AN ASSESSMENT AND FORECAST OF TECHNOLOGICAL DEVELOPMENTS IN THE OFFICE COMMUNICATIONS SYSTEMS (OCS) INDUSTRY AND ITS SUPPLY/DEMAND CONSIDERATIONS

VOLUME 2

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VOLUME 2

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VOLUME 1

VOLUME 2

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4.0 COMPETITIVE ANALYSIS AND CANADIAN INDUSTRIAL PERFORMANCE

4.1 Introduction

This Chapter deals primarily with Canadian companies manufacturing the following Office Communications Systems (OCS) equipment:

* Multifunctional workstations
* Voice/data PABXs
* Local Area Networks (LANs)
* Storage peripherals
* Input and output devices
* Office systems software

In accordance with the Terms of Reference, we have identified the major Canadian companies and their competitors, their product/system offerings, their strategies, and their strengths and weaknesses. We have also outlined potential opportunities and threats to the Canadian OCS industry.

Companies have been discussed in this chapter, generally relative to the following four vendor categories:

1) Total system suppliers

2) Niche suppliers

3) Commodity suppliers

4) Defence suppliers

Total system suppliers can provide all the components of an integrated office communications system, including mainframe. They are the prime contractors and assume all responsibilities for integration. Niche suppliers can provide major subsystems, generally following the standards set by the major system suppliers. These major subsystems may also be capable of being integrated with the subsystems provided by other suppliers, into a total overall system. Commodity suppliers produce components e.g. terminals, printers, mass storage devices. Defensive suppliers provide office communications systems primarily to protect their installed base of data processing mainframes.

Most Canadian vendors fall into the niche or commodity catagories. Northern Telecom is the only Canadian firm with the capability to be a total system supplier. To achieve this, they have acquired two U.S. data processing firms and are entering into agreements with the major mainframe companies. Only through this strategy will they be able to offer complete systems, short of eventually purchasing a major mainframe company. In addition, they are also positioning themselves as a niche supplier, with the "Open World" concept. With this strategy, Northern Telecom will be able to supply PABX and other subsystems, capable of integration with either the total system supplier's offering or with subsystems from other suppliers. (Further details are provided in Section 4.3.)

Mitel is a major niche supplier, capitalizing on its experience in telecommunications. Before the collapse of its agreement with IBM, it was moving towards a very powerful niche position with its equipment being part of IBM's total system offering. AES Data Ltd. and Micom (a division of Philips Information Systems) are both niche suppliers, currently struggling to move from being dedicated word processor suppliers to multi-functional workstation integrated system suppliers. Gandalf, Develcon and several others are successfull niche suppliers, using their telecommunications base to develop subsystems for use in overall office communications networks. Canstar Communications and others are niche vendors with LAN offerings. On the software side, Officesmiths, OCRA Communications and Systemhouse are niche suppliers, with Officesmiths providing electronic filing subsystems and OCRA and Systemhouse offering systems integration software and facilities. GEAC, the only Canadian mainframe manufacturer, is basically a defensive supplier, providing office automation systems to protect its installed base in the library and financial sectors. Most other Canadian vendors are commodity suppliers. These and the above companies are detailed further in this chapter of the report.

Canadian firms, by world standards, are generally quite small. The most successful ones have usually carved out a very specialized product area for themselves and are not directly competing against the larger multinationals. Other firms are assemblers of foreign technology; or build custom equipment and systems; or provide systems in a local geographic

area, where sales and service can overcome competition from the larger suppliers. In the software sector, with a very few exceptions, most firms are providing custom software services, or non-integrated packaged systems, usually in the area of financial and accounting software. There are no large Canadian vendors with significant sales of packaged software for office systems.

Table 4-1 presents a summary of the product offerings of selected major suppliers. Financial highlights are shown in Table 4-2. Appendix 4A contains the most recent fiscal information available on the major public companies.

All the major multinationals have offices in Canada but few manufacture office communications systems here, other than on a commodity basis. IBM and DEC have manufacturing plants in Canada, but are not manufacturing products here in the areas covered by this report. Control Data manufactures a super microcomputer in Toronto, but say they do not intend to enter the office systems market. Micom (a division of Philips) has been previously discussed; Memorex (a division of Burroughs) is producing storage peripherals in Canada; Dysan Corporation of the U.S. is expected to start manufacturing here shortly, and several others are outlined in this report. However, there is a great deal more manufacturing which could be done in Canada by the multinationals, particularly if they followed the world product mandate strategy endorsed by the Canadian government.

TABLE 4-1

SOME PRODUCT OFFERINGS FROM SELECTED MAJOR VENDORS

	WORD PROCESSORS	MICRO COMPUTERS	SPECIAL TERMINALS	DIGITAL PABX'S	MODEMS	MULTI-PLEXERS	VOICE MAIL	LAN'S	STORAGE PERIPHERALS	OCR	FACSIMILE	NON-IMPAC PRINTERS
AES DATA LTD.	*											
APPLE		X										
AT&T	X	X	X	X	X		X					
BURROUGHS									*	X	X	
CANON												X
CANSTAR								*				
COMMODORE		X										
COMTERM		*					*					
CONTROL DATA									X			
CYBERNEX		*	X									
DATAPOINT				X								X
DEC	X	X	X					X	X			
DELPHAX												*
DEVELCOM					*	*		*				
DY-4		*						*				
DYSAN									X			
ELECTROHOME			*									
ESE					X	X						
GANDALF					*	*						
GEAC			*									
GLENAYRE							X					
GTE				X								
HEWLETT-PACKARD		X						X		X		I
HITECH										*		
IBM	X	X	X				X		X			X
MAI		*										
MONITORA TELEPHONE SYSTEM							X					
MATROX			*									
MATSUSHITA		X		X								
MICOM	*	*										
MICOM SYSTEMS					X	X						
MICROTEL				*								
MINOLTA												X
MITEL			*	*								
NCR										X		
NEC											X	X
NELMA	X	*										
NET ONE DATA CORP								*				
NORPAK			*									
NORTHERN TELECOM			*	*								
OLIVETTI	X									X		
OSBORN		*										
RACHEL MILGO					X							
RICOH											X	
ROLM				X								
SASK TEL							X					
SHUGART CORP									X			
SIEMENS				X								X
SPECTRIX		*										
SPERRY		X					X					
STORAGE TECHNOLOGIES									X			
TANDY		X										
TIE TELECOMMUNICATIONS				*								
TIMEPLEX						X						
TOSHIBA		X										
TRAN COMMUNICATIONS					*	*						
VMS							X					
WANG	X						X	X				
XEROX	X	X						X			X	X
3M									X		X	

Legend: * Denotes manufacturing carried out in Canada
x Denotes manufactured outside Canada

TABLE 4-2

MAJOR COMPANIES PARTICIPATING
IN THE
OFFICE COMMUNICATION SYSTEMS INDUSTRY

COMPANY	TOTAL SALES $ MILLIONS	NET INCOME	PROFIT MARGIN %	R&D EXPEN-DITURE	R&D AS % OF SALES	SALES GROWTH**
AT&T	69,848	249	.4	862	1.2	6.2
IBM	40,180	5,485	13.7	3,682	9.2	16.9
XEROX	8,464*	466	5.5	130	1.5	.1
RAYTHEON CO.	5,937*	300	5.1	66	1.1	7.7
HONEYWELL	5,753*	231	4.0	429	7.5	4.8
DEC	5,584	328	5.9	631	11.3	30.7
SPERRY CORP.	4,914	216	4.4	102	2.1	5.4
HEWLETT PACKARD	4,710	432	9.2	493	10.5	12.4
BURROUGHS CORP.	4,390*	197	4.5	65	1.5	4.9
MOTOROLA INC.	4,328*	244	5.6			14.3
NCR CORP.	3,731*	288	7.7	64	1.7	5.8
NORTHERN TELECOM	3,304	268	8.1	325	9.8	8.8
WANG LABORATORIES	2,185	210	9.6	1,068	48.9	42.0
HARRIS CORP.	1,996	80	4.0			10.3
MICOM	1,132	21	1.9	12	1.1	
APPLE COMPUTER INC.	983*	77	7.8	60	6.1	68.6
DATA GENERAL	829	23	2.8	85	10.2	2.9
AMDAHL	778*	46	5.9	102	13.1	68.2
ROLM CORP.	660	38	5.8	49	7.5	31.2
DATAPOINT	540	8	1.5	10	1.9	6.2
PRIME COMPUTER	517*	33	6.4	52	10.1	18.5
LANIER BUSINESS PRODUCTS	389*	14	3.6			11.3
MAI	376*	40	10.6	18	4.8	4.9
MITEL CORP.	343	-32	-9.3	50	14.4	34.3
DYSAN	180*	49	27.2	35	19.4	26.1
CONVERGENT TECHNOLOGIES	164*	15	9.1	16	10.0	69.5
INTECOM INC.	79*	14	17.7	7	9.0	130.9
GANDALF	69	5	7.2	9	13.2	18.0
GEAC	48*	3	6.3	4	8.1	35.0
DEVELCON	16*	3	18.8	1	3.6	67.6

* 1983 Fiscal Year (All others 1984)
** Last 2 Fiscal Years

Source: 1) Dialog Information Services, Disclosure II Database
(See Appendix 4A)
2) Company Annual Reports

Besides the prospects for Northern Telecom, there are only three, possibly four, U.S. based companies with the potential to become total system suppliers. These are IBM, DEC, WANG & AT&T. Other major companies will either remain as niche suppliers or attempt to move up to total system supplier status by merging or making some kind of arrangement with other vendors. The following outlines the strategies and strengths and weaknesses of the four potential total system suppliers.

IBM reported revenues of $46 billion in 1984, and has targetted for sales increases of 15% per year. During the year they became very aggressive in the office communications systems market and the personal business computer market. There has been a rapid introduction of new products; e.g. the IBM AT, a scaled down System 36 (which will act as a department level computer) and the PC Network. They engaged in very intense marketing tactics e.g. personal computer price cuts of 20% or more, special dealer promotions and new distribution channels. One of the most significant events for IBM in 1984 was the purchase of ROLM. The merger of IBM's computer expertise with ROLM's telecommunications expertise marks the entry of IBM into the total system supplier category.

IBM is the dominant force in the data processing market (80% of all large mainframes are IBM). It is also their intention to become the dominant force in the office communications system market. The purchase of ROLM and their entry into the personal computer business (they now have about

40% market share) are two major steps in this direction. Despite their technical, financial and marketing strength, IBM does have several weaknesses. They are:

1) Lack of product line compatibility

At the present time, IBM has a mainframe based office system, a department based office system, and various other subsystem offerings. Full integrated compatability is not expected until 1990.

2) Networking

IBM is not expected to be able to provide their token passing ring LAN for another two years.

3) Telecommunications

The acquisition of ROLM will not be followed by smooth integration into the IBM world. IBM may be able to avoid major problems similar to those encountered by Northern Telecom in their acquisition of two U.S. data processing firms, but it will take time to digest such a major move into the telecommunications world.

IBM is a financial/marketing dominated firm. Telecommunications firms tend to be the opposite, with engineering/technical

dominance. Managerial and organizational problems will slow the pace towards new total system offerings.

Digital Equipment Corporation posted revenues of $5.6 billion in 1984, an increase of 31% over 1983. Their 1984 net income was $329 million, up from $283 million in 1983. Recently, DEC redefined their corporate market strategy. They abandoned the "commodity" microcomputer business (i.e. retail marketing of DEC products). In the office automation sector, DEC is concentrating its efforts on providing integrated solutions. DEC claims to have one thousand "integrated systems" already installed and working in offices around the world. They are concentrating on their traditional strength in the supply of systems directly to the larger companies.

DEC has a number of strengths that will enable it to remain one of the leaders in office communications systems. These are:

1) An excellent reputation in data processing; providing easy to use interactive computer systems.

2) An extensive installed base of VAX computers, (e.g. over 3,400 in Canada)

3) Good communications expertise, with approximately 1,500 Ethernet LANs installed, and 1,000 systems using PABX's.

4) A multivendor approach to providing a total integrated system.

DEC's major weakness, according to industry observers, has been a lack of cohesive strategy and organizational structure, aimed at the office systems market. It is too early to tell, but the refocussing of their marketing strategy is a positive sign that their internal problems may be over. Another weakness has been a lack of major capabilities in the integration of voice, data and image. DEC is now making a conscious R & D effort to correct this. For example, in Canada, DEC has donated $25 million to the University of Waterloo to conduct research in a number of areas of interest to them, including graphics, videotext, artificial intelligence, networking and software engineering.

The prognosis for DEC is that they will be a successful total system supplier. Generally, most vendors are making their equipment compatible with the IBM world, the DEC world, or both.

WANG reported revenues in 1984 of $2.2 billion -- an increase of 42% over the previous fiscal year. Their corporate objective is to increase revenue by 15 to 20% annually. WANG's primary office communications systems strategy is to expand their strong traditional word processing base into a unified office automation system. They recognize the requirement to live in a multivendor environment, hence the commitment to connect to

various IBM and DEC products. WANG is also producing IBM compatible machines, recognizing the opportunity to connect to the IBM mainframe world. In 1984 WANG signed agreements with Mitel, AT&T and Northern Telecom in order to integrate their systems with the PABX offerings of the major suppliers. They have dropped their original intent to develop their own PABX system. More announcements are expected in 1985 moving WANG towards their goal as a supplier of integrated office communications systems.

WANG's strengths are:

1) An excellent reputation as the number one word processing manufacturer.

2) A strong understanding of office systems and end user requirements.

3) A willingness to enter into corporate alliances in areas where they lack the expertise to go it alone (e.g. PABXs).

4) Good integrated systems, with continuing research and development on providing integrated voice/data workstations.

5) Rapid, consistent revenue growth and financial performance.

WANG's primary weakness is related to their traditional position as the world's leading word processor company. While they have a range of small to medium-sized data processing systems, they are generally perceived to be weaker than IBM and DEC in data processing capabilities. They now have to make the transition from a dedicated work processor company to an office communications system company. Industry contacts also indicate that there have been service problems associated with Wang's rapid growth and that their marketing is weak outside of their traditional customer base. However, in 1984 WANG captured 4% of the U.S. personal computer market. This may signal the start of a successful expansion beyond their administrative/ secretarial base into the manager's and professional's office. The prognosis for WANG is that they will succeed as a total office system supplier to smaller organizations, operating in a multivendor environment, and as a niche supplier to larger organizations.

AT&T had revenues of $69.8 billion in 1984, with a net income of $248.7 million. AT&T's strategy towards office automation is very aggressive. Part of the reason for this is their late entry into the OCS industry, and the after shock of deregulation. Their overall strategy is simply to be a leader in office automation systems. They have not delineated a detailed strategic path to the integrated office system. In 1984 they offered twice as many products as in 1983, and are planning to continue that trend. They intend to be IBM compatible with

connectability to WANG, Hewlett Packard, Honeywell, and DEC mainframes.

AT&T's most important strengths are their financial resources and reputation. They are very strong in the telecommunications industry sector. Another strength is their UNIX[4-1] operating system. It is the backbone of their office systems offering. With IBM adopting a UNIX operating based system for the IBM AT, this may now tend to become the standard for multi-user environments.

AT&T's weaknesses at this time are substantial. They do not have a detailed strategic approach to the office communications systems market and do not have an integrated product line. They lack experience in designing and selling equipment in a non-regulated environment and their "3B" family of computers does not have a large installed base. Finally, they do not have a strong market identity as a supplier of office communications systems and have not traditionally been a strong marketing organization.

AT&T have the financial resources to succeed. However, it will be several years before they reach the stage of being able to offer a total system, unless they acquire the expertise through acquisitons or mergers.

4.2 Multifunctional Workstations

4.2.1 Overview

Word processors, desktop microcomputers (both standalone and communicating) and special terminals used in office communications systems, are covered in this section.

The trend has been a shift from standalone word processors to shared logic and shared resource systems. At the same time, the microcomputer has increased its penetration of the word processing market as prices fall and both software and hardware continue to become more sophisticated. As well, the telecommunications companies are integrating the telephone with the terminal and the microcomputer. These three products -- the word processor, microcomputer and communicating workstation -- are merging to yield the multifunctional workstation.

The trend towards multifunctional workstations is illustrated by the scope of vendor offerings. Figure 4-1 illustrates the industry in early 1980. Vendors basically produced either word processors or microcomputers plus a few voice/data terminals. The one exception was XEROX which produced the "XEROX STAR", a hybrid workstation. Figure 4-2 shows the current situation where vendors are manufacturing a wider range of products, and the distinction between product type is becoming fuzzier. For example, IBM now manufactures both a word processor and a personal computer (which itself can be used for personal

FIGURE 4-1

MAJOR VENDORS OF WORDPROCESSORS,
MICROCOMPUTERS, AND VOICE/DATA TERMINALS - 1980

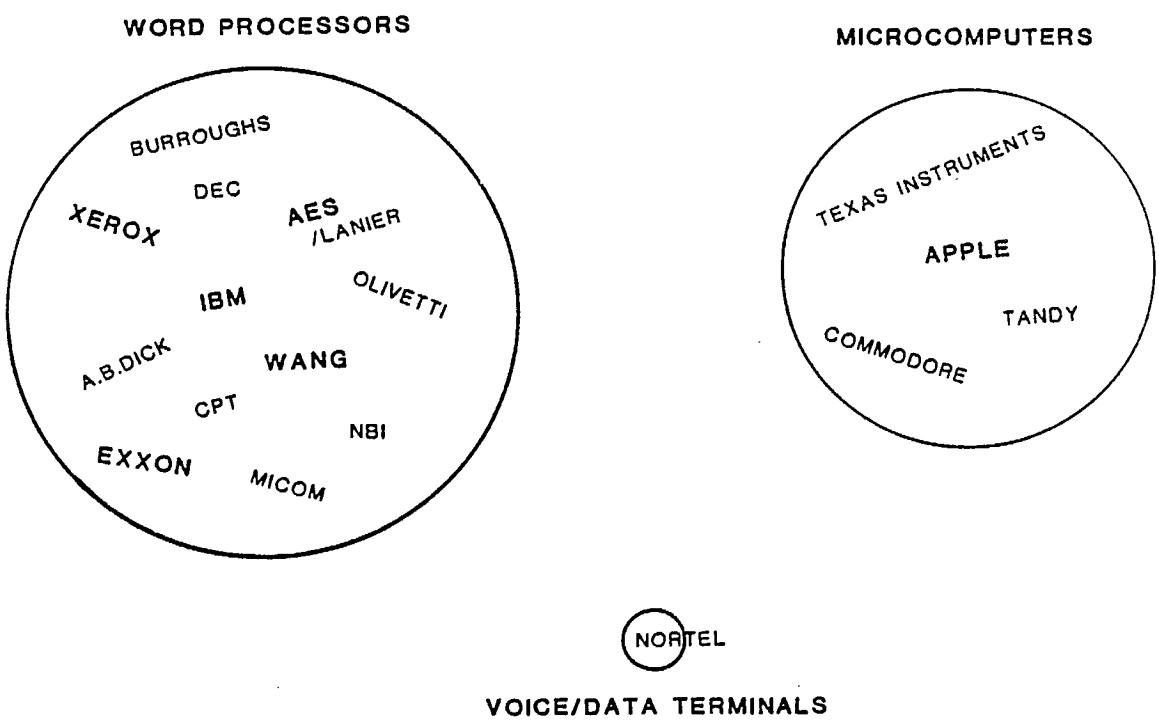
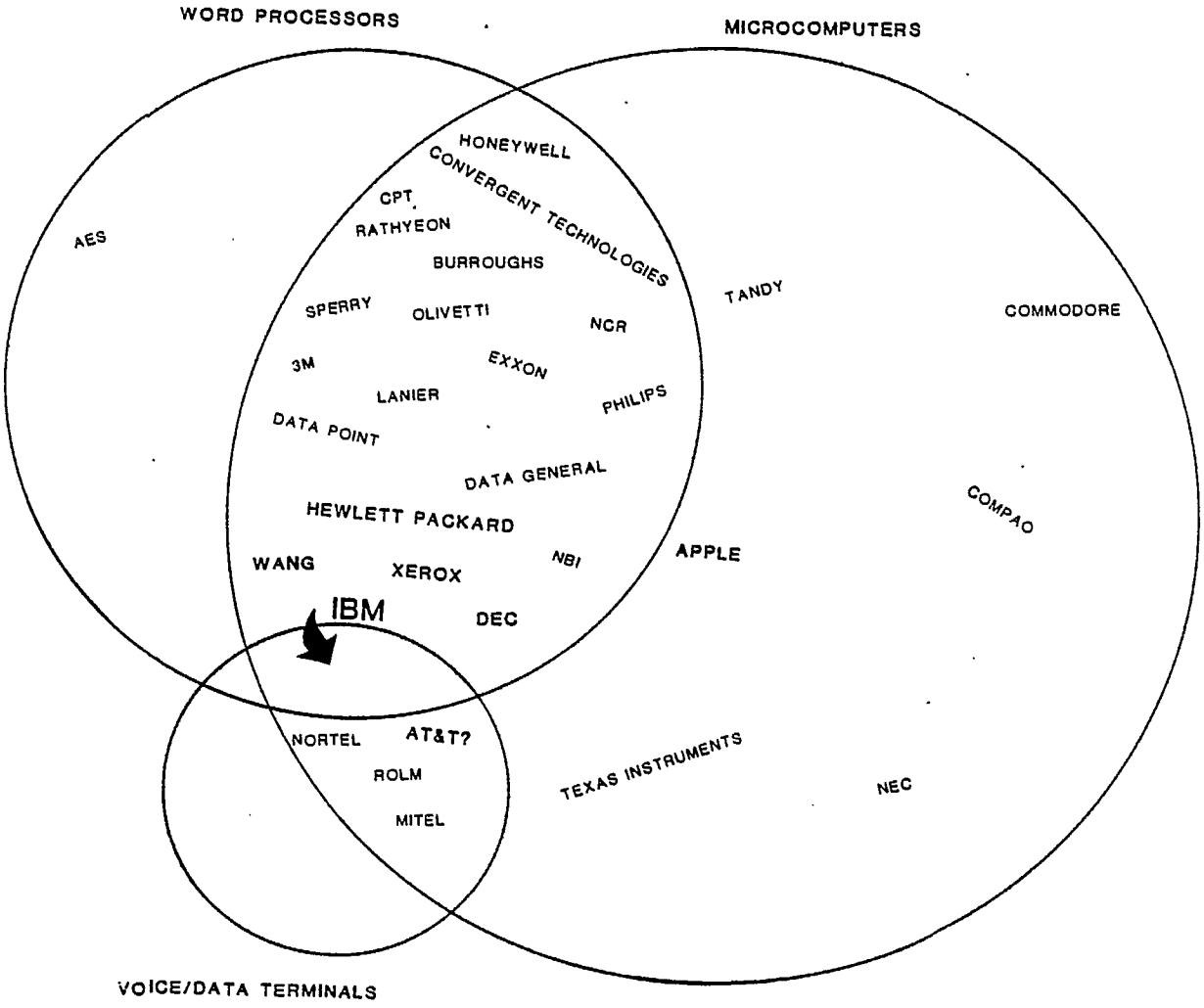


FIGURE 4-2

MAJOR VENDORS OF WORD PROCESSORS,
MICROCOMPUTERS, VOICE/DATA TERMINALS,
AND INTEGRATED PRODUCTS - 1984



computing and word processing). In 1985, IBM, (among other manufacturers) will also be offering an integrated voice/data microcomputer.

In the following analysis, emphasis has been placed on those firms manufacturing word processors, microcomputers and voice/data terminals in Canada. They have been analyzed in terms of their size, major competitors, product line, R & D and financial/marketing resources. They have also been viewed within the context of the four vendor catagories outlined in Section 4.1.

4.2.2 Word Processor Manufacturers

Canada has two world class firms manufacturing word processing equipment in Canada. They are AES Data Limited and Micom Co. (a subsidiary of Philips Information Systems) both of Montreal. In Canada they compete under their respective names. Outside of Canada the Micom product line is sold under the Philips label and AES is sold under the Lanier name. (Lanier is Micom's main distributor.) In 1985 Micom will be marketing outside Canada under their own name, using the Lanier and Savin distribution networks.

There are no other firms manufacturing word processing equipment in Canada. Nelma Data Corporation are purchasing their word processing equipment from an OEM supplier (ONTEL Corp.) in the United States.

Table 4-3 illustrates the breakdown by major companies, of the Canadian word processor market. As can be seen by the changing market shares, the entry of IBM into the market had a major impact on AES and Micom. DEC and Olivetti have had a similar impact on the "other category". The latter includes over twenty different suppliers of word processing equipment.

AES Data Ltd. of Montreal has been caught between an economic downturn, intense competition from U. S. manufacturers such as IBM, a shift towards utilizing microcomputers for word processing and increasing use of clustered word processing systems. During 1982 and 1983 they showed financial losses and their R&D expenditures had dropped to 8% of total sales. Recently the company underwent a major retrenchment. They received an investment of $15 million from their parent company (the Canada Development Corporation), cut their break even point by $30 million, and streamlined their product offerings. They have now increased their commitment to R&D expenditures to 10% of sales and are becoming more marketing oriented.

AES has decided on a three stage strategic approach to office automation. The first stage is to continue their commitment to providing clustered and standalone word processing systems for office support staff. The second stage is to produce workstations for the manager and the professional. The third is to produce an integrated office system. This is expected to be offered in 1985. It will be based on a star configured LAN ("AES Net"), with a UNIX operating system and

TABLE 4-3

WORD PROCESSING AND OFFICE AUTOMATION SYSTEMS
Percentage of units installed in Canada

COMPANY	Y E A R			
	1981	1982	1983	1984(est)
AES Data Ltd	33	18	19	18
Philips/Micom Inc.	26	18	16	17
Wang Canada Ltd.	12	14	15	14.5
I B M	-	28	27	27.5
DEC	-	-	-	5
Olivetti	-	-	-	5
Others	29	22	23	13
TOTAL	100	100	100	100

Ref: Evans Research Corp. Market Forecast for Canadian Information Processing Systems, October, 1983.

Ref: Evans Research Corp. An Analysis of Selected Major Vendors of Multi-terminal Word Processing Systems, April, 1982.

their 7600 series network controller.

AES's strengths are their expertise in word processing and text handling, their capability to connect with systems other than AES and their overall financial strength as part of the Canada Development corporation. Their recent financial problems and management changes have also had a positive side in that they now have a corporate strategy for handling the office communications systems market. As well, the change in their U.S. distribution strategy now allows AES to market through more than one distributor, and to build a market position under the AES name. Previously, they distributed in the U.S. under the Lanier name, with Lanier as the exclusive distributor.

A primary AES weakness is that they are approaching the integrated office systems market from the word processing side. However, the integrated office of the 80's is oriented towards computer and communications technologies. This is not an area in which AES has a great deal of experience. In addition, AES's traditional marketing strength lies in sales to office support staff. Now, they must also sell to managerial and professional users. A further weakness is that they are not well known in the United States (approximately 70% of their production is sold there), and they must now build a new brand name in that highly competitive market.

AES will be a niche supplier in a multivendor environment. They will continue to be a supplier of word

processing systems at least until 1988, selling to their already installed base of AES customers. They will also supply systems to companies with high text handling requirements and attempt to move into the integrated systems market with their new offerings.

Micom Co., Montreal, is a subsidiary of Philips Information Systems, Toronto, and ultimately Philips NV of the Netherlands. Compared to AES, Micom is in a much stronger position. Philips Information Systems, which is responsible for the marketing and distribution of Micom's office automation products, recorded sales of $62 million, up from $38 million in 1983, an increase of 38.7%. Of the $62 million in sales, approximately $42 million came from the sales of MICOM word processors. Micom has also recently begun to manufacture the Philips personal computer in Canada, and have reportedly sold over 10,000 units. During 1984 Micom relocated to a new 230,000 square foot facility in Saint Laurent, Quebec, the result of an investment of $15 to $20 million. They are now manufacturing the Micom line and the Philips PC in this plant, and are assembling an expanded version of the Megadoc storage and retrieval system (See Section 4.5)

The Philips strategy is to provide products from the entry level word processor stage through to office systems integration via a local area network. Figure 4-3 shows one of the MICOM 3000 series word processors, and the Philips personal computer, both key elements in their integrated office communications systems strategy. Philips also produces: An

FIGURE 4-3: A MICOM WORD PROCESSOR AND THE PHILIPS MICROCOMPUTER

MICOM 3003 WORD PROCESSOR

PHILIPS PERSONAL COMPUTER

Information Management Facility (IMF) (a distributed document processing system); an Information Processing System (IPS) (a 32 bit microcomputer UNIX based system); a LAN (a twisted pair, token passing system); the MEGADOC mass storage system; and the COMIS office automation software (developed by Philips). Philips' systems are capable of operating on an IBM or IBM compatible mainframe. Their overall strategy is to be an integrated office system supplier operating in an IBM world.

Micom's position as part of the overall Philips corporate group is a major strength. Philips has focussed on office automation as a growth area, and are committed to being a major participant. This should have a positive effect on the Montreal and Toronto operations. For example, the merger of its data and telecommunications divisions may result in an integrated voice/data workstation, and the logical manufacturing plant is in Montreal. A further strength is that other divisions of Philips are manufacturing large computers, hence there is a good installed base of both mainframes and word processing systems. Finally, they have an excellent distribution system worldwide.

Micom's only weakness is that they are somewhat late in formulating and implementing their office communications systems strategy and, like AES, they are coming from the word processing side. However unlike AES they have access to Philips' technology and marketing strengths.

The prognosis for Micom and Philips Information Systems is very favourable. They will most likely be a strong niche supplier, working within a multivendor environment and making corporate alliances to enhance their competitive position in the integrated office systems marketplace.

4.2.3 Office Personal Microcomputers

As stated earlier, the desktop microcomputer is evolving into the multifunctional workstation. There are a number of reasons for this transition:

1) The increase in random access memory (RAM), speed and storage capacity.

2) The decrease in hardware costs.

3) The proliferation of inexpensive software (standard packages for word processing, spread sheets, data base management).

4) The development of cost effective communications hardware and software.

5) The increasing networking capabilities and micro to mainframe functionality.

6) The entry of major companies such as IBM, Wang, DEC, and Xerox into the field. Plus the more recent entry of firms such as Olivetti, AT&T, and Hewlett-Packard.

5) The increasing acceptance of the microcomputer as an essential piece of office equipment.

In Canada over fifty vendors of personal computers are supplying the marketplace. Table 4-4 shows the respective market shares of the major companies. None of these major suppliers is manufacturing here. Canada does have a few smaller scale companies. However, the two leading firms, Comterm (formerly Bytec-Comterm) and Osborne Canada, have ceased manufacturing. A smaller firm, David Computers, has also ceased manufacturing and is distributing computer parts. The remaining Canadian manufacturers are summarized in Table 4-5.

Comterm announced the closure of their Hyperion manufacturing plant in October 1984. This closure resulted in a loss of $48.3 million and a lay off of 125 employees. The difficulties with the Hyperion are said to be related to faulty disk drives purchased from Ramax Inc. of California, in addition to high production costs and marketing problems. The company attempted to market the Hyperion on a direct sales basis throughout Canada and the United States, with a marketing budget of about $7 million. They faced increasing competition from IBM as well as from numerous other microcomputer manufacturers. Increasing competition caused prices to decline and Comterm's losses increased. In 1983 the retail price of the Hyperion was about $6,000. By late 1984 it was selling for less than $2,700.

Comterm is currently in the process of retenching.

TABLE 4-4

THE SHARES OF THE MICROCOMPUTER MARKET HELD BY THE MAJOR VENDORS

COMPANY	Y E A R			
	1981	1982	1983	1984(est)
IBM Canada	-	8%	29%	39%
Radio Shack (Tandy)	40%	25%	14%	11%
Commodore Business Machines	20%	13%	15%	11%
Apple Canada	27%	18%	8%	6%
DEC	-	-	6%	5%
Others	13%	36%	28%	29%

Sources:

Evans Research Corporation, Report on Microcomputer Markets in Canada, July 10, 1982.

Evans Research Corporation, Forecasts for the Canadian Information Processing Industry (Systems less than $15,000), October 1, 1983.

Newton-Evans Research Company, Corporate Strategies for the U.S. Computer Industry, 1983-1984 ed.

TABLE 4-5

CANADIAN MICROCOMPUTER MANUFACTURERS

COMPANY	1984 SALES ($ mil)	NUMBER OF EMPLOYEES	PRODUCT OFFERINGS
CEM Corporation	N/A	10	ICON educational computer
Cybernex Ltd.	5.0	113	Video displays & terminals
DY-4 Systems Inc.	2.2	75	STD bus and VME products, micro-computers, local area networks
Nelma Data Corporation	5.0	100	"Persona" personal computer, intelligent terminals, wireless modem
Spectrix Microsystems Inc.	3.0	12	"Super" 32 bit microcomputer

This year the company realized $814,000 net income on sales of $10.8 million. They are concentrating on the terminal business utilizing the expertise gained in producing the Hyperion. By combining their terminal expertise plus Hyperion technology, they are hoping to regain entry to the office automation marketplace. Comterm will continue to face difficult times over the next few years, if they survive.

CEM Corporation (Canadian Educational Microcomputer Products) of Toronto, designed and markets the ICON educational microcomputer. Microtel Ltd. is assembling this computer at their Brockville plant. The ICON was developed under a $10 million contract from the Ontario Ministry of Education. It is a dedicated educational computer and is not expected to be used in general office automation.

Cybernex Ltd., while predominately a supplier of video displays, also produces intelligent terminals. They are an OEM manufacturer and are manufacturing computer terminals for Honeywell. Cybernex are not producing business microcomputers or office automation equipment of their own.

DY-4 Systems Inc. of Ottawa, designs and manufactures all of its products in Canada. They have sales of about $2.2 million (1984) and employ a workforce of 75. While their strength is in manufacturing STD bus and VME products, they have expanded their product line by producing a system of distributed microcomputers based on a local area network. To date they have

95 of these systems installed in Canada, each connecting on the average of 12 to 16 workstations.

DY-4's "Dynasty" system consists of 8 bit CP/M based microcomputers, interconnected via a dual twisted pair LAN. The microcomputer is manufactured from the board level up. In 1985, DY-4 expects to offer a new system. This will support up to 48 workstations, (including the IBM PC) employs an OMNI net protocol with collision detection, and will operate over a distance of 4000 feet. After the test phase of this system, they hope to sell the technology and marketing rights to a large company, such as Crowntek, who have the financial and marketing strength to handle Canadian and U.S. sales.

DY-4 cannot compete directly against the major manufacturers. They also recognize that they do not have the financial or market strength to sell their product on a direct sales basis. They have good products and have gained valuable expertise in system configuration and interconnectability. They recognize their technical strengths and the need for assistance in marketing. It is expected that DY-4 will be a successful Canadian niche supplier, producing specialized products for distribution by larger firms.

Nelma Data Corporation of Mississauga manufacturers the Persona personal computer, a smart terminal, a visual display terminal, and a wireless modem. They also distribute word processing equipment, IBM compatible computers and portable

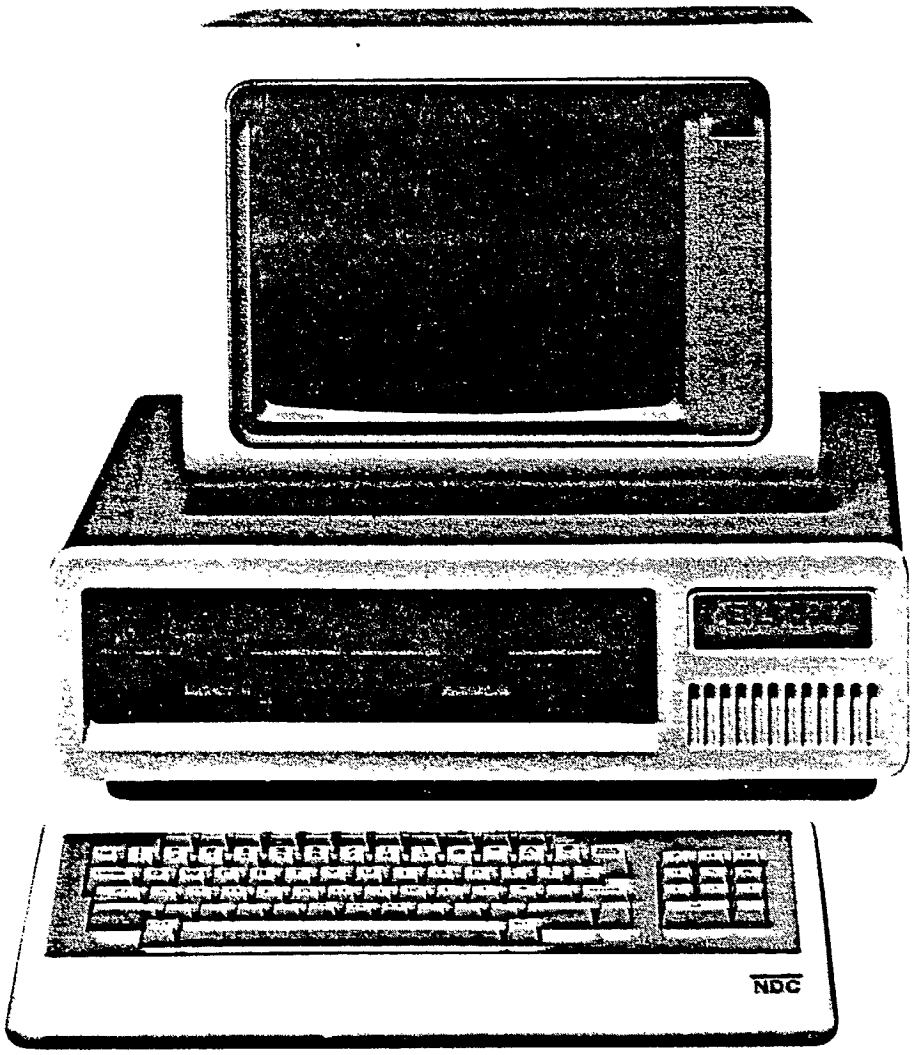
microcomputers. Nelma Data employs about 100 and has sales of about $5 million. Recent information indicates that Nelma lost $1.85 million in fiscal year 1984, considerably better than the $5.79 million lost in the previous year. In October 1984, Nelma received new funds from the Ontario Government and have taken a number of refinancing measures.

The Persona personal computer is shown in Figure 4-4. It uses a Z80A microprocessor with a CP/M operating system. The computer is assembled in Canada using mostly imported parts and technology.

Nelma Data Corp. has undergone a very difficult financial time combined with adverse publicity. They have been very close to bankruptcy. In spite of their problems, they are still surviving. With the refinancing measures their strategy now is to focus on increased distribution and to concentrate on the development of unique products such as their wireless modem. If they survive, Nelma Data will be a commodity supplier and distributor of office systems equipment.

Spectrix Microsystems Inc. of Markham produces the SPECTRIX super microcomputer family, incorporating the 32 bit Motorola MC 68000 processor. The SPECTRIX computer can support up to twenty-six users and can be networked using Ethernet. Figure 4-5 is a copy of the technical specifications for the SPECTRIX 30 system. The SPECTRIX group of products are in their third generation of development and occupy a unique niche between

FIGURE 4-4



THE NELMA PERSONAL COMPUTER

CPU: Zilog Z80A

MEMORY: 8 x 64 KB Dynamic RAM Chips
2 x 2 KB 2716 Chips for Operating System Software

FIGURE 4-5

Processor - MC68000™ family

Memory Management - Hardware segment/paging
Clockrate - 10MHz
Bus - Multibus
Bus capacity - 12 slots

Memory

256Kb to 1Mb of no wait state RAM on private CPU/memory bus
256Kb to 2Mb of memory on Multibus
Maximum memory - 2Mb
Cycle time - 150ns
32Kb of EPROM/ROM is provided for deadstart and diagnostics

9-Track Tape Support - optional

Type - industry standard ½", 9-track, 1600bpi drive
Speed - 25ips
Controller - DMA, microprocessor controlled

Tape

Type - ¼" cartridge tape
Modes - start/stop, streaming
Capacity - 48Mb on 450 foot cartridge
Transfer rate - 440Kbits/sec
Controller - DMA, Motorola 6809 based

Local Area Network - optional

Type - ETHERNET™
Controller - DMA, microprocessor controlled
Software - full range of file transfer and session support software available

Disc

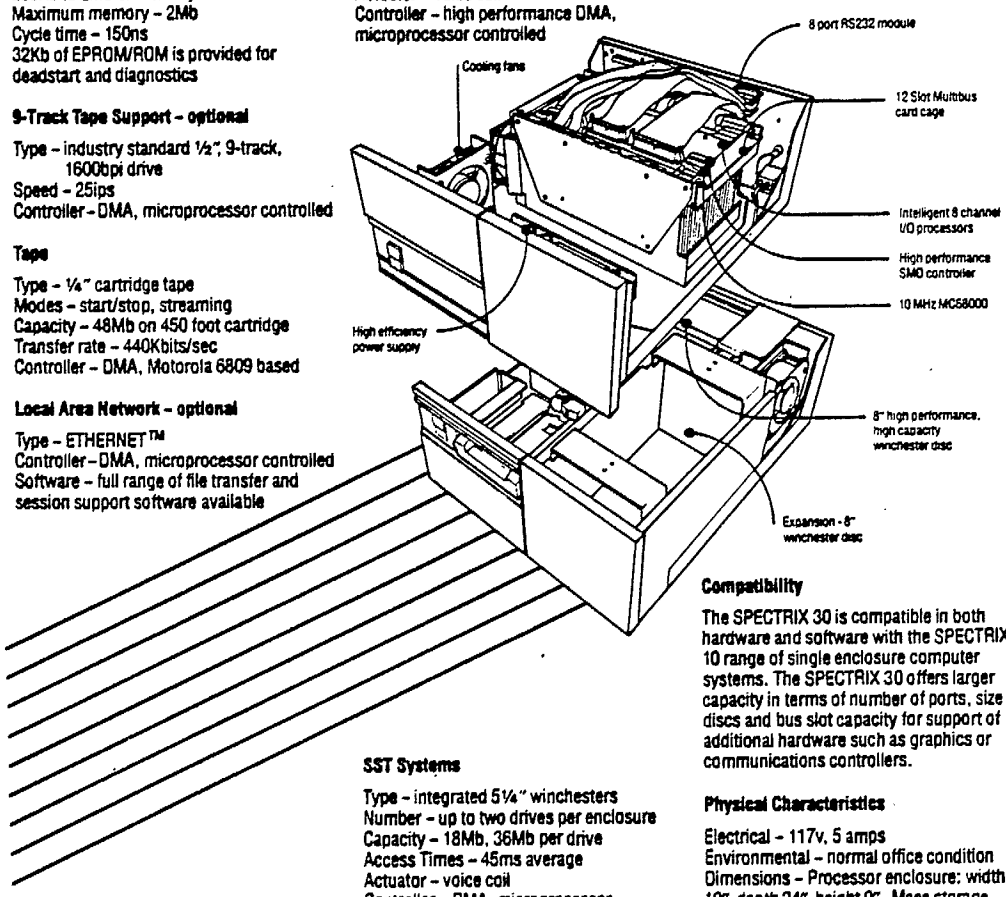
Two mass storage subsystems are supported offering a choice in cost/performance

SMD Systems

Type - 8" winchesters
Number - up to two drives per enclosure
Capacity - 84Mb per drive
Access times - 20ms average
Actuator - voice coil
Controller - high performance DMA, microprocessor controlled

I/O

Type - RS232 standard
Number - 2 minimum, 8 port expansion module
26 maximum dependent on total configuration
Speeds - 50 to 19.2Kbd, software selectable
Customization - through individual port personality cards
Controller - DMA, microprocessor controlled



SST Systems

Type - integrated 5¼" winchesters
Number - up to two drives per enclosure
Capacity - 18Mb, 36Mb per drive
Access Times - 45ms average
Actuator - voice coil
Controller - DMA, microprocessor controlled

Compatibility

The SPECTRIX 30 is compatible in both hardware and software with the SPECTRIX 10 range of single enclosure computer systems. The SPECTRIX 30 offers larger capacity in terms of number of ports, size of discs and bus slot capacity for support of additional hardware such as graphics or communications controllers.

