP USES A LOGICAL TRUTH TABLE TO GENERATE CONTROL
FUNCTIONS. THIS NEW PART WILL CONSIDERABLY SIMPLIFY THE
DESIGN, DEVELOPMENT AND MANUFACTURE OF CONTROL SECTIONS IN OUR
COMPUTERS. THESE CIRCUITS WILL BE USED IN THE S-O COMPUTER.

3) AIR COOLING OF CHIPS

A PATENT APPLICATION HAS BEEN FILED FOR A METHOD OF AIR COOLING
HIGH WATTAGE CHIPS. THE COOLING IS ACCOMPLISHED BY
INDIVIDUALLY CONSTRUCTING AN AIR JET TO EACH CHIP. THE
TECHNOLOGY HAS BEEN LEVERAGED BY LICENSING A SMALL BUSINESS
(STAR TECHNOLOGY) AND IT IS BEING USED IN THE MEMORY FOR THE
CYBER 205. WE HAVE ACHIEVED 8 TO 1 SIZE AND POWER REDUCTIONS
FOR A 4 MILLION WORD MEMORY WITH NO DEGRADATION IN PERFORMANCE.

4) OPTICAL DISK SYSTEM

IN 1983 WE WILL CONFIGURE A PROTOTYPE OPTICAL DISK SYSTEM TO
RECORD PETROLEUM SEISMIC DATA BOTH IN THE FIELD AND AT THE
PROCESSING CENTER. THE POTENTIAL TO REPLACE EXISTING SEISMIC
TAPE LIBRARIES IS SIGNIFICANT, SINCE A TYPICAL LIBRARY CONTAINS
A THIRD TO A HALF MILLION REELS OF TAPE. A SIMILAR OPPORTUNITY
EXISTS IN MANUFACTURING, ARCHITECTURE AND CONSTRUCTION WHERE
LARGE NUMBERS OF ENGINEERING DRAWINGS WILL BE COMPUTERIZED OVER
THE NEXT DECADE.

5) AUTOMATED PIPING ANALYSIS AND DESIGN

PERHAPS ONE EXAMPLE WILL SUFFICE TO ILLUSTRATE THE KIND OF
INNOVATION INVOLVED IN COMBINING EXISTING SOFTWARE PROGRAMS TO
COME UP WITH NEW APPLICATIONS WHICH INCREASE THE USABILITY (AND
THE USE!) OF CYBER COMPUTERS. THE AUTOMATED PIPING ANALYSIS
AND DESIGN SYSTEM COMBINES A GRAPHICS PACKAGE AND THE
ENGINEERING DESIGN LIBRARY FROM OUR MANUFACTURING AREA WITH A
PARTS PROGRAM ACQUIRED FROM MOBIL OIL. THE RESULT IS AN
INTEGRATED APPLICATION WHICH ALLOWS A CONSTRUCTION ENGINEER TO
GRAPHICALLY DESIGN A PLANT PIPING SYSTEM. FROM THIS DESIGN,
THE ENGINEER CAN THEN ANALYZE THE MODEL AND CREATE A COMPLETE
PARTS LIST IN THE PROCESS. FUNDING FOR "APADS" WAS OBTAINED
FROM ONE OF OUR CUSTOMERS, CAROLINA POWER AND LIGHT, AND WE NOW
HAVE FULL DISTRIBUTION RIGHTS TO THAT PACKAGE.

(CHART/13 OFF)

III. COOPERATION FOR BASIC TECHNOLOGY

NO PRESENTATION ON INNOVATION COULD BE COMPLETE WITHOUT MENTION
OF THE PRINCIPAL MEANS AVAILABLE TO DEVELOP THE BASIC ADVANCED
TECHNOLOGY WE NEED -- AND THAT, OF COURSE, IS COOPERATION.
IF I'VE LEFT THAT TIL LAST IT IS ONLY TO EMPHASIZE THE POINT THAT IN FACT THERE IS ONLY ONE FINAL ANSWER AND THAT IS TO SHARE AS MUCH OF THE COSTS AND THE RISKS AS WE POSSIBLY CAN.