Physical Characteristics

Electrical - 117v, 5 amps
Environmental - normal office condition
Dimensions - Processor enclosure: width 19", depth 24", height 9" Mass storage enclosure: width 19", depth 24", height 9"

SPECTRIX MICROSYSTEMS INC

431 Alden Road, No. 10
Markham, Ontario, Canada L3R 4N4
(416) 474-1955

Unix is a trademark of AT&T Corporation.
Multibus is a registered trademark of Intel Corp.
MC68000 is a trademark of Motorola Corp.

the micro and the minicomputer markets. They are also WANG 2200 compatible.

Spectrix Microsystems has gained extensive experience in producing and marketing these products. They are gaining valuable experience in a Manitoba pilot project where the SPECTRIX super microcomputer is being used with Telidon technology and Trigon software. SPECTRIX microsystems is a strong supplier in a very specialized niche.

4.2.4 Voice/Data Workstations

The voice/data workstation is essentially a combination of telephone and microcomputer. It can have fully integrated functions or can be "plastic" integrated (that is, a phone and computer together in a plastic case.) These products are recent entrants into the office automation market and are expected to become increasingly important.

Mitel is manufacturing a voice/data workstation called the KONTACT (Figure 4-6). The KONTACT is one of the first of its kind with integrated capabilities, handling voice, text and data. It can send or receive messages while the user is performing other tasks. The KONTACT's standard software includes: telephone, electronic mail, data communications, terminal emulations, word processing, spreadsheet and time management. Its hardware includes a built in modem, RS232C communications port, telephone, standard display and keyboard.

The KONTACT was the first of its type on the market, and presently there are few comparable products. (1985 is expected to see similar products from IBM and Northern Telecom. Rolm launched similar products in 1984.)

Lanpar, the national distributor of the KONTACT workstation, has installed approximately 300 units. Sales have been very disappointing. Part of the problem is that the KONTACT workstation is not able to run other popular software (i.e. IBM). While Mitel has no plan to produce an IBM compatible KONTACT in the near future, they may manufacture a UNIX based system, depending on what IBM does over the next couple of years. A further problem is price. The basic unit cost is about $5,300, with 246k RAM. This is considerably more than a displayphone, or other personal computers. While it has integrated voice/data features, the market has not yet accepted the need for such a higher priced workstation.

(See Section 4.3.1 for further analysis of Mitel in their main business area, the PABX.)

Northern Telecom is planning to market an integrated voice/data workstation in early 1985. There is a picture of it in their financial report, but details have not yet been released. The predecessor to this new voice/data workstation is the displayphone which was introduced a few years ago.

FIGURE 4-6

THE MITEL KONTACT

The two main uses of the displayphone are database access and electronic mail, in addition to its enhanced telephone features. The displayphone has been designed for use by management and executives. Its disadvantages are:

1) not price competitive compared with separate equipment;

2) limited display size

3) lacks computing capability;

4) lacks graphics capability;

5) 300 baud modem

6) small keyboard

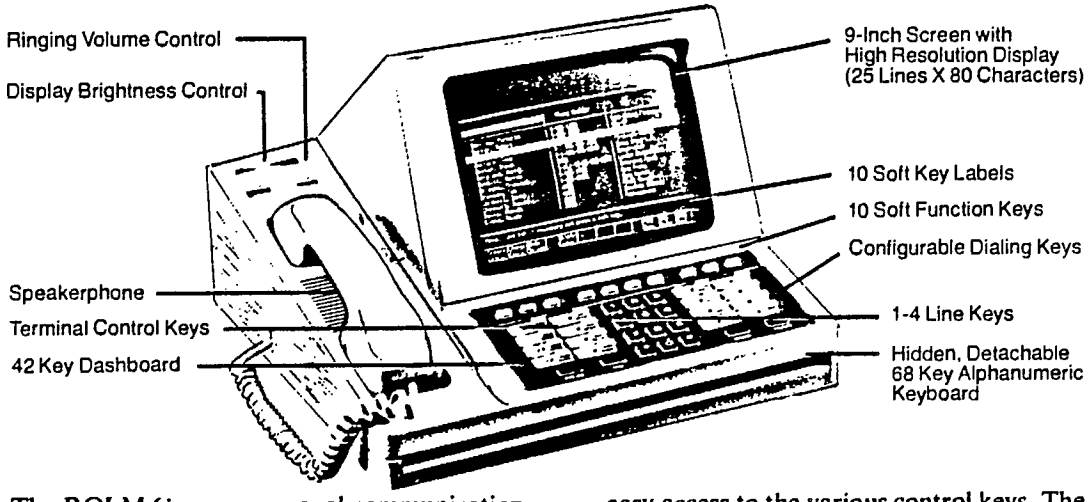
7) limited telephone directory

ROLM, a U.S. PABX manufacturer, recently introduced three new personal communications terminals called the Cedar, Cypress and Juniper. The Cypress (Figure 4-7) has a phone built into a terminal. It has a 128 kb dynamic RAM for program code and 8 kb non-volitile, removable RAM for personal data. The Cedar has the same functions as the Cypress, plus it is compatible with IBM PC software. The Juniper has the functionality of a personal computer coupled to a digital phone.

FIGURE 4-7

THE ROLM CYPRUS

THE CYPRESS PACKAGE



The ROLM Cypress personal communication terminal consists of four basic components:

1. **A 9-inch screen** displaying up to 25 lines of 80 characters, plus a special 48 character line for status information when used in the 3270 mode. This high-resolution screen (7 X 9 dots per character) is equipped with a brightness control and uses an anti-glare design for maximum readability.
2. **A multiple-section dashboard** giving the user easy access to the various control keys. The following groups of keys are conveniently mounted on the dashboard:
   - *A telephone dialing pad* that is also used as a calculator numeric pad.
   - *10 "soft" function keys*, which have different functions depending on how the Cypress terminal is being used.
   - *1-4 line keys* for accessing different telephone lines.

Again it is IBM PC compatible. The Juniper is the closest to the Mitel KONTACT. Although Rolm has a subsidiary in Canada, none of these products are manufactured here as yet.

Samanda of Mississauga is another recent entry into the personal communications workstation market. They will be manufacturing a unit with combined telephone and microcomputer features, targeted to the executive secretary. The workstation is based on Micom and Northern Telecom technology. It will not be IBM compatible, and the microcomputer capability will not be stressed because they hope to avoid the intense competition within the microcomputer market. The product will be priced in the $4,000 to $5,000 range. Without IBM compatability, Samanda may run into the same problems which have hit other non IBM compatible products.

Cygnet Technologies, of California, manufactures the only other competitive product to the KONTACT, called the CoSystem. It is similar to the displayphone, with a Z80 microprocessor. It supports PC-DOS and MS-DOS operating systems, ASCII terminal emulation and communications with the IBM PC/xT.

4.2.5 Other Systems

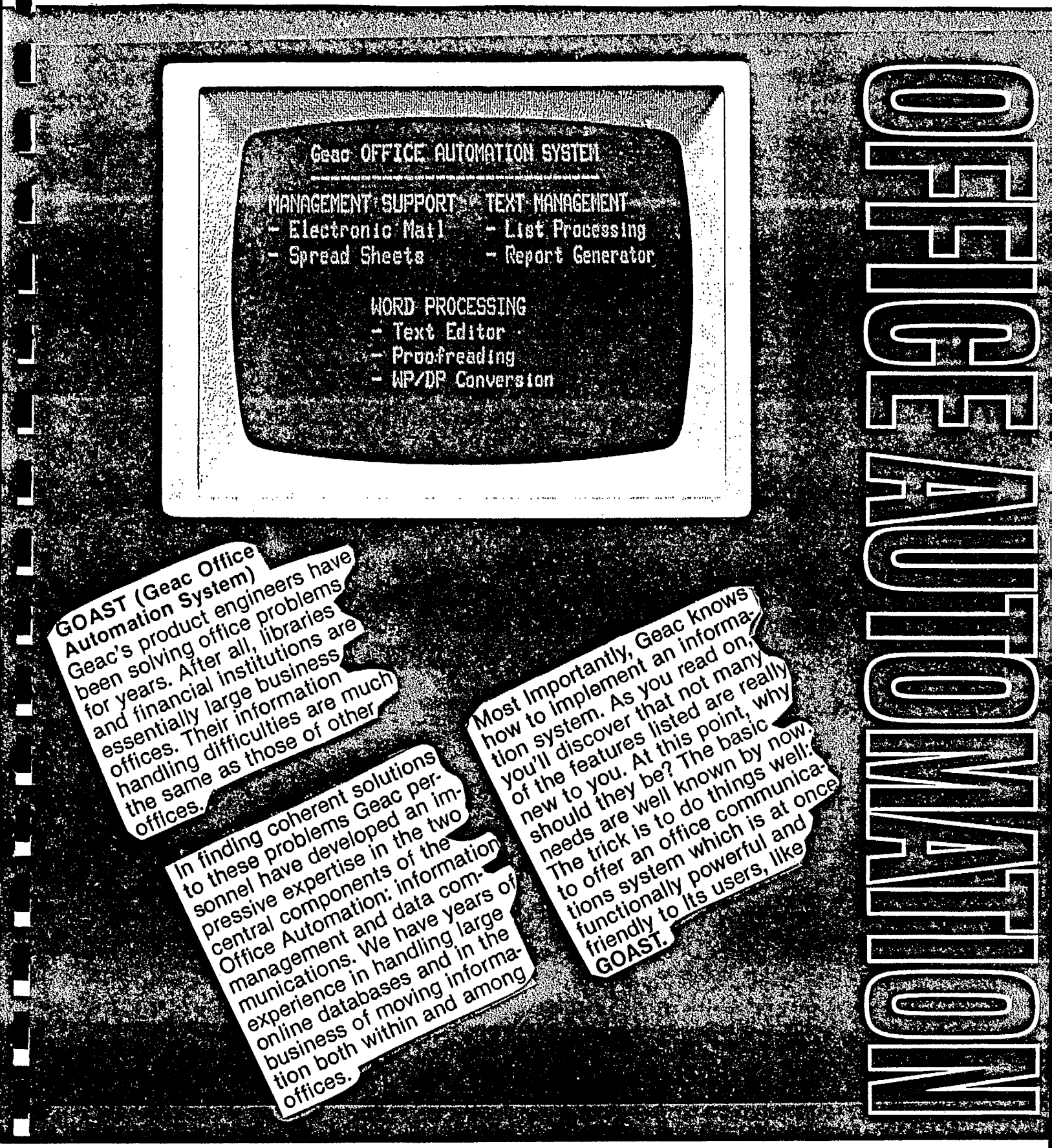
GEAC is the only Canadian mainframe manufacturer. Instead of competing directly with firms like IBM and DEC, they have developed a specialized niche for themselves in integrated

on-line processing systems for specific vertical markets, primarily financial institutions and libraries. GEAC has recently introduced a new office automation system, called Goast, to complement their current offerings. (See Figure 4-8) GEAC is strong in their specialized market area and it is expected that they will be equally successful in marketing the GOAST system, particularly to their installed customer base. Sources estimate that GOAST will account for revenue of over $10 million within the next two years.

GOAST provides complete office automation features including spread sheet, electronic mail, word processing, and electronic filing. The system is compatible with other GEAC installed systems. One major disadvantage of the GOAST system is its total reliance on the mainframe computer. If there are problems at the mainframe the whole network goes down. GEAC is also in the process of evaluating a number of new products which they have in the prototype stage, and in some cases test installed at customer sites. These products include a GEAC micro that is IBM compatible, a Financial Terminal Systems product, optical disc technology, "C" compiler, Relational Data Base Management System and a new family of terminals. GEAC is also conducting an office automation pilot project at the Ministry of State for Economic and Regional Development.

GEAC is currently a defensive supplier, producing office systems products to defend their installed base. They are currently moving towards being a niche supplier, specializing in

FIGURE 4-8: THE GEAC OFFICE AUTOMATION SYSTEM



financial and library market segments.

There are other firms in Canada manufacturing special terminals, including business graphics. These firms are outside the Terms of Reference; however, they deserve a brief mention.

* Matrox is a supplier of high resolution, interactive colour graphics terminals and is also a supplier of boards and related products.

* Electrohome Electronics has a unit for the display projection of microcomputer images, a high performance colour graphics terminal, and a number of other video display products.

* Norpak is one of the hardware suppliers for Telidon. Cableshare is another hardware participant.

The major international firms producing colour business graphics are Hewlett-Packard, IBM, and Datapoint.

4.3 Voice/Data PABXs

4.3.1 PABXs

Digital switching technology has gained wide acceptance since the introduction of the first digital PABX, the Rolm CBX in 1974. Today, it is estimated that over 10% of all PABX installations employ digital technology for both control and switching functions. In 1979 the role of the digital PABX was expanded through the introduction of new data interface equipment. These data interface products allowed terminals, computers, word processors and other data devices to be directly connected to, and have their data switched through, the digital PABX.

The digital PABX with its data interface modules has the potential to meet most of the office communications switching requirements, with the additional advantage of being able to permit simultaneous voice/data transmission over existing wiring. The PABX has become the focal point of the integrated electronic office, and a global race is on to integrate data handling capabilities with the traditional voice function of the PABX.

The major vendors include: American Telephone and Telegraph Company (AT&T) and the ITT Corporation, both of New York; Rolm Corporation of Santa Clara, California; and the Canadian firms Northern Telecom of Mississauga and Mitel

Corporation of Kanata. Table 4-6 details the product offering of these and other major PABX vendors.

There are four major Canadian vendors manufacturing digital PABXs. These are:

* Northern Telecom Ltd.
  Mississauga, Ontario

* Mitel Corporation
  Kanata, Ontario

* Microtel Ltd. (formerly AEL Microtel Ltd.)
  Burnaby, British Columbia

* TIE/Telecommunications
  Toronto, Ontario

Northern Telecom is the largest and is in the best competitive postion. Northern is one of the world's leading manufacturers of digital switching equipment, and has been a pioneer in the development and implementation of digital business communication systems.

Revenue for 1983 amounted to $3.3 billion, an increase of nearly 9% over 1982 revenue. Total revenue for 1984 is expected to exceed $4 billion representing an increase of more than 25% over 1983. Figure 4-9 illustrates the historic growth of sales and net income over the past five fiscal years.

TABLE 4-6

MAJOR VENDORS OF DIGITAL PABXs

MANUFACTURERS	FAMILY NAME	MODELS/LINE SIZES	FIRST DIGITAL PABX	INSTALLATIONS	INTEGRATED VOICE/DATA	ELECTRONIC MAIL	VOICE MAIL	PACKET INTERFACE	LAN INTERFACE
ROLM	CBX	VSCBX - 24 TO 144 SCBX - 48 TO 208 MCBX - 100 TO 800 LCBX II - 600 TO 1500 VLCBX - 1200 TO 4000	1974	6000 1982 - 11,000	ETS 100D RS 232C INTERFACE - 19.2Kbps DTI/DLI - DATA TERMINAL INTERFACE/ DATA LINE INTERFACE RS 232C INTERFACE - 19.2Kbps SUBMULTIPLEXING - UP TO 96Kbps USES TDM CONTROL CARD 56Kbps SYNCHRONOUS PLANNED FOR '83	YES - REMS - ROLM ELECTRONIC MESSAGE SYSTEM USES ETS 100D	YES	X.25 INTERFACE PLANNED FOR '83	NO
NORTHERN TELECOM, INC.	SL-1 AND SL-100	SL-1A TO 200 SL-1LE TO 1000 SL-1VLE TO 2500 SL-1IL TO 4500 SL-1ILE TO 8000 SL-100 TO 30000	1975	3000	ADM/DLU - ADD-ON DATA MODULE DATA LINE UNIT RS 232C INTERFACE 19.2Kbps NEEDS 2 TWISTED PAIR 56Kbps SYNCHRONOUS PLANNED	YES	NO	NO	HAS LICENSED ETHERNET
HARRIS - DIGITAL TELEPHONE SYSTEMS	DTS 1200	DI201 TO 520 ADDRESSES DI202 TO 992 ADDRESSES DI203 TO 120 LINES - 24 TRUNKS DI204 TO 992 (REDUNDANT DI202) DI205 TO 384 (REDUNDANT DI201)	1975	7000	PLANNED FOR FUTURE 9.6Kbps MODEMS USED UNTIL THEN	NO	NO	NO	HAS LICENSED ETHERNET
GTE AUTOMATIC ELECTRIC	GTD SERIES	GTD-120A TO 120 LINES - 28 TRUNKS GTD-1000 TO 1000 LINES - 256 TRUNKS GTD-4600-E TO 9200 LINES - 1152 TRUNKS	1976	6000	SDU/DACU - SUBSCRIBER DATA UNIT DATA ACCESS CHANNEL UNIT VOICE DIGITIZED AT SDU RS 232C INTERFACE 19.2Kbps SYNCHRONOUS TO 56Kbps NEEDS 3 TWISTED PAIR FOR SIMULTANEOUS VOICE/DATA USE T-1 LINK FROM DACU TO SWITCH PLANNED FOR 82-83 - USE MODEMS NOW	NO	NO	YES	NO
ROCKWELL - WESCOM	580 DSS	580VS TO 120 LINES - 48 TRUNKS 580S TO 576 LINES - 96 TRUNKS 580M TO 1152 LINES - 192 TRUNKS 580L TO 2304 LINES - 576 TRUNKS 580VL TO 11520 LINES (PLANNED FOR '82)	1975	120	DVSS - DATA/VOICE SWITCHING SYSTEM PLANNED FOR '82 RS 232C INTERFACE 9.6Kbps ASYNC. - 4.8Kbps SYNC. 64Kbps PLANNED NEEDS 3 TWISTED PAIR	NO	NO	NO	NO
NEC TELEPHONES, INC.	NEAX22	NEAX22VS TO 720 LINES - 144 TRUNKS NEAX22SA TO 1600 LINES - 336 TRUNKS NEAX22 TO 12000 LINES - 1920 TRUNKS	1978	500?	DATA MODULE/DATA LINE UNIT RS 232C INTERFACE 19.2Kbps ASYNC. - 56Kbps SYNC. NEEDS 3 TWISTED PAIR	NO	NO	NO	NO
STROMBERG-CARLSON (UNITED TECHNOLOGIES)	DBX	DBX - 150 TO 5376	1977/ 1978	120	COMPANDED PCM - 64Kbps.	NO	NO	NO	NO
AMERICAN TELECOM, INC. (FUJITSU)	FOCUS	FOCUS I TO 96 LINES FOCUS II TO 400 LINES FOCUS III TO 750 LINES (TO 1500 LINES WITH LIGHT LOADING)	1976	500	NO - MODEMS ONLY	NO	NO	NO	NO

TABLE 4-6 continued

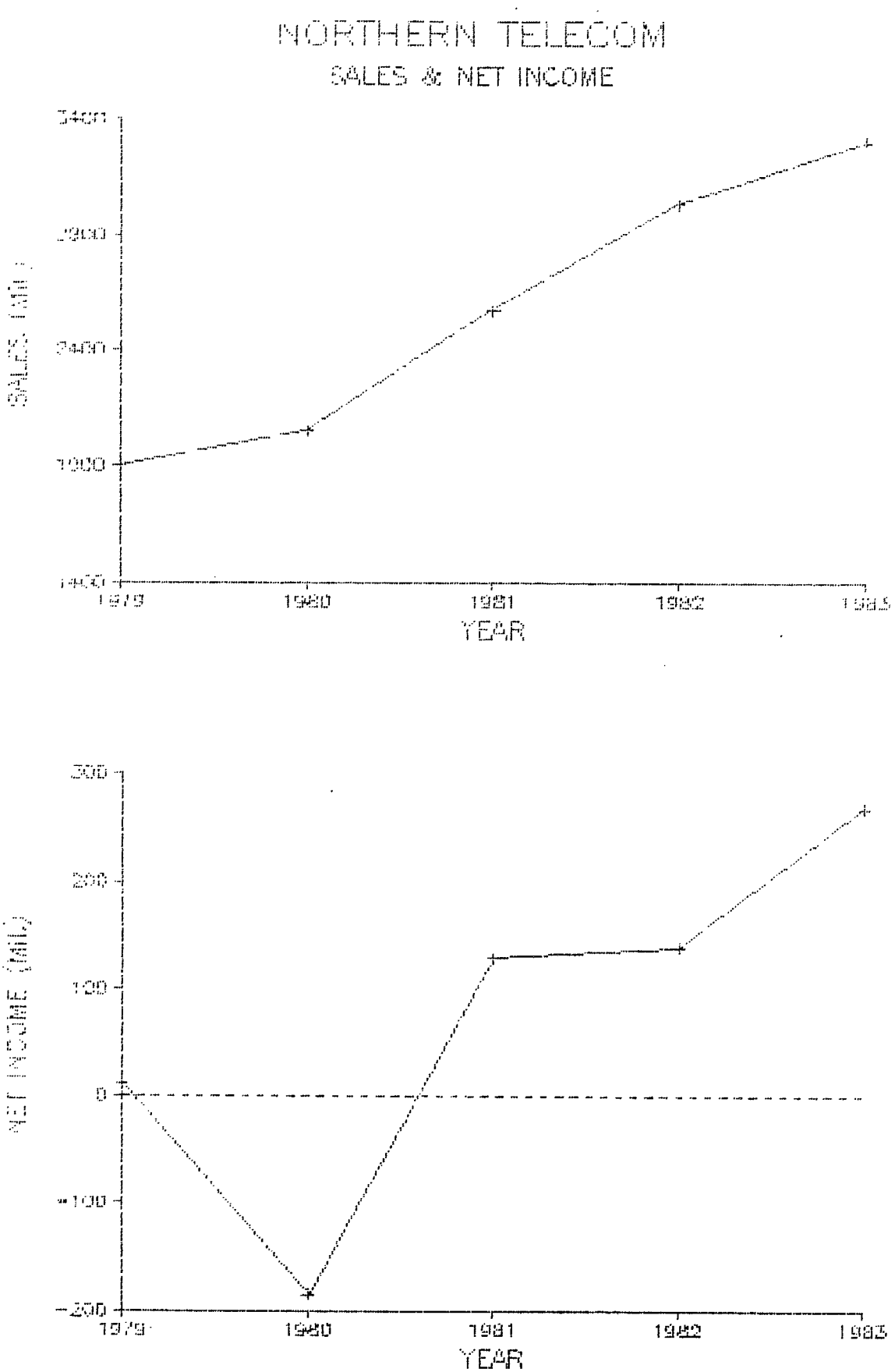
MANUFACTURERS	FAMILY NAME	MODELS/LINE SIZES	FIRST DIGITAL PABX	INSTALLATIONS	INTEGRATED VOICE/DATA	ELECTRONIC MAIL	VOICE MAIL	PACKET INTERFACE	LAN INTERFACE
OKI ELECTRONICS OF AMERICA	SPECTRUM	SPECTRUM 270 TO 4096 PORTS	1980	6	NO - MODEMS ONLY *(see below)	NO	NO	NO	NO
INTECOM, INC.	IBX S/40	IBX S/40 TO 8192 PORTS	1980 (1982)	6+	DATA OPTION BOARD ON DIGITAL PHONE DATA ACCESS BOARD ON INTERFACE MPIR DATA INTERFACE UNIT ON MASTER CONTROL RS 232C OR 449 INTERFACES 110bps TO 19.2Kbps ASYNCHRONOUS 1200 TO 57.6Kbps SYNCHRONOUS	NO	NO	YES - X.25 INTENET PACKET CONTROLLER	HAS LICENSED ETHERNET
DATAPOINT CORP.	ISX - INFORMATION SWITCHING EXCHANGE	ISX VERSION 1 TO 1288 PORTS ISX VERSION X TO 20000 PORTS	1981	2	DSU - DATA SERVICE UNIT (PLANNED) STAND ALONE OR WITH INFOSET I OR II RS 232C OR 449 INTERFACE TO 9.6Kbps ASYNCHRONOUS TO 56Kbps SYNCHRONOUS NEEDS 3 TWISTED PAIR	NO	NO	NO	YES DATAPOINT ARC
LEXAR (UNITED TECHNOLOGIES)	LBX - LEXAR BUSINESS EXCHANGE	LBX - 1024 PORTS	1981	6	LX-DATA RS 232C AND 449 INTERFACES ASYNCHRONOUS TO 19.2Kbps (ALT. VOICE/DATA) TO 4.8Kbps - SIMULTANEOUS SYNCHRONOUS PLANNED TO 56Kbps 2 PAIR	NO	NO	NO	PLANNED FOR LEXAR DATA HIGHWAY ALSO HAS LICENSED ETHERNET
MITEL	SX-2000	SX-2000 TO 91392 17 GROUPS @ 5376 LINES/GROUP	MAY 1983		DATA OPTION ON SUPERSETS RS 232C AND 449 INTERFACES TO 19.2Kbps ASYNCHRONOUS TO 56Kbps SYNCHRONOUS PLANNED DATA ONLY OPTION - TO 256Kbps 2Mbps HOST-TO-HOST SWITCHING PLANNED	PLANNED	PLANNED		ETHERNET
ANDERSON JACOBSON, INC.	IOX - INTEGRATED OFFICE EXCHANGE	IOX-1024 TO 1000 PORTS UP TO 930 PORTS, UP TO 930 TRUNKS, UP TO 16 ATTENDANT CONSOLES IOX-16000 TO 16000 PORTS	1982	1	DATA INTERFACE OPTION ON PHONES RS 232C INTERFACE TO 19.2Kbps ASYNC. AND SYNC. PLAN FOR 64Kbps, 256Kbps AND 2Mbps			PLANNED - TELENET, TYMENET, SNA/SDLC	PLANNED
SIEMENS CORP.	SATURN III	SATURN III TO 992 PORTS	1982	2	ASYNCHRONOUS AT UP TO 19.2Kbps	NO	NO	NO	PROBABLY PLANNED
HITACHI	DCC - DIGITAL COMMUNICATIONS CONTROLLER	DX-30 TO 300 PORTS DX-? TO 5000 PORTS		1	YES - 9.6Kbps ASYNCHRONOUS 56Kbps SYNCHRONOUS PLANNED	YES	YES	YES - X.25	
ITT	DCS - OFFICE COMMUNICATIONS SYSTEM	DCS 300 - 50 TO 300 LINES	APRIL 1983	NONE					
AMERICAN BELL	DIMENSION AIS/SYSTEM 85	SYSTEM 85 TO 1536 PORTS	1983^ (below)	SECOND HALF OF 1983	ASYNCHRONOUS TO 19.2Kbps 64Kbps PLANNED	YES		PROBABLY TO AIS/NET1000	

* Can have data equipment shelf - up to 16 terminals through standard computer data interfaces.

^ 4 in field test

SOURCE: Survey of Available PABX's
Digital PABX Functions Features & Applications.
1983 Carnegie Press, Inc.

FIGURE 4-9



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Northern's key strength is in the company's commitment to research and development. Bell Northern Research (BNR) is by far the largest private research organization in Canada. BNR, Northern's research arm, is jointly owned by Northern Telecom (70%) and Bell Canada (30%). Expenditures on R&D alone amount to about 7% to 9% of annual revenue. R&D plus overall capital investment will total approximately $900 million in 1984, with about half of the capital investment in Canada.

In digital switching equipment, Northern has a significant marketing and technological edge and enjoys large economies of scale in manufacturing and distribution. At the heart of Northern Telecom's digital business communications systems is the SL family of PABXs. One of the major features of the SL family is the product's large degree of versatility.

> "A wealth of software written to support the SL-1, offers special features for industry, government, health care facilities, hotels and motels, and educational institutions. New capabilities were added to the SL-1 during 1982 and beyond, including interface capability with digital networks; compatibility with X.25 data protocol to enable operating with the SL-10 system in data packet networks; synchronous data capability and connectivity with selected local area networks."[4-2]

In 1978 Northern acquired two U.S. data processing firms, Sycor Incorporated and Data 100 Corp. These firms were

leaders in the design and marketing of terminal-based networks for distributed information systems. Datamation analyzed this acquisition in its June 1984 publication:

> ".... The Canadian telecommunications hardware vendor bought several U.S. data processing companies in the late 1970's in hopes of meshing their terminals and CPU's with PBX's and other gear and creating the office of the future available from one vendor. Instead it lost key DP designers and marketers, customers and money. In 1983, however, the hemorrhaging ended when the company announced that the last consolidation of its DP operation into an Electronic Office Systems group (EOS) led to break-even or marginally profitable operations at year end."

As a result of these acquisitions, Northern obtained the technology associated with Sycor's Models 445 and 585 distributed data processing systems. This technology significantly strengthened Northern's data processing capability.

In an industry sector characterized by competitor allegiances Northern Telecom is apparently going it alone. However, agreements have been reached with such major companies as Digital Equipment Corporation, Sperry Inc., Hewlett-Packard, Data General and Wang. The focus of these agreements has been to allow compatibility between Northern's digital business communications products and the data processing hardware of the other companies. This is part of Northern Telecom's Open World Concept.

The "Open World" will enable organizations to connect many types and makes of equipment into one integrated system which can then evolve as requirements and technology evolve. The Open World concept has placed Northern Telecom in a key competitive position. Many analysts believe that because of the large number of office products available from different vendors, the key to integration will be open communication systems. To test this concept Northern Telecom, Bell Canada and Sperry Inc. have recently conducted field trials on the integration of office communications, host computer and workstations. The trials allowed 20 Sperry workstations to be linked to a host computer via Northern Telecom's SL-1 digital switch. It is one of the first office automation trials using existing equipment and with communications over ordinary telephone wires.

Northern is involved in a major field trial carried out as part of the Office Communications Systems (OCS) program administered by the Federal Department of Communications. The trial is being carried out at the Department of Revenue (Customs and Excise) by Bell Northern Research. The development of the integrated office system is divided into two phases:

1) The initial phase involves
   - one digital PABX switch located in the Toronto regional office and one in Ottawa;
   - fifty workstations installed in Toronto and fifty in Ottawa, distributed primarily amongst the Tax Interpretation and Special Audit divisions;

- the system provides:
  - electronic messaging
  - advanced telephone service
  - personal filing
  - report production.

2) The second phase involves:
   - expansion of the system incorporating more areas of the Department.

Table 4-7 outlines the equipment Bell Northern Research is using in the OCS Field Trial. In 1985 they will be offering more sophisticated integrated office systems including an integrated voice/data workstation.

Northern Telecom's experience in digital communication technology along with a solid commitment to make its products compatible in the Open World concept, have helped ensure Northern's role as a key niche supplier in the office communications systems market. Further, Northern's acquisition of data processing expertise and its program of compatibility with major mainframe suppliers may give it the capability of becoming a total systems supplier.

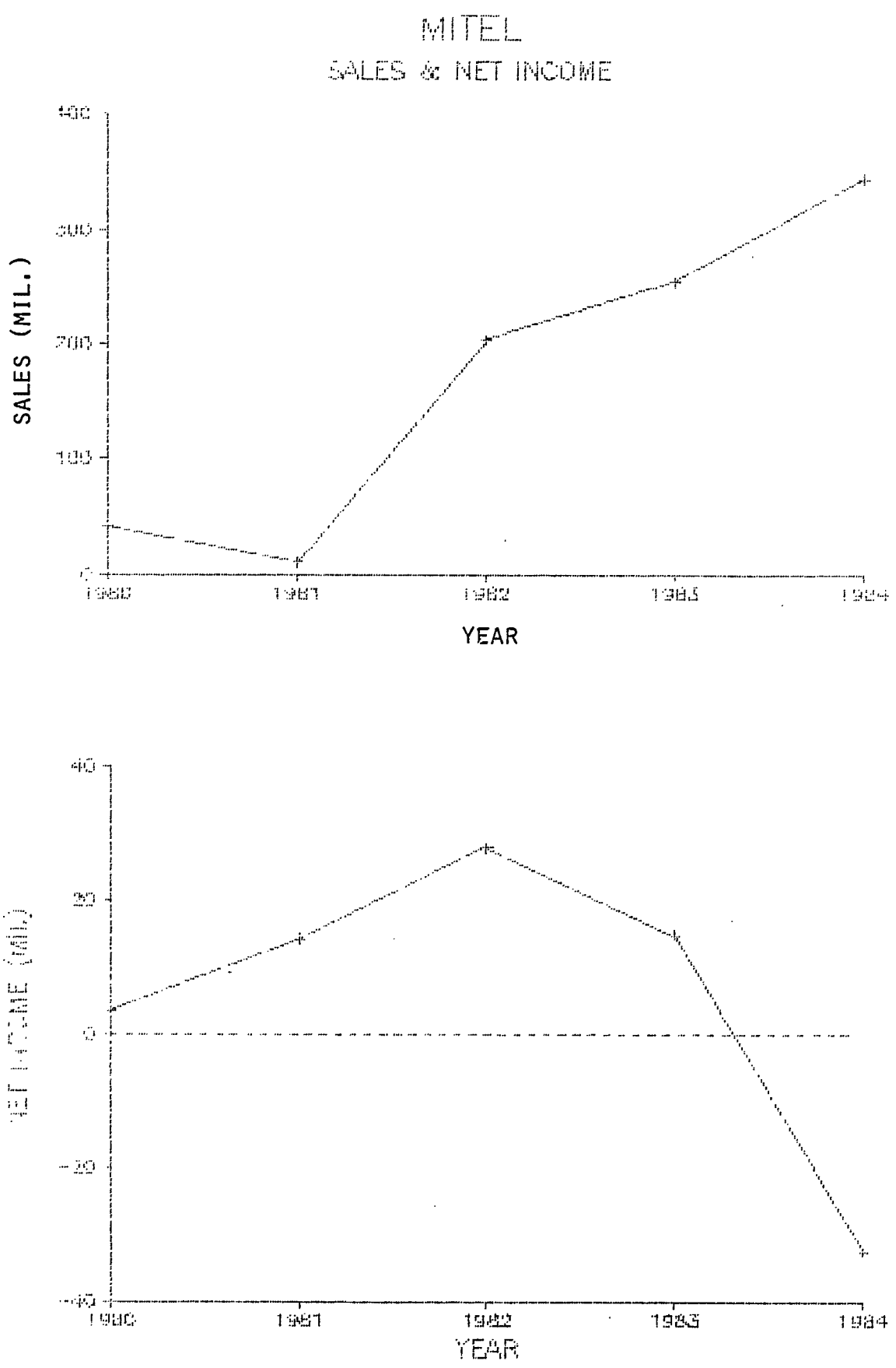
Mitel Corporation of Kanata is the next most important Canadian supplier of PABX's. Until 1981 Mitel had enjoyed phenomenal growth, experiencing eight consecutive years of revenue doubling. Figure 4-10 illustrates the trend in sales and net income over the last five fiscal years. For fiscal 1984,

TABLE 4-7

BELL NORTHERN RESEARCH FIELD TRIAL
AT
CUSTOMS AND EXCISE

Northern Telecom Ltd.	-	SL-1 Switching Equipment, Nodes, Modules (Data)
	-	Telephones and Displayphones
Digital Equipment Corporation	-	VT 100 Terminals
Gandalf Technologies Inc.	-	Statistical Multiplexers, Modems and Datasets
TEK	-	Printers
OKI Electronics	-	Printers

FIGURE 4-10



ROBERTSON NICKERSON LIMITED

revenues totalled $343 million, an increase from $255 million in 1983. However, even with this substantial growth, Mitel incurred a loss of over $30 million in 1984, counting extraordinary items. Financial losses were coupled with layoffs at many plants and at Mitel's Kanata headquarters.

During the rapid growth years, Mitel's strength was in the small to medium size PABXs. Their overall share of the U.S. PABX market was 12% in 1982. In comparison, however, their share of the under 100 line segment was 36%, more than three times its nearest competitor. In order to capitalize on this large base, Mitel introduced the Generic 1000. The Generic 1000 allows earlier Mitel switches to be upgraded with modern digital technology. Northern Business Information estimates this product will allow Mitel to capitalize on an existing base of over two million lines.

Mitel's entry into the office of the future has been its digital PABX, the SX2000. Mitel finally began shipment of the SX-2000, in January of 1984. Delays of more than a year in the introduction of the SX-2000, have cost the company dearly. IBM cancelled its agreement with Mitel; a Canadian dealer dropped the SX-2000 in favour of the Saturn Series of digital PABXs made by Siemens Electric Ltd., citing the consistent failure of Mitel in meeting stated delivery dates, and others followed. Although the SX-2000 is now being produced, so are similar products by at least four other competitors. Most notable is the 2400 made by the Nippon Electric Company (NEC) of Japan. Northern Business

Information estimates that NEC had completed about 30 installations of the 2400 by January 1984. Also, Mitel has all but been shut out in sales of the SX-2000 to the U.S. regional telephone companies.

Mitel hopes to be producing about 50 SX-2000s per month by the end of 1984 thus contributing about $50 million in revenue for fiscal 1985. As of December, 1984 a total of 96 SX-2000s had been installed in four countries. Many analysts feel the success of the SX-2000 is vital to the short-term well being of Mitel.

Further product enhancement involves a technology development agreement with Octel Communications Corporation of San Jose, California. The agreement provides for the development and use of Octel's Aspen voice messaging system on Mitel equipment. Development of this system will give voice messaging features to a range of Mitel's PABXs including the SX-100, SX-200, and SX-2000. Together with the Generic 1000, Mitel has a good opportunity to offer certain office automation features on some of its existing installed base.

In May of 1983 Mitel ceased development of Skyswitch (a satellite communications switch). However, Mitel still has an interest in Skyswitch. SED Systems Inc. of Saskatoon along with Mitel, are major shareholders in Skyswitch Satellite Communications Company of Denver, Colorado. The company hopes to manufacture and market satellite communications technology previously developed by Mitel. In 1982, Mitel and IBM announced

plans to develop a product similar to the SX-2000 that would link with IBM's computer products. However, on July 10, 1984 IBM dropped Mitel and entered into an agreement with Rolm. Since then, IBM has acquired ownership of Rolm, one of Mitel's major competitors.

Mitel's other office product offering is their KONTACT workstation. This has been already discussed in Section 4.2.4.

Mitel has been the shining light of the Canadian "high tech" industry, with its good product line and rapid growth rate. During the past year and a half it has suffered financial losses, management turmoil (with five key executives leaving), a plant closing, loss in investor confidence, problems in delivering the SX-2000, and loss of the IBM agreement. On the positive side Mitel has reached agreements with a number of other companies such as WANG; they are finally delivering the SX-2000; and they have a large installed customer base. As such, Mitel has the potential to be in a sound competitive position as a niche supplier of office communications equipment.

Microtel Ltd. (formerly AEL Microtel Ltd.) was formed through the amalgamation of Automatic Electric (Canada) and Lenkurt Electric (Canada). Microtel's immediate parent is the British Columbia Telephone Company (B. C. Tel) which is ultimately controlled by the General Telephone and Electronics Corporation (GTE) of Stanford, Connecticut. For the first nine months of 1984, Microtel reported an operating loss of $9

million, on sales of $98 million versus a profit of $1.8 million on sales of $145 million in 1983. Microtel employs approximately 2800.

Due to these losses, Microtel has begun restructuring to streamline company product offerings, expand exports and increase profitability. They have dropped several product lines, including certain types of analog multiplex equipment, some telephone sets (such as rotary dial), and some analog PBX equipment. They have consolidated manufacturing activities by closing their Winnipeg plant and selling off their telephone interconnect business. They have also reorganized their marketing department. Microtel is currently concentrating on five product lines: the Spacetel satellite communications system, the System 51 switch, digital transmission products, cellular mobile radio, and their VLSI circuit shop.

Microtel has negotiated world product mandates on several product lines from its U.S. parent, GTE. These include System 51 monitoring devices and the Spacetel satellite communication system. Spacetel incorporates a computer controlled method of sharing the transmission circuit to and from the satellite. This significantly reduces satellite communications costs. Microtel is working to enhance Spacetel so it can be marketed as a closed communication system for companies wishing to transmit inter-office data.

One of Microtel's key strengths is its association with Automatic Electric, the manufacturing subsidiary of its American parent, GTE. The family of digital systems introduced by Microtel in 1982 centres around the GTD EAX#5 switchboard developed in cooperation with Automatic Electric in the United States. Last year, GTE announced a new digital PABX, the Omni. Microtel has been negotiating with GTE for the introduction of the Omni into Canada.

Microtel's primary weakness has been its domestic orientation. A large portion of the company's sales have been to domestic customers, with B.C. Tel and Quebec Telephone being the major buyers. In 1982 for example, exports accounted for only 15% of sales. Since then the company's new strategy has been to focus on a relatively narrow market segment and to move vigorously into the U.S. market. Backed by GTE, Microtel should be able to develop a major niche position as a supplier of communications systems to the integrated office. While much of its product line has been aimed in the past at domestic markets, it is now taking a world product mandate strategy.

TIE/Communications Canada Ltd. of Toronto is planning to produce a new digital PABX, the Mercury, in its new automated assembly plant in Sherbrooke, Quebec. The Mercury was acquired, unfinished, from Plessey Canada when TIE agreed to purchase Plessey Canada from Plessey Company of Britain. TIE is supported in this venture by the marketing strength and expertise of its U.S. parent company TIE/Communications Inc. of Shelton,

Connecticut. The acquisition of Plessey places TIE in direct competition with other established Canadian companies, such as Northern Telecom and Mitel.

Assistance from the Canadian Industrial Renewal Board in the form of a grant of $8.3 million has aided TIE in the expansion of their Canadian operations. $5.6 million went to assist in the construction and pre-production expenses for their new plant in Sherbrooke, Quebec and a further $2.7 million went to enhance the R&D operations in Toronto, where advanced software is being developed for the TIE PABX. Revenue for 1983 amounted to $18.3 million, up from $11.6 million the previous year.

TIE recently announced marketing agreements with Bell Canada, B.C. Tel, and CTG. The agreement with Bell is worth over $20 million and allows Bell to market TIE's Meritor family of electronic key telephone systems throughout Bell's operating territory. The Meritor systems are to be built in TIE's Sherbrooke plant. The agreement with B.C. Tel is similar and is worth about $4 million. The agreement with CTG (TIE's largest independent dealer) is for $6 million in microprocessor-controlled communications equipment, TIE's Ultracom and Ultrakey electronic key telephone systems and its new digital PABX, the Mercury.

TIE/Communications Canada Ltd. will be a strong niche supplier of Canadian manufactured communications equipment to the automated office.

4.3.2 Communications Devices

This analysis deals primarily with modems and multiplexers, a product area where Canadian companies are actively involved.

The widespread use of distributed data processing has fuelled a dynamic market growth rate for both modems and multiplexers. 1982 shipments of modems by U.S. manufacturers totalled about $950 million. Multiplexer shipments totalled about $220 million. There is intense competition in this market with about 75 modem vendors and 35 multiplexer vendors competing for market share.

Table 4-8 details some of the leading U.S. based manufacturers plus Gandalf Technologies (Ottawa, Canada). In addition to Gandalf, other major Canadian manufacturers include Develcon Electronics, ESE Limited, and Tran Communications.

Gandalf Technologies is the leading Canadian manufacturer of data communications equipment with revenue of $58.6 million in fiscal 1984. Figure 4-11 contains information on their revenue trend over the past five years, as well as their net income. Gandalf realized an increase of 15.2% in revenue over 1983, and an increase of 35.8% in net income. Research and development expenditures rose from 7.9% of revenue in fiscal 1982 to 11.1% in fiscal 1983, and were 13.2% of revenue for fiscal 1984. This increase in R&D expenditures is in response to

DATA COMMUNICATION INDUSTRY
DOLLAR VALUE OF WORLDWIDE 1982 SHIPMENTS OF MODEMS AND MULTIPLEXERS
BY U.S. - BASED MANUFACTURERS

TABLE 4-8

COMPANY	MODEMS			MULTIPLEXERS		
	$ VALUE OF SHIPMENTS	% OF TOTAL SHIPMENTS	MARKET-SEGMENT STRENGTHS	$ VALUE OF SHIPMENTS	% OF TOTAL SHIPMENTS	MARKET SEGMENT OF SHIPMENTS
	$ IN MILLIONS			$ IN MILLIONS		
Rachel Milgo	198	20.8	M,H	-	-	-
Codex (Motorola)	160	16.8	M,H	55	25.0	M
Paradyne	125	13.2	M,H	2	.9	-
A T & T	110	11.6	L,M	-	-	-
Racel Vadic	85	9.0	L	-	-	-
UDS (Motorola)	50	5.3	-	-	-	-
General Data Comm.	43	4.5	L,M	13	5.9	H
Gandalf	23	2.4	SHM	5	2.3	-
Intertel	16	1.7	-	-	-	-
Micom	7	.7	-	34	15.5	L
Infotron	-	-	-	30	13.6	M,H
Timeplex	-	-	-	25	11.4	M
Rexon	52	5.5	-	10	4.5	-
Digital Communication	-	-	-	7	3.2	-
Other	81	8.5	-	39	17.7	-
Total	950	100		220	100	

MODEMS:
L= low speed-1200 bps or less
M= medium speed - between 1200 and 2400 bps
H= high speed - greater then 2400 bps
SHM= short haul modems

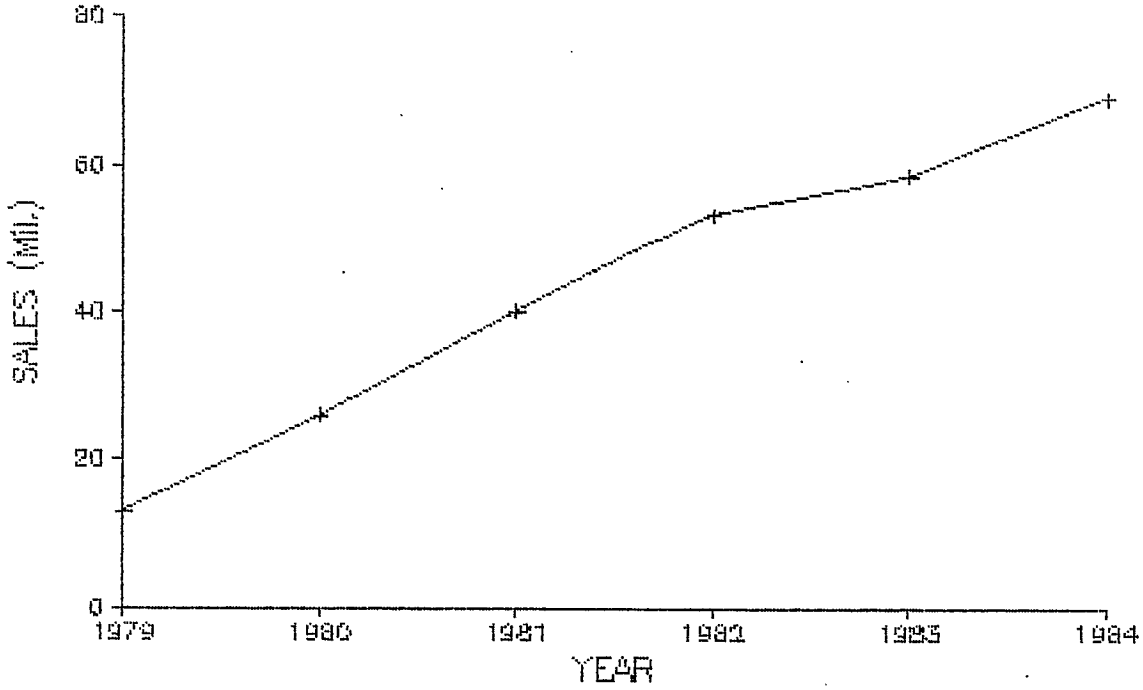
MULTIPLEXERS:
L= low end (1 to 16 input channels)
M= medium (24 to 96 input channels)
H= high (96 input channels or more and high capacities e.g. wideband)

SOURCE: DATA COMMUNICATIONS EQUIPMENT INDUSTRY, KIDDLER, PEABODY & CO. - AUGUST 2, 1983

FIGURE 4-11

GANDALF TECHNOLOGIES INC.

SALES & NET INCOME



increased competition and a need for the company to revamp almost its entire product line. R&D expenditures are expected to stabilize at about 11% of revenue. Gandalf employs approximately 1000.

Gandalf primarily manufactures local data sets (short haul modems) and private automatic computer exchanges (PACXs). The company has significant market strength in the short haul modem market with about 50% market share. This stems from the company's traditional ability to design and sell products to meet the requirements of limited distance transmission over local networks. In addition to an extensive line of modems, the company also markets a device called the "line miser". This device allows existing telephone wiring to be used simultaneously for voice and data transmission. Data does not pass through a telephone PABX but is switched by Gandalf's PACX, which sits next to the PABX. This provides the voice/data handling capability of a digital PABX.

Gandalf manufactures a wide variety of PACXs. The most recent, the PACX 2000 (Figure 4-12) is designed to provide a communications link between personal computers, terminals, word processors, printers and other equipment. It is a software controlled distributed switching system which can handle up to 896 intelligent devices. Multiple systems can also be interconnected to form a network capable of handling thousands of attachments. The PACX 2000 is a new product line positioned to penetrate the market for networking applications in the automated office.

FIGURE 4-12: THE GANDALF PACX 2000

The PACX 2000 In The Background

Gandalf has a reputation for producing good, reliable, well manufactured equipment. They have recognized the market trends and where they can excel in satisfying their customer needs. The greatest difficulty ahead for Gandalf may be increasing competition between the PABX, LAN, and PACX technologies. However, the industry view is that different applications and customers will evolve for each of these three technologies. Therefore, it is expected that Gandalf will remain a strong successful niche vendor providing communications systems and equipment for the automated office.

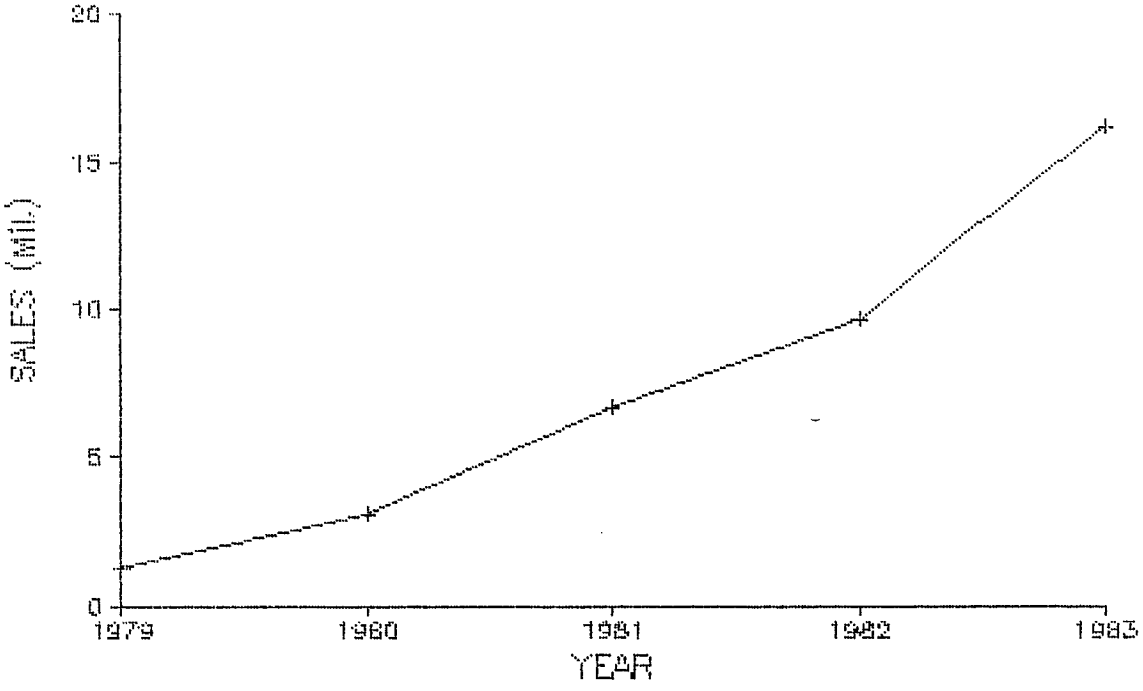
Develcon Electronics Ltd. of Saskatoon specializes in modems and data switching systems. (Recently, they also began to deliver a local area network called Develnet, which is discussed in Section 4.4 of this report). In fiscal year 1984 Develcon reported sales of $20.3 million and net income of $.89 million. Figure 4-13 illustrates their sales and net income for the past five years. Develcon spent $572,000 on research and development in 1983 (3.5% of sales). They employ approximately 120.

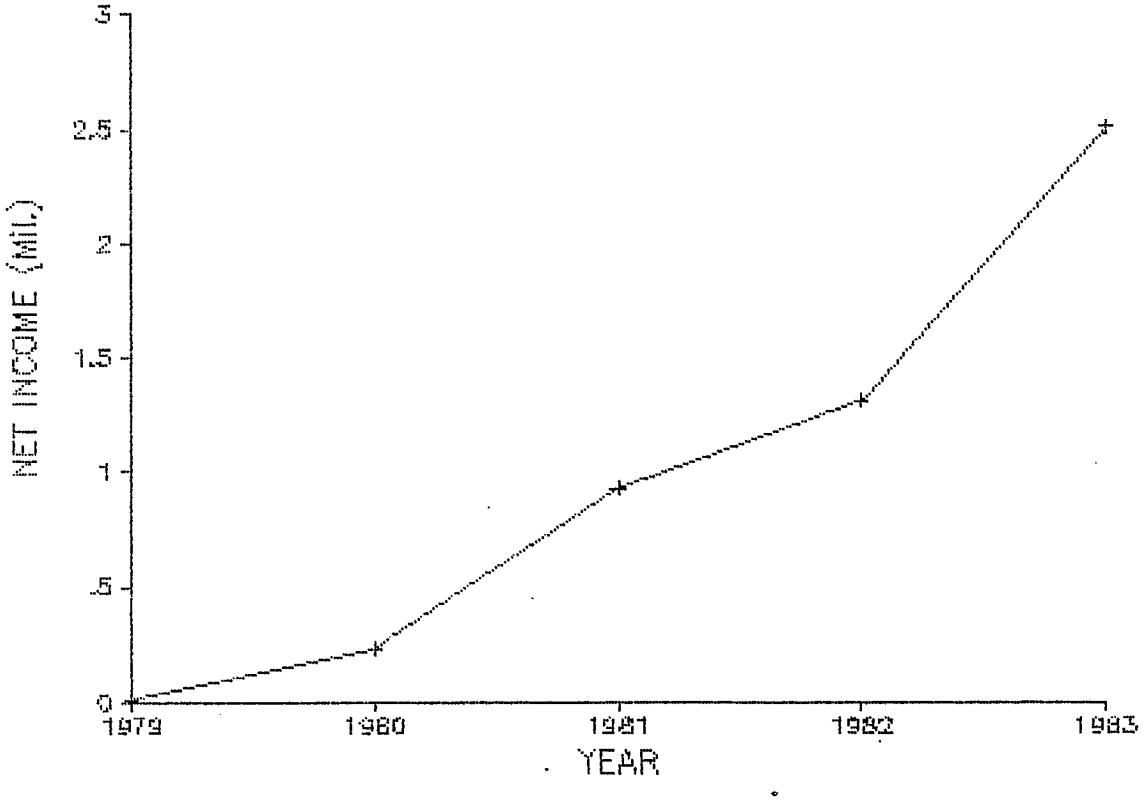
The U.S. is Develcon's major market, accounting for over 67% of sales in 1983. To further aid in the penetration of the U.S. market and to combat intense competition, Develcon's strategy has been to build a strong U.S. sales and distribution network and establish brand recognition. They have had a number of problems with their U.S. branch and recently underwent a major reorganization. One indicator that the reorganization may have been successful, is a recent contract valued at $5.2 million with NASA for the supply of data communications equipment.

FIGURE 4-13

DEVELCON ELECTRONICS

SALES & NET INCOME





ESE Limited of Toronto is part of the Motorola Information Systems Group. Other group members include Four-Phase Systems and Universal Data Systems. ESE designs and manufactures data and telecommunication products for worldwide markets and offers a complete line of modems and multiplexers. As part of Motorola's Information Systems Group, ESE can rely on Motorola's expertise in semiconductor technology and the group's expertise in distributed data processing.

Late in 1983 ESE announced the construction of a new 27,000 square foot manufacturing facility. About two-thirds of the new plant's production is aimed at the U.S. and other export markets.

Motorola Information Systems Ltd. was formed by the merger of ESE Ltd. and Four Phase Systems. Also included in this corporate family is Codex and Universal Data Systems. Mortorola supplies a complete range of telecommunications products, i.e., PABXs, multiplexers, data network products, business computers, and office automation products. Their fiscal 1983 sales were $514 million with a loss in net income of $5 million.

In 1984, Motorola Information Systems completed construction of a $14 million headquarters facility in Brampton, Ontario. This facility employs 500-600 and has approximately 50,000 sq. ft. of manufacturing space primarily for the production of multiplexers and modems.

Tran Communications Ltd. Mississauga, was a subsidiary of Tran Telecommunication Corporation of the U.S. They were purchased by the U.S. computer manufacturer, Amdahl Corporation, and Tran now forms part of Amdahl's Communications Systems Division. Tran manufactures digital time division multiplexers and limited distance data sets in Canada, and reports sales in excess of $18 million. TRAN is well positioned for the manufacture of time division multiplexers capable of operating on T-1 lines. The demand for such devices will increase as T-1 services become more popular amongst business users.

4.3.3 Digital Voice Messaging

Digital voice messaging systems are already being introduced in Canada by Bell and several of the provincial telephone companies. The Manitoba Telephone System is currently operating the "Hello Central" system as a value added service to subscribers; Sask Tel has introduced a similar service; and B.C. Tel has also announced its intention to establish a service.

Bell Canada's digital voice messaging system is currently undergoing field trials. This involves the testing of two types of systems. One is based on a public network concept and operates on a similar basis to the Envoy 100 electronic mail system. The second involves integrating a digital voice messaging system with a digital PABX. This is intended to provide private network services suitable for corporate messaging requirements. Northern Telecom has also recently announced an

agreement with Comterm of Montreal to adapt Comterm's voice messaging system to its SL-1 switch.

Glenayre Electronics of Vancouver has acquired the rights to a voice mailboxing system developed by VMX Inc. of Dallas, Texas. Potential applications include connection to an office PABX. Glenayre employs 165 people and has sales of $15.5 million. Their primary business is train control systems, radio communications, and custom electronics.

Communtron Ltd. of Toronto manufactures digital voice storage systems for use in applications where a caller must wait for a free operator, for example, airline reservation numbers or catalogue ordering. Although this type of system is not capable of store and forward, it is providing the company with valuable experience in digitized voice storage. Communtron has sales of $1.5 million and employs 25.

Voice and Data Systems of Nepean, is developing a voice messaging system. Using a digital touchtone telephone, their system will permit users to send and receive voice messages through a combination of voice "mailbox" and "store and forward" techniques.

4.4 Local Area Networks

A Local Area Network (LAN) is a communications system allowing a number of information processing devices to communicate on a local basis. Such a system does not cross public boundries or become subject to CTRC/FTC regulations. Thus, a LAN would be used within a building or between buildings for sharing different computer and peripheral resouces. It would normally be the property of the companies and institutions using it. (Technical details on local area networks are provided in Chapter 3 of this report.)

The leading firms supplying LANs are 3M, Datapoint, Xerox, Wang, Hewlett-Packard, Digital Equipment, Prime Computer, IBM and NEC. Table 4-9 illustrates some of the major companies producing LANs, their types and characteristics. In Canada there are basically six companies producing local area networks. They are Canstar, Develcon, DY-4 Systems, Nortel, NET ONE Data Corporation, and the University of Waterloo.

Canstar Communications, a unit of the Canada Wire and Cable Co. Ltd. (part of the Noranda Group), has developed a local area networks (Hubnet) utilizing fibre optic technology. The company was established in 1977 as a result of the work carried out by Dr. Stewart Lee and Dr. Peter Boulton of the University of Toronto to develop a network for the University campus. Canstar expects to begin full scale marketing of the Hubnet System in 1985, with a medium sized, high-speed LAN costing approximately

TABLE 4-9

LAN VENDORS

COMPANY	NETWORK	NETWORK TYPE: Baseband	NETWORK TYPE: Broadband	ACCESS METHOD: Contention	ACCESS METHOD: Token Passing	ACCESS METHOD: Other	TRANSMISSION SPEED: to 1M bps	TRANSMISSION SPEED: to 2M bps	TRANSMISSION SPEED: to 10M bps	TRANSMISSION SPEED: over 10M bps	CABLE LENGTH: to 2000 ft	CABLE LENGTH: to 5000 ft	CABLE LENGTH: over 5000 ft	GATEWAYS: IBM SNA/SDLC	GATEWAYS: X.25	GATEWAYS: Xerox Ethernet	GATEWAYS: Other	APPLICATION AREA: General Business	APPLICATION AREA: Electronic Mail	APPLICATION AREA: Word Processing	APPLICATION AREA: Industrial	APPLICATION AREA: Other
A.B. Dick	the Loop	●			●		●					●						●	●	●		
Amdax	Cablenet		●			●			●	●			●			●	●	●	●	●	●	●
Apollo	Domain	●			●					●		●				●		●	●		●	●
Convergent Technologies	LRS	●				●		●			●					●		●	●		●	
Corvus Systems	Omninet	●			●		●					●				●						●
Data General	XODIAC NBS	●			●			●				●				●			●		●	
Datapoint	ARC	●				●			●		●	●				●		●	●	●	●	
Digital Equipment	DECdataway	●				●	●					●					●				●	
Electrosound Systems	DLX-10	●			●		●					●									●	
Electrosound Systems	DLX-320	●			●		●					●							●		●	
Gould	Modicon Modbus	●				●	●						●				●				●	●
Gould	Modicon Modway	●			●	●		●					●			●					●	●
Hewlett-Packard	Interface Bus	●				●			●		●						●				●	●
IBM/NAD	8100	●				●	●				●			●		●		●	●	●		
IBM/NMP	Series/1 Ring	●			●			●				●				●						
Intecom	InteNet	●				●	●						●			●	●	●	●	●		
Interactive Systems/3M	VIDEODATA		●			●	●						●				●			●	●	
Logica	Polynet	●			●				●		●					●	●	●	●	●	●	
Molecular Computer	INFINET I	●			●		●				●									●		
Molecular Computer	INFINET II	●			●		●				●									●		
Network Systems	HYPERchannel	●			●					●		●					●			●	●	
Nestar	Cluster/One	●			●		●				●						●	●	●	●		
Novell Data Systems	Novell 2000	●				●	●					●					●			●		
Ohio Scientific	IBS-NET	●				●	●				●	●				●	●	●	●	●		
Prime Computer	Ringnet	●			●			●			●					●		●	●	●	●	
Sperry Univac	SHINPADS	●				●			●		●						●				●	
Standard Engineering	Microlink	●			●	●	●					●				●		●	●		●	
Stratus Computer	StrataLINK	●			●		●				●					●		●	●	●		
Syntek	MARS/NET	●			●		●					●				●		●		●		
Sytek	LocalNet		●		●		●					●				●		●		●		
Teletype	4540 Local Connect	●			●			●			●										●	
Three Rivers	Packet-Stream		●		●				●			●				●			●		●	
3COM	UNET	●			●		●					●					●			●	●	
Ungermann-Bass	NET/ONE Baseband	●			●				●		●						●			●		
Ungermann-Bass	NET/ONE Broadband		●		●				●			●					●			●		
Wang Labs	Wangnet		●			●				●		●					●					
Xerox	Ethernet	●			●				●		●		●			●	●					
Zeda	InfiNet	●			●		●					●										
Zilog	Z-Net	●			●		●					●				●						
Ztel	Axis	●				●		●				●										

Source: Data Decisions

$150,000. It has already signed a technology and sales agreement with Lynd Communications Systems of Reno, Nevada. Canstar's strategy is to provide local area networks for applications requiring transmission of high volumes of data, for example, from one host computer to another. Canstar also envisions its LAN with a PABX gateway.

In December, 1984, Canstar was awarded a substantial contract (up to $20 million) from CNCP Telecommunications of Toronto. In January 1984, Canstar installed a local area network for Systemhouse as part of the Department of National Defence OCS field trial, sponsored by the Department of Communications. At the same time they have implemented a full scale test of Hubnet involving 300 terminals, at the University of Toronto. These activities will place Canstar in a strong position as a Canadian niche supplier of LAN systems.

Develcon of Saskatoon, a manufacturer of data communications equipment, has also recently announced a local area network offering - Develnet. Develnet is made up of local switches or nodes providing distributed switching as well as a cost effective LAN. Up to 64 Develnet nodes may be interconnected, and each node can support up to 248 data lines -- a potential 16,000 line network. Develcon expects its Develnet to be as popular as its Dataswitch was five years ago. With sales of $16.1 million and distribution throughout North America, Develcon should be successful in marketing Develnet. Other details on the company were provided in Section 4.3.2.

DY-4 Systems markets a LAN as part of its Dynasty System described in Section 4.2.3. It is a dual twisted pair LAN connecting their 8 bit CP/M based microcomputer workstations. In 1985 DY-4 will be offering a network for supporting up to 48 workstations, including the IBM PC, using OMNI net protocol with collision detection.

DY-4 Systems is a smaller company but with good technical experience, concentrating on being a niche supplier, selling through larger firms and distributors.

Northern Telecom has announced a star configured local area network using the standard telephone lines and integrated with its family of PABXs. At the present time they expect practical data rates of 56 Kb/sec. By 1990 they are aiming for data rates of 2.54 Mb/sec. Nortel is also working towards compatibility between the Ethernet based LAN and its SL 1 data switch. "Open World (by Northern Telecom) is the strategy for the office of the future, entailing a big shift to private networks as integrated office networks and systems become more important to businesses, because they can provide better management and efficiency." (Mr. Light, Chairman of Northern Telecom).

Northern Telecom also has extensive experience in fibre optics. As part of a $22 million contract with the Saskatchewan government, Nortel has implemented a 3,200 km fibre optics network designed to link Saskatchewan's eight cities and 40 larger towns. As part of this project Nortel built a fibre

optics manufacturing plant in Saskatoon. Nortel has also installed fibre optics in Manitoba, and are conducting research in Alberta. As of 1983 Northern Telecom has designed, manufactured and installed 132 fibre optic systems in Canada.

Northern Telecom is discussed in more detail in Section 4.3. Their financial statement is also presented in Appendix 4A.

Net One Data Corporation of Mississauga produces the Easy Net line linking 8 and 16 bit machines, such as Xerox, NCR and Kaypro. The LAN uses bus topology and can link a maximum of 255 microcomputers. However, its efficiency declines significantly if over 60 units are networked. Net One forecasts sales of 27,000 units worldwide in 1984. They currently employ 15 and have sales of $4 million.

The University of Waterloo's Computer Systems Group produces JANET. This is an IBM PC LAN supporting up to 16 work-stations (with or without floppy drives), public and end user ID protected files, print server, and multiple hard disks of variable capacity on the PC file server. They also produce the Waterloo PC Network (marketed exclusively by IBM). This is an IBM PC to IBM mainframe network supporting disketteless workstations, protected files, print server, micro-mainframe file access and 3270 terminal emulation.

Associated with the University of Waterloo is Waterloo Microsystems Inc. The company was established in 1982 and is owned by its employees, with minority interests held by Crowntek Investments (35%) and the University of Waterloo (7%). Waterloo Microsystems produces the Waterloo Port which was developed in the University's research laboratory.

Waterloo Port claims to be the first network operating system to integrate a friendly user interface with multi-tasking, sophisticated networking and real-time performance. Port also supports PC-DOS as a guest operating system. Port has been licenced to Crowntek Networks Inc. (See Section 4.7) for use as the foundation of their office networking product, PROD/NET. Crowntek offers PROD/NET as a "full solution" office automation system providing an integrated set of software for both micro and host computers. PROD/NET integrates local area networks and peripherals with word processors, terminals, other networks, and host computer applications into a single office system.

4.5 Storage Peripherals

With the increasing volume of computerized data, users are requiring peripheral memory with greater and greater storage capacity. Typically, storage peripherals can range from less than 20 megabytes to support a small microcomputer system, to over 1 gigabyte for large mainframes. (See Chapter 3 for technical details on storage peripherals.)

The magnetic storage peripheral market is dominated by IBM, Memorex, and 3M Corporation. Their strengths vary in different sectors of the market.

* IBM claims 17% of the hand pack rigid disk market.

* Memorex leads the 14" rigid disk segment claiming an 18% market share. They also claim 15% of the 8" mini rigid disk segment and 20% of the data cassette market.

* 3M dominates the cartridge segment of the market, claiming 90% to 95% of the market share.

Other leading firms include Dysan Corporation, Tabor Corporation, Vertex Peripheral, Shugart Corporation, Control Data Corporation, Century Data Systems, and DEC.

Optical disk technology is becoming increasingly important. It will ultimately be used for the transfer and storage of large volumes of information in much the same way that paper is used today. However, the technology is still being developed and only large corporations are expected to be using optical disk storage for the next several years. Products employing optical storage technology are in the late stages of development in Toshiba, Philips and the RCA Laboratories. Other firms with large R&D expenditures include AT&T, Control Data, Eastman Kodak, Wang, and IBM. Current manufacturers of this technology include Philips, Control Data, and Dexter Technology Corporation.

Memorex, a division of Burroughs, is currently the largest firm producing storage peripherals in Canada (although Philips is assembling the Megadoc storage system here). Burroughs Memorex Inc., operates a plant in Winnipeg with a world product mandate for storage peripherals. During 1984 they switched from manufacturing head disk assemblies to Memorex disk drives. The plant is currently being renovated. The Winnipeg plant employs 366 people and has gross revenues of about $72 million (1983). Table 4-10 contains a breakdown of Burrough's Canadian operations. Burroughs (Canada) had sales of $135 million in 1983. Burroughs Corporation (U.S.) had worldwide sales of approximately $6 billion with employment of 64,000. Appendix 4A contains a financial report for Burroughs, U.S.

In 1980, Burroughs underwent a major management restructuring and corporate reorganization as part of an overall

TABLE 4-10

BURROUGHS MEMOREX CANADIAN FACILITIES

LOCATION	PRODUCT/ ACTIVITY	SALES*	STAFF
Scarborough, Ontario	Headquarters Office Supplies		94
Greenfield Park, Que.	Office Forms		48
Brossard, Que.	Bank Cheques		80
Winnipeg, Man.	Storage Products	$ 72 million	366
Montreal, Que.	R & D Facility		44
		$135 Million	652

* Sales breakdown for some plants is confidential.

acquisition program. Typical firms acquired were: Systems Development Corporation, Systems Research Incorporated, Midwest Systems Group Inc., and Memorex Corporation. The Memorex acquisition will prove to be the most valuable since a key weakness in the Burroughs' product line was the company's peripherals. Memorex brings to Burroughs an extensive expertise in the manufacture of disk products and a complete range of storage media. Memorex has also been developing an optical storage system.

Burroughs has entered the office communication systems market with its Office Information System -- the Burroughs OFIS 1. The system has a full range of capabilities including personal computing, word processing, host computer, and line of peripherals. These products are not manufactured in Canada. Burroughs' office automation strategy is to focus on specific vertical markets such as government, manufacturing, distribution, finance, and the health care industry through the creation of a new group called Industry Systems. The responsibility of this new group is the vertical markets of these target sectors and the delivery of office automation offerings to them.

Burroughs has gradually expanded their operation in Canada. They now do much more manufacturing and R&D than in the past, through the acquisition of the Winnipeg facility and the establishment of a software research and development division in Montreal, which employs 44. They estimate that exports account for 48% of total revenue, a figure they consider excellent

FIGURE 4-14


Burroughs-OFIS™
Office Information System
Information for the Asking

compared to IBM and Digital. The position of Burroughs Memorex in Canada is that of a commodity supplier to the office automation market. Given their overall capabilities, more could be done in Canada, particularly with respect to the OFIS offering, to position the Canadian operation as a niche supplier with a world product mandate.

Didak Manufacturing Limited has established an 18,000 square foot plant in Arnprior, Ontario to produce 8" and 5 1/4" floppy disks. The plant is expected to cost $2.7 million with the federal government assisting with a $655,000 repayable grant. The company is hoping for annual sales of $7 to $8 million, and to achieve a Canadian market share of 5%-8% by 1986. Didak is importing the coated oxide and mylar coated polyester media, stamping it and assembling with a liner and PVC jacket. They are also planning to expand their product line to include microdiskettes 4" and under. Didak employs approximately 60 in the Arnprior plant.

At the present time, there is intense competition in the floppy disk market and the Arnprior plant has probably come on stream just at a particularly difficult time. However, Didak has stated that their product will be produced to the highest industry standards and they have acquired high quality production machinery. In addition, their sales will be only through established distributors with a reputation for quality products and service.

If Didak can live up to this satement of quality, distribution and service while producing a price competitive product, they should be a successful commodity supplier to the office communications systems market.

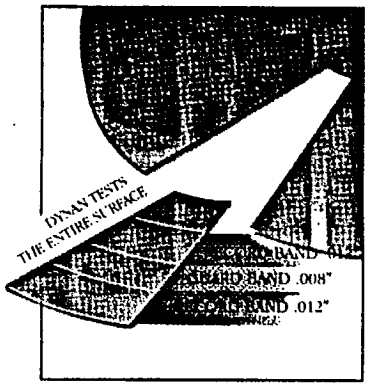
Dysan Corporation of Santa Clara will shortly be constructing a manufacturing plant in Canada. Industry contacts did not know whether the purchase of Dysan by Xidex Magnetics (Kodak) will have an impact on the construction of this plant. If it is built it is expected to cost between $6 and $10 million. The first phase of operations will be to provide facilities for producing software copies. The next phase is anticipated to be the manufacture of diskettes (i.e., 5 1/4", 3 1/2"). Dysan forecasts that 80% to 90% of the demand for their diskettes (Figure 4-15) in Canada will be satisfied by this plant. Dysan is expected to be very successful in Canada as a commodity supplier, because of their reputation and excellent distribution network.

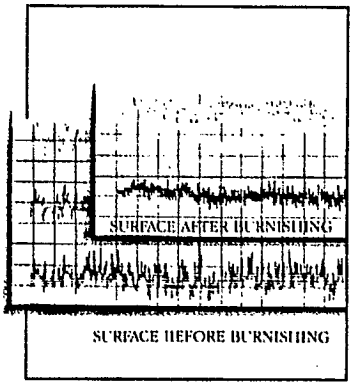
A finacial report for Dysan (U.S.) is presented in Appendix 4A. In fiscal 1983, they had gross sales of $180 million, and net income of $48.9 million. Their R&D expenditures were 19% of sales, or $35 million. Dysan has a reputation for good quality products, excellent R&D, and innovative management. In November 1984, Xidex purchased Dysan for $214.6 million, and as a result, greater emphasis has been placed on marketing and advertising.

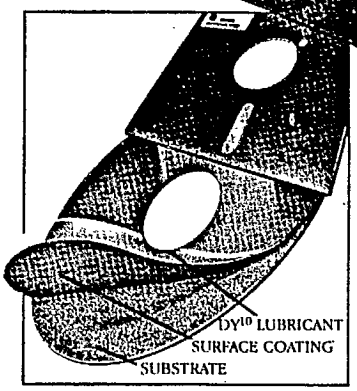
FIGURE 4-15: FLOPPY DISKETTES MANUFACTURED BY DYSAN

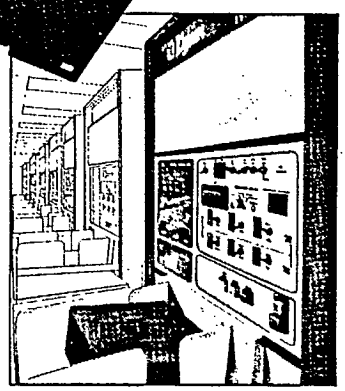
DISCOVER THE DYSAN DIFFERENCE

Four Reasons Why The Dysan Difference is Worth Paying For









1. 100% Surface Tested

Only Dysan provides fully usable diskette surfaces that are truly 100% error-free across the entire face of the diskette. An exclusive on-and-between the track testing procedure guarantees error-free performance regardless of temperature and humidity distortions or slight head misalignments.

2. Advanced Burnishing Techniques

Dysan's advanced polishing methods create a smoother, more uniform diskette surface. This results in better signal quality on each track, less wear on drive heads and reliable access to data after millions of head passes.

3. DY10™ Lubricant

Dysan's proprietary DY10 lubricant complements the advanced burnishing process. Both maximize error-free performance while minimizing headwear. Optimal signal presence is maintained between the head and diskette surface during millions of write/read interfaces.

DY10 is a trademark of Dysan Corporation

4. Auto-Load Certification

Dysan's unique quality control methods reflect technological leadership in designing, producing and testing precision magnetic media. Each diskette is unerringly certified by Dysan-built, automated and microprocessor controlled certifiers. Your system and data base will benefit from Dysan's diskette reliability and unsurpassed quality.

RobertsonNickerson Limited

Philips Information Systems has already been discussed in Section 4.2.2 under the subject of Micom (a division of Philips). As indicated, Philips is assembling the Megadoc (an office filing system using optical disk technology) in their Saint Laurent plant. The Megadoc can electronically store over eight million pages. Philips has also joined with Control Data Ltd. to develop and manufacture optical storage systems.

4.6 Input and Output Devices

Input and output devices include a wide variety of products ranging from computer card readers, high speed printers, VDTs, and other peripherals such as the mouse, touch screens, and joysticks. The focus of this section will be on the following sectors:

1) Optical Character Recognition equipment

2) Laser printers

3) Facsimile

Most analysts feel these products will play a very prominent role in the automated office of the future. However, these are all markets where Canadian industry has been traditionally weak, with little manufacturing activity.

4.6.1 Optical Character Recognition (OCR)

HiTech Canada Limited of Ottawa, is the only company in Canada actively involved in R&D and the manufacturing of optical character recognition equipment. Incorporated in 1973, HiTech has been engaged in the development of advanced technology in both computer and communications systems. Since 1973 HiTech has grown to employ over 65 with annual revenue of about $4.0 million. It has two distict divisions: the System Division

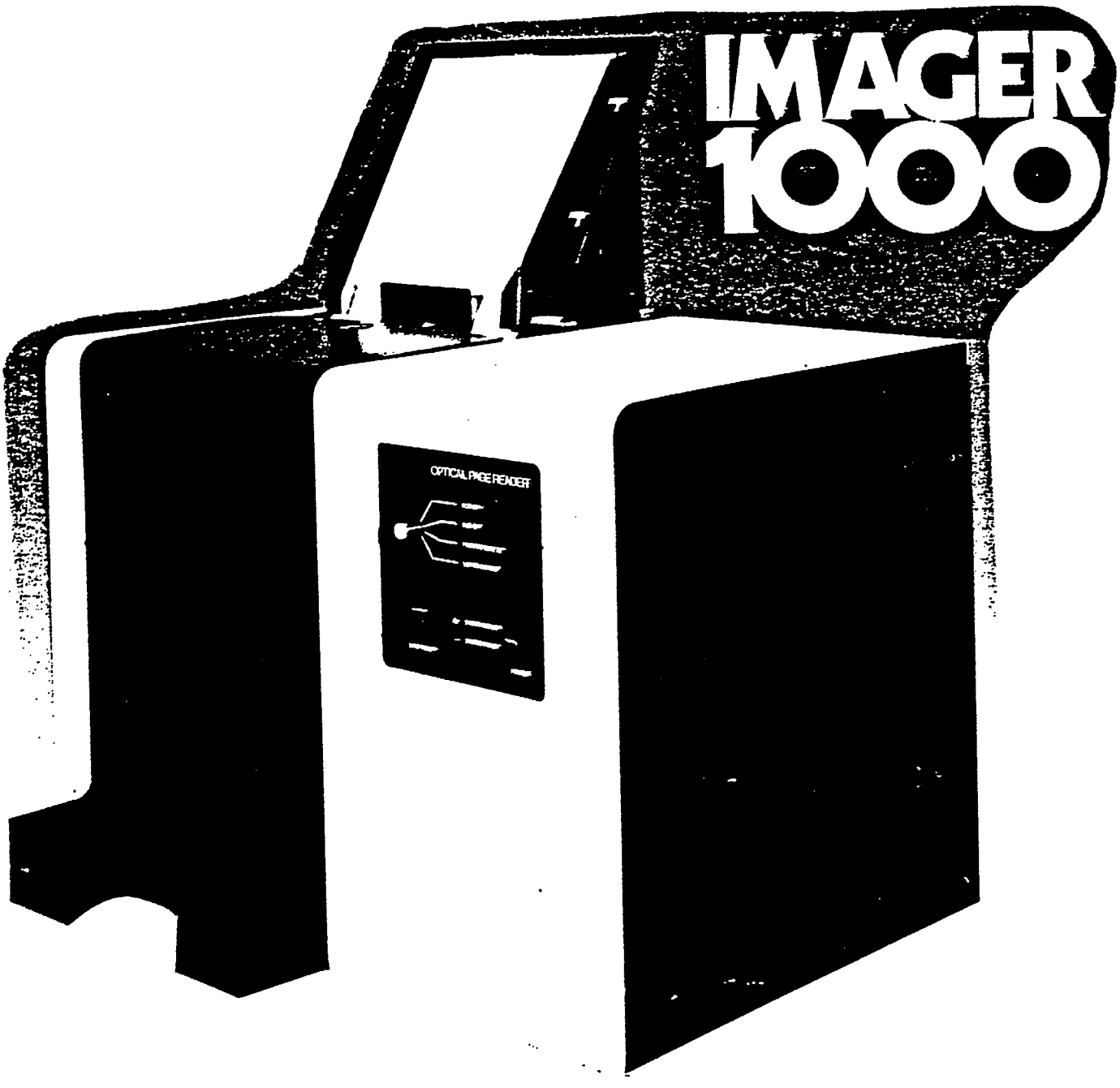
which is responsible for custom computer systems and consulting services; and the Imaging Products Division, which specializes in imaging processing/OCR technology.

Products currently manufactured in Ottawa and marketed internationally include the Imager 1000, the company's most popular series of OCR equipment. The HiTech Imager 1000, shown in Figure 4-16, is the standard model capable of handling four different fonts (Courier, Letter Gothic, and Prestige Elite) in either French or English. It has an error rate of less than one in 150,000 characters, and it is able to scan in a nominal range of 10 to 17 seconds per page. The company is also nearing completion of research and development on a new series of Automatic Document Entry equipment. Included in this series are: Mark Sense Readers, Text/Graphic Readers, and Document Readers.

HiTech's R&D in optical character recognition and data compression is recognized internationally. While relatively small, they have the capability to become a successful commodity supplier to the automated office. However with the forthcoming technology changes vis-a-vis the integration of OCR and FAX, they face the danger of not having the financial resources to maintain their position in the marketplace.

FIGURE 4-16

HITECH CANADA LTD.'S MOST POPULAR OCR PRODUCT



4.6.2 Laser Printers

Currently, there are no laser printers being produced in Canada, but one Canadian company is manufacturing a similar type of non-impact printer.

Delphax Systems of Mississauga, manufacture high speed non-impact printers using ionography technology. (See Chapter 3 for details.) Delphax, in mid-1984, introduced a printing system capable of 60 pages per minute and 240 dots per inch.

Delphax employs 70 and has sales of approximately $5.5 million. About 75% of their production goes to the U.S., with the remainder sold in Canada and Europe. Delphax recently moved its head office to Westwood, Massachusetts in order to be closer to its major market. However, its manufacturing plant remains in Mississauga and is expected to about double its employment in 1985. In December, 1984 Xerox announced that it was purchasing the Canada Development Corporation's share of Delphax. Dennison Manufacturing company of Framingham, Massachusetts continues to own the remaining 50% of Delphax.

Delphax competes against at least fifty different vendors of laser printers. Although the printing technology employed by Delphax does not provide as good a quality print as laser technology, the Delphax offering does have some competitive advantages. Laser printers often require as many as 3,000 moving parts compared to only 276 for Delphax's ionographic printers.

With fewer moving parts the printer's reliability is increased and hardware costs are reduced.

Delphax has entered into a licensing agreement with Itoh Electronics Inc. of Japan for the production of a desk top thirty page per minute non-impact printer, the S3000. Itoh will make the printer while Delphax will manufacture the print cartridges and dielectric cylinders. The first shipments of the S3000 are expected early in 1985. The competitive significance of this agreement is that, at least for the moment, Delphax can offer the fastest non-impact printer on the market, at the lowest price.

The competition in the non-impact printing market will be tough with such established firms as IBM, Siemens, Xerox, Hewlett-Packard, Datapoint, and Canon being the major U.S. manufacturers. Japan is rapidly entering this market and included among the Japanese participants are Hitachi, Fujitsu, Minolta and NEC. The part ownership of Delphax by Xerox changes the possible outlook for Delphax. They are now part of a major organization with significant financial and marketing resources, an excellent reputation in the copier business, and an extensive dealer/distribution network. As a result, Delphax is expected to play a successful role as a commodity supplier to the office automation market.

4.6.3 Facsimile Devices

Industry analysts beliveve the Canadian market for facsimile equipment will grow at about 25% per year. The total market is expected to reach 28,000 units in 1985.

There are no facsimile equipment manufacturing plants in Canada, at this time. Muirhead Systems Ltd. of Toronto does some custom engineering (e.g. computer to FAX interface) but all the facsimile equipment which they sell is imported.

Growth of the facsimile market is expected to be encouraged by the introduction of advanced CCITT Group IV machines. These machines will have store and forward capabilities, be able to print teletex and have superior print compared to the existing group III facsimile. With the introduction of these new machines, current facsimile devices will be considered obsolescent.

Stiff competition in the facsimile market is coming from Japanese vendors. Leading Japanese competitors include Hitachi, Matsushita, GEC, NEC, Ricoh, and Toshiba. Frost and Sullivan predict that the Japanese market share of facsimile equipment will increase from 54% to 85% in the 1983-1987 period. This is a very significant increase since A. D. Little is projecting that the entire facsimile market (including both terminal costs and transmission costs) will double from $1 billion to $2 billion over nearly the same period.

Industry contacts believe that, in the face of the increasing Japanese competition, there is no possibility of Canadian facsimile manufacturing in the forseeable future. The only opportunity might be some assembly or parts manufacturing under license from a Japanese supplier.

4.7 Office Applications Software

Table 4-11 details the ten leading U.S. software publishing firms and Table 4-12, the most popular programs. Analysts expect the U.S. market to grow by 32% per year and to top $10 million in 1984. In Canada, Evans Research Corporation estimated the Canadian market for total software at $457 million in 1980 and $608 million in 1981. The market is expected to grow by 28% annually, reaching $5.4 billion by 1990. The applications software market was estimated at $114 million and $161 million in 1980 and 1981, respectively, and analysts estimate that it will reach $2.2 billion by 1990 -- an annual growth rate of 34%. (See Chapter 2 for more detail on market estimates.) Office applications software is defined as being office automation applications only (i.e. standard or semi-standard "off-the-shelf" packages).