(CHART 14)

THERE'S NO NEED TO REPEAT HERE THE PROJECTS AND AIMS OF MCC OR SRC OR MEIS -- THE THREE MAJOR COOPERATIONS INVOLVED. PERHAPS TWO NUMBERS WILL SUFFICE. IN 1983-1985, CONTROL DATA WILL SPEND $15.4 MILLION IN THESE COOPERATIONS. THEIR BUDGETS WILL TOTAL SOME $137 MILLION. $137 MILLION OF RESEARCH FOR $15 MILLION. THAT'S WORTH WORKING VERY HARD TO GET.

(CHART 14 OFF)

IV SUMMARY AND PERSPECTIVE

FINALLY, IT IS NECESSARY TO REMIND OURSELVES ONCE AGAIN THAT IN SPITE OF 1983 EXPENDITURES OF $315 MILLION IN TECHNICAL EFFORT AND $106 MILLION IN NET EXPENDITURES FOR DEVELOPING NEW BUSINESSES, THE NEEDS ARE EVEN GREATER. WITHOUT GOING INTO DETAIL, DOCUMENTED REQUESTS FOR ADDITIONAL TECHNICAL EXPENDITURES EXCEED $91 MILLION AND JUSTIFIABLE NEW BUSINESS DEVELOPMENT NET EXPENDITURES ARE PROBABLY IN EXCESS OF $50 MILLION OVER THE THREE-YEAR PERIOD.

BUT -- PROFITABILITY IN TERMS OF ROIC OR ROE THOUGH BUDGETED TO IMPROVE FROM 1982 WILL NOT REGAIN 1981 LEVELS. SO THINGS ARE STRAINED.

WHAT IT NETS DOWN TO IS THIS:

1) FIRST, EVERYTHING CONSIDERED WE ARE PRETTY WELL BALANCED. THERE CERTAINLY IS NO BLATANT SACRIFICE OF THE LONG-TERM NEEDS FOR SHORT-TERM EARNINGS; NOR ARE WE JUST SPENDING IN AN UNCONTROLLED OR UNSTRATEGIC WAY.

2) SECOND, WHILE WE CERTAINLY DO HAVE A LOT OF THINGS GOING AND THEY TAKE A LOT OF MONEY, I HAVE TO SAY THAT I FEEL BETTER ABOUT THESE NEW AND DEVELOPING BUSINESSES THAN IN SOME TIME.

(CHART 15)

THIS FINAL CHART REFLECTS THAT. PLEASE NOTE IN PARTICULAR THAT TOM MILLER'S BUSINESS DEVELOPMENT GROUP HAS ACHIEVED THE DISTINCTION OF ALMOST "DISAPPEARING" FROM THE CHART IN 1983 AND APPEARING IN "GHOST" FORM IN 1984-85. THAT'S A RESULT, OF COURSE, OF FORECASTING A NEAR BREAKEVEN FOR THE GROUP IN 1983 AND A PROFIT IN 1984-85. ACTUALLY, THE TWO PRINCIPAL COMPONENTS OF BUSINESS DEVELOPMENT -- EDUCATION AND
HEALTHCARE -- WILL BE PROFITABLE IN 1983 WITH THE $3 MILLION LOSS IN COMPUTER-BASED EDUCATION BEING MORE THAN OFFSET BY CDI PROFITS. THAT'S BY NO MEANS ASSURED -- BUT AT LEAST WE HAVE THE COURAGE TO FORECAST IT.

AND ON THAT HAPPY NOTE, I'LL CLOSE. ARE THERE QUESTIONS?

(CHART 15 OFF)
INFORMATION SERVICES AND PRODUCTS

NET INNOVATION EXPENDITURES IN DEVELOPING BUSINESSES

$124 M
AG. DVP. & OTHER

$106 M
AG. DVP. & OTHER

$100 M
INTL. SERVICES

$70 M
INTL. SVCS.

$50 M
SMALL BUSINESS SERVICES

SYSTEMS & SERVICES CO.