Statistics Canada estimates there are 1,400 software companies in Canada. Although there are hundreds of very small firms, Evans Research estimated that, in 1981, 28 Canadian suppliers accounted for 53.4% of the total software market. However, in general these firms tend to produce custom designed software for large Canadian computer users, not packaged software for office automation applications.

There are no firms in Canada competing in a significant way in the most popular types of microcomputer based

TABLE 4-11

THE TEN LEADING U.S. MICROCOMPUTER SOFTWARE PUBLISHERS (1983 Sales)

COMPANY		MILLION
I B M *	-	$ 100
Radio Shack	-	110
Apple	-	68
Microsoft	-	68
Visa Corp	-	55
Micro Pro	-	52
Digital Research	-	46
Lotus Development	-	40
Ashton Tate	-	35
Peach Tree	-	22

*Note: IBM usually purchases software from specialized firms.

Source: Business Week, "Software The New Driving Force" February 27, 1984

TABLE 4-12

MOST POPULAR MICROCOMPUTER SOFTWARE PROGRAMS

TYPE		MONTHLY SHIPMENTS (1,000s - 1983)
Spread Sheets		
Lotus	-	24
Visicalc	-	21
Multiplan	-	17
Supercalc	-	7
Database Management		
PFS: File	-	10
dBase II	-	8
PFS: Report	-	7
Word Processing		
Wordstar	-	17
Apple Writer	-	15
Easy Writer	-	6
Accounting		
Home Accounting	-	13
BPI General Accounting	-	7
Peach Tree General Ledger	-	4
T O T A L	-	156

Source: Business Week, "Software The New Driving Force" February 27, 1984

packaged software, such as spread sheets. There are many with specialized software applications, particularly in the accounting area, but these are not applications with significant relevance to the integrated office automation market. There are a few Canadian firms, primarily those working on the Department of Communications OCS field trials (e.g. Systemhouse, OCRA and Officesmiths), who are producing and developing systems software. Others of interest include those working on fourth generation languages (e.g. Cognos, Synerlogic, Catalyst) since this area is already impacting on the development of office systems software, through increased programming productivity.

The focus of this section of the report is on Canadian software producers of packaged office automation programs. It does not include custom shops producing specialized one-of-a-kind software for the office.

Systemhouse Limited of Ottawa, provides a wide variety of software product lines and services. During the first nine months of the 1984 fiscal year, they reported revenues of $43,270,000, and a loss of $4,318,490. Systemhouse has consistently reported losses for the past few years. In fiscal 1983 they lost $28.8 million, in 1982 they lost $29.5 million, and in 1981 their loss was $27.5 million. In 1984, Systemhouse reorganized into five discrete companies -- XIOS Systems Corp., Systemhouse Controls Limited, Systemhouse Graphics Systems Limited, Systemhouse Business Systems Limited and Systemhouse (International) Limited. The reorganization was effective at

the beginning of the new fiscal year, September 1, 1984.

Analysts view the reorganization as a positive move in order for Systemhouse to regain the credibility lost since 1981. Part of the problem was that Systemhouse expanded too rapidly into the U.S. They also made a number of wrong investments and had very high R&D expenditures much of which did not result in the development of successful new products. Systemhouse has recently began to shift its emphasis from custom software services to software products. In 1981 software products accounted for almost negligible revenue. In 1983 the company estimated that software products accounted for 40 per cent of revenue and now expect they will exceed 50 per cent in 1984.

Systemhouse (XIOS Systems Corporation) is conducting one of the largest Department of Communications OCS field trials at the Department of National Defence. Some of the features of this field trial are:

- includes multiple components, i.e., 12 microcomputer nodes, 94 personal work centres, 15 word processors, 3 personal computers, 14 letter-quality printers and 19 displayphones;
- provides broad functionality, from management activities to document preparation and editing;
- follows the "Open World" concept;
- is expandable to any size of client site;
- encompasses multiple geographic locations;

From the field trial, Systemhouse has developed extensive expertise in linking multi-vendor products into an integrated office communications system. They used over nine different equipment suppliers, including IBM, DEC, Spectrix, Comterm, Gandalf, and Canstar. The field trial started in October 1982, with the first workstations installed in August 1983. The complete system is expected to be fully functional in 1985.

Systemhouse has been in a generally weak position because of their substantial financial problems. The reorganization is expected to improve their image and attract new capital to the stronger divisions. Industry contacts indicate that Systemhouse overall has a strong recognition factor but this is more closely associated with EDP consulting, not office automation. However, the field trial places the XIOS System Corporation of Systemhouse in a strong position to become a successful niche supplier of office automation system software and integration expertise.

Cognos Coporation, of Ottawa, formerly Quasar Systems Ltd., is one of the major software firms in Canada. It employs 230 people and has gross revenues of $20 million from worldwide sales. Established in 1969, the company's primary business was consulting and custom software. However, since 1979 the emphasis has been on packaged application software. In the current fiscal year, 79% of its revenue is from software product sales and 21% from consulting fees.

The name change from Quasar to Cognos was effective January 1, 1984. Its purpose is to reflect their changing business direction and new emphasis on packaged software. Cognos is concentrating on the development of fourth generation languages. Recently they received five software awards including one for Powerhouse, their new fourth generation language. Cognos has also expanded its product line to include software for DEC as well as Hewlett-Packard computers. They have also signed an agreement with Data General on a joint software development program.

Cognos has managed to establish a very strong recognition factor, in spite of its recent name change. After Systemhouse, it is the most recognized Canadian software company. Cognos distributes in over 25 countries with 75% of its sales to the U.S. Hence it has a good base for North American distribution. Cognos also has a good technical reputation. Cognos will be a strong software supplier primarily concentrating on fourth generation language packages and other productivity tools for the automated office.

Synerlogic (formerly Bailey and Rose) while predominately a software consulting firm, is moving towards the supply of software products. The company feels this shift in focus has resulted in an increase in profits despite a small drop in revenue (e.g. "A turning point for the company occurred early last year when it acquired the rights to ACT/I, a unique Canadian software product.") ACT/I is a software program for

increasing programming productivity in the development of on-line office systems.

Synerlogic was founded in 1976 and now employs 150 with sales over $7.5 million. This year it relocated the corporate office from Ottawa to Calgary. Synerlogic is focusing on three specific areas: custom software development, productivity tools such as ACT/1, and computer assisted learning (CAL). Through its consulting division, it also provides solutions to office automation problems.

Officesmiths Inc. of Ottawa are developing office automation software, primarily in electronic filing and records managment. Established in 1981, Officesmiths currently have a staff of 10 and sales of about $700,000 (1983 fiacal year.) Officesmiths is another participant in the OCS field trials and is working with the Department of Engergy, Mines and Resources (EMR). The focus of this field trial is on policy and procedures management. The software is being provided by Officesmiths and the hardware by ZILOG, a subsidiary of EXXON. Since the start of the field trial, Officesmiths has begun licencing discussions with ten companies interested in using its electronic filing system software. Officesmiths currently sell the software as a package and provide custom modifications for specific applications. They are focussing on markets within governments and large organizations. Typical systems, including training, cost in the area of $250,000. The company forecasts sales of $10 million over the next three years.

Officesmiths is one of the few Canadian companies with a specific office systems software niche. It has gained experience and proved out its product through its participation in the field trials. However, the firm remains quite small with limited resources, and sales have been slow. Its position may also be threatened by the new productivity tools (i.e. fourth generation languages) which now allow firms to develop their own software systems much faster and cheaper then previously possible.

Logo Computer Systems Inc. (System d'Ordinateur Logo Inc.) of Montreal, produces software packages for the Apple Computer and IBM. They have also signed an agreement with Fujitsu Ltd. of Japan, making LCSI logo software available to Fujitsu microcomputer users. Logo software is also available for DEC, Atari, Coleco, Thomson Brant and Sinclair computers. Logo was incorporated in 1980 and employs approximately 70. An estimated 90% of its sales are outside of Canada.

Catalyst International Business Systems Inc. has developed an office automation software package which analysts say may be a prototype expert system for business. The new software is a fourth generation language with some artificial intelligence features. Currently the software operates on mainframes only. The cost is between $35,000 and $75,000. Within a year software should be available for microcomputers. Catalyst International forecasts sales of 15,000 packages per year for the microcomputer version.

OCRA Communications Ltd., Ottawa, is primarily a systems integrator and systems software developer. OCRA employs 15 and has annual sales of about $1.6 million. OCRA is installing an office automation system at Environment Canada under the OCS field trials. The pilot stage initially involved 33 workstations installed in the Management Services Directorate and 38 workstations in the Environment Protection Agency. In May 1984 OCRA was awarded a $1.2 million contract to carry out the second phase of the project.

OCRA encountered major delays in implementing the field trials. The company had thought it could put together the sort of system people wanted simply by customizing existing products. However they could not find a cost-effective software package to integrate all the components. As a result, they licensed Officesmiths' Electronic Filing Cabinet and modified it to fit the requirement. OCRA backers include CNCP Telecommunications, Mitel, Gandalf, and Nabu.

OCRA has gained significant experience as a systems integrator due to the OCS field trials. However, the type of work is highly customized in nature. As a result there is not a great deal of proprietary packaged software that can be used for future systems, and it is this latter area that provides the higher profit margins. There is also intense competition in the custom software field with practically all software firms claiming expertise in solving office automation problems.

A key marketing problem for OCRA will be to take their current field trial experience and "package" it in such a way as to be able to differentiate themselves from the competition.

Northern Telecom (BNR) is participating in the OCS field trial at the Department of Revenue. (This has already been discussed in Section 4.3.1.) About two thirds of the research staff at BNR is engaged in software development. However, this is primarily with respect to Northern Telecom's current product offerring -- PABXs, although research in a variety of other areas such as artificial intelligence is underway.

Crowntek Inc. of Markham, Ontario is a subsidiary of Crownx Inc., which also owns the Crown Financial Group and the Extendicare Group. Crowntek Inc. was established in July 1983 and consists of 23 business units with more than 1300 employees. The major units of interest are:

1) Crowntek Communications Inc.

   This unit absorbed the operations previously carried on by Datacrown Inc., a major computer timesharing service organization established in 1971.

2) Crowntek Networks Inc.

   Development of computer-based integrated

office automation systems e.g. PROD/NET, a complete networking system for micros with micro to mainframe communications.

3) Datacrown Technology Inc.

A software development unit engaged in the development of computer systems software, including electronic mail and electronic storage systems.

4) Polaris Technology Corporation

Developer of industry specific software applications, primarily data base management systems.

5) Waterloo Microsytems Inc. (35% ownership)

Software systems development (e.g. Waterloo Port - a network operating system.

Crowntek has a number of other major operating units but the above are the primary Canadian ones concerned with office systems software.

Duncan MacLachlan, President and Chief Executive Officer of Crowntek Inc. says that "Crowntek Communications Inc. will be one of some 20 to 30 companies which are emerging

throughout the world as super integrated information service companies, emphasizing information management based on a combination of services and software, as opposed to data processing."

With its financial resources, worldwide distribution networks and integrated technology units, Crowntek will be a strong Canadian niche participant in the office software market.

4.8 Opportunities and Threats to Canadian Industry

There are opportunities for Canadian manufacturers to compete in specialized niches in the office communication systems market. Expertise exists mainly in communications, word processing, local area networks, and software. Some expertise is being developed to deliver systems for the integrated electronic office, primarily by Northern Telecom, but also by others. Threats to Canadian industry include increasing competition from U. S. vendors, and in certain areas, from Japanese vendors.

IBM, Wang, and DEC are the leaders in the move to full integrated multifunctional systems. IBM's strategy is to provide full corporate office automation facilities based on their mainframe offerings, and to provide multifunctional workstation systems used in a LAN configuration, with mainframe connection capabilitiy. Wang's strategy is to build upon their very strong office presence with user-friendly, integrated, multifunctional systems and become a major departmental system niche vendor. DEC's strategy is to provide integrated systems directly to the larger companies and to their installed mainframe customer base.

The only potential Canadian competition is from Northern Telecom. Northern Telecom's strategy is the "Open World" concept. This will allow Northern Telecom to build on their PABX expertise and compete for a position as a major departmental system niche vendor and, in co-operation with major mainframe suppliers, as a possible total systems vendor.

Northern Telecom will shortly introduce a multifunctional voice/data workstation and integrated office system. With their technical and financial strengths, Northern Telecom will be a major contender in this market. (Mitel also has a voice/data workstation but it is a stand alone and Mitel has no current plans to continue its development as part of an integrated system.)

The other Canadian companies with the best prospects are AES, Micom and Geac. AES and Micom are moving from dedicated word processing systems towards the supply of integrated office systems. AES has some ways to go but, if it succeeds, it will be a departmental system niche vendor serving the smaller to medium sized firms. Micom is likely to integrate its Canadian manufactured product line within the overall Philips systems offering, and also become a major departmental system niche vendor. Geac will be successful in selling integrated systems to their existing mainframe customers in their very specialized market niche (libraries and financial institutions).

Limited opportunities exist for Canadian manufacturers in the stand alone workstation market. The market is microcomputer based and the only two major Canadian manufacturers of microcomputers have recently ceased production. Some niche suppliers remain (e.g. educational microcomputers) and it is likely only in specialized products of this nature, that future opportunities may arise. Currently, there is intense competition in the workstation market and the industry shake out is

continuing. Only major suppliers capable of also offering the workstation as part of an integrated office system will survive.

The competition for workstations is predominately from American vendors. The Japanese have had problems penetrating this market because of the English language barrier and lack of software development by independent software firms. Typical Japanese firms now entering the market include Sanyo, Canon, Sony, Epson, Panasonic, Seiko, and NEC Corporation. However, the Japanese are not expected to excell in producing multifunctional workstations, unless the workstation becomes a great deal more generic in nature than at present. Competition is expected to remain primarily American.

It is unlikely that any future manufacturers of stand alone multifunctional workstations or microcomputers will emerge in Canada, in light of current competitive pressures. All current suppliers are attempting to hold their own.

Canadian PABX manufacturers have established themselves as leaders in digital technology and should be in a key competitive position to meet the opportunities of the integrated electronic office market. Northern Telecom is in the best position to take advantage of the demand for voice/data PABXs. They have a good reputation, extensive distribution network, experience and good technology.

The most recent major event of importance to Northern Telecom and the other Canadian PABX manufacturers has been the

AT&T divestiture. This allows AT&T to diversify into new unregulated markets, such as computer manufacturing and the information industry. As a result, AT&T, along with its PABX manufacturing subsidiary, Western Electric, may now strategically position itself to be a totally integrated office systems supplier. This presents both a threat and an opportunity to Canadian firms. A significant market opportunity was created by the separation of AT&T from its twenty-two Bell operating companies. Previously, these companies acquired almost all their telecommunications equipment from AT&T. As a result of the divestiture they are now free to buy from other manufacturers. Northern Telecom led the way in sales in 1983 with $360 million of mainly large scale DMS switches.

While the market for voice/data PABXs is expected to more than double by 1988, PABX manufacturers will face increasing competition in a deregulated marketplace. A competitive advantage will lie with companies offering value-added features such as electronic mail and voice, LANs, and packet switching.

The most serious threat to Canadian manufacturers lies in the competitive allegiances now forming between key PABX manufacturers and major computer hardware and software vendors. Most notable is the purchase of Rolm by IBM. To date, Northern Telecom has taken a different strategy with its "Open World" concept. Instead of acquiring an interest in a major mainframe manufacturer, it is attempting to develop PABX equipment and system compatability with all mainframe manufacturers. In

addition, it has acquired DP expertise through the purchase of two relatively smaller DP firms in the U.S. (See section 4.3.) With these moves, Northern Telecom will be able to:

1) Sell a completely integrated office system, connected to the installed mainframe base of any computer manufacturer.

2) Sell PABX equipment to mainframe manufacturers (except IBM) for incorporation into their integrated office system offerings.

3) Maintain the viability of their own installed PABX base, by allowing the integrated connection of other mainframes and other integrated office systems.

From a purely technical viewpoint, this places Northern Telecom in a reasonable position to compete with the IBM/Rolm threat. However, it does make for a weaker overall marketing position, since it will be extremely difficult to place its PABXs within the IBM dominated mainframe world. IBM's marketing strength will tend to "pull" Rolm with it.

After Northern Telecom, the next largest Canadian PABX supplier is Mitel. Despite its difficulties, Mitel is now delivering its SX2000 switch. However, the delays, financial losses and the termination of their IBM agreement have had a serious affect on their potential. At the moment Mitel is left

with the worst of two worlds. They have not as yet achieved Northern Telecom's "Open World" concept of compatability nor are they aligned with a major integrated office systems supplier like IBM. It further appears that they will have no multifunctional workstation system offering of their own, unless further work is done on the Mitel KONTACT to build it into an office system. As a result Mitel will likely remain a niche vendor of PABXs. A major factor in their future success in office communications systems will depend on how fast they can achieve compatibility with systems vendors such as Wang and DEC. The Japanese PABX manufacturers also appear to be another serious threat on the horizon to Mitel, in the North American market. According to a Frost and Sullivan report, Japan's share of the PBX market will jump from 15% to 32% between 1983 and 1987.

The other major PABX vendors, Microtel and TIE/ Communications are subsidiaries of multinationals. Both are primarily telecommunications niche vendors in Canada and will not be major competitors in the integrated systems market, from their Canadian base. However, both have manufacturing facilities here and, with their parents' resources, could become major niche exporters if they adopted a world product mandate strategy.

Good opportunities exist for Canadian firms manufacturing specialized data communications equipment and systems. The market is growing rapidly and the industry has a good technological base from Canada's traditional strength in telecommunication equipment. The U.S. market for modems and

multiplexers alone totalled over $1.2 billion in 1982 and by 1987 is estimated to be worth nearly $3 billion. (See Table 4-8). Canadian firms have mainly entered this market as niche vendors, such as Gandalf and Develcon, who have beem major innovators in the limited distance data set market.

The key characteristics essential to success in this market are:

1) the need for continuing technical innovation;

2) the need for compatibility of products both within a vendor's product line and with other types of communications equipment;

3) the need for a clear market approach, i.e., total communications system supplier vs. niche or commodity supplier;

4) the need for efficient economies of scale in both manufacturing and distribution, to withstand the price pressures caused by intense competition.

The data communications market is not seriously affected by competition from Europe and Japan. This is largely due to the systems and service requirements of data communications. The importance of the service aspect was stressed by a Gandalf staff member recently commenting on the introduction of their PACX system to the U.S. market.

> "... We didn't even attempt to sell it in the U.S. until we had the appropriate base of technical people trained to maintain the PACX, and until we had sufficient test equipment, spare parts and organization so that we could service a customer quickly..."

A few Japanese firms such as NEC and Fujitsu have participated in this market on an OEM basis. However, the unwillingness of large businesses to use products from new vendors will be another key barrier to foreign competition.

Digital voice messaging systems, or voice mail systems, are currently being offered or have been announced by such major vendors as IBM, Wang and Sperry. These systems are just emerging and are still in the embryonic stage of development. There are opportunities in this area, but with the need for integration, these will be limited to the larger systems suppliers such as Northern Telecom and Mitel.

Opportunities exist for Canadian manufacturers of local area networks. There are several strong Canadian contenders such as Canstar and Crowntek/Waterloo Microsystems (See Section 4.4). However, the market may become much more threatening, when the current controversy over standards and the PABX versus LAN are finally resolved. Once standards are set, the market will become very competitive with only the best and most cost effective surviving.

With respect to the PABX versus LAN controversy, a hybrid system will undoubtedly evolve. In the small office with a limited number of work stations and peripherals, the digital PABX will be adequate. Maximum transmission rates are in the area of 9.6 kilobytes and are within the capabilities of available digital PABXs. It is also more cost effective to use the installed base of telephone cable, than install coaxial cable, or fibre optics.

In an office where there is a requirment to have access to the mainframe(s) (for major file transfer and data manipulation); to use graphics and video; to handle high speed peripherals such as laser printers, and so forth; a LAN is the most effective solution. Of particular importance is the ability to access common shared resource peripherals. These devices are generally very expensive to provide to users individually but are comparatively inexpensive when use is distributed among many users. A coaxial cable or fibre optics based local area network can provide the high volume, high speed communications required.

A hybrid system involves an interface between the local area network and digital PABX. Through this interface, terminals connected to the PABX have access to all of the computer and peripheral ports just the same as those which are directly connected to the LAN. Another advantage to this system is that the both terminals on the PABX and on the LAN have access to a common modem pool for connection to the external worldwide communications system.

The threat to the Canadian LAN industry, is the potential dominance of the market by the large multinationals. As indicated previously, the lack of standards has resulted in a proliferation of LAN offerings. This may change as IBM enters the market. One view is that an IBM LAN could give legitimacy to the market and possibly increase the sale of all LANs. Another view is that the market is so small that after IBM takes its share, there might be nothing left. However, IBM does not as yet have a serious LAN offering. The current one is only an interim measure. Once IBM does come out with its LAN offering, standards will stabilize and the market will shake out into a smaller number of larger vendors, most of whom will have to have formed alliances with the major office communications systems vendors, in order to survive.

Opportunities exist for Canadian manufacturers in the production of storage peripherals. The most important are floppies and microfloppies, Winchester technology disks, and optical disks.

The microfloppy diskettes and regular floppies are considered opportunities because of the participation of Memorex, Didak and Dysan. Currently the industry is growing at about 45% per year. The trend is towards the 3 1/2" microfloppy with 0.5 and over megabyte capacity. These units will capture the market where data portability is most important. At $2 a diskette, it's as cheap to use a diskette as a file, especially when they can be carried in the pocket.

Winchester disk systems also appear to be an opportunity. The first Winchesters that came on the market used 14" disks and these are still being used on mainframe systems. The market is moving down to standards of 5 1/4" disks and the even smaller 3" sizes are now emerging to suit the personal business computing market. It is here that the greatest growth is foreseen. Tallgrass Technologies Canada Inc. is a newly incorporated Canadian distributor of their U.S. parent's hard disk for microcomputers. They project sales of $12 to $14 million for 1984. There are no Canadian firms with Winchester disk technology. However, the market in Canada will soon develop to a size sufficient to support production, and possibly with Canadian government encouragement, firms such as Tallgrass can be persuaded to start manufacturing here.

Optical disk technology is on the threshold of becoming a viable alternative to magnetic recording for the mass storage of information. It will be used for the storage of large volumes of information in much the same way that paper is used today. The reason is the low cost of storage promised by optical disk technology, coupled with the speed and convenience with which the stored information can be handled. Optical disk technology is expected to be a complimentary system to the spinning magnetic disk and magnetic tape drive. Memorex, Philips, and Control Data are all strong in optical disk technology and there are opportunities for specialized applications. For example, Dexter Technology Corporation of Mountainview, California has manufactured wallet-size read-only

cards that use an optically modified surface. These cards are read by photo diode arrays. The advantage is the cards cost about $1.50 each when manufactured in volume at 100,000 units per day. Each card can handle about two million characters or about 800 pages of text.

With the large R&D expenditures required, it is unlikely that Canadian firms will be able to enter this market as niche suppliers of optical disk systems. Currently, the major contenders are all large multinationals. However, there are many opportunities for applying optical disk technology to office systems and for using this technology in innovative ways to produce other systems and products (e.g. systems for technical manuals and maintenance). It is in this area that opportinities exist for Canadian firms. In addition, there will be opportunities for manufacturing in Canada by the multinationals, most of whom already have other plants here. Essential to this is the adoption of a world product mandate strategy by these firms, to produce in Canada as a commodity supplier for domestic and export markets.

The greatest threat to Canadian mass storage suppliers is the fierce competition that can be expected from Japan. Weak marketing and cultural differences have so far inhibited the Japanese suppliers from major penetration of the computer market. As a result, they have followed a strategy of concentrating on peripheral equipment and are investing heavily in optical disk technology and other areas such as input/output devices.

Competition in the production of input/output devices is intense. Canadian industry is weak in this market and is expected to remain that way. There do not appear to be opportunities for new Canadian vendors unless they have a very unique product, or are multi-national subsidiaries with major financial and marketing capabilities. While Canada has one firm (Delphax) with a unique product in non-impact printing, the market will be tough with such established firms as IBM, Siemens, Xerox, Hewlett-Packard, Datapoint, and Canon being the major U.S. manufacturers. Japan is also rapidly entering this market, with such firms as Hitachi, Fujitsu, Minolta, and NEC.

Growth of the facsimile market is expected to be encouraged by the introduction of advanced CCITT Group IV machines. There are no Canadian manufacturers and stiff competiton in the market is coming from Japanese vendors. Leading Japanese competitors include Hitachi, Matsushita, GEC, NEC, Ricoh, and Toshiba. Frost and Sullivan predict that the Japanese market share of facsimile equipment will increase from 54% to 85% in the 1983-1987 period. As a result there appears to be no opportunities for Canadian manufacturing except under licence from one of the established firms.

Opportunities do exist in the merger of OCR and facsimile technologies. HiTech is currently the only Canadian company in a position to take advantage of this market. However, HiTech is small (65 employees) and may lack the financial strength to make the very large investments needed to be a major

player in this field. However, the firm does have the technological base to develop into a strong specialized supplier, particularly if it were able to obtain the required resources through association with a large corporation.

Canada has a strong consulting software industry, developing custom systems, but is weak in applications software capability. There are no major Canadian suppliers of the most common packaged software for office automation. There are several smaller companies producing specialized software. For example, Logo in educational software, Officesmiths with their electronic filing cabinet and others with a variety of accounting and financial systems. However, even in these areas, much of the market is moving towards integrated software, and there are no major Canadian suppliers in this market. There are two reasons for this:

1) The market requires large expenditures on marketing and distribution. Canadian firms have the technical capability, but do not have the financial resources to market the product.

2) As software requires more and more integration, the market for individual specialized software packages is declining.

The best opportunity is in integrated software packates for the international market. However, this market is dominated by U.S.

firms. There is already a shake-out in this industry and it is generally agreed that it would be extremely difficult, if not impossible, for a new firm to enter the market at this time and produce applications packages to compete with the major firms, like Microsoft. The exception would very specialized software targeted to a specific vertical market sector, e.g. forestry related business applications.

Canada's weakness in office communications systems software means increasing dependance on foreign vendors, in an information dominant society. This will not be good for Canada and may retard the development of the Canadian OCS industry. This problem is well known and the following comments are typical:

"Applications software is the fastest-growing segment of the market. It is expected to have an average annual growth of 34 percent to 1990."[4-3]

"In the past, many Canadian software companies failed despite the fact that they developed excellent technical products, because they could not solve financial and marketing problems."[4-4]

"Unlike U.S. start-ups, Canadian companies rarely have the five necessary ingredients for success - general management skills, financial management, technology, production and distribution."[4-5]

FOOTNOTES

CHAPTER 4

4-1 UNIX was originally developed by Bell Laboratories for use on its own equipment. It was designed for minicomputers and therefore became more popular when the 16 bit microcomputers became available. UNIX has a large software base written in "C" but there are many variations of UNIX and not all support the same features. (See also Section 3.7.1 of Chapter 3.)

4-2 "Corporate Strategies of U.S. Computer Companies." Newton Evans Research Company, 1983-1984 Edition.

4-3 "Growth Surge Marks the Software Industry" Globe and Mail, October 1983

4-4 "Crowntek Sets Up Networks for Software" Globe and Mail, May 1984

4-5 "Province Seeks to Widen Use of High Tech Innovations" Globe and Mail, April 1984

APPENDIX 4A

FINANCIAL STATEMENTS -

MAJOR PUBLIC COMPANIES

IN THE

OFFICE COMMUNICATIONS INDUSTRY

AMDAHL CORP
DISCLOSURE CO NO: A380875000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: ARTHUR ANDERSEN & CO.
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/30/83	12/31/82
	ASSETS (000S)	
CASH	27,585	4,997
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	249,276	154,273
INVENTORIES	123,261	158,519
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	21,059	21,969
TOTAL CURRENT ASSETS	421,181	339,758
PROP, PLANT & EQUIP	413,627	309,251
ACCUMULATED DEP	170,802	126,118
NET PROP & EQUIP	242,825	183,133
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	59,645	42,429
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	NA	NA
TOTAL ASSETS	723,651	565,320
	LIABILITIES (000S)	
NOTES PAYABLE	22,035	16,296
ACCOUNTS PAYABLE	28,305	26,249
CUR LONG TERM DEBT	1,778	1,024
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	99,188	NA
INCOME TAXES	NA	NA
OTHER CURRENT LIAB	56,878	118,031
TOTAL CURRENT LIAB	208,184	161,600
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	86,681	55,245
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	56,447	78,053
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	351,312	294,898
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	1,940	877
CAPITAL SURPLUS	237,465	175,695
RETAINED EARNINGS	132,934	93,850
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	372,339	270,422
TOT LIAB & NET WORTH	723,651	565,320

FISCAL YEAR ENDING	12/30/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	777,680	462,243	442,774
COST OF GOODS	450,522	263,627	233,245
GROSS PROFIT	327,158	198,616	209,529
R & D EXPENDITURES	101,728	81,276	75,117
SELL GEN & ADMIN EXP	149,878	119,169	106,489
INC BEF DEP & AMORT	75,552	(1,849)	27,923
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	12,604	18,330	21,899
INTEREST EXPENSE	15,599	8,315	7,410
INCOME BEFORE TAX	72,557	8,166	42,412
PROV FOR INC TAXES	29,300	3,299	15,648
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	43,257	4,867	26,764
EX ITEMS & DISC OPS	3,200	1,900	NA
NET INCOME	46,457	6,767	26,764
OUTSTANDING SHARES	38,796,000	17,542,000	17,878,000

QUARTERLY REPORT FOR	03/30/84	06/30/84
	INCOME STATEMENT (000S)	
NET SALES	174,555	196,811
COST OF GOODS	96,350	112,856
GROSS PROFIT	78,205	83,955
R & D EXPENDITURES	30,341	31,658
SELL GEN & ADMIN EXP	43,095	44,251
INC BEF DEP & AMORT	4,769	8,046
DEPRECIATION & AMORT	NA	NA
NON-OPERATING INC	3,974	3,163
INTEREST EXPENSE	2,145	3,388
INCOME BEFORE TAX	6,598	7,821
PROV FOR INC TAXES	2,450	2,900
MINORITY INT (INC)	NA	NA
INVEST GAINS/LOSSES	NA	NA
OTHER INCOME	NA	NA
NET INC BEF EX ITEMS	4,148	4,921
EX ITEMS & DISC OPS	NA	NA
NET INCOME	4,148	4,921
OUTSTANDING SHARES	39,428,000	39,547,000

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	777,680	46,457	1.03
1982	462,243	6,767	0.16
1981	442,774	26,764	0.66
1980	394,351	15,221	0.40
1979	313,973	15,304	0.44

COMMENTS:
EXTRAORDINARY ITEM IS NET OPERATING LOSS CARRYFORWARD (10-Q 04-01-83) (10-Q 07-01-83) AND (10-K 12-30-83);CASH INCLUDES SHORT TERM INVESTMENTS

AMERICAN TELEPHONE & TELEGRAPH CO
DISCLOSURE CO NO: A603000000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: COOPERS & LYBRAND
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	4,775,100	2,453,700
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	9,730,900	8,579,500
INVENTORIES	1,436,300	1,178,800
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	674,200	245,800
TOTAL CURRENT ASSETS	16,616,500	12,457,800
PROP, PLANT & EQUIP	166,894,000	158,046,200
ACCUMULATED DEP	43,139,800	29,982,800
NET PROP & EQUIP	123,754,200	128,063,400
INVEST & ADV TO SUBS	6,146,300	5,726,100
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	1,938,200
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	3,012,800	NA
TOTAL ASSETS	149,529,800	148,185,500
	LIABILITIES (000S)	
NOTES PAYABLE	NA	NA
ACCOUNTS PAYABLE	1,462,500	1,339,700
CUR LONG TERM DEBT	2,307,500	3,045,000
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	2,816,800	3,491,300
INCOME TAXES	NA	263,700
OTHER CURRENT LIAB	9,281,900	5,819,800
TOTAL CURRENT LIAB	15,868,700	13,959,500
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	26,055,000	25,820,800
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	44,810,300	44,105,000
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	86,734,000	83,885,300
MINORITY INT (LIAB)	510,900	535,800
PREFERRED STOCK	1,522,500	1,851,400
COMMON STOCK NET	965,700	896,400
CAPITAL SURPLUS	36,289,800	32,128,100
RETAINED EARNINGS	23,506,900	28,888,500
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	62,284,900	63,764,400
TOT LIAB & NET WORTH	149,529,800	148,185,500

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	70,813,000	65,866,400	58,654,700
COST OF GOODS	20,918,400	20,114,700	17,617,200
GROSS PROFIT	49,400,600	45,751,700	41,037,500
R & D EXPENDITURES	862,200	610,600	507,200
SELL GEN & ADMIN EXP	25,703,500	21,218,000	18,340,400
INC BEF DEP & AMORT	22,834,900	23,923,100	22,189,900
DEPRECIATION & AMORT	9,854,200	8,734,500	7,900,300
NON-OPERATING INC	393,700	327,000	303,900
INTEREST EXPENSE	4,307,200	3,930,000	4,362,800
INCOME BEFORE TAX	9,067,200	11,585,600	10,230,700
PROV FOR INC TAXES	3,371,300	4,930,300	4,119,100
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	50,700	336,700	711,300
NET INC BEF EX ITEMS	5,746,600	6,992,000	6,822,900
EX ITEMS & DISC OPS	(5,497,900)	286,800	NA
NET INCOME	248,700	7,278,800	6,822,900
OUTSTANDING SHARES	965,731,000	896,425,000	815,108,000

QUARTERLY REPORT FOR	03/31/84	06/30/84	09/30/84
	INCOME STATEMENT (000S)		
NET SALES	8,139,300	8,627,300	8,009,900
COST OF GOODS	3,842,600	3,980,400	3,947,100
GROSS PROFIT	4,296,700	4,646,900	4,062,800
R & D EXPENDITURES	538,100	592,300	578,900
SELL GEN & ADMIN EXP	3,318,500	3,259,900	2,976,000
INC BEF DEP & AMORT	440,100	794,700	507,900
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	131,200	119,500	114,400
INTEREST EXPENSE	210,800	220,400	247,100
INCOME BEFORE TAX	360,500	693,800	375,200
PROV FOR INC TAXES	133,600	238,300	57,900
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	226,900	455,500	317,300
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	226,900	455,500	317,300
OUTSTANDING SHARES	996,223,000	NA	NA

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	69,848,000	249,000	0.13
1982	65,757,000	7,279,000	8.40
1981	59,081,000	6,823,000	8.47
1980	51,549,000	5,967,000	8.04
1979	46,183,000	5,655,000	8.01

COMMENTS:
OPERATING EXPENSES TREATED AS SELLING, GENERAL & ADMINISTRATIVE EXPENSES (10-Q 03-31-83) (10-Q 06-30-83) (10-Q 09-30-83);OTHER INCOME IS EQUITY EARNINGS (10-Q 03-31-83) (10-Q 06-30-83) (10-Q 09-30-83) (1983 ANNUAL REPORT TO SHAREHOLDERS);CASH INCLUDES MARKETABLE SECURITIES, NET OF DRAFTS OUTSTANDING;DEPOSITS & OTHER ASSETS INCLUDES DEFERRED CHARGES;EXTRAORDINARY ITEM IS EFFECT OF CHANGE IN ACCOUNTING POLICIES;OUTSTANDING STOCK AS OF 06-30-84 IS 1,011,479,000 (10-Q 06-30-84);OUTSTANDING STOCK AS OF 09-30-84 IS 1,025,661,000 AND AS OF 10-31-84 IS 1,027,460,000 (10-Q 09-30-84)

APPLE COMPUTER INC
DISCLOSURE CO NO: A713500000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: ARTHUR YOUNG & COMPANY
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	09/30/83	09/24/82
	ASSETS (000S)	
CASH	143,284	153,056
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	136,420	71,478
INVENTORIES	142,457	75,368
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	46,832	11,312
TOTAL CURRENT ASSETS	468,993	311,214
PROP, PLANT & EQUIP	109,960	57,294
ACCUMULATED DEP	42,910	22,811
NET PROP & EQUIP	67,050	34,483
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	20,536	12,090
TOTAL ASSETS	556,579	357,787
	LIABILITIES (000S)	
NOTES PAYABLE	NA	4,185
ACCOUNTS PAYABLE	52,701	25,125
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	37,321	24,349
INCOME TAXES	NA	15,307
OTHER CURRENT LIAB	38,764	16,790
TOTAL CURRENT LIAB	128,786	85,756
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	48,584	12,887
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	NA	NA
NON-CUR CAP LEASES	1,308	2,052
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	178,678	100,695
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	183,715	141,070
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	195,046	118,332
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(860)	(2,310)
SHAREHOLDER'S EQUITY	377,901	257,092
TOT LIAB & NET WORTH	556,579	357,787

FISCAL YEAR ENDING	09/30/83	09/24/82	09/25/81
	INCOME STATEMENT (000S)		
NET SALES	982,769	583,061	334,783
COST OF GOODS	505,765	288,001	170,124
GROSS PROFIT	477,004	295,060	164,659
R & D EXPENDITURES	60,040	37,979	20,956
SELL GEN & ADMIN EXP	287,325	154,872	77,560
INC BEF DEP & AMORT	129,639	102,209	66,143
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	16,483	14,563	10,400
INTEREST EXPENSE	NA	NA	NA
INCOME BEFORE TAX	146,122	116,772	76,543
PROV FOR INC TAXES	69,408	55,466	37,123
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	76,714	61,306	39,420
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	76,714	61,306	39,420
OUTSTANDING SHARES	59,198,397	57,123,000	55,309,000

QUARTERLY REPORT FOR	12/30/83	03/30/84	06/29/84
	INCOME STATEMENT (000S)		
NET SALES	316,229	300,103	422,144
COST OF GOODS	182,828	178,328	247,093
GROSS PROFIT	133,401	121,775	175,051
R & D EXPENDITURES	25,269	13,197	17,175
SELL GEN & ADMIN EXP	102,671	95,765	129,574
INC BEF DEP & AMORT	5,461	12,813	28,302
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	5,125	3,791	4,960
INTEREST EXPENSE	NA	NA	NA
INCOME BEFORE TAX	10,586	16,604	33,262
PROV FOR INC TAXES	4,764	7,472	14,967
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	5,822	9,132	18,295
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	5,822	9,132	18,295
OUTSTANDING SHARES	59,409,868	59,979,747	60,117,161

SEGMENT DATA SALES (000S) OP INCOME
NA

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	982,769	76,714	1.28
1982	583,061	61,306	1.06
1981	334,783	39,420	0.70
1980	117,126	11,698	0.24
1979	47,867	5,073	0.12

COMMENTS:
CASH INCLUDES MARKETABLE SECURITIES;OTHER EQUITY IS NOTES RECEIVABLE FROM SHAREHOLDERS;NONOPERATING INCOME IS NET INTEREST AND OTHER INCOME (10-Q 12-30-83)

BURROUGHS CORP
DISCLOSURE CO NO: B948600000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PRICE WATERHOUSE
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	54,600	23,187
MRKTABLE SECURITIES	NA	31,753
RECEIVABLES	1,080,200	1,033,940
INVENTORIES	1,266,200	1,182,860
RAW MATERIALS	NA	444,316
WORK IN PROGRESS	510,100	738,546
FINISHED GOODS	643,500	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	NA	110,294
TOTAL CURRENT ASSETS	2,401,000	2,382,034
PROP, PLANT & EQUIP	2,661,600	2,670,785
ACCUMULATED DEP	1,398,300	1,402,476
NET PROP & EQUIP	1,263,300	1,268,309
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	286,500	348,904
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	147,400	123,876
TOTAL ASSETS	4,098,200	4,123,123
	LIABILITIES (000S)	
NOTES PAYABLE	110,300	150,651
ACCOUNTS PAYABLE	525,800	423,643
CUR LONG TERM DEBT	10,800	18,579
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	402,500	235,005
INCOME TAXES	166,700	96,564
OTHER CURRENT LIAB	29,500	206,602
TOTAL CURRENT LIAB	1,245,600	1,131,044
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	55,300	120,854
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	565,400	830,576
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	1,866,300	2,082,474
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	227,800	211,855
CAPITAL SURPLUS	602,000	456,581
RETAINED EARNINGS	1,615,400	1,530,163
TREASURY STOCK	4,800	5,983
OTHER LIABILITIES	(208,500)	(151,967)
SHAREHOLDER'S EQUITY	2,231,900	2,040,649
TOT LIAB & NET WORTH	4,098,200	4,123,123

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	4,296,500	4,095,291	3,318,491
COST OF GOODS	2,638,500	2,669,690	1,896,360
GROSS PROFIT	1,658,000	1,425,601	1,422,131
R & D EXPENDITURES	248,200	220,560	220,187
SELL GEN & ADMIN EXP	1,084,900	1,048,780	889,677
INC BEF DEP & AMORT	324,900	156,261	312,267
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	93,200	90,960	86,937
INTEREST EXPENSE	115,400	172,093	145,078
INCOME BEFORE TAX	302,700	75,128	254,126
PROV FOR INC TAXES	105,800	(16,100)	105,200
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	196,900	91,228	148,926
EX ITEMS & DISC OPS	NA	26,400	NA
NET INCOME	196,900	117,628	148,926
OUTSTANDING SHARES	45,436,100	42,196,000	42,022,000

QUARTERLY REPORT FOR	03/31/84	06/30/84	09/30/84
	INCOME STATEMENT (000S)		
NET SALES	1,082,500	1,217,800	1,136,800
COST OF GOODS	665,400	515,200	691,400
GROSS PROFIT	417,100	702,600	445,400
R & D EXPENDITURES	64,800	69,100	70,500
SELL GEN & ADMIN EXP	273,700	528,400	281,100
INC BEF DEP & AMORT	78,600	105,100	93,800
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	16,900	15,900	16,500
INTEREST EXPENSE	26,200	28,500	33,300
INCOME BEFORE TAX	69,300	92,500	77,000
PROV FOR INC TAXES	26,300	35,200	26,800
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	43,000	57,300	50,200
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	43,000	57,300	50,200
OUTSTANDING SHARES	45,390,712	45,428,393	45,337,485

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	4,389,700	196,900	4.60
1982	4,186,300	117,600	2.80
1981	3,405,400	148,900	3.58
1980	2,902,400	82,000	1.99
1979	2,831,000	305,500	7.45

COMMENTS:
FINANCIAL DATA TAKEN FROM 1983 ANNUAL REPORT TO SHAREHOLDERS;CASH INCLUDESSHORT-TERM INVESTMENTS;OTHER EQUITY IS FRGN. CURRENCY TRANSLATION ADJUSTMENT; FIVE YEAR SUMMARY SALES REPRESENT TOTAL REVENUES

CONVERGENT TECHNOLOGIES INC
DISCLOSURE CO NO: C757200000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: COOPERS & LYBRAND
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	84,764	27,291
MRKTABLE SECURITIES	50,010	10,014
RECEIVABLES	39,620	25,366
INVENTORIES	57,650	30,077
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	6,473	1,289
TOTAL CURRENT ASSETS	238,517	94,037
PROP, PLANT & EQUIP	15,349	6,735
ACCUMULATED DEP	NA	NA
NET PROP & EQUIP	15,349	6,735
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	322	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	1,306	96
TOTAL ASSETS	255,494	100,868
	LIABILITIES (000S)	
NOTES PAYABLE	NA	NA
ACCOUNTS PAYABLE	25,944	6,475
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	299	241
ACCRUED EXPENSES	3,063	4,053
INCOME TAXES	2,036	9,533
OTHER CURRENT LIAB	NA	NA
TOTAL CURRENT LIAB	31,342	20,302
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	NA	67
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	NA	NA
NON-CUR CAP LEASES	592	895
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	31,934	21,264
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	197,253	68,224
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	27,595	12,692
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(1,288)	(1,312)
SHAREHOLDER'S EQUITY	223,560	79,604
TOT LIAB & NET WORTH	255,494	100,868

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	163,542	96,462	13,105
COST OF GOODS	117,677	61,758	6,591
GROSS PROFIT	45,865	34,704	6,514
R & D EXPENDITURES	16,437	7,226	2,574
SELL GEN & ADMIN EXP	17,547	9,271	2,871
INC BEF DEP & AMORT	11,881	18,207	1,069
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	13,061	3,666	200
INTEREST EXPENSE	204	269	127
INCOME BEFORE TAX	24,738	21,604	1,142
PROV FOR INC TAXES	9,835	9,689	365
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	14,903	11,915	777
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	14,903	11,915	777
OUTSTANDING SHARES	36,262,447	30,037,605	17,092,356

QUARTERLY REPORT FOR	03/31/84	06/30/84	09/30/84
	INCOME STATEMENT (000S)		
NET SALES	58,609	84,980	105,661
COST OF GOODS	47,401	66,570	88,452
GROSS PROFIT	11,208	18,410	17,309
R & D EXPENDITURES	2,854	3,498	4,574
SELL GEN & ADMIN EXP	8,146	8,174	10,730
INC BEF DEP & AMORT	208	6,738	2,005
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	3,072	578	818
INTEREST EXPENSE	68	NA	NA
INCOME BEFORE TAX	3,212	7,316	2,823
PROV FOR INC TAXES	1,381	3,198	124
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	1,831	4,118	2,699
EX ITEMS & DISC OPS	NA	(10,582)	NA
NET INCOME	1,831	(6,464)	2,699
OUTSTANDING SHARES	36,281,974	36,038,917	36,265,018

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	163,542	14,903	0.40
1982	96,462	11,915	0.42
1981	13,105	777	0.04
1980	351	(3,365)	NA
1979	NA	(317)	NA

COMMENTS:
FINANCIALS TAKEN FROM 1983 ANNUAL REPORT TO SHAREHOLDERS;OTHER LIABILITIES IS NOTES RECEIVABLES FROM SHAREHOLDERS;FIVE YEARS SUMMARY DATA FOR 1979 IS FOR FIVE MONTH PERIOD

DATA GENERAL CORP
DISCLOSURE CO NO: D102000000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PRICE WATERHOUSE
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	09/24/83	09/25/82
	ASSETS (000S)	
CASH	210,815	155,324
MRKTABLE SECURITIES	24,225	36,554
RECEIVABLES	169,637	167,768
INVENTORIES	216,280	217,310
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	9,583	8,450
TOTAL CURRENT ASSETS	630,540	585,406
PROP, PLANT & EQUIP	421,822	358,090
ACCUMULATED DEP	207,476	157,013
NET PROP & EQUIP	214,346	201,077
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	NA	NA
TOTAL ASSETS	844,886	786,483
	LIABILITIES (000S)	
NOTES PAYABLE	16,452	15,166
ACCOUNTS PAYABLE	46,123	45,580
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	23,040	19,638
INCOME TAXES	67,787	63,181
OTHER CURRENT LIAB	55,751	44,465
TOTAL CURRENT LIAB	209,153	188,030
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	27,857	30,177
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	138,878	139,233
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	375,888	357,440
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	226	218
CAPITAL SURPLUS	140,526	123,714
RETAINED EARNINGS	328,246	305,111
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	468,998	429,043
TOT LIAB & NET WORTH	844,886	786,483

FISCAL YEAR ENDING	09/24/83	09/25/82	09/26/81
	INCOME STATEMENT (000S)		
NET SALES	828,904	805,910	736,872
COST OF GOODS	476,391	457,414	382,555
GROSS PROFIT	352,513	348,496	354,317
R & D EXPENDITURES	84,662	84,538	74,573
SELL GEN & ADMIN EXP	231,321	228,052	198,389
INC BEF DEP & AMORT	36,530	35,906	81,355
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	21,290	18,727	13,878
INTEREST EXPENSE	16,810	17,582	19,683
INCOME BEFORE TAX	41,010	37,051	75,550
PROV FOR INC TAXES	17,875	17,222	34,740
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	23,135	19,829	40,810
EX ITEMS & DISC OPS	NA	4,829	9,853
NET INCOME	23,135	24,658	50,663
OUTSTANDING SHARES	22,641,000	21,936,000	10,497,000

QUARTERLY REPORT FOR	12/17/83	03/10/84	06/02/84
	INCOME STATEMENT (000S)		
NET SALES	219,586	248,448	277,053
COST OF GOODS	127,946	144,948	160,085
GROSS PROFIT	91,640	103,500	116,968
R & D EXPENDITURES	19,714	20,380	23,278
SELL GEN & ADMIN EXP	58,311	63,727	68,831
INC BEF DEP & AMORT	13,615	19,393	24,859
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	1,430	1,614	5,061
INTEREST EXPENSE	NA	NA	4,018
INCOME BEFORE TAX	15,045	21,007	25,902
PROV FOR INC TAXES	6,020	8,401	9,842
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	9,025	12,606	16,060
EX ITEMS & DISC OPS	NA	NA	3,473
NET INCOME	9,025	12,606	19,533
OUTSTANDING SHARES	22,744,483	23,779,000	24,190,000

SEGMENT DATA — SALES (000S) — OP INCOME

NA

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	828,904	23,135	0.96
1982	805,910	24,658	1.14
1981	736,872	50,663	2.39
1980	653,887	54,690	2.60
1979	507,483	49,814	2.41

COMMENTS:

CASH INCLUDES MARKETABLE SECURITIES;1982 BALANCE SHEET IS RESTATED

DATAPOINT CORP
DISCLOSURE CO NO: D157000000
CROSS REFERENCE: WAS COMPUTER TERMINAL CORP

AUDITOR CHANGE: NA
AUDITOR: PEAT, MARWICK, MITCHELL & CO.
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	07/31/83	07/31/82
	ASSETS (000S)	
CASH	8,236	7,043
MRKTABLE SECURITIES	98,962	45,359
RECEIVABLES	135,523	132,445
INVENTORIES	77,823	97,318
RAW MATERIALS	27,603	27,796
WORK IN PROGRESS	15,519	22,249
FINISHED GOODS	34,701	47,273
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	3,346	3,495
TOTAL CURRENT ASSETS	323,890	285,660
PROP, PLANT & EQUIP	137,587	153,242
ACCUMULATED DEP	NA	NA
NET PROP & EQUIP	137,587	153,242
INVEST & ADV TO SUBS	12,464	9,166
OTH NON-CUR ASSETS	13,982	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	88,659	112,422
DEPOSITS & OTH ASSET	10,092	11,260
TOTAL ASSETS	586,674	571,750
	LIABILITIES (000S)	
NOTES PAYABLE	8,138	14,597
ACCOUNTS PAYABLE	28,020	21,053
CUR LONG TERM DEBT	8,299	5,479
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	55,431	58,892
INCOME TAXES	3,987	2,479
OTHER CURRENT LIAB	1,927	1,834
TOTAL CURRENT LIAB	105,802	104,334
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	27,172	9,856
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	123,737	131,603
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	256,711	245,793
MINORITY INT (LIAB)	NA	(193)
PREFERRED STOCK	NA	NA
COMMON STOCK NET	5,026	4,992
CAPITAL SURPLUS	187,227	185,253
RETAINED EARNINGS	149,251	141,174
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(11,541)	(5,269)
SHAREHOLDER'S EQUITY	329,963	326,150
TOT LIAB & NET WORTH	586,674	571,750

FISCAL YEAR ENDING	07/31/83	07/31/82	07/31/81
	INCOME STATEMENT (000S)		
NET SALES	540,192	508,486	449,490
COST OF GOODS	295,098	277,205	226,318
GROSS PROFIT	245,094	231,281	223,172
R & D EXPENDITURES	47,267	44,637	36,532
SELL GEN & ADMIN EXP	183,936	180,239	109,077
INC BEF DEP & AMORT	13,891	6,405	77,563
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	NA	NA	7,785
INTEREST EXPENSE	8,194	2,260	NA
INCOME BEFORE TAX	5,697	4,145	85,348
PROV FOR INC TAXES	(2,380)	1,623	36,397
MINORITY INT (INC)	NA	117	190
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	8,077	2,405	48,761
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	8,077	2,405	48,761
OUTSTANDING SHARES	20,102,084	19,967,553	19,521,002

QUARTERLY REPORT FOR	10/31/83	01/31/84	04/30/84
	INCOME STATEMENT (000S)		
NET SALES	139,724	140,806	155,017
COST OF GOODS	75,120	72,813	81,736
GROSS PROFIT	64,604	67,993	73,281
R & D EXPENDITURES	10,263	10,665	12,583
SELL GEN & ADMIN EXP	40,919	42,924	47,535
INC BEF DEP & AMORT	13,422	14,404	13,163
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	(3,898)	605	2,669
INTEREST EXPENSE	NA	NA	NA
INCOME BEFORE TAX	9,524	15,009	15,832
PROV FOR INC TAXES	4,089	6,460	7,864
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	5,435	8,549	7,968
EX ITEMS & DISC OPS	NA	741	NA
NET INCOME	5,435	9,290	7,968
OUTSTANDING SHARES	20,147,120	20,207,495	20,230,320

SEGMENT DATA — SALES (000S) OP INCOME

NA

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	540,192	8,077	0.40
1982	508,486	2,405	0.12
1981	449,490	48,761	2.45
1980	318,826	33,478	1.90
1979	232,101	25,246	1.46

COMMENTS:

NA

DEVELCON ELECTRONICS LTD
DISCLOSURE CO NO: D464500000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PEAT, MARWICK, MITCHELL & CO.
AUDITOR'S REPORT: UNQUALIFIED;EXCEPT FOR, CHANGE IN THE METHOD OF ACCOUNTING FOR DEVELOPMENT COSTS WITH WHICH THE AUDITORS CONCUR

FISCAL YEAR ENDING	08/31/83	08/31/82
	ASSETS (000S)	
CASH	1,047	3,208
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	5,616	2,804
INVENTORIES	4,221	1,640
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	486	336
TOTAL CURRENT ASSETS	11,370	7,988
PROP, PLANT & EQUIP	1,808	1,229
ACCUMULATED DEP	NA	NA
NET PROP & EQUIP	1,808	1,229
INVEST & ADV TO SUBS	83	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	NA	54
TOTAL ASSETS	13,261	9,271
	LIABILITIES (000S)	
NOTES PAYABLE	650	NA
ACCOUNTS PAYABLE	1,112	662
CUR LONG TERM DEBT	32	54
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	471	241
INCOME TAXES	782	613
OTHER CURRENT LIAB	NA	NA
TOTAL CURRENT LIAB	3,047	1,570
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	181	130
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	521	576
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	3,749	2,276
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	4,785	4,785
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	4,883	2,366
TREASURY STOCK	156	156
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	9,512	6,995
TOT LIAB & NET WORTH	13,261	9,271

FISCAL YEAR ENDING	08/31/83	08/31/82	08/31/81
	INCOME STATEMENT (000S)		
NET SALES	16,191	9,660	6,673
COST OF GOODS	6,014	3,909	2,804
GROSS PROFIT	10,177	5,751	3,869
R & D EXPENDITURES	572	290	264
SELL GEN & ADMIN EXP	5,133	2,828	1,802
INC BEF DEP & AMORT	4,472	2,633	1,803
DEPRECIATION & AMORT	304	129	93
NON-OPERATING INC	263	73	NA
INTEREST EXPENSE	83	279	282
INCOME BEFORE TAX	4,348	2,298	1,428
PROV FOR INC TAXES	1,831	984	497
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	2,517	1,314	931
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	2,517	1,314	931
OUTSTANDING SHARES	2,887,500	2,887,500	NA

QUARTERLY REPORT FOR	02/29/84	05/31/84
	INCOME STATEMENT (000S)	
NET SALES	3,559	4,365
COST OF GOODS	1,493	1,962
GROSS PROFIT	2,066	3,003
R & D EXPENDITURES	203	318
SELL GEN & ADMIN EXP	2,038	2,628
INC BEF DEP & AMORT	(175)	57
DEPRECIATION & AMORT	134	134
NON-OPERATING INC	158	353
INTEREST EXPENSE	52	21
INCOME BEFORE TAX	(203)	255
PROV FOR INC TAXES	(126)	67
MINORITY INT (INC)	NA	NA
INVEST GAINS/LOSSES	NA	NA
OTHER INCOME	NA	NA
NET INC BEF EX ITEMS	(77)	188
EX ITEMS & DISC OPS	NA	61
NET INCOME	(77)	249
OUTSTANDING SHARES	3,737,500	3,737,500

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	16,191	2,517	0.88
1982	9,660	1,314	0.58
1981	6,673	931	0.44
1980	3,089	234	0.11
1979	1,258	14	0.01

COMMENTS:
*FOREIGN CURRENCY, CANADIAN DOLLARS;ALL INFORMATION FROM REGST F-1 NO. 2-87522, 10-31-83;CASH INCLUDES BANK TERM DEPOSITS;EXTRAORDINARY ITEM IS TAX BENEFIT FROM OPERATING LOSS CARRYFOWARD (10-Q 05-31-84);

DIGITAL EQUIPMENT CORP
DISCLOSURE CO NO: D570000000
CROSS REFERENCE: NA

? TYPE 3/8/1
3/8/1
0002538
DIGITAL EQUIPMENT CORP
DISCLOSURE CO NO: D570000000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: COOPERS & LYBRAND
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	06/30/84	07/02/83
	ASSETS (000S)	
CASH	476,150	556,209
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	1,527,257	1,125,037
INVENTORIES	1,852,168	1,353,830
RAW MATERIALS	456,490	320,820
WORK IN PROGRESS	614,766	557,509
FINISHED GOODS	780,912	475,501
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	226,338	166,283
TOTAL CURRENT ASSETS	4,081,913	3,201,359
PROP, PLANT & EQUIP	2,351,786	1,961,368
ACCUMULATED DEP	840,446	621,642
NET PROP & EQUIP	1,511,340	1,339,726
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	NA	NA
TOTAL ASSETS	5,593,253	4,541,085
	LIABILITIES (000S)	
NOTES PAYABLE	13,181	14,897
ACCOUNTS PAYABLE	278,111	213,728
CUR LONG TERM DEBT	1,374	1,371
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	224,036	194,035
INCOME TAXES	312,871	221,820
OTHER CURRENT LIAB	250,971	178,516
TOTAL CURRENT LIAB	1,080,544	824,367
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	92,180	82,626
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	441,313	92,810
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	1,614,037	999,803
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	57,811	56,357
CAPITAL SURPLUS	1,610,575	1,509,781
RETAINED EARNINGS	2,310,830	1,975,144
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	3,979,216	3,541,282
TOT LIAB & NET WORTH	5,593,253	4,541,085

FISCAL YEAR ENDING	06/30/84	07/02/83	07/03/82
	INCOME STATEMENT (000S)		
NET SALES	5,584,426	4,271,854	3,880,771
COST OF GOODS	3,379,632	2,605,970	2,187,620
GROSS PROFIT	2,204,794	1,665,884	1,693,151
R & D EXPENDITURES	630,696	472,392	349,778
SELL GEN & ADMIN EXP	1,179,529	830,564	758,607
INC BEF DEP & AMORT	394,569	362,928	584,766
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	41,477	61,195	102,811
INTEREST EXPENSE	35,096	13,078	14,746
INCOME BEFORE TAX	400,950	411,045	672,831
PROV FOR INC TAXES	72,171	127,423	255,676
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	328,779	283,622	417,155
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	328,779	283,622	417,155
OUTSTANDING SHARES	57,811,416	56,357,078	55,227,370

QUARTERLY REPORT FOR	09/29/84
	INCOME STATEMENT (000S)
NET SALES	1,515,263
COST OF GOODS	917,032
GROSS PROFIT	598,231
R & D EXPENDITURES	165,024
SELL GEN & ADMIN EXP	323,348
INC BEF DEP & AMORT	109,859
DEPRECIATION & AMORT	NA
NON-OPERATING INC	11,818
INTEREST EXPENSE	17,874
INCOME BEFORE TAX	103,803
PROV FOR INC TAXES	(40,413)
MINORITY INT (INC)	NA
INVEST GAINS/LOSSES	NA
OTHER INCOME	NA
NET INC BEF EX ITEMS	144,216
EX ITEMS & DISC OPS	NA
NET INCOME	144,216
OUTSTANDING SHARES	58,076,518

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1984	5,584,400	328,800	5.73
1983	4,271,900	283,600	5.00
1982	3,880,800	417,200	7.53
1981	3,198,100	343,300	6.70
1980	2,368,000	249,900	5.45

COMMENTS:
CASH INCLUDES TEMPORARY CASH INVESTMENTS

DYSAN CORP
DISCLOSURE CO NO: D990000000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PRICE WATERHOUSE
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	10/29/83	10/30/82
	ASSETS (000S)	
CASH	60,678	14,771
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	33,619	23,170
INVENTORIES	35,387	35,220
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	2,048	4,965
TOTAL CURRENT ASSETS	131,732	78,126
PROP, PLANT & EQUIP	100,396	80,850
ACCUMULATED DEP	NA	NA
NET PROP & EQUIP	100,396	80,850
INVEST & ADV TO SUBS	6,787	10,851
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	2,020	1,151
TOTAL ASSETS	240,935	170,978
	LIABILITIES (000S)	
NOTES PAYABLE	NA	NA
ACCOUNTS PAYABLE	18,570	9,128
CUR LONG TERM DEBT	861	723
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	5,211	4,387
INCOME TAXES	6,888	4,262
OTHER CURRENT LIAB	753	856
TOTAL CURRENT LIAB	32,283	19,356
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	9,179	5,999
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	10,218	5,000
NON-CUR CAP LEASES	9,099	9,657
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	60,779	40,012
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	101,592	101,324
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	78,564	29,642
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	180,156	130,966
TOT LIAB & NET WORTH	240,935	170,978

FISCAL YEAR ENDING	10/29/83	10/30/82	10/31/81
	INCOME STATEMENT (000S)		
NET SALES	180,013	142,756	104,202
COST OF GOODS	109,482	83,796	67,118
GROSS PROFIT	70,531	58,960	37,084
R & D EXPENDITURES	35,001	25,491	15,866
SELL GEN & ADMIN EXP	30,211	23,629	12,162
INC BEF DEP & AMORT	5,319	9,840	9,056
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	67,932	900	NA
INTEREST EXPENSE	NA	NA	3,327
INCOME BEFORE TAX	73,251	10,740	5,729
PROV FOR INC TAXES	25,850	3,050	1,300
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	1,521	1,320	729
NET INC BEF EX ITEMS	48,922	9,010	5,158
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	48,922	9,010	5,158
OUTSTANDING SHARES	16,982,966	16,760,915	14,080,978

QUARTERLY REPORT FOR	01/29/84	05/05/84	08/04/84
	INCOME STATEMENT (000S)		
NET SALES	52,102	44,973	52,147
COST OF GOODS	32,574	27,200	37,973
GROSS PROFIT	19,528	17,773	14,174
R & D EXPENDITURES	9,802	9,219	22,627
SELL GEN & ADMIN EXP	9,933	7,286	11,610
INC BEF DEP & AMORT	(207)	1,268	(20,063)
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	3,331	31,022	1,174
INTEREST EXPENSE	NA	NA	26
INCOME BEFORE TAX	3,124	32,290	(18,915)
PROV FOR INC TAXES	1,100	10,665	(4,275)
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	67	837	146
NET INC BEF EX ITEMS	2,091	22,462	(14,494)
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	2,091	22,462	(14,494)
OUTSTANDING SHARES	17,170,372	17,172,122	17,212,447

SEGMENT DATA SALES (000S) OP INCOME
NA

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	180,013	48,922	2.85
1982	142,756	9,010	0.55
1981	104,202	5,158	0.38
1980	62,871	7,993	0.74
1979	33,777	3,001	0.32

COMMENTS:
OTHER INCOME IS EQUITY EARNINGS (10-Q 01-29-83) (10-Q 04-30-83) (10-Q 07-30-83) AND (10-K 10-29-83):CASH INCLUDES SHORT TERM INVESTMENTS

EXXON CORP
DISCLOSURE CO NO: E979562000
CROSS REFERENCE: WAS STANDARD OIL CO OF NEW JERSEY

AUDITOR CHANGE: NA
AUDITOR: PRICE WATERHOUSE
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	748,266	741,324
MRKTABLE SECURITIES	3,347,953	2,707,416
RECEIVABLES	NA	NA
INVENTORIES	4,970,803	5,536,221
RAW MATERIALS	NA	3,798,532
WORK IN PROGRESS	NA	1,737,689
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	7,900,237	8,366,098
OTHER CURRENT ASSETS	1,628,296	2,441,627
TOTAL CURRENT ASSETS	18,595,460	19,792,686
PROP, PLANT & EQUIP	61,785,831	58,109,505
ACCUMULATED DEP	20,917,407	19,127,676
NET PROP & EQUIP	40,868,424	38,981,829
INVEST & ADV TO SUBS	1,746,620	1,714,484
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	1,752,486	NA
DEPOSITS & OTH ASSET	NA	1,799,551
TOTAL ASSETS	62,962,990	62,288,550
	LIABILITIES (000S)	
NOTES PAYABLE	867,285	2,747,685
ACCOUNTS PAYABLE	11,000,240	11,692,366
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	NA	NA
INCOME TAXES	3,171,163	2,024,689
OTHER CURRENT LIAB	NA	NA
TOTAL CURRENT LIAB	15,038,688	16,464,740
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	9,327,744	8,944,340
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	4,668,915	4,555,580
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	3,271,905	2,697,771
TOTAL LIABILITIES	32,307,252	32,662,431
MINORITY INT (LIAB)	1,212,643	1,185,928
PREFERRED STOCK	NA	NA
COMMON STOCK NET	2,822,254	1,760,554
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	29,515,384	27,211,257
TREASURY STOCK	1,824,146	NA
OTHER LIABILITIES	(1,070,397)	(531,620)
SHAREHOLDER'S EQUITY	29,443,095	28,440,191
TOT LIAB & NET WORTH	62,962,990	62,288,550

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	93,446,663	102,058,895	113,220,300
COST OF GOODS	57,159,849	66,789,3[illegible]	76,076,432
GROSS PROFIT	36,286,814	35,269,535	37,143,868
R & D EXPENDITURES	1,408,009	1,773,318	1,650,214
SELL GEN [illegible]OMIN EXP	4,948,385	5,253,148	5,232,793
INC BEF DEP & AMORT	29,930,420	28,243,069	30,[illegible],861
DEPRECIATION & AMORT	3,527,817	3,333,455	2,898,920
NON-OPERATING INC	1,287,308	1,499,650	1,702,261
INTEREST EXPENSE	748,758	669,[illegible]95	779,688
INCOME BEFORE TAX	26,941,153	25,739,669	28,284,514
PROV FOR INC TAXES	21,805,511	21,443,070	23,342,745
MINORITY INT (INC)	157,685	110,667	115,554
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	4,977,957	4,185,932	4,826,215
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	4,977,957	4,185,932	4,826,215
OUTSTANDING SHARES	84,697,004	866,005,691	866,005,691

QUARTERLY REPORT FOR	03/31/84	06/30/84
	INCOME STATEMENT (000S)	
NET SALES	24,498,000	24,031,000
COST OF GOODS	12,582,000	14,481,000
GROSS PROFIT	11,916,000	9,550,000
R & D EXPENDITURES	307,000	30[illegible],000
SELL GEN & ADMIN EXP	7,728,000	7,119,000
INC BEF DEP & AMORT	3,881,000	2,122,000
DEPRECIATION & AMORT	978,000	953,000
NON-OPERATING INC	362,000	276,000
INTEREST EXPENSE	132,000	55,000
INCOME BEFORE TAX	3,133,000	1,390,000
PROV FOR INC TAXES	1,658,000	NA
MINORITY INT (INC)	NA	40,000
INVEST GAINS/LOSSES	NA	NA
OTHER INCOME	NA	NA
NET INC BEF EX ITEMS	1,475,000	[illegible],350,000
EX ITEMS & DISC OPS	NA	NA
NET INCOME	1,475,000	1,350,000
OUTSTANDI[illegible] SHARES	836,334,095	NA

SEGMENT DATA (12/31/83)	SALES (000S)	OP INCOME
PETROLEUM	83,[illegible]2,000	5,083,000
CHEMICALS	6,392,000	270,000
OTHER	3,433,000	37,000

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	93,447,[illegible]00	4,978,000	5.78
1982	102,059,000	4,186,000	4.82
1981	113,220,000	4,8[illegible]6,000	5.58
1980	108,412,000	5,350,000	6.15
1979	83,555,000	4,295,000	4.87

COMMENTS:
OTHER EQUITY IS CU[illegible]ATIVE FRGN EXCHANGE TRANSLATION ADJUSTMENTS;NON OPERATING INCOME/EXPENSE INCLUDES MINORITY INTEREST (10-Q 03-31-84)

GANDALF TECHNOLOGIES INC
DISCLOSURE CO NO: G058000000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PEAT, MARWICK, MITCHELL & CO.
AUDITOR'S REPORT: UNQUALIFIED;EXCEPT FOR, CONSISTENCY APPLICATION RE CHANGE IN METHOD OF ACCOUNTING FOR FRGN. CURRENCY TRANSLATION UNDER FASB NO. 52, WITHWHICH THE AUDITORS CONCUR

FISCAL YEAR ENDING	07/31/83	07/31/82
	ASSETS (000S)	
CASH	961	490
MRKTABLE SECURITIES	16,152	15,475
RECEIVABLES	10,528	11,404
INVENTORIES	10,850	11,000
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	1,476	1,498
TOTAL CURRENT ASSETS	39,967	39,867
PROP, PLANT & EQUIP	15,885	8,702
ACCUMULATED DEP	NA	NA
NET PROP & EQUIP	15,885	8,702
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	211	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	448	80
TOTAL ASSETS	56,511	48,649
	LIABILITIES (000S)	
NOTES PAYABLE	3,014	2,241
ACCOUNTS PAYABLE	2,422	2,585
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	NA	NA
INCOME TAXES	635	1,721
OTHER CURRENT LIAB	4,185	3,522
TOTAL CURRENT LIAB	10,256	10,069
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	770	1,319
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	5,454	507
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	16,480	11,895
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	22,423	22,278
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	18,070	14,476
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(462)	NA
SHAREHOLDER'S EQUITY	40,031	36,754
TOT LIAB & NET WORTH	56,511	48,649

FISCAL YEAR ENDING	07/31/83	07/31/82	07/31/81
	INCOME STATEMENT (000S)		
NET SALES	58,580	53,318	40,214
COST OF GOODS	31,251	25,877	19,824
GROSS PROFIT	27,329	27,441	20,390
R & D EXPENDITURES	6,491	4,217	2,813
SELL GEN & ADMIN EXP	17,405	14,564	10,282
INC BEF DEP & AMORT	3,433	8,660	7,295
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	1,678	2,016	34
INTEREST EXPENSE	390	270	928
INCOME BEFORE TAX	4,721	10,406	6,401
PROV FOR INC TAXES	1,022	3,712	2,290
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	3,699	6,694	4,111
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	3,699	6,694	4,111
OUTSTANDING SHARES	9,832,134	9,800,554	NA

QUARTERLY REPORT FOR	10/29/83	01/28/84	04/28/84
	INCOME STATEMENT (000S)		
NET SALES	14,777	15,849	17,432
COST OF GOODS	8,175	8,092	9,040
GROSS PROFIT	6,602	7,757	8,392
R & D EXPENDITURES	2,058	2,102	2,467
SELL GEN & ADMIN EXP	4,260	4,712	4,851
INC BEF DEP & AMORT	284	943	1,074
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	419	379	362
INTEREST EXPENSE	75	84	51
INCOME BEFORE TAX	628	1,238	1,385
PROV FOR INC TAXES	113	251	5
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	515	987	1,380
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	515	987	1,380
OUTSTANDING SHARES	9,841,882	9,858,994	9,864,015

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	58,580	3,699	0.38
1982	53,318	6,694	0.73
1981	40,214	4,111	0.53
1980	26,135	3,303	0.44
1979	12,900	1,249	0.16

COMMENTS:
*FOREIGN CURRENCY, CANADIAN DOLLARS (10-K 07-31-83) AND (10-Q 10-29-83);INCOME TAX INCLUDES OTHER TAXES PAYABLE;OTHER EQUITY IS FRGN. CURRENCY TRANSLATION ADJUSTMENT

HARRIS CORP FLA
DISCLOSURE CO NO: H203156000
CROSS REFERENCE: WAS HARRIS INTERTYPE CORP

AUDITOR CHANGE: NA
AUDITOR: ERNST & WHINNEY
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	06/30/84	06/30/83
	ASSETS (000S)	
CASH	32,205	25,395
MRKTABLE SECURITIES	111,906	284,035
RECEIVABLES	357,749	309,003
INVENTORIES	353,697	341,488
RAW MATERIALS	131,325	114,497
WORK IN PROGRESS	222,372	226,991
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	193,283	134,869
TOTAL CURRENT ASSETS	1,048,840	1,094,790
PROP, PLANT & EQUIP	919,476	796,454
ACCUMULATED DEP	390,371	329,231
NET PROP & EQUIP	529,105	467,223
INVEST & ADV TO SUBS	89,534	15,471
OTH NON-CUR ASSETS	NA	30,533
DEFERRED CHARGES	9,824	8,688
INTANGIBLES	19,560	20,466
DEPOSITS & OTH ASSET	NA	NA
TOTAL ASSETS	1,696,863	1,637,171
	LIABILITIES (000S)	
NOTES PAYABLE	11,716	11,260
ACCOUNTS PAYABLE	128,590	98,127
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	153,086	169,095
INCOME TAXES	134,149	115,755
OTHER CURRENT LIAB	129,122	99,318
TOTAL CURRENT LIAB	556,663	493,555
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	108,813	124,858
CONVERTIBLE DEBT	NA	30,000
LONG TERM DEBT	213,296	227,492
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	878,772	875,905
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	40,009	39,535
CAPITAL SURPLUS	130,566	117,383
RETAINED EARNINGS	658,465	612,881
TREASURY STOCK	226	174
OTHER LIABILITIES	(10,723)	(8,359)
SHAREHOLDER'S EQUITY	818,091	761,266
TOT LIAB & NET WORTH	1,696,863	1,637,171

FISCAL YEAR ENDING	06/30/84	06/30/83	06/30/82
	INCOME STATEMENT (000S)		
NET SALES	1,995,802	1,809,302	1,646,181
COST OF GOODS	1,316,792	1,177,536	1,036,245
GROSS PROFIT	679,010	631,766	609,936
R & D EXPENDITURES	NA	NA	NA
SELL GEN & ADMIN EXP	590,871	540,036	482,223
INC BEF DEP & AMORT	88,139	91,730	127,713
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	30,366	16,046	14,903
INTEREST EXPENSE	23,039	28,657	15,609
INCOME BEFORE TAX	95,466	79,119	127,007
PROV FOR INC TAXES	21,774	17,231	47,958
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	6,718	1,931	1,128
NET INC BEF EX ITEMS	80,410	63,819	80,177
EX ITEMS & DISC OPS	NA	5,555	21,299
NET INCOME	80,410	69,374	101,476
OUTSTANDING SHARES	39,948,121	31,593,940	31,317,522

QUARTERLY REPORT FOR	09/28/84
	INCOME STATEMENT (000S)
NET SALES	511,726
COST OF GOODS	336,992
GROSS PROFIT	174,734
R & D EXPENDITURES	NA
SELL GEN & ADMIN EXP	156,460
INC BEF DEP & AMORT	18,274
DEPRECIATION & AMORT	NA
NON-OPERATING INC	10,313
INTEREST EXPENSE	6,732
INCOME BEFORE TAX	21,855
PROV FOR INC TAXES	(78)
MINORITY INT (INC)	NA
INVEST GAINS/LOSSES	NA
OTHER INCOME	3,384
NET INC BEF EX ITEMS	25,317
EX ITEMS & DISC OPS	NA
NET INCOME	25,317
OUTSTANDING SHARES	40,221,995

SEGMENT DATA (06/30/84)	SALES (000S)	OP INCOME
INFORMATION SYSTEMS	320,400	22,100
LANIER	409,600	22,900
COMMUNICATIONS	401,100	20,500
SEMICONDUCTOR	234,300	15,100
GOVERNMENT SYSTEMS	399,300	51,400

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1984	1,995,802	80,410	2.02
1983	1,809,302	63,819	1.62
1982	1,646,181	80,177	2.05
1981	1,418,796	105,740	2.73
1980	1,177,174	73,911	1.94

COMMENTS:
PRIOR YEARS FINANCIALS RESTATED TO CONFORM TO CURRENT PRESENTATION; FIVE YEAR SUMMARY NET INCOME IS INCOME BEFORE EXTRAORDINARY ITEM

HEWLETT PACKARD CO
DISCLOSURE CO NO: H497200000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PRICE WATERHOUSE
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	10/31/83	10/31/82
	ASSETS (000S)	
CASH	880,000	684,000
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	951,000	773,000
INVENTORIES	748,000	659,000
RAW MATERIALS	469,000	428,000
WORK IN PROGRESS	NA	NA
FINISHED GOODS	279,000	231,000
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	53,000	99,000
TOTAL CURRENT ASSETS	2,632,000	2,215,000
PROP, PLANT & EQUIP	2,157,000	1,760,000
ACCUMULATED DEP	726,000	589,000
NET PROP & EQUIP	1,431,000	1,171,000
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	98,000	84,000
TOTAL ASSETS	4,161,000	3,470,000
	LIABILITIES (000S)	
NOTES PAYABLE	148,000	156,000
ACCOUNTS PAYABLE	203,000	139,000
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	457,000	417,000
INCOME TAXES	112,000	151,000
OTHER CURRENT LIAB	NA	NA
TOTAL CURRENT LIAB	920,000	863,000
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	283,000	219,000
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	71,000	39,000
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	1,274,000	1,121,000
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	733,000	587,000
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	2,154,000	1,762,000
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	2,887,000	2,349,000
TOT LIAB & NET WORTH	4,161,000	3,470,000

FISCAL YEAR ENDING	10/31/83	10/31/82	10/31/81
	INCOME STATEMENT (000S)		
NET SALES	4,710,000	4,189,000	3,528,000
COST OF GOODS	2,195,000	1,967,000	1,659,000
GROSS PROFIT	2,515,000	2,222,000	1,869,000
R & D EXPENDITURES	493,000	424,000	349,000
SELL GEN & ADMIN EXP	1,294,000	1,122,000	953,000
INC BEF DEP & AMORT	728,000	676,000	567,000
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	NA	NA	NA
INTEREST EXPENSE	NA	NA	NA
INCOME BEFORE TAX	728,000	676,000	567,000
PROV FOR INC TAXES	296,000	293,000	262,000
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	432,000	383,000	305,000
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	432,000	383,000	305,000
OUTSTANDING SHARES	254,914,000	125,346,000	122,672,551

QUARTERLY REPORT FOR	01/31/84	04/30/84	07/31/84
	INCOME STATEMENT (000S)		
NET SALES	1,278,000	1,519,000	1,559,000
COST OF GOODS	595,000	699,000	744,000
GROSS PROFIT	683,000	820,000	815,000
R & D EXPENDITURES	135,000	145,000	149,000
SELL GEN & ADMIN EXP	384,000	439,000	448,000
INC BEF DEP & AMORT	164,000	236,000	218,000
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	NA	NA	NA
INTEREST EXPENSE	NA	NA	NA
INCOME BEFORE TAX	164,000	236,000	218,000
PROV FOR INC TAXES	69,000	95,000	84,000
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	95,000	141,000	134,000
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	95,000	141,000	134,000
OUTSTANDING SHARES	256,100,000	257,000,000	256,300,000

SEGMENT DATA (10/31/83)	SALES (000S)	OP INCOME
COMPUTER PRODUCTS	2,420,000	392,000
ELECTRONIC TEST & MEASUREMENT	1,753,000	381,000
MEDICAL ELECTRONIC EQUIPMENT	343,000	61,000
ANALYTICAL INSTRUMENTATION	184,000	23,000

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	4,710,000	432,000	1.69
1982	4,189,000	383,000	1.53
1981	3,528,000	305,000	1.24
1980	3,046,000	263,000	1.09
1979	2,330,000	199,000	0.84

COMMENTS:
RECLASSIFIED CERTAIN AMOUNTS IN BALANCE SHEET (1982) AND INCOME STATEMENTS (1981 & 1982) TO CONFORM WITH THE 1983 FORMAT;CASH INCLUDES MARKETABLE SECURITIES;INVENTORIES, RAW MATERIALS INCLUDES WORK-IN-PROGRESS;COMMON STOCK INCLUDES CAPITAL SURPLUS;EARNINGS PER SHARE REFLECT 2-FOR-1 STOCK SPLIT IN 08-83

HONEYWELL INC
DISCLOSURE CO NO: H715000000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: DELOITTE HASKINS & SELLS
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	42,600	42,600
MRKTABLE SECURITIES	475,600	273,700
RECEIVABLES	1,048,900	1,180,400
INVENTORIES	966,700	937,200
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	NA	NA
TOTAL CURRENT ASSETS	2,533,800	2,433,900
PROP, PLANT & EQUIP	2,561,600	2,446,300
ACCUMULATED DEP	1,115,600	1,054,300
NET PROP & EQUIP	1,446,000	1,392,000
INVEST & ADV TO SUBS	408,400	409,400
OTH NON-CUR ASSETS	24,100	33,000
DEFERRED CHARGES	NA	NA
INTANGIBLES	128,600	118,300
DEPOSITS & OTH ASSET	134,500	84,300
TOTAL ASSETS	4,675,400	4,470,900
	LIABILITIES (000S)	
NOTES PAYABLE	139,000	115,900
ACCOUNTS PAYABLE	246,700	245,500
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	743,600	688,400
INCOME TAXES	126,600	95,300
OTHER CURRENT LIAB	87,800	121,400
TOTAL CURRENT LIAB	1,349,700	1,266,500
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	252,900	307,000
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	695,500	676,300
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	63,600	77,700
TOTAL LIABILITIES	2,361,700	2,327,500
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	70,300	34,800
CAPITAL SURPLUS	655,800	659,100
RETAINED EARNINGS	1,744,700	1,596,100
TREASURY STOCK	300	32,000
OTHER LIABILITIES	(156,800)	(114,600)
SHAREHOLDER'S EQUITY	2,313,700	2,143,400
TOT LIAB & NET WORTH	4,675,400	4,470,900

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	5,753,100	5,490,400	5,351,200
COST OF GOODS	3,814,800	3,541,600	3,422,200
GROSS PROFIT	1,938,300	1,948,800	1,929,000
R & D EXPENDITURES	428,600	396,900	368,800
SELL GEN & ADMIN EXP	1,172,800	1,206,700	1,145,600
INC BEF DEP & AMORT	336,900	345,200	414,600
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	69,600	157,000	71,900
INTEREST EXPENSE	91,800	118,100	123,100
INCOME BEFORE TAX	314,700	384,100	363,400
PROV FOR INC TAXES	83,500	111,200	104,100
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	231,200	272,900	259,300
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	231,200	272,900	259,300
OUTSTANDING SHARES	46,866,336	22,727,859	23,173,999

QUARTERLY REPORT FOR	04/01/84	07/01/84	09/30/84
	INCOME STATEMENT (000S)		
NET SALES	1,392,300	1,486,700	1,496,400
COST OF GOODS	928,000	970,000	996,200
GROSS PROFIT	464,300	516,700	500,200
R & D EXPENDITURES	101,400	104,100	108,700
SELL GEN & ADMIN EXP	301,400	298,100	304,400
INC BEF DEP & AMORT	61,500	114,500	87,100
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	NA	NA	NA
INTEREST EXPENSE	3,700	4,000	7,100
INCOME BEFORE TAX	57,800	110,500	80,000
PROV FOR INC TAXES	18,200	36,200	(13,300)
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	39,600	74,300	93,300
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	39,600	74,300	93,300
OUTSTANDING SHARES	46,883,893	46,912,080	47,427,396

SEGMENT DATA (12/31/83)	SALES (000S)	OP INCOME
AEROSPACE AND DEFENSE	1,540,100	109,000
CONTROL PRODUCTS	976,100	40,200
CONTROL SYSTEMS	1,570,800	134,900
INFORMATION SYSTEMS	1,666,100	130,800

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	5,753,100	231,200	5.03
1982	5,490,400	272,900	6.08
1981	5,351,200	259,300	5.69
1980	4,924,700	288,900	6.46
1979	4,209,500	256,400	5.85

COMMENTS:
1982 AND 1981 INCOME STATEMENT ARE RECLASSIFIED;OTHER EQUITY IS FRGN. CURRENCY TRANSLATION ADJUSTMENT

INTECOM INC
DISCLOSURE CO NO: I382060000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: ARTHUR YOUNG & COMPANY
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/30/83	12/31/82
	ASSETS (000S)	
CASH	29,384	12,691
MRKTABLE SECURITIES	56,454	17,048
RECEIVABLES	27,043	6,761
INVENTORIES	24,746	15,171
RAW MATERIALS	9,382	9,111
WORK IN PROGRESS	15,364	6,060
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	2,137	386
TOTAL CURRENT ASSETS	139,764	52,057
PROP, PLANT & EQUIP	16,653	7,562
ACCUMULATED DEP	3,155	1,333
NET PROP & EQUIP	13,498	6,229
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	751	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	453	61
TOTAL ASSETS	154,466	58,347
	LIABILITIES (000S)	
NOTES PAYABLE	NA	NA
ACCOUNTS PAYABLE	11,213	5,967
CUR LONG TERM DEBT	47	54
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	7,784	2,752
INCOME TAXES	NA	NA
OTHER CURRENT LIAB	7,793	8,658
TOTAL CURRENT LIAB	26,837	17,431
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	NA	NA
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	89	121
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	460	501
TOTAL LIABILITIES	27,386	18,053
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	121,038	47,726
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	6,042	(7,432)
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	127,080	40,294
TOT LIAB & NET WORTH	154,466	58,347

FISCAL YEAR ENDING	12/30/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	79,370	34,371	8,458
COST OF GOODS	48,960	22,241	10,461
GROSS PROFIT	30,410	12,130	(2,003)
R & D EXPENDITURES	7,137	4,354	2,237
SELL GEN & ADMIN EXP	13,854	5,081	1,846
INC BEF DEP & AMORT	9,419	2,695	(6,086)
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	5,587	884	190
INTEREST EXPENSE	NA	142	305
INCOME BEFORE TAX	15,006	3,437	(6,201)
PROV FOR INC TAXES	4,926	1,561	NA
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	10,080	1,876	(6,201)
EX ITEMS & DISC OPS	3,394	1,561	NA
NET INCOME	13,474	3,437	(6,201)
OUTSTANDING SHARES	30,604,452	13,527,620	11,714,583

QUARTERLY REPORT FOR	03/31/84	06/30/84	09/30/84
	INCOME STATEMENT (000S)		
NET SALES	21,010	28,267	40,011
COST OF GOODS	14,418	19,203	25,963
GROSS PROFIT	6,592	9,064	14,048
R & D EXPENDITURES	2,239	2,428	2,470
SELL GEN & ADMIN EXP	4,921	5,336	6,160
INC BEF DEP & AMORT	(568)	1,300	5,418
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	1,423	1,188	1,650
INTEREST EXPENSE	NA	NA	NA
INCOME BEFORE TAX	855	2,488	7,068
PROV FOR INC TAXES	299	704	2,120
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	556	1,784	4,948
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	556	1,784	4,948
OUTSTANDING SHARES	30,727,452	32,376,586	32,441,986