BUSINESS DEVELOPMENT

1982

1983

AG. DVP. & OTHER

SYSTEMS & SERVICES CO.

BUSINESS DEVELOPMENT

1984-1985 AVERAGE

BUSINESS SERVICES

SMALL BUSINESS

INTL. SVCS.

AG. DVP. & OTHER

SYSTEMS & SERVICES CO.

BUSINESS DEVELOPMENT

1984-1985 AVERAGE
COOPERATION FOR BASIC TECHNOLOGY

1. MICROELECTRONICS AND COMPUTER TECHNOLOGY CORPORATION (MCC)
2. SEMICONDUCTOR RESEARCH CORPORATION (SRC)
3. MICROELECTRONICS AND INFORMATION SCIENCES CENTER (MEIS)

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COMPUTER SYSTEMS

1. VLSI ON-CHIP TESTING
2. LSI-HIGH DENSITY CAD
3. AIR COOLING OF CHIPS
4. OPTICAL DISK SYSTEM
5. AUTOMATED PIPING ANALYSIS AND DESIGN

1983-1985

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PERIPHERAL PRODUCTS

1. PRINTER TECHNOLOGIES
2. THIN FILM HEADS AND MEDIA
3. PLATED MEDIA
4. VERTICAL RECORDING
5. OPTICAL RECORDING

1983-1985

ADVANCED TECHNOLOGY $ 90M
ADVANCED PRODUCT DEVELOPMENT 57
PRODUCT & SERVICE DEVELOPMENT 336
NEW BUSINESS DEVELOPMENT 0
CONTINUING BUSINESS DEVELOPMENT 0
TOTAL $483M
# FINANCIAL SERVICES

(NEW SERVICES, NEW PRODUCTS, NEW MARKETING)

1. HOMEOWNER FINANCIAL SERVICE CENTERS
2. ERA NETWORK
3. MORTGAGE BANKING
4. THRIFT STRATEGY

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# SMALL BUSINESS SERVICES

1. COURSEWARE
2. APPLICATIONS
3. MID-RANGE MICROCOMPUTER SYSTEM
4. VERY SMALL BUSINESS COMPUTER SYSTEMS
5. MARKETING AND DISTRIBUTION

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COMPUTER SERVICES

1. TRANSMATIC
2. CYBERCASH
3. DISTRIBUTED APPLICATION FACILITY
4. GERMANY CAD CENTER
5. PLATO/STAYWELL
6. HELP
7. AGRICULTURAL SERVICES
8. NETWORK LINKAGE
9. COMPUTER AIDED DESIGN
10. ARTIFICIAL INTELLIGENCE
11. LDEC
12. PLATO HOME DELIVERY
13. NUCLEAR SCIENCE AND ENGINEERING
14. COURSEWARE DEVELOPMENT

1983-1985

ADVANCED TECHNOLOGY $26M
ADVANCED PRODUCT DEVELOPMENT 45
PRODUCT & SERVICE DEVELOPMENT 375
NEW BUSINESS DEVELOPMENT 132
CONTINUING BUSINESS DEVELOPMENT 1386
TOTAL $1964M
CORPORATE STRATEGIES

1. AN EMPHASIS ON COMPUTER SERVICES

2. DEVELOPING THE POTENTIAL OF THE SMALL BUSINESS MARKET

3. FINANCIAL SERVICES MOVE TO NEW MONEY SOURCES, NEW FINANCIAL PRODUCTS, AND NEW MARKETING METHODS

4. CONTINUING LEADERSHIP IN PERIPHERAL PRODUCTS

5. CONCENTRATION ON SIX PRIMARY APPLICATION MARKETS IN THE COMPUTER MAINFRAME BUSINESS:
   - EDUCATION
   - ENERGY
   - MANUFACTURING
   - ELECTRIC UTILITIES
   - PETROLEUM/MINING
   - WEATHER
INFORMATION SERVICES AND PRODUCTS