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	79,370	13,474	0.44
1982	34,371	3,437	0.14
1981	8,458	(6,201)	(0.32)
1980	NA	(3,782)	(0.27)
1979	NA	(886)	(0.09)

COMMENTS:
EXTRAORDINARY ITEM IS BENEFIT OF LOSS CARRYFORWARD (10-Q 07-01-83) AND (10-K 12-30-83);FINANCIAL DATA TAKEN FROM ANNUAL REPORT TO SHAREHOLDERS;CASH INCLUDES INTEREST-BEARING DEPOSITS

INTERNATIONAL BUSINESS MACHINES CORP
DISCLOSURE CO NO: I510600000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PRICE WATERHOUSE
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	616,000	405,000
MRKTABLE SECURITIES	4,920,000	2,895,000
RECEIVABLES	5,735,000	4,976,000
INVENTORIES	4,381,000	3,492,000
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	1,618,000	1,246,000
TOTAL CURRENT ASSETS	17,270,000	13,014,000
PROP, PLANT & EQUIP	29,187,000	30,767,000
ACCUMULATED DEP	13,045,000	13,204,000
NET PROP & EQUIP	16,142,000	17,563,000
INVEST & ADV TO SUBS	3,831,000	1,964,000
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	NA	NA
TOTAL ASSETS	37,243,000	32,541,000
	LIABILITIES (000S)	
NOTES PAYABLE	532,000	529,000
ACCOUNTS PAYABLE	1,253,000	983,000
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	4,120,000	3,441,000
INCOME TAXES	3,220,000	2,854,000
OTHER CURRENT LIAB	382,000	402,000
TOTAL CURRENT LIAB	9,507,000	8,209,000
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	713,000	323,000
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	2,674,000	2,851,000
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	1,130,000	1,198,000
TOTAL LIABILITIES	14,024,000	12,581,000
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	5,800,000	5,008,000
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	19,489,000	16,259,000
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(2,070,000)	(1,307,000)
SHAREHOLDER'S EQUITY	23,219,000	19,960,000
TOT LIAB & NET WORTH	37,243,000	32,541,000

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	40,180,000	34,364,000	29,070,000
COST OF GOODS	16,395,000	13,688,000	11,737,000
GROSS PROFIT	23,785,000	20,676,000	17,333,000
R & D EXPENDITURES	3,582,000	3,042,000	2,451,000
SELL GEN & ADMIN EXP	10,614,000	9,286,000	8,383,000
INC BEF DEP & AMORT	9,589,000	8,348,000	6,499,000
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	741,000	328,000	368,000
INTEREST EXPENSE	390,000	454,000	407,000
INCOME BEFORE TAX	9,940,000	8,222,000	6,460,000
PROV FOR INC TAXES	4,455,000	3,813,000	2,850,000
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	5,485,000	4,409,000	3,610,000
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	5,485,000	4,409,000	3,610,000
OUTSTANDING SHARES	610,724,641	602,406,128	592,293,624

QUARTERLY REPORT FOR	03/31/84	06/30/84
	INCOME STATEMENT (000S)	
NET SALES	9,585,000	11,139,000
COST OF GOODS	3,955,000	4,533,000
GROSS PROFIT	5,630,000	6,666,000
R & D EXPENDITURES	904,000	1,012,000
SELL GEN & ADMIN EXP	2,617,000	2,828,000
INC BEF DEP & AMORT	2,109,000	2,826,000
DEPRECIATION & AMORT	NA	NA
NON-OPERATING INC	211,000	237,000
INTEREST EXPENSE	92,000	101,000
INCOME BEFORE TAX	2,228,000	2,962,000
PROV FOR INC TAXES	1,026,000	1,339,000
MINORITY INT (INC)	NA	NA
INVEST GAINS/LOSSES	NA	NA
OTHER INCOME	NA	NA
NET INC BEF EX ITEMS	1,202,000	1,623,000
EX ITEMS & DISC OPS	NA	NA
NET INCOME	1,202,000	1,623,000
OUTSTANDING SHARES	610,938,155	611,500,893

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	40,180,000	5,485,000	9.04
1982	34,364,000	4,409,000	7.39
1981	29,070,000	3,610,000	6.14
1980	26,213,000	3,397,000	5.82
1979	22,863,000	3,011,000	5.16

COMMENTS:
FINANCIALS TAKEN FROM 1983 ANNUAL REPORT TO SHAREHOLDERS;RECLASSIFIED INCOME STATEMENTS (1981 & 1982) TO REFLECT STATE AND LOCAL INCOME TAXES IN CONFORMITY WITH 1983 PRESENTATION;INVESTMENTS & ADVANCES TO SUBSIDIARIES INCLUDES OTHER ASSETS;ACCRUED EXPENSES INCLUDES OTHER CURRENT LIABILITIES;OTHER EQUITY IS FRGN. CURRENCY TRANSLATION ADJUSTMENT

LANIER BUSINESS PRODUCTS INC
DISCL [illegible]RE CO NO: L158125000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: ERNST & WHINNEY
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	06/03/83	05/28/82
	ASSETS (000S)	
CASH	6,523	5,014
MRKTABLE SECURITIES	3,081	4,000
RECEIVABLES	91,328	105,224
INVENTORIES	103,967	133,824
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	678	430
TOTAL CURRENT ASSETS	205,577	248,492
PROP, PLANT & EQUIP	48,999	42,797
ACCUMULATED DEP	9,009	8,804
NET PROP & EQUIP	39,990	33,993
INVEST & ADV TO SUBS	19,537	18,039
OTH NON-CUR ASSETS	10,000	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	2,533	4,748
TOTAL ASSETS	277,637	305,272
	LIABILITIES (000S)	
NOTES PAYABLE	NA	54,207
ACCOUNTS PAYABLE	13,538	15,074
CUR LONG TERM DEBT	512	4,512
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	32,354	25,836
INCOME TAXES	6,700	10,515
OTHER CURRENT LIAB	53,832	44,136
TOTAL CURRENT LIAB	106,936	154,280
MORTGAGES	NA	NA
DEFERRED CHARGES INC	NA	NA
CONVERTIBLE DEBT	30,000	30,000
LONG TERM DEBT	15,997	2,493
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	152,933	186,773
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	15,004	14,937
CAPITAL SURPLUS	19,250	18,515
RETAINED EARNINGS	92,756	85,047
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(2,306)	NA
SHAREHOLDER'S EQUITY	124,704	118,499
TOT LIAB & NET WORTH	277,637	305,272

FISCAL YEAR ENDING	06/03/83	05/28/82	05/29/81
	INCOME STATEMENT (000S)		
NET SALES	389,093	349,708	303,110
COST OF GOODS	145,543	121,586	110,671
GROSS PROFIT	243,550	228,122	192,439
R & D EXPENDITURES	NA	NA	NA
SELL GEN & ADMIN EXP	216,210	179,450	144,797
INC BEF DEP & AMORT	27,340	48,672	47,642
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	139	2,627	2,428
INTEREST EXPENSE	7,897	5,483	2,418
INCOME BEFORE TAX	19,582	45,816	47,652
PROV FOR INC TAXES	8,723	21,416	23,112
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	2,615	1,526	996
NET INC BEF EX ITEMS	13,474	25,926	25,536
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	13,474	25,926	25,536
OUTSTANDING SHARES	15,[illegible],195	14,936,563	7,416,711

QUARTERLY REPORT FOR	09/02/83
	INCOME STATEMENT (000S)
NET SALES	83,659
COST OF GOODS	29,561
GROSS PROFIT	54,098
R & D EXPENDITURES	NA
SELL GEN & ADMIN EXP	52,210
INC BEF DEP & AMORT	1,888
DEPRECIATION & AMORT	NA
NON-OPERATING INC	372
INTEREST EXPENSE	862
INCOME BEFORE TAX	2,883
PROV FOR INC TAXES	1,303
MINORITY INT (INC)	NA
INVEST GAINS/LOSSES	NA
OTHER INCOME	1,129
NET INC BEF EX ITEMS	4,107
EX ITEMS & DISC OPS	NA
NET INCOME	4,107
OUTSTANDING SHARES	15,175,905

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	389,093	13,474	0.90
1982	349,708	25,926	1.68
1981	303,110	25,536	1.70
1980	253,166	17,380	1.18
1979	183,513	13,676	0.94

COMMENTS:
CURRENT AND LONG-TERM PORTIONS OF DEBT INCLUDES CAPITALIZED LEASES; OTHER EQUITY IS FRGN. CURRENCY TRANSLATION ADJUSTMENT;OTHER INCOME IS EQUITY EARNINGS (10-K 05-31-83) (10-Q 09-02-83);COMPANY ERROR OF $1485000 IN INCOME BEFORE INCOME TAXES (10-Q 09-02-83)

MANAGEMENT ASSISTANCE INC
DISCLOSURE CO NO: M108900000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PEAT, MARWICK, MITCHELL & CO.
AUDITOR'S REPORT: UNQUALIFIED;EXCEPT FOR, CHANGES IN THE METHOD OF ACCOUNTING FOR VACATION PAY AND PENSION COSTS WITH WHICH THE AUDITORS CONCUR

FISCAL YEAR ENDING	09/30/83	09/30/82
	ASSETS (000S)	
CASH	4,783	4,007
MRKTABLE SECURITIES	2,187	4,552
RECEIVABLES	62,190	50,199
INVENTORIES	79,641	67,502
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	21,277	20,566
TOTAL CURRENT ASSETS	170,078	146,826
PROP, PLANT & EQUIP	92,455	81,189
ACCUMULATED DEP	30,831	23,864
NET PROP & EQUIP	61,624	57,325
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	7,883	10,799
TOTAL ASSETS	239,585	214,950
	LIABILITIES (000S)	
NOTES PAYABLE	4,133	3,899
ACCOUNTS PAYABLE	16,593	13,572
CUR LONG TERM DEBT	775	476
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	31,581	32,311
INCOME TAXES	1,347	2,156
OTHER CURRENT LIAB	12,920	10,740
TOTAL CURRENT LIAB	67,349	63,154
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	19,341	18,876
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	73,997	31,364
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	160,687	113,394
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	3,370	3,348
CAPITAL SURPLUS	76,315	76,029
RETAINED EARNINGS	27,789	26,741
TREASURY STOCK	25,405	1,096
OTHER LIABILITIES	(3,171)	(3,466)
SHAREHOLDER'S EQUITY	78,898	101,556
TOT LIAB & NET WORTH	239,585	214,950

FISCAL YEAR ENDING	09/30/83	09/30/82	09/30/81
	INCOME STATEMENT (000S)		
NET SALES	375,885	358,387	332,186
COST OF GOODS	212,713	192,105	180,034
GROSS PROFIT	163,172	166,282	152,152
R & D EXPENDITURES	18,025	15,467	15,214
SELL GEN & ADMIN EXP	136,601	134,203	121,361
INC BEF DEP & AMORT	8,546	16,612	15,577
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	673	1,665	2,166
INTEREST EXPENSE	5,572	3,434	3,113
INCOME BEFORE TAX	3,647	14,843	14,630
PROV FOR INC TAXES	3,603	8,567	8,185
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	44	6,276	6,445
EX ITEMS & DISC OPS	1,004	1,258	2,307
NET INCOME	1,048	7,534	8,752
OUTSTANDING SHARES	7,107,223	8,304,344	8,311,073

QUARTERLY REPORT FOR	12/31/83	03/31/84	06/30/84
	INCOME STATEMENT (000S)		
NET SALES	102,910	108,975	107,473
COST OF GOODS	58,926	62,517	64,182
GROSS PROFIT	43,984	46,458	43,291
R & D EXPENDITURES	4,648	5,239	5,140
SELL GEN & ADMIN EXP	35,029	43,907	36,990
INC BEF DEP & AMORT	4,307	(2,688)	1,161
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	189	156	146
INTEREST EXPENSE	2,161	1,240	1,065
INCOME BEFORE TAX	2,335	(3,772)	242
PROV FOR INC TAXES	1,285	(2,075)	2,430
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	1,050	(1,697)	(2,188)
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	1,050	(1,697)	(2,188)
OUTSTANDING SHARES	7,152,051	8,426,309	7,359,616

SEGMENT DATA (09/30/83)	SALES (000S)	OP INCOME
INFORMATION PROCESSING SYSTEMS	205,169	(10,205)
MAINTENANCE & RELATED SERVICES	173,137	28,034
OTHER	6,692	1,193

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	375,900	40	0.01
1982	358,400	6,300	0.76
1981	332,200	6,400	0.79
1980	303,800	14,100	1.73
1979	264,400	23,200	2.91

COMMENTS:
OTHER EQUITY IS UNAMORTIZED COST OF RESTRICTED STOCK GRANTS;EXTRAORDINARY ITEM IS UTILIZATION OF FRGN. TAX LOSS CARRYFORWARD CREDITS;SEGMENT DATA SALES INCLUDES INTERSEGMENT SALES;FIVE YEAR SUMMARY NET INCOMES AND EARNINGS PER SHARE ARE FROM CONTINUING OPERATIONS, BEFORE EXTRAORDINARY ITEMS

MICOM SYSTEMS INC
DISCLOSURE CO NO: M519000000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: ERNST & WHINNEY
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	03/31/84	03/31/83
	ASSETS (000S)	
CASH	11,903	26,151
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	33,746	18,234
INVENTORIES	29,012	11,901
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	6,340	1,611
TOTAL CURRENT ASSETS	81,001	57,888
PROP, PLANT & EQUIP	44,425	12,746
ACCUMULATED DEP	7,200	3,454
NET PROP & EQUIP	37,225	9,292
INVEST & ADV TO SUBS	12,035	2,500
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	5,053	374
TOTAL ASSETS	135,314	70,054
	LIABILITIES (000S)	
NOTES PAYABLE	1,099	NA
ACCOUNTS PAYABLE	8,498	4,275
CUR LONG TERM DEBT	282	121
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	8,965	4,623
INCOME TAXES	1,429	1,964
OTHER CURRENT LIAB	NA	NA
TOTAL CURRENT LIAB	20,273	10,983
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	483	393
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	1,362	NA
NON-CUR CAP LEASES	NA	148
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	22,118	11,524
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	64,755	30,071
CAPITAL SURPLUS	NA	29,022
RETAINED EARNINGS	49,744	NA
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(1,303)	(563)
SHAREHOLDER'S EQUITY	113,196	58,530
TOT LIAB & NET WORTH	135,314	70,054

FISCAL YEAR ENDING	03/31/84	03/31/83	03/31/82
	INCOME STATEMENT (000S)		
NET SALES	132,540	84,276	57,671
COST OF GOODS	57,849	37,974	25,581
GROSS PROFIT	74,691	46,302	32,090
R & D EXPENDITURES	12,090	7,953	4,647
SELL GEN & ADMIN EXP	34,899	21,724	15,855
INC BEF DEP & AMORT	27,702	16,625	11,588
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	2,097	2,706	3,176
INTEREST EXPENSE	306	111	218
INCOME BEFORE TAX	29,493	19,220	14,546
PROV FOR INC TAXES	8,771	5,786	5,850
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	20,722	13,434	8,696
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	20,722	13,434	8,696
OUTSTANDING SHARES	15,334,198	14,391,776	14,225,682

QUARTERLY REPORT FOR	06/30/84
	INCOME STATEMENT (000S)
NET SALES	41,745
COST OF GOODS	18,843
GROSS PROFIT	22,902
R & D EXPENDITURES	3,721
SELL GEN & ADMIN EXP	10,589
INC BEF DEP & AMORT	8,592
DEPRECIATION & AMORT	NA
NON-OPERATING INC	393
INTEREST EXPENSE	80
INCOME BEFORE TAX	8,905
PROV FOR INC TAXES	2,654
MINORITY INT (INC)	NA
INVEST GAINS/LOSSES	NA
OTHER INCOME	NA
NET INC BEF EX ITEMS	6,251
EX ITEMS & DISC OPS	NA
NET INCOME	6,251
OUTSTANDING SHARES	15,365,968

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1984	1,132,540	20,722	1.34
1983	84,276	13,434	0.92
1982	57,671	8,696	0.61
1981	36,445	4,213	0.35
1980	16,940	1,823	0.16

COMMENTS:
OTHER LIABILITIES IS FRGN CURRENCY TRANSLATION ADJUSTMENTS AND NOTES RECEIVABLES RELATED TO COMMON STOCK ISSUED

MITEL CORP
DISCLOSURE CO NO: M689800000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: CLARKSON GORDON
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	02/24/84	02/25/83
	ASSETS (000S)	
CASH	132,454	167,336
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	74,306	76,412
INVENTORIES	149,585	118,272
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	11,373	970
TOTAL CURRENT ASSETS	367,718	362,990
PROP, PLANT & EQUIP	303,136	257,873
ACCUMULATED DEP	56,971	33,280
NET PROP & EQUIP	246,165	224,593
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	31,839	14,757
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	22,582	4,663
TOTAL ASSETS	668,304	607,003
	LIABILITIES (000S)	
NOTES PAYABLE	71,020	95,965
ACCOUNTS PAYABLE	70,695	48,071
CUR LONG TERM DEBT	3,119	2,154
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	NA	NA
INCOME TAXES	22,252	820
OTHER CURRENT LIAB	2,515	NA
TOTAL CURRENT LIAB	169,601	147,010
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	NA	NA
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	192,664	183,655
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	362,265	330,665
MINORITY INT (LIAB)	12,600	NA
PREFERRED STOCK	51,520	NA
COMMON STOCK NET	220,079	217,707
CAPITAL SURPLUS	21,840	NA
RETAINED EARNINGS	NA	58,631
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	293,439	276,338
TOT LIAB & NET WORTH	668,304	607,003

FISCAL YEAR ENDING	02/24/84	02/25/83	02/26/82
	INCOME STATEMENT (000S)		
NET SALES	342,609	255,085	204,129
COST OF GOODS	175,289	126,100	92,977
GROSS PROFIT	167,320	128,985	111,152
R & D EXPENDITURES	49,493	27,093	18,814
SELL GEN & ADMIN EXP	99,269	76,928	59,169
INC BEF DEP & AMORT	18,558	24,964	33,169
DEPRECIATION & AMORT	25,317	18,372	10,377
NON-OPERATING INC	7,718	3,603	9,472
INTEREST E NSE	23,892	7,407	4,440
INCOME BEFORE TAX	(22,933)	2,788	27,824
PROV FOR INC TAXES	(3,352)	(12,009)	(134)
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	(19,581)	14,797	27,958
EX ITEMS & DISC OPS	(12,830)	NA	NA
NET INCOME	(32,411)	14,797	27,958
OUTSTANDING SHARES	38,426,107	38,270,113	37,274,800

QUARTERLY REPORT FOR	05/25/84	08/24/84
	INCOME STATEMENT (000S)	
NET SALES	71,782	93,476
COST OF GOODS	40,270	53,228
GROSS PROFIT	31,512	40,248
R & D EXPENDITURES	10,601	8,928
SELL GEN & ADMIN EXP	26,581	27,601
INC BEF DEP & AMORT	(5,670)	3,719
DEPRECIATION & AMORT	7,550	7,671
NON-OPERATING INC	2,816	2,715
INTEREST EXPENSE	6,838	7,738
INCOME BEFORE TAX	(17,242)	(8,975)
PROV FOR INC TAXES	543	1,079
MINORITY INT (INC)	NA	NA
INVEST GAINS/LOSSES	NA	NA
OTHER INCOME	NA	NA
NET INC BEF EX ITEMS	(17,785)	(10,054)
EX ITEMS & DISC OPS	NA	NA
NET INCOME	(17,785)	(10,054)
OUTSTANDING SHARES	38,427,434	38,430,215

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1984	342,609	(32,411)	(0.85)
1983	255,085	14,797	0.39
1982	204,129	27,958	0.77
1981	111,212	14,334	0.44
1980	4 ,411	3,658	0.12

COMMENTS:
*FOREIGN CURRENCY, CANADIAN DOLLAR;INTEREST EXPENSES INCLUDE DEBENTURE REDEMPTION PREMIUM (10-Q 05-25-84)AND (10-Q 08-24-84);CASH INCLUDES SHORT-TERM INVESTMENTS (10-Q 08-24-84);OTHER LIABILITIES AMOUNT IS TRANSLATION ACCOUNT (10-Q 08-24-84);ACCOUNTS PAYABLE INCLUDE ACCRUED LIABILITIES (10-Q 08-24-84)

MOTOROLA INC
DISCLOSURE CO NO: M848100000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PEAT, MARWICK, MITCHELL & CO.
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	25,000	21,000
MRKTABLE SECURITIES	182,000	128,000
RECEIVABLES	655,000	553,000
INVENTORIES	679,000	653,000
RAW MATERIALS	NA	NA
WORK IN PROGRESS	576,000	542,000
FINISHED GOODS	103,000	111,000
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	189,000	157,000
TOTAL CURRENT ASSETS	1,730,000	1,512,000
PROP, PLANT & EQUIP	2,278,000	1,957,000
ACCUMULATED DEP	849,000	691,000
NET PROP & EQUIP	1,429,000	1,266,000
INVEST & ADV TO SUBS	44,000	36,000
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	33,000	19,000
TOTAL ASSETS	3,236,000	2,833,000
	LIABILITIES (000S)	
NOTES PAYABLE	NA	NA
ACCOUNTS PAYABLE	340,000	223,000
CUR LONG TERM DEBT	8,000	9,000
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	398,000	318,000
INCOME TAXES	90,000	38,000
OTHER CURRENT LIAB	NA	NA
TOTAL CURRENT LIAB	836,000	588,000
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	108,000	112,000
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	262,000	369,000
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	82,000	64,000
TOTAL LIABILITIES	1,288,000	1,133,000
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	118,000	115,000
CAPITAL SURPLUS	463,000	400,000
RETAINED EARNINGS	1,367,000	1,185,000
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	1,948,000	1,700,000
TOT LIAB & NET WORTH	3,236,000	2,833,000

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	4,328,000	3,786,000	3,570,000
COST OF GOODS	2,593,000	2,269,000	2,086,000
GROSS PROFIT	1,735,000	1,517,000	1,484,000
R & D EXPENDITURES	NA	NA	NA
SELL GEN & ADMIN EXP	1,113,000	1,013,000	985,000
INC BEF DEP & AMORT	622,000	504,000	499,000
DEPRECIATION & AMORT	289,000	244,000	205,000
NON-OPERATING INC	NA	NA	NA
INTEREST EXPENSE	24,000	48,000	35,000
INCOME BEFORE TAX	309,000	212,000	259,000
PROV FOR INC TAXES	65,000	42,000	77,000
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	244,000	170,000	182,000
EX ITEMS & DISC OPS	NA	8,000	NA
NET INCOME	244,000	178,000	182,000
OUTSTANDING SHARES	39,384,281	38,293,489	31,565,781

QUARTERLY REPORT FOR	03/31/84	06/30/84
	INCOME STATEMENT (000S)	
NET SALES	1,256,000	1,416,000
COST OF GOODS	715,000	801,000
GROSS PROFIT	541,000	615,000
R & D EXPENDITURES	NA	NA
SELL GEN & ADMIN EXP	353,000	384,000
INC BEF DEP & AMORT	188,000	231,000
DEPRECIATION & AMORT	81,000	84,000
NON-OPERATING INC	NA	NA
INTEREST EXPENSE	3,000	7,000
INCOME BEFORE TAX	104,000	140,000
PROV FOR INC TAXES	26,000	42,000
MINORITY INT (INC)	NA	NA
INVEST GAINS/LOSSES	NA	NA
OTHER INCOME	NA	NA
NET INC BEF EX ITEMS	78,000	98,000
EX ITEMS & DISC OPS	NA	NA
NET INCOME	78,000	98,000
OUTSTANDING SHARES	39,445,913	118,479,287

SEGMENT DATA (12/31/83)	SALES (000S)	OP INCOME
COMMUNICATIONS PRODUCTS	1,620,000	92,000
SEMICONDUCTOR PRODUCTS	1,601,000	213,000
INFORMATION SYSTEMS PRODUCTS	514,000	(5,000)
OTHER PRODUCTS	696,000	81,000

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	4,328,000	244,000	6.26
1982	3,786,000	178,000	4.87
1981	3,570,000	182,000	5.10
1980	3,284,000	192,000	5.45
1979	2,879,000	171,000	4.91

COMMENTS:
INVENTORIES, WORK-IN-PROGRESS INCLUDES RAW MATERIALS

NCR CORP
DISCLOSURE CO NO: N416250000
CROSS REFERENCE: WAS NATIONAL CASH REGISTER CO

AUDITOR CHANGE: NA
AUDITOR: PRICE WATERHOUSE
AUDITOR'S REPORT: UNQUALIFIED;EXCEPT FOR, CONSISTENCY APPLICATION RELATED TO CHANGE IN ACCOUNTING METHOD PURSUANT TO FASB NO. 52 WITH WHICH THE AUDITORS CONCUR

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	516,941	411,924
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	910,690	934,841
INVENTORIES	721,575	694,140
RAW MATERIALS	252,945	216,055
WORK IN PROGRESS	NA	NA
FINISHED GOODS	468,630	478,085
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	44,567	70,184
TOTAL CURRENT ASSETS	2,193,773	2,111,089
PROP, PLANT & EQUIP	1,938,039	1,912,986
ACCUMULATED DEP	1,091,385	1,060,592
NET PROP & EQUIP	846,654	852,394
INVEST & ADV TO SUBS	139,501	101,105
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	124,940	126,973
DEPOSITS & OTH ASSET	255,434	181,485
TOTAL ASSETS	3,560,302	3,373,046
	LIABILITIES (000S)	
NOTES PAYABLE	57,670	78,047
ACCOUNTS PAYABLE	140,402	117,904
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	129,114	116,782
INCOME TAXES	202,721	149,654
OTHER CURRENT LIAB	517,950	504,065
TOTAL CURRENT LIAB	1,047,857	966,452
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	NA	NA
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	325,298	341,298
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	67,635	66,999
TOTAL LIABILITIES	1,440,790	1,374,749
MINORITY INT (LIAB)	74,639	61,722
PREFERRED STOCK	32	58
COMMON STOCK NET	424,366	415,232
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	1,841,630	1,623,889
TREASURY STOCK	99,500	9,211
OTHER LIABILITIES	(121,655)	(93,393)
SHAREHOLDER'S EQUITY	2,044,873	1,936,575
TOT LIAB & NET WORTH	3,560,302	3,373,046

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	3,730,951	3,526,217	3,432,701
COST OF GOODS	1,856,169	1,782,463	1,803,252
GROSS PROFIT	1,874,782	1,743,754	1,629,449
R & D EXPENDITURES	257,522	248,647	229,195
SELL GEN & ADMIN EXP	1,140,023	1,100,651	1,057,814
INC BEF DEP & AMORT	477,237	394,456	342,440
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	91,717	86,971	88,292
INTEREST EXPENSE	45,889	51,616	72,498
INCOME BEFORE TAX	523,065	429,811	358,234
PROV FOR INC TAXES	235,400	195,400	150,000
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	287,665	234,411	208,234
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	287,665	234,411	208,234
OUTSTANDING SHARES	26,429,280	26,743,768	26,609,301

QUARTERLY REPORT FOR	03/31/84	06/30/84
	INCOME STATEMENT (000S)	
NET SALES	861,435	998,802
COST OF GOODS	439,842	495,128
GROSS PROFIT	421,593	503,674
R & D EXPENDITURES	63,881	68,300
SELL GEN & ADMIN EXP	280,336	305,064
INC BEF DEP & AMORT	77,376	130,310
DEPRECIATION & AMORT	NA	NA
NON-OPERATING INC	15,174	20,314
INTEREST EXPENSE	9,723	10,111
INCOME BEFORE TAX	82,827	140,513
PROV FOR INC TAXES	37,300	64,300
MINORITY INT (INC)	NA	NA
INVEST GAINS/LOSSES	NA	NA
OTHER INCOME	NA	NA
NET INC BEF EX ITEMS	45,527	76,213
EX ITEMS & DISC OPS	NA	NA
NET INCOME	45,527	76,213
OUTSTANDING SHARES	105,537,420	102,112,599

SEGMENT DATA SALES (000S) OP INCOME
NA

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	3,730,951	287,665	10.55
1982	3,526,217	234,411	8.75
1981	3,432,701	208,234	7.72
1980	3,322,370	254,686	9.51
1979	3,002,640	234,602	8.78

COMMENTS:
CASH INCLUDES MARKETABLE SECURITIES;OTHER EQUITY IS FRGN. CURRENY TRANSLATION ADJUSTMENTS

NORTHERN TELECOM LTD
DISCLOSURE CO NO: NS59375000
CROSS REFERENCE: WAS NORTHERN ELECTRIC CO LTD

AUDITOR CHANGE: NA
AUDITOR: TOUCHE ROSS & CO.
AUDITOR'S REPORT: UNQUALIFIED;AFTER GIVING EFFECT TO CHANGE IN METHOD OF ACCOUNTING FOR FRGN. CURRENCY TRANSLATION, WITH WHICH THE AUDITORS CONCUR

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	108,300	149,600
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	749,600	550,500
INVENTORIES	672,800	577,600
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	43,000	36,500
TOTAL CURRENT ASSETS	1,573,700	1,314,200
PROP, PLANT & EQUIP	1,432,300	1,159,500
ACCUMULATED DEP	628,700	543,100
NET PROP & EQUIP	803,600	616,400
INVEST & ADV TO SUBS	433,000	433,100
OTH NON-CUR ASSETS	NA	51,500
DEFERRED CHARGES	36,100	NA
INTANGIBLES	26,600	28,200
DEPOSITS & OTH ASSET	NA	NA
TOTAL ASSETS	2,873,000	2,443,400
	LIABILITIES (000S)	
NOTES PAYABLE	1,600	1,300
ACCOUNTS PAYABLE	686,000	516,600
CUR LONG TERM DEBT	27,800	35,600
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	123,400	115,700
INCOME TAXES	NA	NA
OTHER CURRENT LIAB	33,400	8,900
TOTAL CURRENT LIAB	872,200	678,100
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	77,000	76,800
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	163,000	304,700
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	281,800	365,700
TOTAL LIABILITIES	1,394,000	1,425,300
MINORITY INT (LIAB)	13,500	12,600
PREFERRED STOCK	NA	NA
COMMON STOCK NET	755,700	524,400
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	667,400	443,700
TREASURY STOCK	NA	NA
OTHER LIABILITIES	42,400	37,400
SHAREHOLDER'S EQUITY	1,465,500	1,005,500
TOT LIAB & NET WORTH	2,873,000	2,443,400

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	3,304,000	3,035,500	2,570,900
COST OF GOODS	2,112,000	2,124,200	1,847,200
GROSS PROFIT	1,192,000	911,300	723,700
R & D EXPENDITURES	324,800	241,400	181,600
SELL GEN & ADMIN EXP	560,700	461,900	359,300
INC BEF DEP & AMORT	306,500	208,000	182,800
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	29,200	24,400	30,400
INTEREST EXPENSE	10,600	39,600	64,200
INCOME BEFORE TAX	325,100	192,800	149,000
PROV FOR INC TAXES	98,000	60,400	35,800
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	227,100	132,400	113,200
EX ITEMS & DISC OPS	41,300	7,000	16,000
NET INCOME	268,400	139,400	129,200
OUTSTANDING SHARES	114,607,222	106,352,286	34,947,544

QUARTERLY REPORT FOR	03/31/84	06/30/84
	INCOME STATEMENT (000S)	
NET SALES	899,100	1,048,200
COST OF GOODS	556,700	640,900
GROSS PROFIT	342,400	407,300
R & D EXPENDITURES	101,400	110,400
SELL GEN & ADMIN EXP	163,000	187,600
INC BEF DEP & AMORT	78,000	109,300
DEPRECIATION & AMORT	NA	NA
NON-OPERATING INC	6,000	20,800
INTEREST EXPENSE	NA	16,500
INCOME BEFORE TAX	84,000	113,600
PROV FOR INC TAXES	26,900	34,900
MINORITY INT (INC)	NA	NA
INVEST GAINS/LOSSES	NA	NA
OTHER INCOME	NA	NA
NET INC BEF EX ITEMS	57,100	78,700
EX ITEMS & DISC OPS	NA	NA
NET INCOME	57,100	78,700
OUTSTANDING SHARES	114,849,012	115,093,697

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	3,304,000	268,400	2.42
1982	3,035,500	139,400	1.32
1981	2,570,900	129,200	1.24
1980	2,054,600	(185,100)	(1.83)
1979	1,900,500	111,200	1.21

COMMENTS:
*FOREIGN CURRENCY, CANADIAN DOLLARS;FINANCIAL STATEMENTS BASED ON CANADIAN ACCOUNTING STANDARDS;FIVE YEAR SUMMARY DATA FOR PRIOR YEARS, 1982 FINANCIAL STATEMENT AND 1981 INCOME STATEMENT RESTATED TO REFLECT CHANGE IN ACCOUNTING METHOD; CASH INCLUDES SHORT-TERM INVESTMENTS;OTHER LIABILITIES FIGURE REPRESENTS FRGN. EXCHANGE ADJUSTMENT;EXTRAORDINARY ITEM IS INCOME TAX REDUCTION FROM PRIOR YEARS' TAX LOSSES OF SUBSIDIARY

PRIME COMPUTER INC
DISCLOSURE CO NO: P729138000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: ARTHUR ANDERSEN & CO.
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	45,069	29,900
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	161,139	149,151
INVENTORIES	85,219	57,491
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	7,548	5,667
TOTAL CURRENT ASSETS	298,975	242,209
PROP, PLANT & EQUIP	186,828	154,321
ACCUMULATED DEP	52,300	34,455
NET PROP & EQUIP	134,528	119,866
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	11,237	14,092
TOTAL ASSETS	444,740	376,167
	LIABILITIES (000S)	
NOTES PAYABLE	5,645	4,318
ACCOUNTS PAYABLE	40,985	28,361
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	891	1,048
ACCRUED EXPENSES	32,616	25,052
INCOME TAXES	11,275	13,571
OTHER CURRENT LIAB	4,598	5,009
TOTAL CURRENT LIAB	96,010	77,359
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	64,272	52,728
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	10,000	10,000
NON-CUR CAP LEASES	6,279	7,173
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	176,561	147,260
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	595	392
CAPITAL SURPLUS	97,732	89,836
RETAINED EARNINGS	175,392	142,889
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(5,540)	(4,210)
SHAREHOLDER'S EQUITY	268,179	228,907
TOT LIAB & NET WORTH	444,740	376,167

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	516,503	435,826	364,787
COST OF GOODS	242,934	185,667	159,663
GROSS PROFIT	273,569	250,159	205,124
R & D EXPENDITURES	52,074	37,047	27,521
SELL GEN & ADMIN EXP	170,530	144,484	118,277
INC BEF DEP & AMORT	50,965	68,628	59,326
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	(1,482)	(1,998)	769
INTEREST EXPENSE	1,686	1,266	5,146
INCOME BEFORE TAX	47,797	65,364	54,949
PROV FOR INC TAXES	15,294	20,438	17,271
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	32,503	44,926	37,678
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	32,503	44,926	37,678
OUTSTANDING SHARES	47,635,589	31,372,114	29,635,353

QUARTERLY REPORT FOR	09/30/84
	INCOME STATEMENT (000S)
NET SALES	165,01[illegible]
COST OF GOODS	77,193
GROSS PROFIT	87,823
R & D EXPENDITURES	16,489
SELL GEN & ADMIN EXP	51,880
INC BEF DEP & AMORT	19,454
DEPRECIATION & AMORT	NA
NON-OPERATING INC	(1,906)
INTEREST EXPENSE	136
INCOME BEFORE TAX	17,412
PROV FOR INC TAXES	(4,453)
MINORITY INT (INC)	NA
INVEST GAINS/LOSSES	NA
OTHER INCOME	NA
NET INC BEF EX ITEMS	21,865
EX ITEMS & DISC OPS	NA
NET INCOME	21,865
OUTSTANDING SHARES	47,324,933

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	516,503	32,503	0.68
1982	435,826	44,926	0.99
1981	364,787	37,678	0.84
1980	267,637	31,222	0.71
1979	152,943	16,940	0.43

COMMENTS:
CASH INCLUDES MARKETABLE SECURITIES;OTHER EQUITY IS FRGN. CURRENCY TRANSLATION ADJUSTMENT

RAYTHEON CO
DISCLOSURE CO NO: R191100000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: COOPERS & LYBRAND
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	38,310	42,839
MRKTABLE SECURITIES	782,619	777,006
RECEIVABLES	600,292	594,599
INVENTORIES	992,848	680,250
RAW MATERIALS	708,271	NA
WORK IN PROGRESS	284,577	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	13,280	306,694
TOTAL CURRENT ASSETS	2,427,349	2,401,388
PROP, PLANT & EQUIP	936,385	885,034
ACCUMULATED DEP	NA	NA
NET PROP & EQUIP	936,385	885,034
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	364,966	223,769
TOTAL ASSETS	3,728,700	3,510,191
	LIABILITIES (000S)	
NOTES PAYABLE	59,768	59,213
ACCOUNTS PAYABLE	337,422	315,995
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	406,910	370,733
INCOME TAXES	384,061	506,155
OTHER CURRENT LIAB	554,031	478,412
TOTAL CURRENT LIAB	1,742,192	1,730,508
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	NA	NA
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	99,067	67,897
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	1,841,259	1,798,405
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	84,626	84,413
CAPITAL SURPLUS	150,554	143,889
RETAINED EARNINGS	1,696,223	1,514,467
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(43,962)	(30,983)
SHAREHOLDER'S EQUITY	1,887,441	1,711,786
TOT LIAB & NET WORTH	3,728,700	3,510,191

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	5,937,264	5,513,370	5,636,184
COST OF GOODS	4,738,167	4,392,049	4,490,714
GROSS PROFIT	1,199,097	1,121,321	1,145,470
R & D EXPENDITURES	247,663	195,935	171,450
SELL GEN & ADMIN EXP	593,157	538,102	531,160
INC BEF DEP & AMORT	358,277	387,284	442,860
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	130,209	137,365	113,700
INTEREST EXPENSE	15,098	17,020	18,409
INCOME BEFORE TAX	473,388	507,629	538,151
PROV FOR INC TAXES	173,241	188,863	214,110
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	300,147	318,766	324,041
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	300,147	318,766	324,041
OUTSTANDING SHARES	84,626,000	84,413,000	84,180,000

QUARTERLY REPORT FOR	04/01/84	06/30/84
	INCOME STATEMENT (000S)	
NET SALES	1,577,867	1,522,222
COST OF GOODS	1,271,089	1,218,170
GROSS PROFIT	306,778	304,052
R & D EXPENDITURES	65,505	60,281
SELL GEN & ADMIN EXP	148,548	133,426
INC BEF DEP & AMORT	92,725	110,345
DEPRECIATION & AMORT	NA	NA
NON-OPERATING INC	38,352	29,960
INTEREST EXPENSE	3,716	1,964
INCOME BEFORE TAX	127,361	138,341
PROV FOR INC TAXES	48,198	53,336
MINORITY INT (INC)	NA	NA
INVEST GAINS/LOSSES	NA	NA
OTHER INCOME	NA	NA
NET INC BEF EX ITEMS	79,163	85,005
EX ITEMS & DISC OPS	NA	(96,450)
NET INCOME	79,163	(11,445)
OUTSTANDING SHARES	84,657,000	84,677,000

SEGMENT DATA (12/31/83)	SALES (000S)	OP INCOME
ELECTRRONICS	330,100	40,300
AIRCRAFT PRODUCTS	642,000	16,000
ENERGY SERVICES	926,000	19,000
MAJOR APPLIANCES	710,000	56,000

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	5,937,300	300,100	3.55
1982	5,513,400	318,800	3.78
1981	563,620	324,000	3.86
1980	5,002,100	282,300	3.40
1979	4,354,200	240,300	2.91

COMMENTS:
OTHER EQUITY IS FRGN. CURRENCY TRANSLATION ADJUSTMENT;EXTRAORDINARY ITEM IS INCOME FROM DISCONTINUED OPERATION (10-Q 06-30-84)

ROLM CORP
DISCLOSURE CO NO: R761775000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: ARTHUR ANDERSEN & CO.
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	06/29/84	07/01/83
	ASSETS (000S)	
CASH	237,372	213,211
MRKTABLE SECURITIES	NA	NA
RECEIVABLES	146,015	95,662
INVENTORIES	167,275	73,705
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	7,944	11,446
TOTAL CURRENT ASSETS	558,606	394,024
PROP, PLANT & EQUIP	225,313	161,366
ACCUMULATED DEP	56,058	40,656
NET PROP & EQUIP	169,255	120,710
INVEST & ADV TO SUBS	NA	NA
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	8,479	5,181
TOTAL ASSETS	736,340	519,915
	LIABILITIES (000S)	
NOTES PAYABLE	NA	NA
ACCOUNTS PAYABLE	44,943	28,503
CUR LONG TERM DEBT	NA	NA
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	58,497	37,289
INCOME TAXES	37,029	21,437
OTHER CURRENT LIAB	31,485	19,210
TOTAL CURRENT LIAB	171,954	106,439
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	19,522	8,198
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	3,528	23,559
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	195,004	138,196
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	443,476	254,247
CAPITAL SURPLUS	NA	NA
RETAINED EARNINGS	97,860	127,472
TREASURY STOCK	NA	NA
OTHER LIABILITIES	NA	NA
SHAREHOLDER'S EQUITY	541,336	381,719
TOT LIAB & NET WORTH	736,340	519,915

FISCAL YEAR ENDING	06/29/84	07/01/83	07/02/82
	INCOME STATEMENT (000S)		
NET SALES	659,704	502,642	380,577
COST OF GOODS	366,338	249,848	185,754
GROSS PROFIT	293,366	252,794	194,823
R & D EXPENDITURES	49,251	35,326	24,410
SELL GEN & ADMIN EXP	217,616	163,424	118,272
INC BEF DEP & AMORT	26,499	54,044	52,141
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	36,255	6,908	2,904
INTEREST EXPENSE	NA	NA	NA
INCOME BEFORE TAX	62,754	60,952	55,045
PROV FOR INC TAXES	25,023	25,409	25,218
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	37,731	35,543	29,827
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	37,731	35,543	29,827
OUTSTANDING SHARES	23,333	21,951,211	17,564,444

QUARTERLY REPORT FOR	09/08/84
	INCOME STATEMENT (000S)
NET SALES	193,665
COST OF GOODS	113,237
GROSS PROFIT	80,428
R & D EXPENDITURES	16,070
SELL GEN & ADMIN EXP	66,322
INC BEF DEP & AMORT	(1,964)
DEPRECIATION & AMORT	NA
NON-OPERATING INC	5,006
INTEREST EXPENSE	NA
INCOME BEFORE TAX	3,042
PROV FOR INC TAXES	406
MINORITY INT (INC)	NA
INVEST GAINS/LOSSES	NA
OTHER INCOME	NA
NET INC BEF EX ITEMS	2,636
EX ITEMS & DISC OPS	NA
NET INCOME	2,636
OUTSTANDING SHARES	NA

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1984	659,704	37,731	1.49
1983	502,642	35,543	1.80
1982	380,577	29,827	1.70
1981	294,576	23,777	1.39
1980	200,729	17,340	1.08

COMMENTS:
1983 SECOND QUARTER INCOME STATEMENT IS FOR SIX MONTHS (10-Q 12-30-83);CASH INCLUDES TEMPORARY CASH INVESTMENTS