GROSS INNOVATION EXPENDITURES BY ORGANIZATION

1982

$905 M

PPCO 12%
SYSTEMS 13%
SERVICES 75%

1983

$1014 M

PPCO 14%
SYSTEMS 13%
SERVICES 73%

1984-1985 AVERAGE

$1387 M

PPCO 12%
SYSTEMS 11%
SERVICES 77%

1983: $1014 M, GROWTH = 12%
1982: $905 M
1984-1985: $1387 M, GROWTH = 37%

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INFORMATION SERVICES AND PRODUCTS

GROSS INNOVATION EXPENDITURES BY P&L LINE ITEM

1982

COST OF SALES
SUPPORT
R&D
NEW AND CONTINUING BUSINESS DEVELOPMENT
3% 10% 21%
66%

1983

3% 9% 19%
69%

1984 & 1985

2% 8% 18%
72%

1982

R&D
SUPPORT
COST OF SALES
NEW & CONTINUING BUSINESS DEVELOPMENT
$187 M
87
27
604
$905 M

1983

$ 194 M
90
31
699
$1014 M

1984 & 1985 AVERAGE

$ 248 M
108
31
1000
$1387 M

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# INFORMATION SERVICES AND PRODUCTS

## INNOVATION EXPENDITURES IN DEVELOPING BUSINESSES ($M)

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INFORMATION SERVICES AND PRODUCTS

NET INNOVATION EXPENDITURES IN DEVELOPING BUSINESSES

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NET EXPENDITURES

$124 M $106 M $59 M

1984 & 1985
INFORMATION SERVICES AND PRODUCTS
GROSS INNOVATION EXPENDITURES BY CATEGORY

ADVANCED TECHNOLOGY
ADVANCED PRODUCT DEVELOPMENT
PRODUCT & SERVICE DEVELOPMENT
NEW BUSINESS DEVELOPMENT
CONTINUING BUSINESS DEVELOPMENT


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# GROSS INNOVATION EXPENDITURES IN DEVELOPING BUSINESSES

($M)

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<td><strong>$1,061.2</strong></td>
</tr>
</tbody>
</table>

INFORMATION SERVICES AND PRODUCTS
TOTAL COSTS & EXPENSES

1982
INNOVATION $905 M
BASE BUSINESS $2255 M

1983
INNOVATION $1014 M
BASE BUSINESS $2399 M

1984 & 1985
INNOVATION
BASE BUSINESS
$2773 M
$6328 M
FINANCIAL SERVICES
TOTAL COSTS & EXPENSES

2% INNOVATION

BASE BUSINESS 98%

1982
INNOVATION $ 16 M
BASE BUSINESS $ 897 M

4% INNOVATION

BASE BUSINESS 96%

1983
INNOVATION $ 39 M
BASE BUSINESS $1024 M

4% INNOVATION

BASE BUSINESS 96%

1984 & 1985
INNOVATION $ 122 M
BASE BUSINESS $3273 M

R M Price CDC speeches Charles Babbage Institute <www.cbi.umn.edu>
CONTROL DATA CORPORATION
TOTAL COSTS & EXPENSES

1982
INNOVATION $921 M
BASE BUSINESS $3151 M

1983
INNOVATION $1053 M
BASE BUSINESS $3423 M

1984 & 1985
INNOVATION $2895 M
BASE BUSINESS $9601 M
INNOVATIVE COMPANIES DO NOT START OUT WITH A “RESEARCH BUDGET.” THEY END WITH ONE. THEY START OUT BY DETERMINING HOW MUCH INNOVATION WILL BE NEEDED FOR THE BUSINESS TO STAY EVEN. THEY ASSUME THAT ALL EXISTING PRODUCTS, SERVICES, PROCESSES AND MARKETS ARE BECOMING OBSOLETE — AND PRETTY FAST AT THAT. THEY TRY TO ASSESS THE PROBABLE SPEED OF DECAY OF WHATEVER EXISTS, AND THEN DETERMINE THE “GAP” WHICH INNOVATION HAS TO FILL FOR THE COMPANY NOT TO GO DOWNHILL.