SPERRY CORP
DISCLOSURE CO NO: S603450000
CROSS REFERENCE: WAS SPERRY RAND CORP

AUDITOR CHANGE: NA
AUDITOR: ARTHUR YOUNG & COMPANY
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	03/31/84	03/31/83
	ASSETS (000S)	
CASH	11,700	33,900
MRKTABLE SECURITIES	155,100	31,300
RECEIVABLES	956,600	956,500
INVENTORIES	1,180,200	1,007,900
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	335,500	451,200
TOTAL CURRENT ASSETS	2,639,100	2,480,800
PROP, PLANT & EQUIP	1,810,600	1,693,700
ACCUMULATED DEP	969,600	888,300
NET PROP & EQUIP	841,000	805,400
INVEST & ADV TO SUBS	427,400	396,600
OTH NON-CUR ASSETS	1,415,800	1,529,600
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	179,300	67,400
TOTAL ASSETS	5,502,600	5,279,800
	LIABILITIES (000S)	
NOTES PAYABLE	111,800	383,900
ACCOUNTS PAYABLE	240,100	177,300
CUR LONG TERM DEBT	35,200	33,500
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	270,000	NA
INCOME TAXES	NA	210,500
OTHER CURRENT LIAB	899,000	776,300
TOTAL CURRENT LIAB	1,556,100	1,581,500
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	433,900	442,400
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	709,700	857,000
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	2,699,700	2,880,900
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	27,200	22,800
CAPITAL SURPLUS	907,200	604,800
RETAINED EARNINGS	2,099,800	1,986,100
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(231,300)	(214,800)
SHAREHOLDER'S EQUITY	2,802,900	2,398,900
TOT LIAB & NET WORTH	5,502,600	5,279,800

FISCAL YEAR ENDING	03/31/84	03/31/83	03/31/82
	INCOME STATEMENT (000S)		
NET SALES	4,914,000	4,663,600	5,045,300
COST OF GOODS	3,054,100	2,886,800	3,103,600
GROSS PROFIT	1,859,900	1,776,800	1,941,700
R & D EXPENDITURES	410,400	375,700	375,200
SELL GEN & ADMIN EXP	1,015,400	1,063,200	1,029,900
INC BEF DEP & AMORT	434,100	337,900	536,600
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	36,000	65,400	50,600
INTEREST EXPENSE	166,600	228,900	269,000
INCOME BEFORE TAX	303,500	174,400	318,200
PROV FOR INC TAXES	103,500	52,100	117,300
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	200,000	122,300	200,900
EX ITEMS & DISC OPS	16,200	(4,200)	20,900
NET INCOME	216,200	118,100	221,800
OUTSTANDING SHARES	54,347,911	45,536,635	42,950,606

QUARTERLY REPORT FOR	06/30/84
	INCOME STATEMENT (000S)
NET SALES	1,187,100
COST OF GOODS	744,100
GROSS PROFIT	443,000
R & D EXPENDITURES	101,700
SELL GEN & ADMIN EXP	249,300
INC BEF DEP & AMORT	92,000
DEPRECIATION & AMORT	NA
NON-OPERATING INC	(14,100)
INTEREST EXPENSE	43,200
INCOME BEFORE TAX	34,700
PROV FOR INC TAXES	14,600
MINORITY INT (INC)	NA
INVEST GAINS/LOSSES	NA
OTHER INCOME	NA
NET INC BEF EX ITEMS	20,100
EX ITEMS & DISC OPS	NA
NET INCOME	20,100
OUTSTANDING SHARES	55,177,354

SEGMENT DATA (03/31/84)	SALES (000S)	OP INCOME
COMPUTER SYSTEMS & EQUIPMENT	2,825,500	265,700
GUIDANCE & CONTROL EQUIPMENT	1,427,400	122,500
FARM EQUIPMENT	728,500	71,800

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1984	4,914,000	216,200	4.17
1983	4,663,600	118,100	2.65
1982	5,045,300	221,800	5.25
1981	4,896,100	311,200	7.63
1980	4,261,800	274,400	7.53

COMMENTS:
EXTRAORDINARY ITEM IS DISCONTINUED OPERATIONS (10-Q 12-31-83) (10-K 03-31-84) ;1981 INCOME STATEMENT AND 1982 FINANCIALS ARE RESTATED;

WANG LABORATORIES INC
DISCLOSURE CO NO: W122000000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: ERNST & WHINNEY
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	06/30/84	06/30/83
	ASSETS (000S)	
CASH	16,000	12,700
MRKTABLE SECURITIES	57,000	220,100
RECEIVABLES	445,200	320,900
INVENTORIES	562,800	316,200
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	46,900	57,700
TOTAL CURRENT ASSETS	1,127,900	927,600
PROP, PLANT & EQUIP	1,154,800	813,200
ACCUMULATED DEP	346,800	245,400
NET PROP & EQUIP	808,000	567,800
INVEST & ADV TO SUBS	262,400	137,800
OTH NON-CUR ASSETS	NA	NA
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	53,600	48,600
TOTAL ASSETS	2,251,900	1,681,800
	LIABILITIES (000S)	
NOTES PAYABLE	192,200	34,300
ACCOUNTS PAYABLE	248,500	188,800
CUR LONG TERM DEBT	21,200	27,700
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	NA	NA
INCOME TAXES	6,500	6,200
OTHER CURRENT LIAB	73,500	51,700
TOTAL CURRENT LIAB	541,900	308,700
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	102,000	72,000
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	358,600	363,300
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	NA	NA
TOTAL LIABILITIES	1,002,500	744,000
MINORITY INT (LIAB)	NA	NA
PREFERRED STOCK	NA	NA
COMMON STOCK NET	69,300	66,100
CAPITAL SURPLUS	576,700	453,600
RETAINED EARNINGS	637,400	443,400
TREASURY STOCK	400	500
OTHER LIABILITIES	(33,600)	(24,800)
SHAREHOLDER'S EQUITY	1,249,400	937,800
TOT LIAB & NET WORTH	2,251,900	1,681,800

FISCAL YEAR ENDING	06/30/84	06/30/83	06/30/82
	INCOME STATEMENT (000S)		
NET SALES	2,184,700	1,538,000	1,159,309
COST OF GOODS	1,117,100	722,300	549,430
GROSS PROFIT	1,067,600	815,700	609,879
R & D EXPENDITURES	160,500	117,500	86,913
SELL GEN & ADMIN EXP	619,300	482,800	360,825
INC BEF DEP & AMORT	287,800	215,400	162,141
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	NA	NA	NA
INTEREST EXPENSE	26,600	25,700	26,002
INCOME BEFORE TAX	261,200	189,700	136,139
PROV FOR INC TAXES	51,000	37,700	29,000
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	210,200	152,000	107,139
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	210,200	152,000	107,139
OUTSTANDING SHARES	138,651,148	0	59,937,025

QUARTERLY REPORT FOR	09/30/84
	INCOME STATEMENT (000S)
NET SALES	553,845
COST OF GOODS	268,066
GROSS PROFIT	285,779
R & D EXPENDITURES	43,268
SELL GEN & ADMIN EXP	162,876
INC BEF DEP & AMORT	79,635
DEPRECIATION & AMORT	NA
NON-OPERATING INC	NA
INTEREST EXPENSE	13,478
INCOME BEFORE TAX	66,157
PROV FOR INC TAXES	15,000
MINORITY INT (INC)	NA
INVEST GAINS/LOSSES	NA
OTHER INCOME	NA
NET INC BEF EX ITEMS	51,157
EX ITEMS & DISC OPS	NA
NET INCOME	51,157
OUTSTANDING SHARES	138,689,134

SEGMENT DATA	SALES (000S)	OP INCOME
NA		

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1984	2,184,700	210,200	1.52
1983	1,538,000	152,000	1.16
1982	1,159,300	107,100	0.88
1981	856,400	78,100	0.68
1980	543,300	52,100	0.50

COMMENTS:
OTHER LIABILITIES AMOUNT IS UNREALIZED FRGN. CURRENCY TRANSLATIONADJUSTMENT

XEROX CORP
DISCLOSURE CO NO: X039600000
CROSS REFERENCE: NA

AUDITOR CHANGE: NA
AUDITOR: PEAT, MARWICK, MITCHELL & CO.
AUDITOR'S REPORT: UNQUALIFIED

FISCAL YEAR ENDING	12/31/83	12/31/82
	ASSETS (000S)	
CASH	326,200	561,200
MRKTABLE SECURITIES	45,100	54,500
RECEIVABLES	1,367,600	1,246,600
INVENTORIES	1,284,800	1,286,000
RAW MATERIALS	NA	NA
WORK IN PROGRESS	NA	NA
FINISHED GOODS	NA	NA
NOTES RECEIVABLE	NA	NA
OTHER CURRENT ASSETS	631,000	665,800
TOTAL CURRENT ASSETS	3,654,700	3,814,100
PROP, PLANT & EQUIP	6,764,800	6,837,000
ACCUMULATED DEP	3,766,500	3,756,100
NET PROP & EQUIP	2,998,300	3,080,900
INVEST & ADV TO SUBS	2,220,100	389,200
OTH NON-CUR ASSETS	274,500	235,200
DEFERRED CHARGES	NA	NA
INTANGIBLES	NA	NA
DEPOSITS & OTH ASSET	149,300	148,300
TOTAL ASSETS	9,296,900	7,667,700
	LIABILITIES (000S)	
NOTES PAYABLE	542,600	426,300
ACCOUNTS PAYABLE	308,800	280,800
CUR LONG TERM DEBT	NA	126,300
CUR PORT CAP LEASES	NA	NA
ACCRUED EXPENSES	960,300	950,600
INCOME TAXES	209,200	203,400
OTHER CURRENT LIAB	285,100	187,800
TOTAL CURRENT LIAB	2,306,000	2,175,200
MORTGAGES	NA	NA
DEFERRED CHARGES/INC	222,800	318,500
CONVERTIBLE DEBT	NA	NA
LONG TERM DEBT	1,460,900	849,600
NON-CUR CAP LEASES	NA	NA
OTHER LONG TERM LIAB	204,400	154,900
TOTAL LIABILITIES	4,194,100	3,498,200
MINORITY INT (LIAB)	438,400	445,200
PREFERRED STOCK	442,000	NA
COMMON STOCK NET	95,100	84,700
CAPITAL SURPLUS	695,300	317,200
RETAINED EARNINGS	3,804,300	3,669,800
TREASURY STOCK	NA	NA
OTHER LIABILITIES	(372,300)	(347,400)
SHAREHOLDER'S EQUITY	4,664,400	3,724,300
TOT LIAB & NET WORTH	9,296,900	7,667,700

FISCAL YEAR ENDING	12/31/83	12/31/82	12/31/81
	INCOME STATEMENT (000S)		
NET SALES	8,463,500	8,455,600	8,510,100
COST OF GOODS	4,236,500	3,916,900	3,747,900
GROSS PROFIT	4,227,000	4,538,700	4,762,200
R & D EXPENDITURES	555,000	565,000	525,800
SELL GEN & ADMIN EXP	3,076,400	3,154,600	3,035,000
INC BEF DEP & AMORT	595,600	819,100	1,201,400
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	261,400	(204,800)	(52,200)
INTEREST EXPENSE	190,400	NA	NA
INCOME BEFORE TAX	666,600	614,300	1,149,200
PROV FOR INC TAXES	136,200	170,600	449,600
MINORITY INT (INC)	64,000	76,000	127,300
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	466,400	367,700	572,300
EX ITEMS & DISC OPS	NA	56,000	25,900
NET INCOME	466,400	423,700	598,200
OUTSTANDING SHARES	94,915,426	84,713,581	84,507,989

QUARTERLY REPORT FOR	03/31/84	06/30/84	09/30/84
	INCOME STATEMENT (000S)		
NET SALES	2,057,100	2,216,500	2,145,500
COST OF GOODS	1,012,800	1,090,000	1,086,500
GROSS PROFIT	1,044,300	1,126,500	1,059,000
R & D EXPENDITURES	130,300	141,900	145,500
SELL GEN & ADMIN EXP	758,200	804,300	796,500
INC BEF DEP & AMORT	155,800	180,300	117,000
DEPRECIATION & AMORT	NA	NA	NA
NON-OPERATING INC	68,800	22,200	49,700
INTEREST EXPENSE	57,700	64,400	70,900
INCOME BEFORE TAX	166,900	138,100	95,800
PROV FOR INC TAXES	40,800	42,600	14,500
MINORITY INT (INC)	NA	NA	NA
INVEST GAINS/LOSSES	NA	NA	NA
OTHER INCOME	NA	NA	NA
NET INC BEF EX ITEMS	126,100	95,500	81,300
EX ITEMS & DISC OPS	NA	NA	NA
NET INCOME	126,100	95,500	81,300
OUTSTANDING SHARES	NA	95,871,498	95,882,931

SEGMENT DATA (12/31/83)	SALES (000S)	OP INCOME
REPROGRAPHICS	6,188,000	1,036,000
PAPER	472,000	23,800
OTHER	2,069,400	(56,800)

FIVE YEAR SUMMARY

YEAR	SALES (000S)	NET INCOME	EPS
1983	8,464,000	466,000	4.42
1982	8,456,000	424,000	5.00
1981	8,510,000	598,000	7.08
1980	8,037,000	565,000	6.69
1979	6,852,000	515,000	6.12

COMMENTS:
NOTES PAYABLE INCLUDES CURRENT PORTION OF LONG-TERM DEBT;OTHER EQUITY IS NET UNREALIZED APPRECIATION OF EQUITY INVESTMENTS, CUMULATIVE TRANSLATION ADJUSTMENTS AND CLASS B STOCK RECEIVABLES AND DEFERRALS

CHAPTER 5 - FEDERAL PROGRAMS, POLICIES AND STRATEGIES

CHAPTER 5

TABLE OF CONTENTS

FIGURES

5.0 FEDERAL PROGRAMS, POLICIES AND STRATEGIES

5.1 Introduction

This Chapter analyses federal programs and policies supporting the Office Communications Systems program. It is primarily the result of interviews with the leading Canadian OCS firms outlined in Chapter 4 (Competitive Analysis and Canadian Industrial Performance).

In accordance with the Terms of Reference, the industry has been interviewed with respect to:

1) Major programs supporting the OCS industry, as follows:

   a) OCS Field Trials

   b) Enterprise Development Program (EDP). (Now restructured to the Industrial and Regional Development Program [IRDP].)

   c) Source Development Fund (SDF)

   d) Program for Export Market Development (PEMD)

2) Policies, as follows:

   a) Regional industrial development

   b) Procurement policy (direct procurement, Canadian content rules, offset programs, government-to-government.)

   c) Telecommunications regulatory policies

5.2 Programs

5.2.1 Introduction

Figure 5-1 shows the distribution of the companies interviewed and the various programs they have used. Six were involved in the field trials. Only one of the firms interviewed had used the Source Development fund. Suprisingly, given these are all major firms, six companies had used no programs at all. The reason given by the majority was that they really did not know much about them. Other comments were:

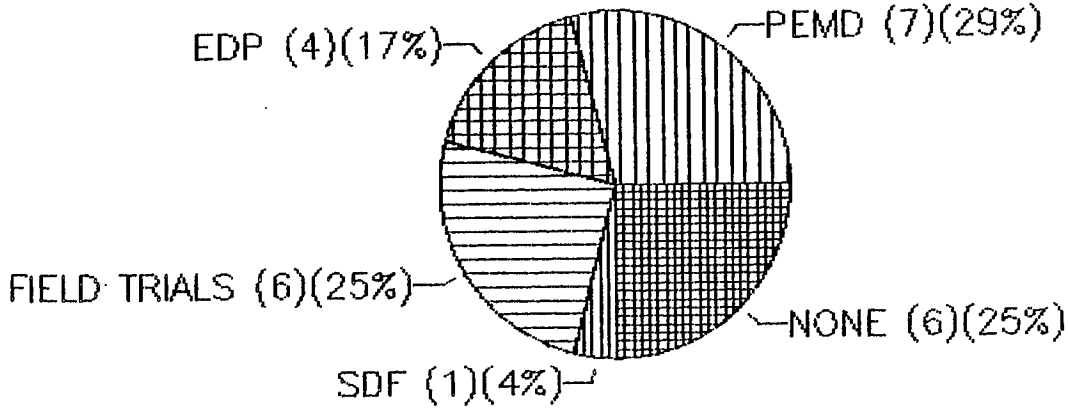
a) They didn't have their product line ready and couldn't take advantage of the programs

and

b) All activities were controlled through the U.S. head office.

FIGURE 5-1

SUMMARY OF RESPONDENTS



TOTAL 25

5.2.2 Use of Federal Programs

Figure 5-2 shows the respondents' answers to the question: "Would you use the Program again?". The answers show that the majority of respondents were reasonably happy and would continue to use the programs. All respondents were 100 percent for the PEMD program, which is viewed as being very effective with little red tape. There was some hesitation on the EDP program, where 25 percent stated they would not use it again; and the field trials, where 33 percent would not use it again. The perceived advantages and disadvantages and reasons for such answers are fairly clearly indicated in the responses shown in Figures 5-3 to 5-10.

These figures provide the answers to the following questions:

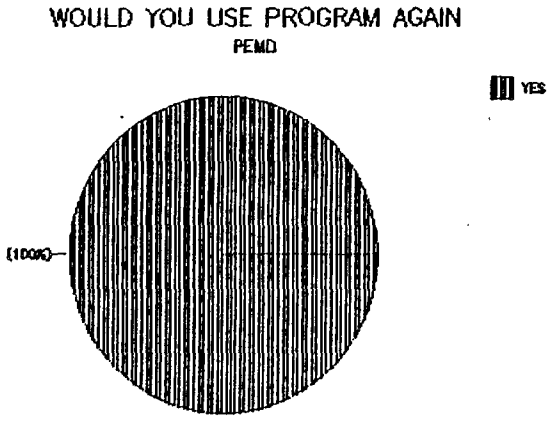
1) How closely did you find the program fulfilled your needs?

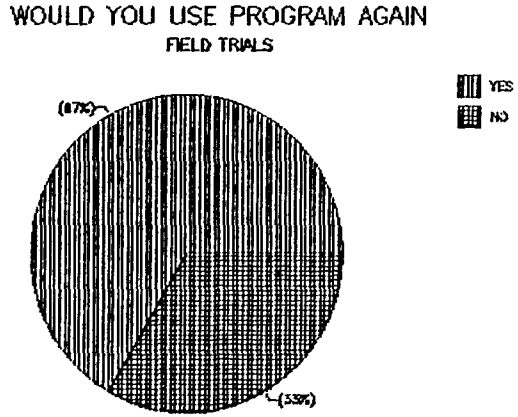
2) How much time and effort did it take you to obtain funding?

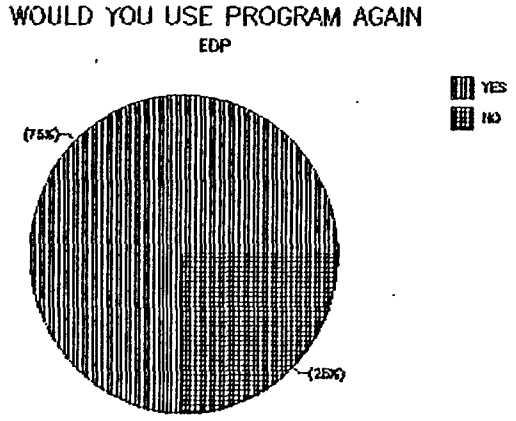
3) How adequate was the funding to your needs?

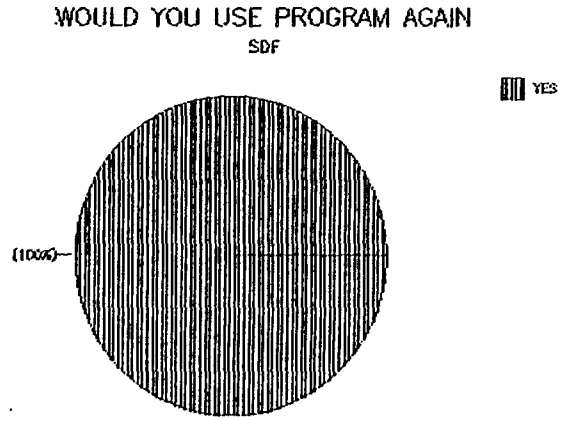
4) How much will the use of this program contribute to your OCS product line?

FIGURE 5-2


WOULD YOU USE PROGRAM AGAIN
PEMD
YES
(100%)


WOULD YOU USE PROGRAM AGAIN
FIELD TRIALS
YES
NO
(67%)
(33%)


WOULD YOU USE PROGRAM AGAIN
EDP
YES
NO
(75%)
(25%)


WOULD YOU USE PROGRAM AGAIN
SDF
YES
(100%)

5.2.3 Impact of Federal Programs

As indicated in Figures 5-3 and 5-4, the majority of respondents on the field trials were very positive. They felt the program did fulfill their needs, funding was reasonably adequate and the program did contribute to their product line. Only one company ranked each question at Level 2, all others were at Level 3 and above. However, one problem is shown in Figure 5-3. Most companies felt the time and effort associated with obtaining funding was excessive. Other comments included:

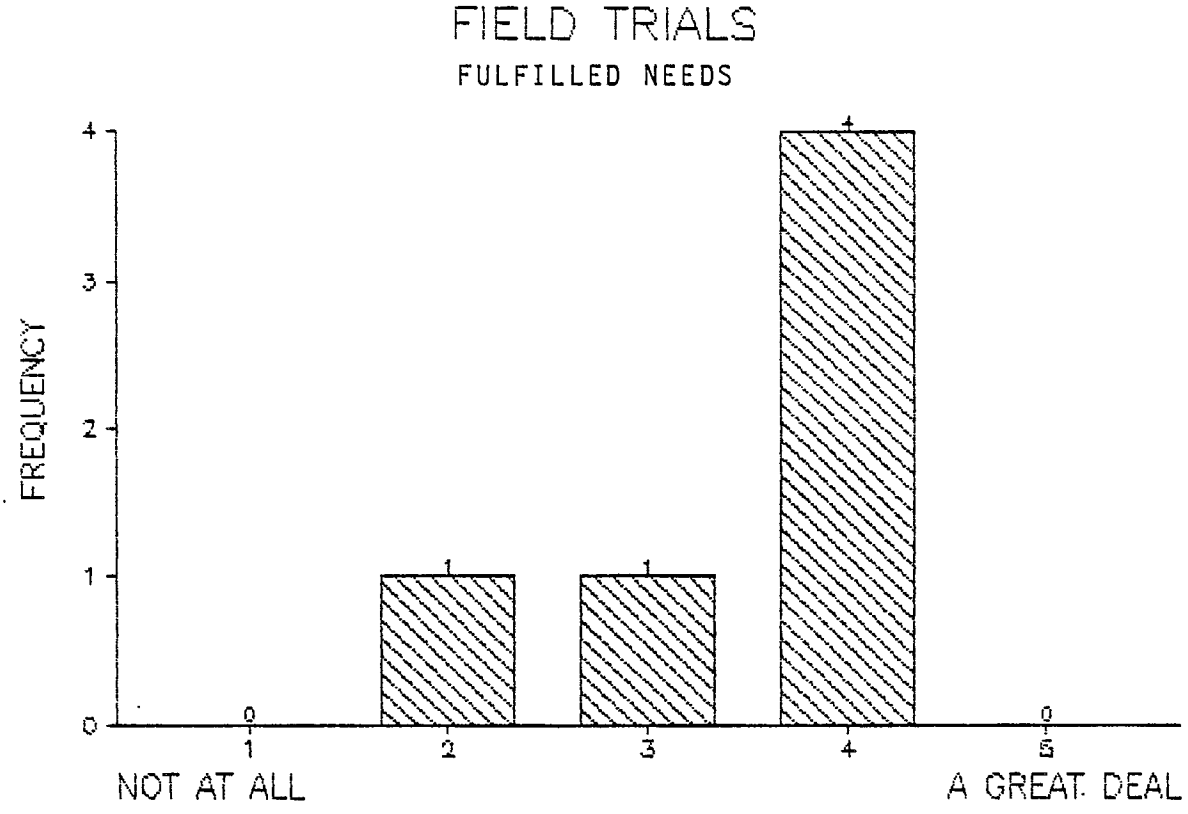
1) A feeling that the field trials were really too short and a more extended period was necessary. Also, there should be some follow-up to the field trials.

2) DSS treated the field trials like a regular contract and not like a development program. As such, management time and effort expended was high and companies were expected to strictly define aspects of the program that were of a developmental nature and could not be defined, in the usual contractual terms.

3) Public endorsements could not be used, as they might be with a private sector client (e.g. "ABC company is fully satisfied with the products provided by "X").

All-in-all however, the data indicates a highly successful program.

FIGURE 5-3


FIELD TRIALS
FULFILLED NEEDS
FREQUENCY
0
1
2
3
4
0
1
1
4
0
1
2
3
4
5
NOT AT ALL
A GREAT DEAL

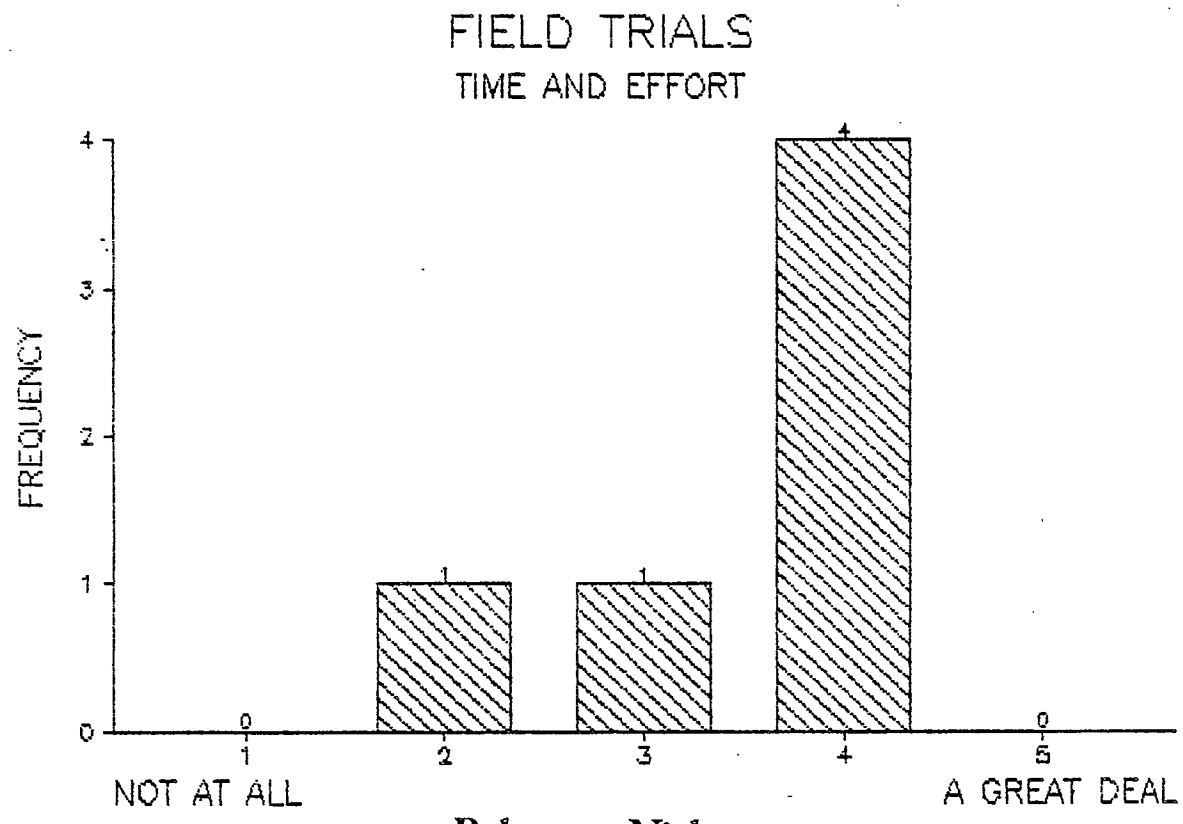
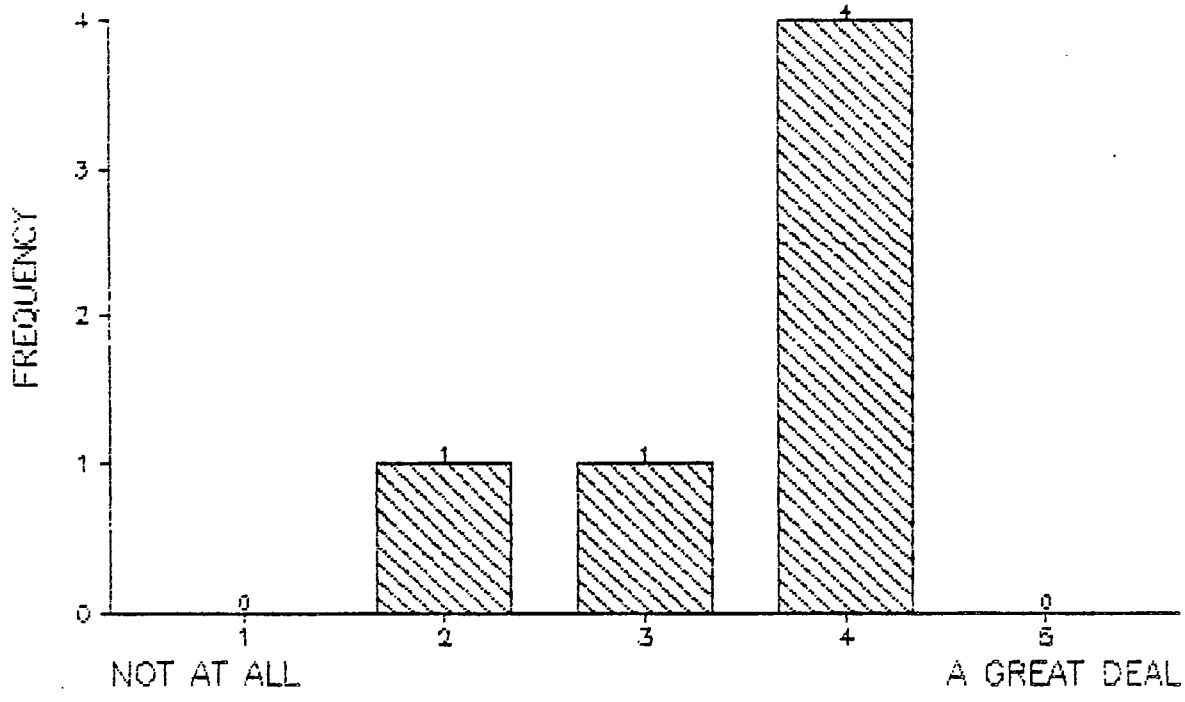

FIELD TRIALS
TIME AND EFFORT
FREQUENCY
0
1
2
3
4
0
1
1
4
0
1
2
3
4
5
NOT AT ALL
A GREAT DEAL

FIGURE 5-4

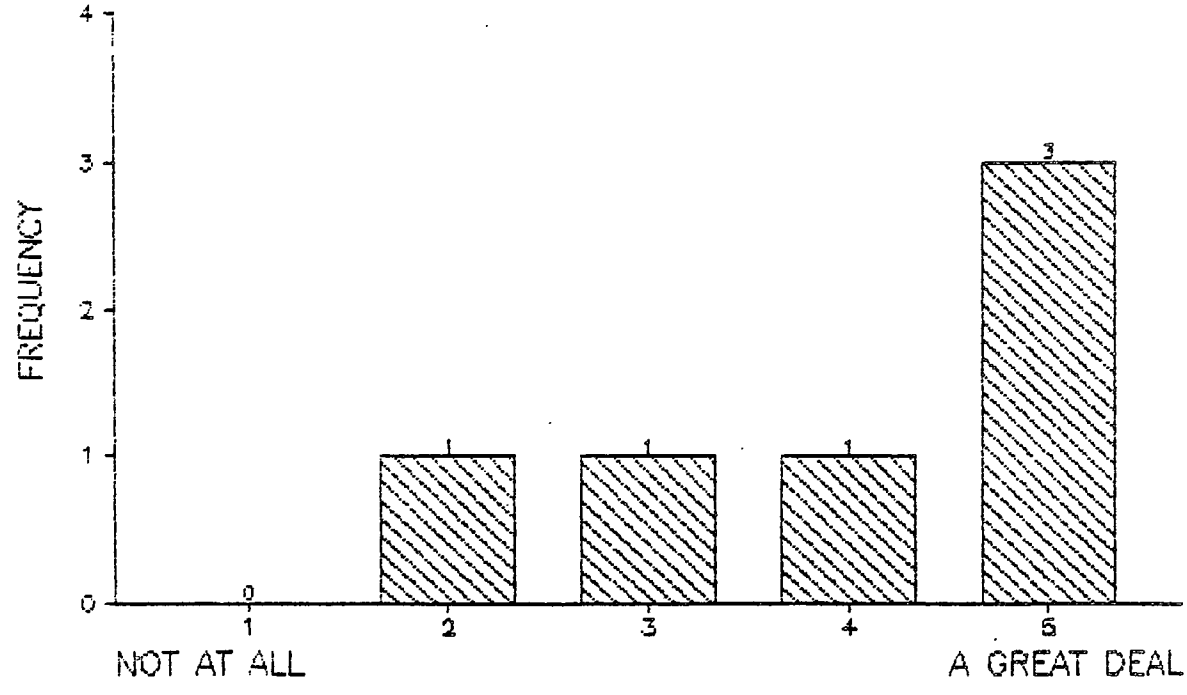
FIELD TRIALS

FUNDING



FIELD TRIALS

CONTRIBUTE TO PRODUCT LINE



Figures 5-5 and 5-6 show the reaction to the EDP program on the part of major OCS industry firms. The reaction was reasonably positive, although slightly less so than the field trials. "Fulfilled needs" is ranked somewhat higher than the field trials, but level of "funding" appears less adequate and the "contribution to product line" is somewhat less. The "time and effort" to obtain funding is ranked high with three out of four respondents at Level 5 ("A great deal of effort"). General comments include:

1) EDP assumes that a firm can totally define a program ahead of time with no flexibility afterwards, i.e., no change. So firms tend to make the project look like it is supposed to look, in order to obtain funding.

2) The level of funding support is so variable, firms never know how much they would get.

3) It takes 12 months to get the funding; a go/no go decision should be made quicker.

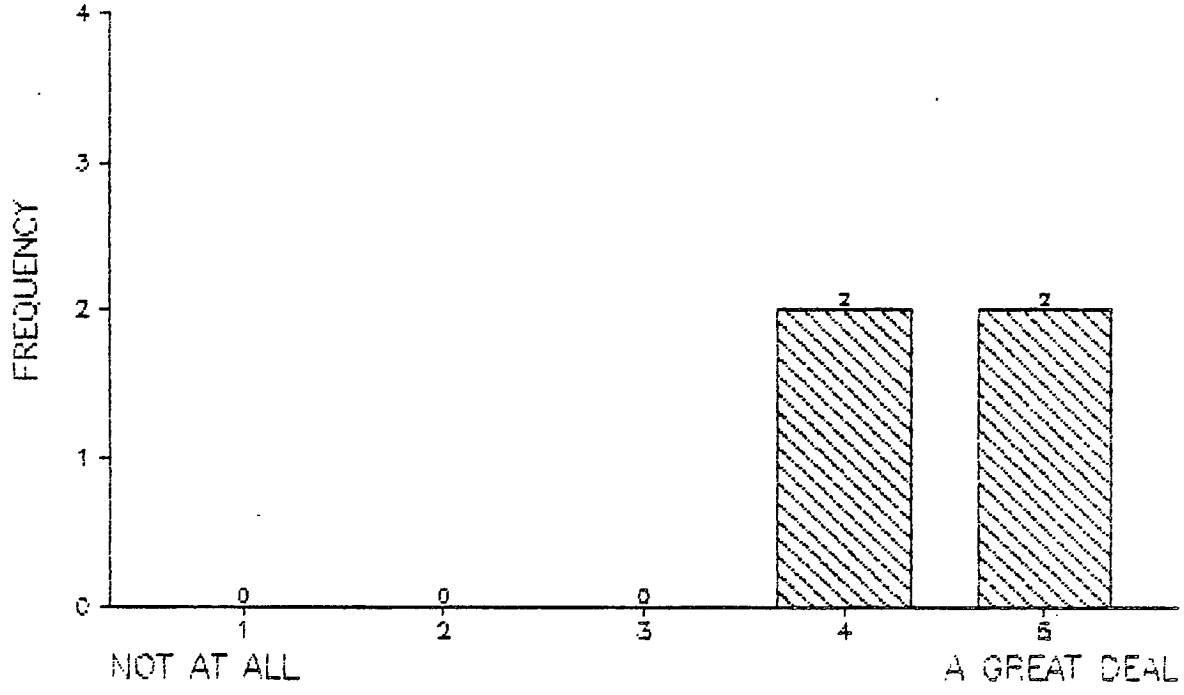
4) The process needs to be streamlined.

Generally, the problems are amplified by the rapid change in technology associated with the OCS marketplace. R&D must fit this very rapidly changing environment. However, by the time a company obtains funding approval on the basis of an

FIGURE 5-5

EDP

FULFILLED NEEDS



EDP

TIME AND EFFORT

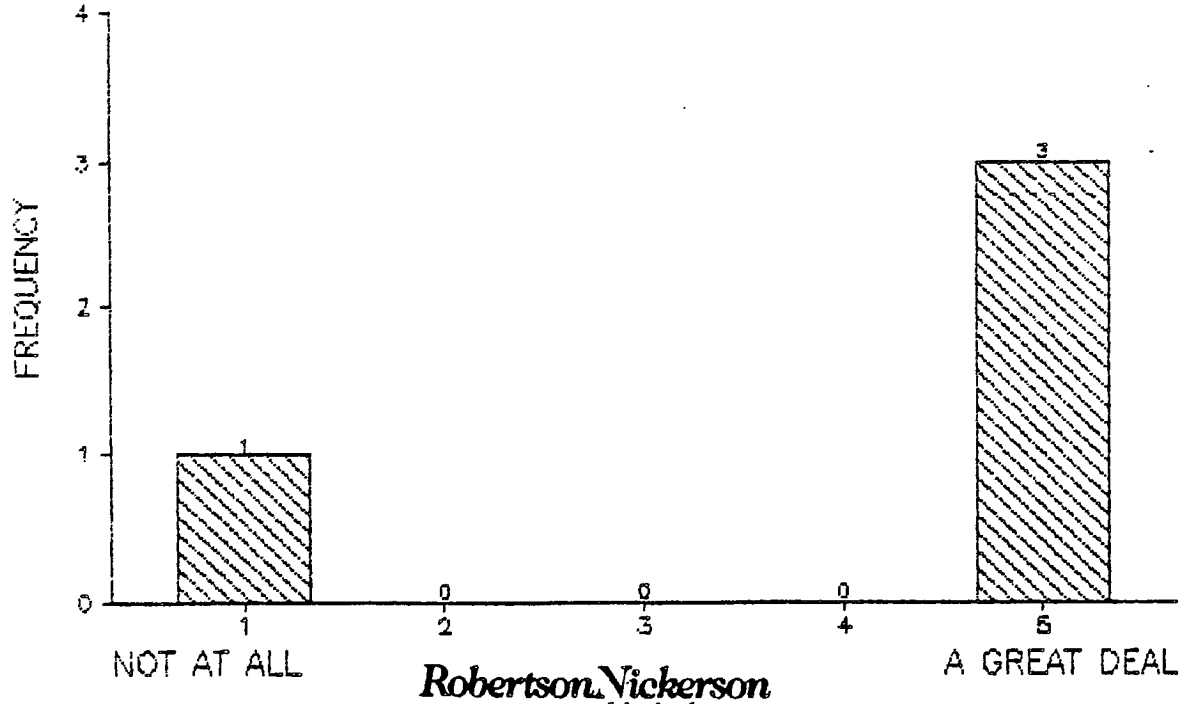
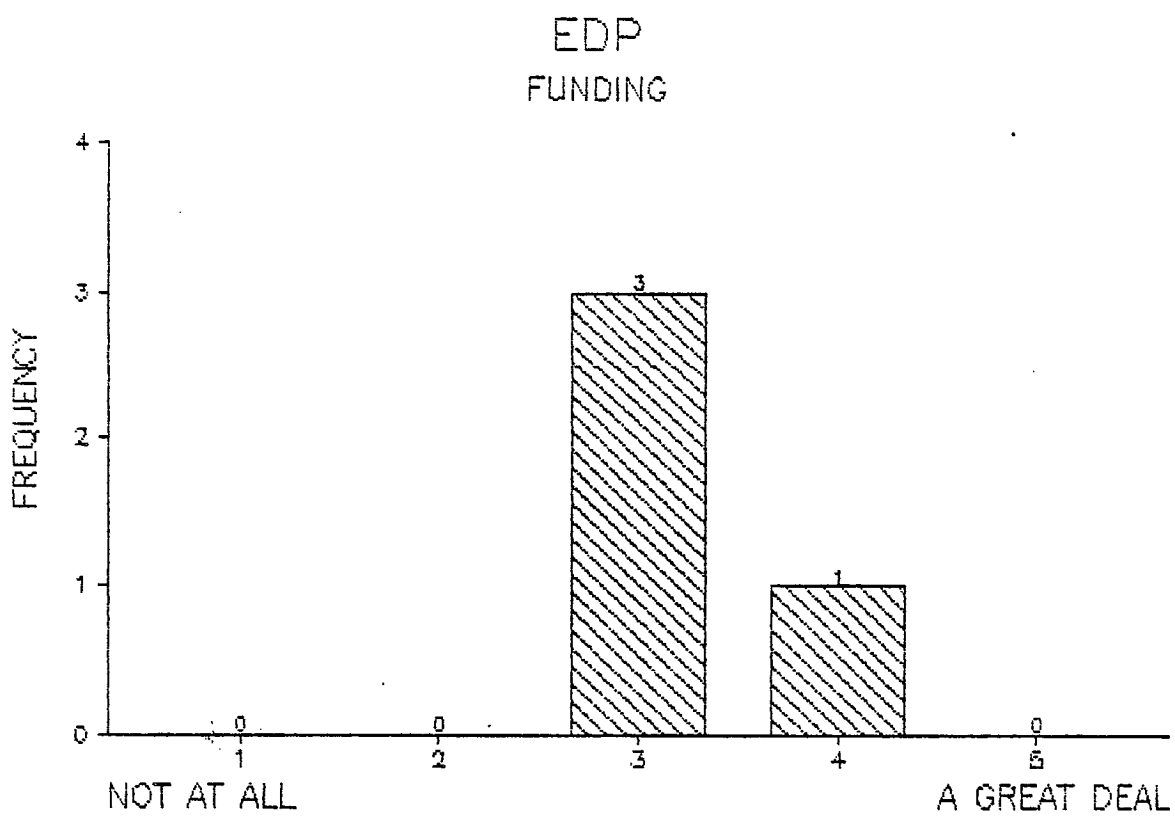
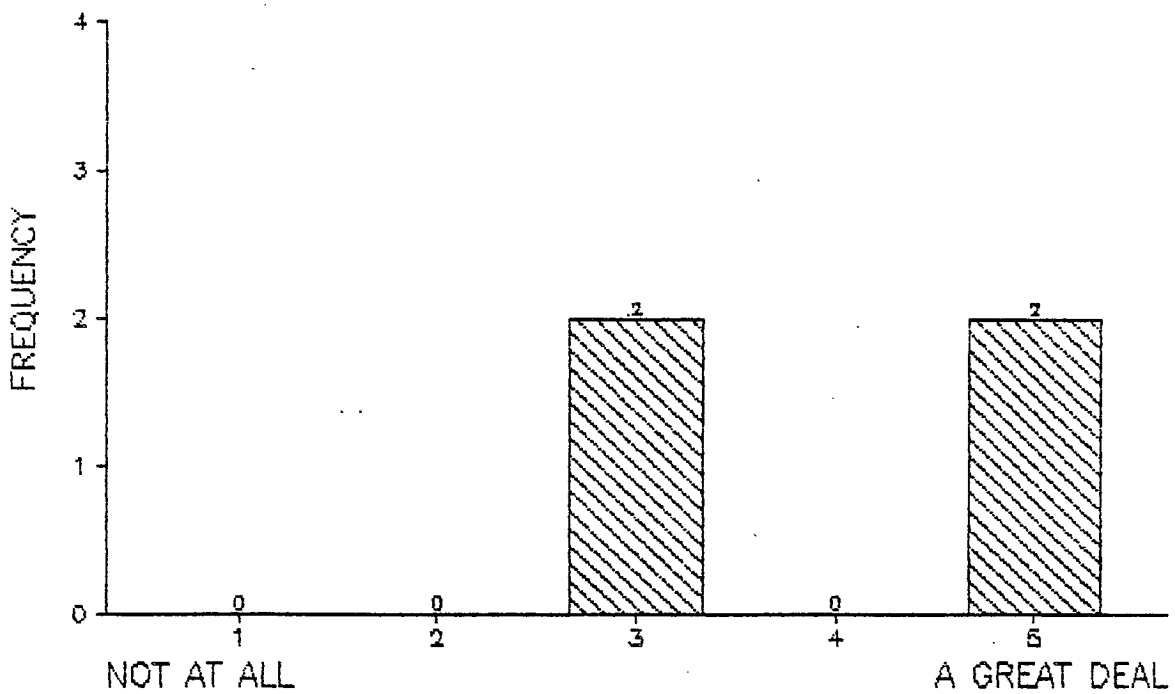


FIGURE 5-6


EDP
FUNDING
FREQUENCY
0
1
2
3
4
0
0
3
1
0
1
2
3
4
5
NOT AT ALL
A GREAT DEAL


EDP
CONTRIBUTE TO PRODUCT LINE
FREQUENCY
0
1
2
3
4
0
0
2
0
2
1
2
3
4
5
NOT AT ALL
A GREAT DEAL

application submitted months before, some aspect of the marketplace may have changed. If the program has little flexibility, the company cannot keep up with the rapidly changing pace. It may, therefore, wind up developing a product on the basis of the funding application rather than on the basis of what the market indicates it needs.

In non-OCS product areas, this is not a problem. However, in OCS, the pace of technology is such that for funding to be effective, it must be quick and it must be flexible. Otherwise, the competition will have the product developed while government and industry are still renegotiating the funding agreement. This implies a need for a different funding mechanism in areas of rapid technological change, such as Office Communications Systems.

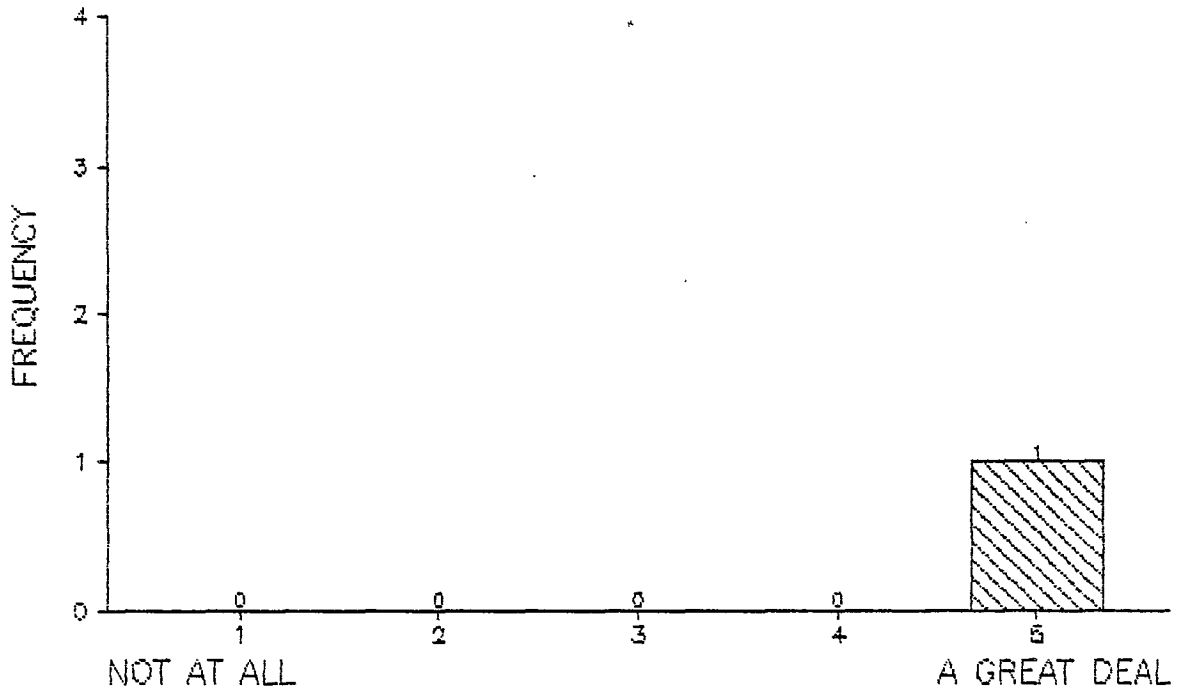
Given that only one firm has used the Source Development Fund, it does not appear to be a very important area to the OCS industry. However, the single recipient was enthusiatic and ranked (See Figures 5-7 and 5-8) "fulfilled needs" and "contribution to product line" at Level 5 ("A great deal"). However, "time and effort" was ranked higher than other programs and "level of funding" was ranked lower.

Figure 5-9 and 5-10, show the responses by companies utilizing PEMD funding. The majority of respondents felt the program "fulfilled their needs", and provided "adequate funding". Obviously, the PEMD program also did not require a great deal of time and effort to obtain funding, as compared to other programs. However, that might be expected as the PEMD

FIGURE 5-7

S D F

FULFILLED NEEDS



SDF

TIME AND EFFORT

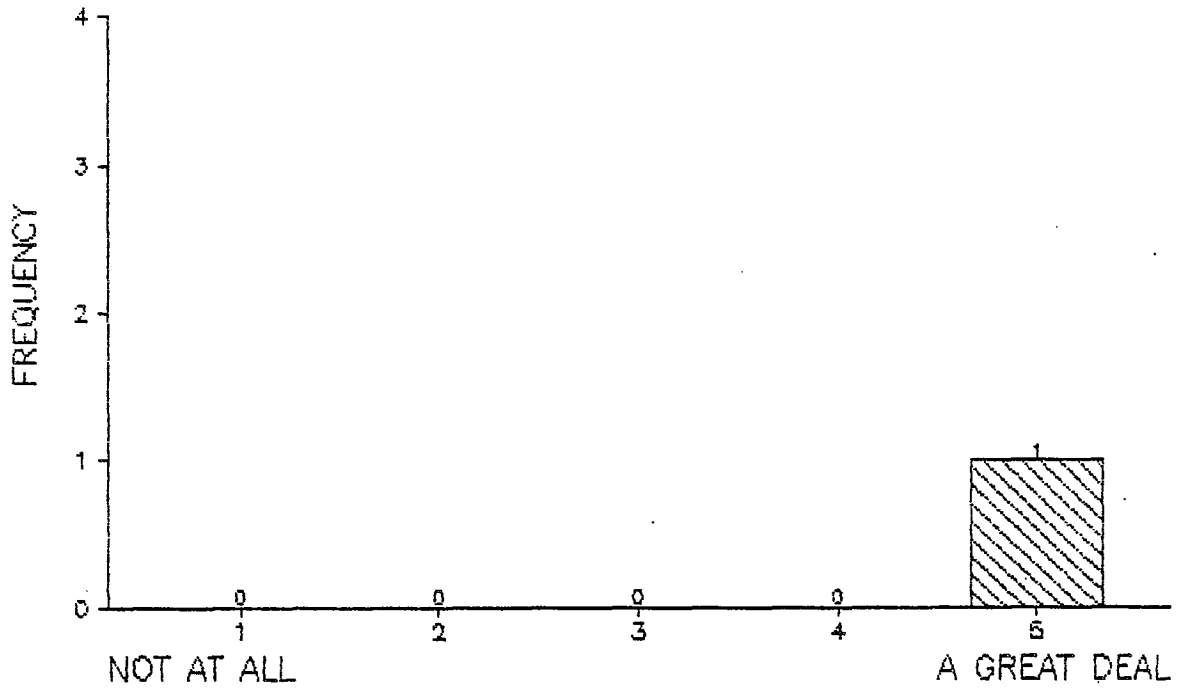
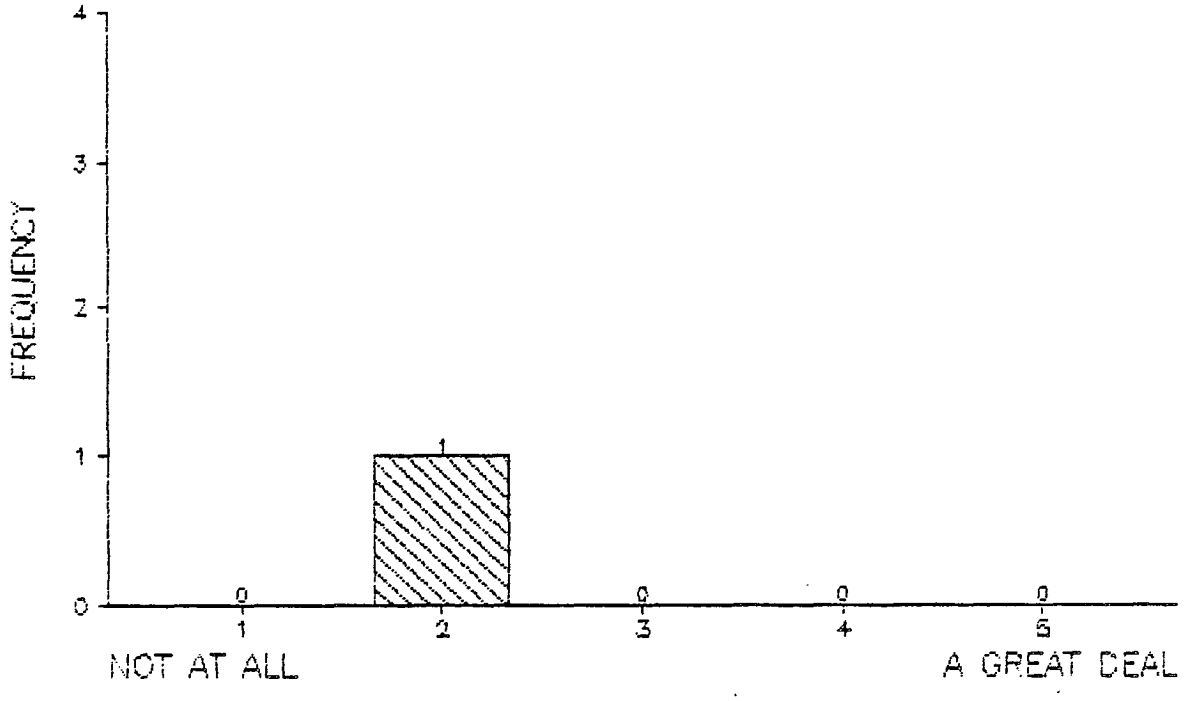


FIGURE 5-8

S D F

FUNDING



SDF

CONTRIBUTE TO PRODUCT LINE

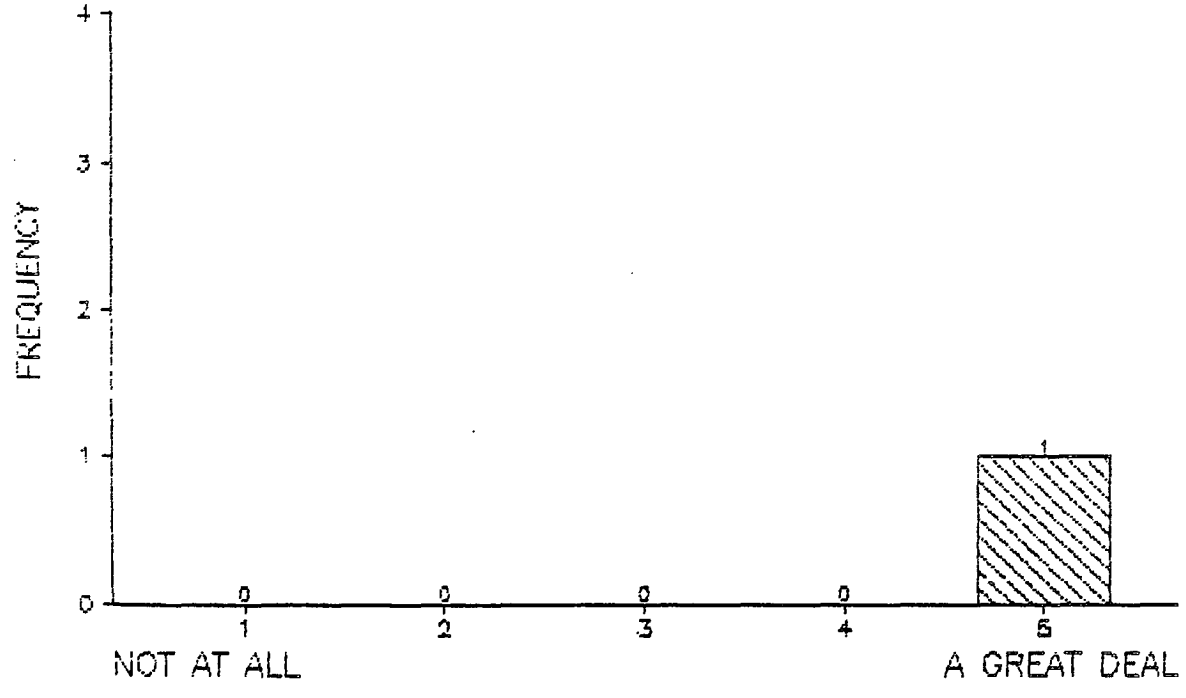
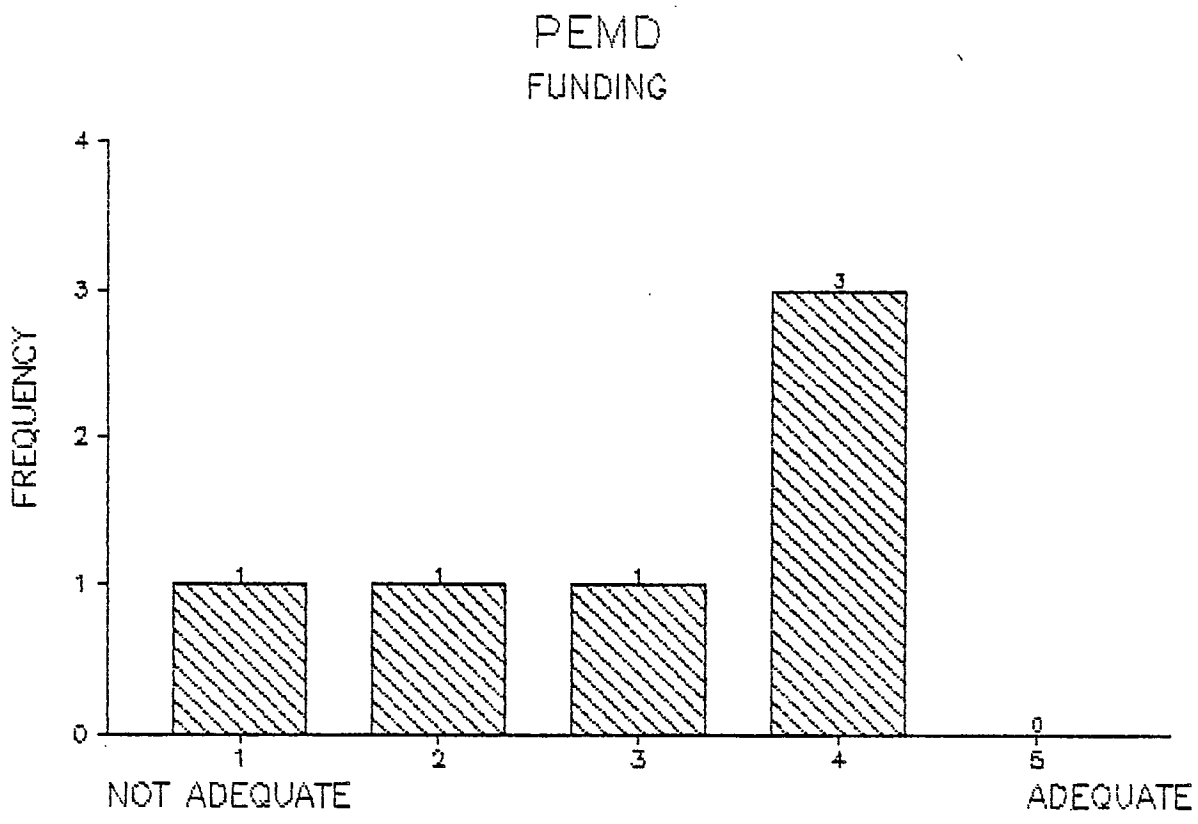


FIGURE 5-9


PEMD
FUNDING
FREQUENCY
0
1
2
3
4
1
1
1
3
0
1
2
3
4
5
NOT ADEQUATE
ADEQUATE

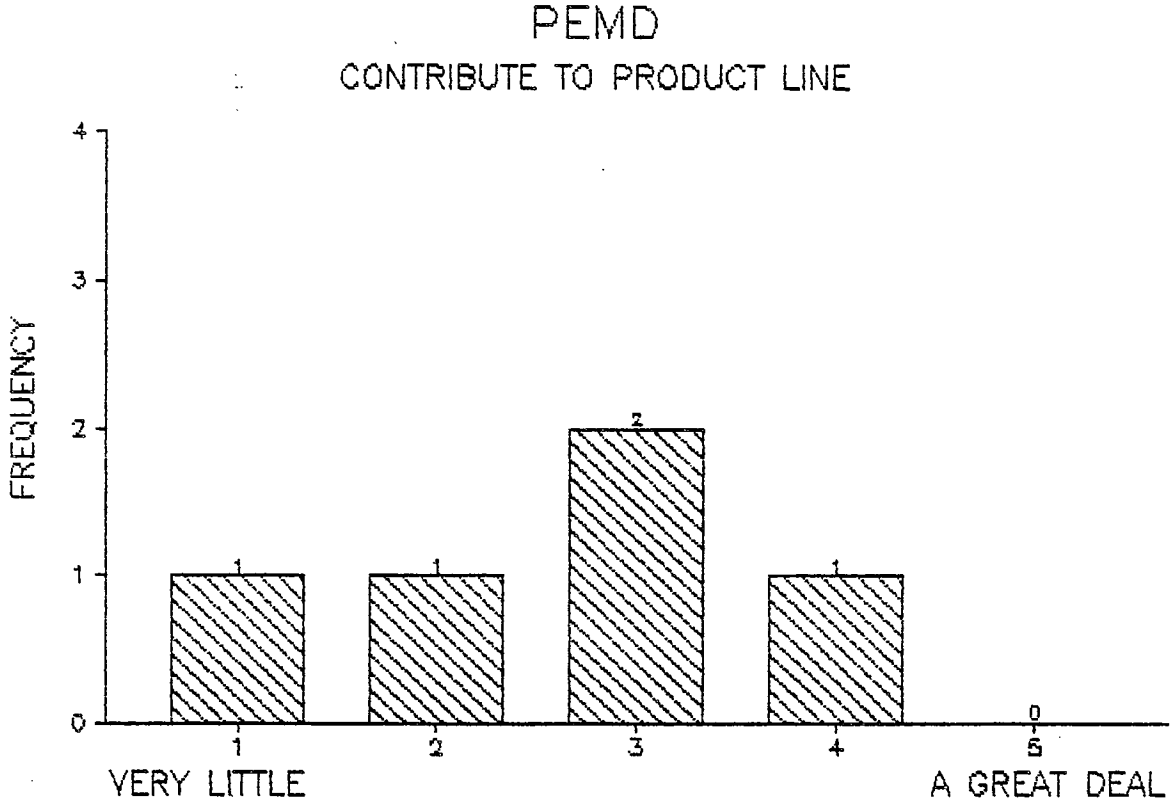
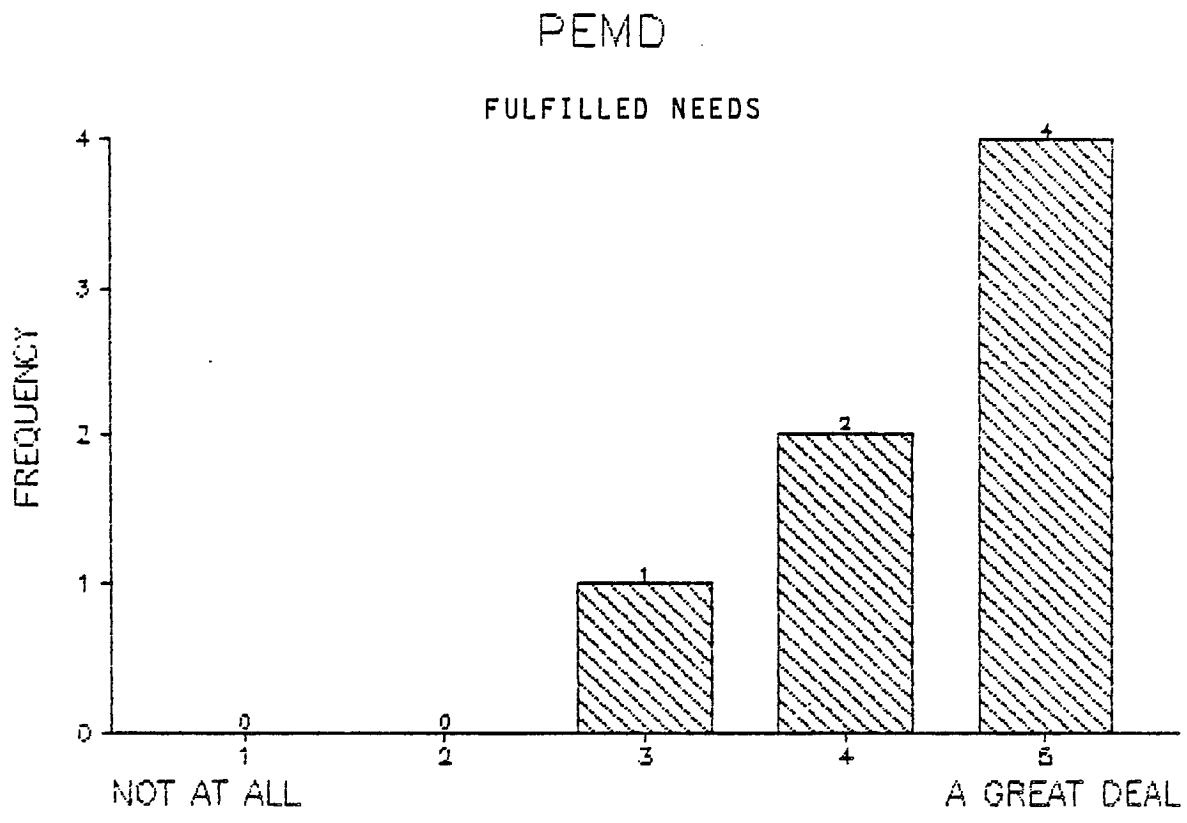
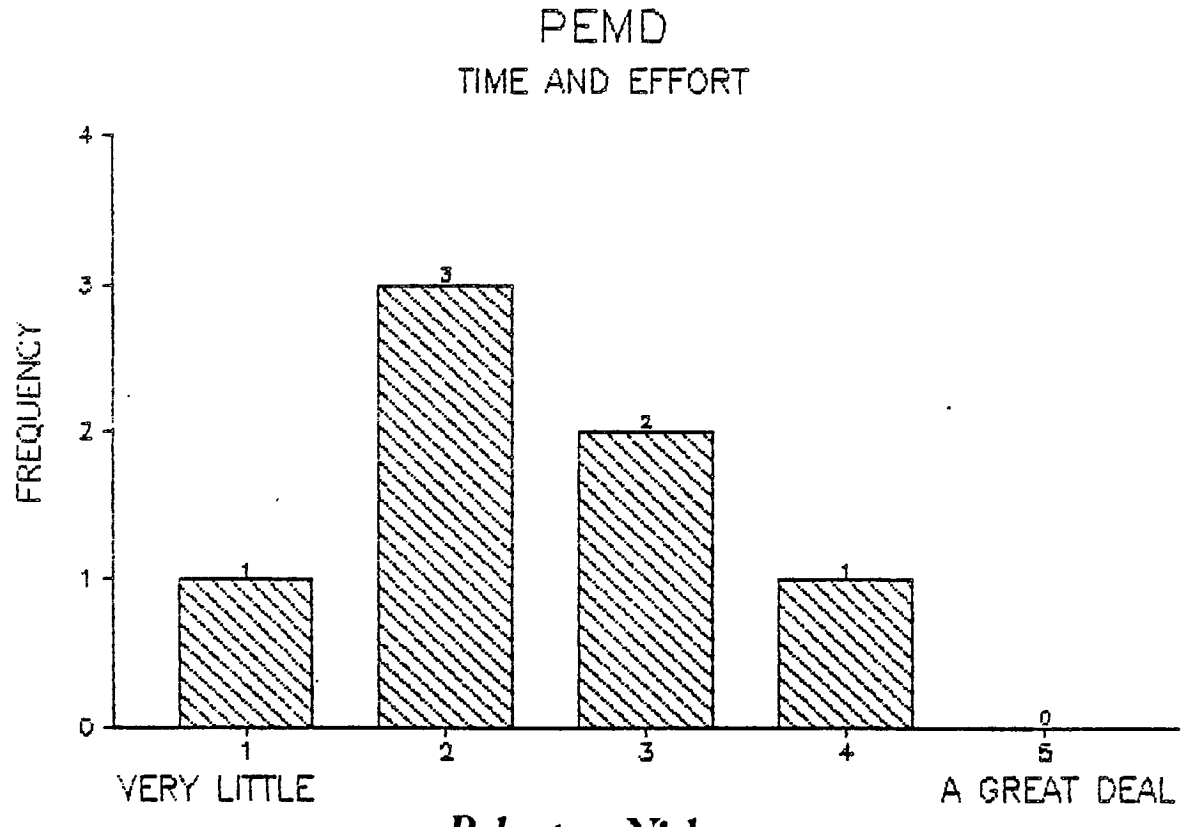

PEMD
CONTRIBUTE TO PRODUCT LINE
FREQUENCY
0
1
2
3
4
1
1
2
1
0
1
2
3
4
5
VERY LITTLE
A GREAT DEAL

FIGURE 5-10


PEMD
FULFILLED NEEDS
FREQUENCY
0
1
2
3
4
0
0
1
2
4
1
2
3
4
5
NOT AT ALL
A GREAT DEAL


PEMD
TIME AND EFFORT
FREQUENCY
0
1
2
3
4
1
3
2
1
0
1
2
3
4
5
VERY LITTLE
A GREAT DEAL

funding does not involve capital projects and is therefore usually for smaller amounts than other programs. The only area in which PEMD scored less than the other programs vis-a-vis the OCS industry was in "contribution to product line". Whereas this was ranked very high in the field trials and EDP, it was ranked only average for PEMD. Again, as PEMD is oriented towards export marketing rather than R&D, this is quite understandable. Suggestions for improvement include:

1) Quicker funding. Marketing requirements cannot wait.

2) Some ambiguous questions on the form (e.g. Canadian content requirements).

3) Expand definition of assistance.

4) Lift ceiling of three applications.

5) A company with offshore offices cannot apply for funding, even though the offshore office is another division and has nothing to do with the product line for which the application is being made.

All-in-all however, the OCS industry respondents indicate a high level of satisfaction with PEMD.

5.3. Federal Policies and Strategies

Figure 5-11 shows the support of the OCS industry for regional development programs. The response was the answer to the question:

> "Do you believe we need more/less/the same level of regional industrial development incentives to encourage the growth of the OCS industry in Canada?"

Given that the majority of the companies interviewed were in Ontario and Quebec, the response shows not only support, but a total lack of any negative attitude towards regional development by the OCS industry. In fact, it shows a high level of support for increased incentives, not only by those companies benefiting, but also by the industry as a whole.

Figures 5-12 to 5-15 show the responses to the question:

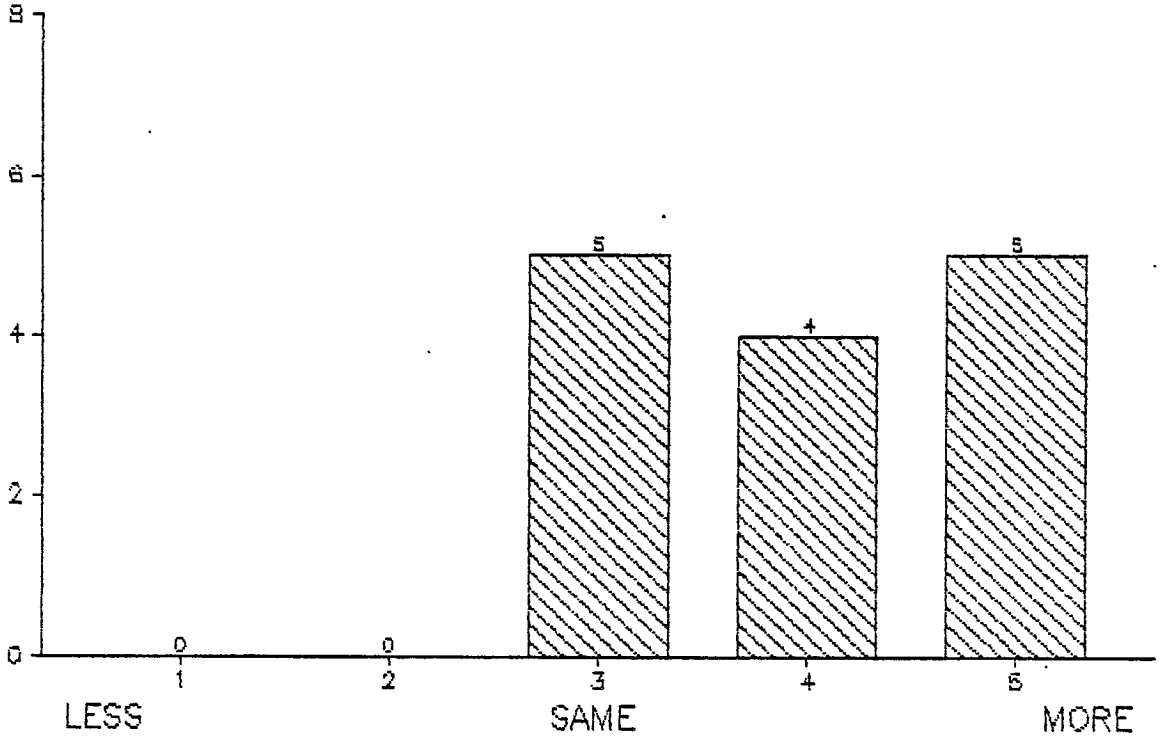
> "To what extent would the following help Canada's OCS industry?"

As a general overview to these figures, it is evident that there is a great deal of support for:

1) More direct government procurement of Canadian OCS equipment and systems.

FIGURE 5-11

REGIONAL INDUSTRIAL DEVELOPMENT INCENTIVES FOR OCS



2) More field trials

3) More tax breaks

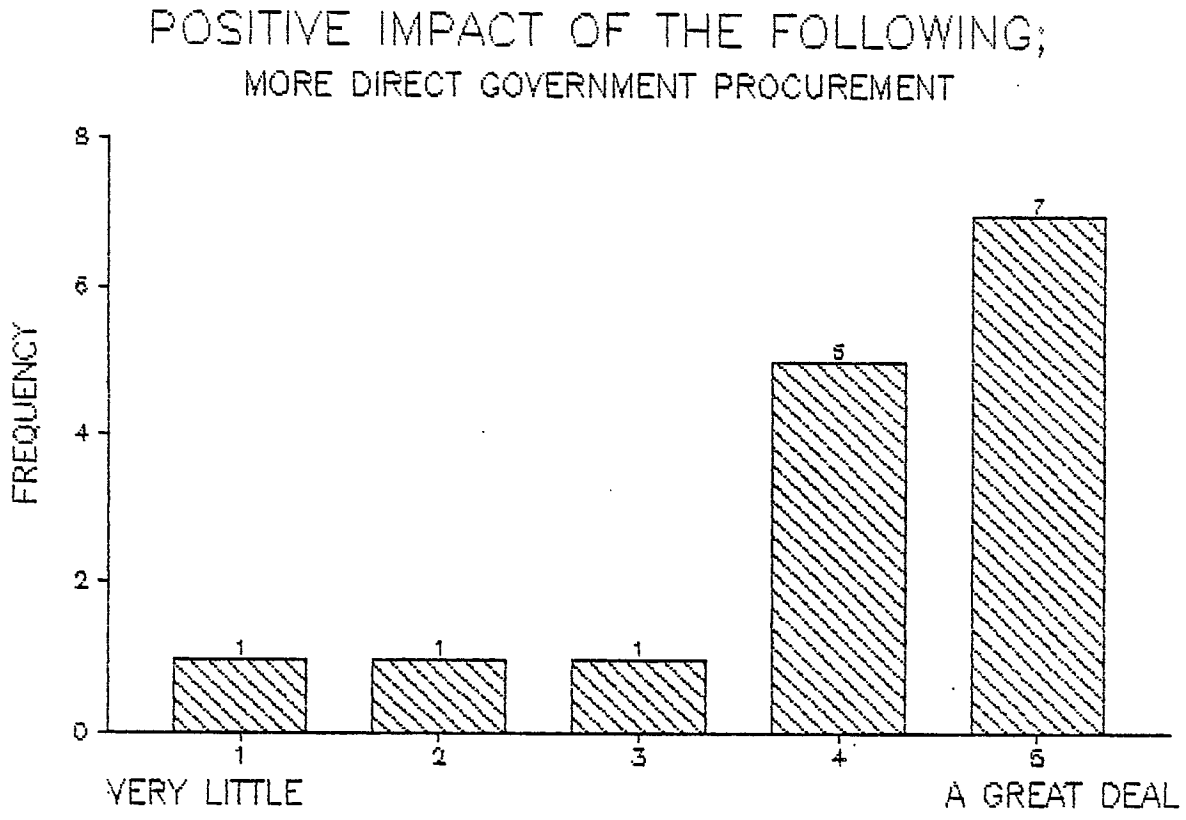
There was not a great deal of support for "More Canadian content regulations", "Offset programs" or "Government-to-government deals". Reaction to regulatory aspects was mixed.

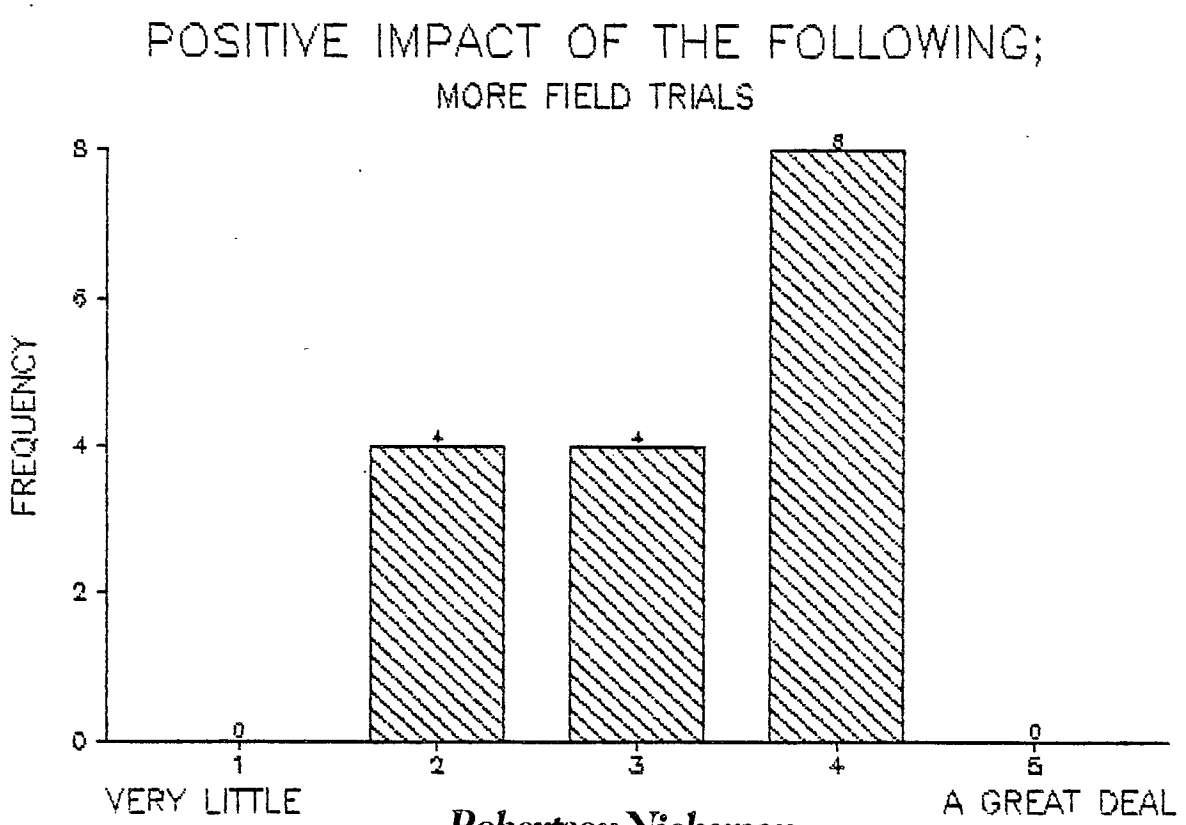
Dealing with each of these in turn, Figure 5-12 shows the response to "More direct government procurement of Canadian OCS equipment and systems". There is a very high level of support for this policy/strategy. About 87 percent of those interviewed, responded at Level 3 and above, indicating the industry feels that direct government procurement has a major potential to help the growth of the OCS industry in Canada. This is obviously related to the response to the field trails where again, over 75 percent felt that more field trials would help Canada's OCS industry. Since the field trials themselves are a form of direct government procurement, the response to these two questions indicates an overwhelming positive response to this program. Other comments were:

1) The field trials should have been larger. They were not extensive enough.

2) More ongoing support and follow-up to the field trials are needed.

FIGURE 5-12


POSITIVE IMPACT OF THE FOLLOWING;
MORE DIRECT GOVERNMENT PROCUREMENT
FREQUENCY
0
2
4
6
8
1
1
1
5
7
1
2
3
4
5
VERY LITTLE
A GREAT DEAL


POSITIVE IMPACT OF THE FOLLOWING;
MORE FIELD TRIALS
FREQUENCY
0
2
4
6
8
0
4
4
8
0
1
2
3
4
5
VERY LITTLE
A GREAT DEAL

3) There are problems in obtaining information on the present and future needs of government departments, as well as delivering Canadian product information to the departments.

4) Since Canadian firms cannot provide complete systems, the government should support the purchase of multi-vendor systems by departments, to which Canadian companies can then contribute equipment and sub-systems. If governments order one-vendor systems, Canadian firms will be locked out of the market.

5) Some respondents feel government procurement policy is geared to offshore equipment, as the "least risk" solution to departmental office automation problems.

6) Give private companies a tax break to "Buy Canadian".

7) Most computer peripherals enter duty free into Canada but not from Canada to the United States.

8) More "Buy Canadian" promotion.

9) More federal/provincial procurement liason on "Buy Canadian" policies.

10) A Canadian Software Development Agency could help with:
   a) Identification of opportunities.
   b) Ways to distribute and display software products.
   c) Increasing government information flow.

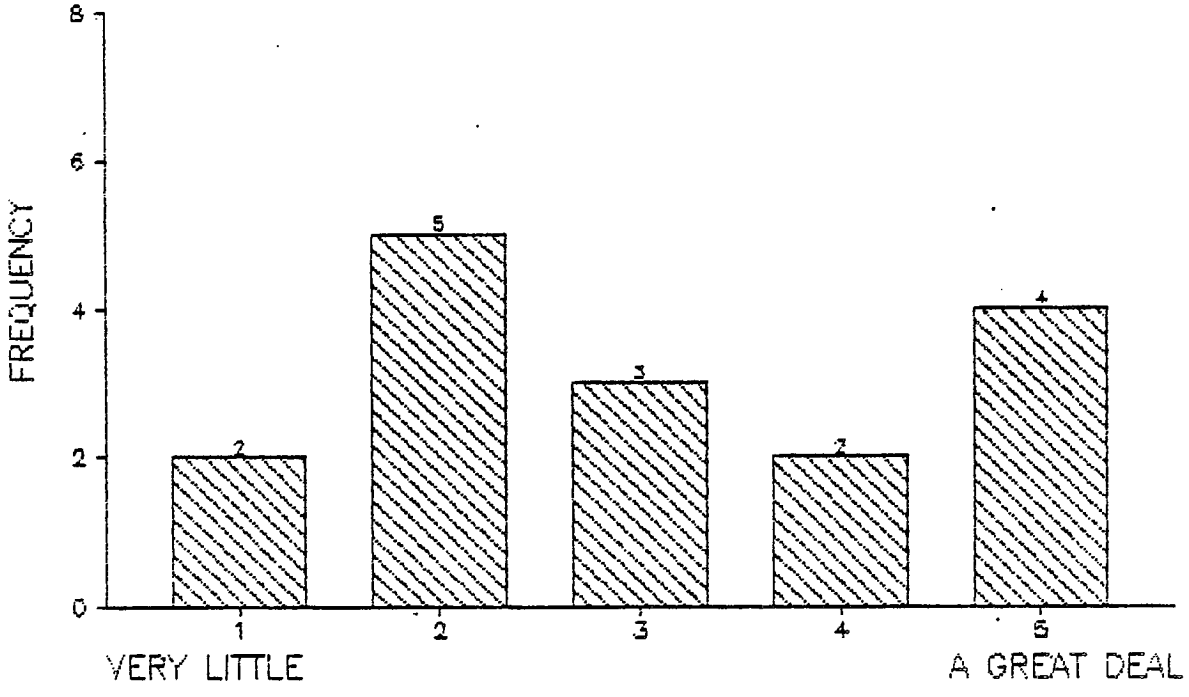
Interestingly, the OCS industry is lukewarm to the introduction of more Canadian content regulations (See Figure 5-13). Only 56 percent ranked this at Levels 3 and above, as having a positive impact on the industry. It would appear that some companies believe that it is quite easy to get around the Canadian content regulations. Several respondents pointed out that government departments had bought from IBM, Wang and others on specifications that did not even allow Canadian companies to compete. Other respondents felt that too many foreign multi-nationals had been rationalized as being "Canadian" for Canadian content purposes.

This reaction is similar for offset programs, (See Figure 5-13) with about 62 percent being favourable, but without any strong consensus. However, since very few companies have had anything to do with offsets, their reaction is not based on exposure to these programs, which are mostly military in nature. Turning to Figure 5-14, the question on "More government-to-government deals" got the same response; very lukewarm with only 53 percent being at all positive, at Levels 3 and above. The rest felt that this policy would not contribute to the growth of the OCS industry. (Note: government-to-government deals means federal/provincial arrangements, interaction with foreign governments, direct assistance vis-a-vis state buying agencies.)

As indicated in Figure 5-14, "More tax breaks" received the greatest positive response of all possible policy alternatives, a total of 87.5 percent at Levels 3 and above.

FIGURE 5-13

POSITIVE IMPACT OF THE FOLLOWING;
MORE CANADIAN CONTENT REGULATIONS



POSITIVE IMPACT OF THE FOLLOWING;
MORE OFFSET PROGRAMS

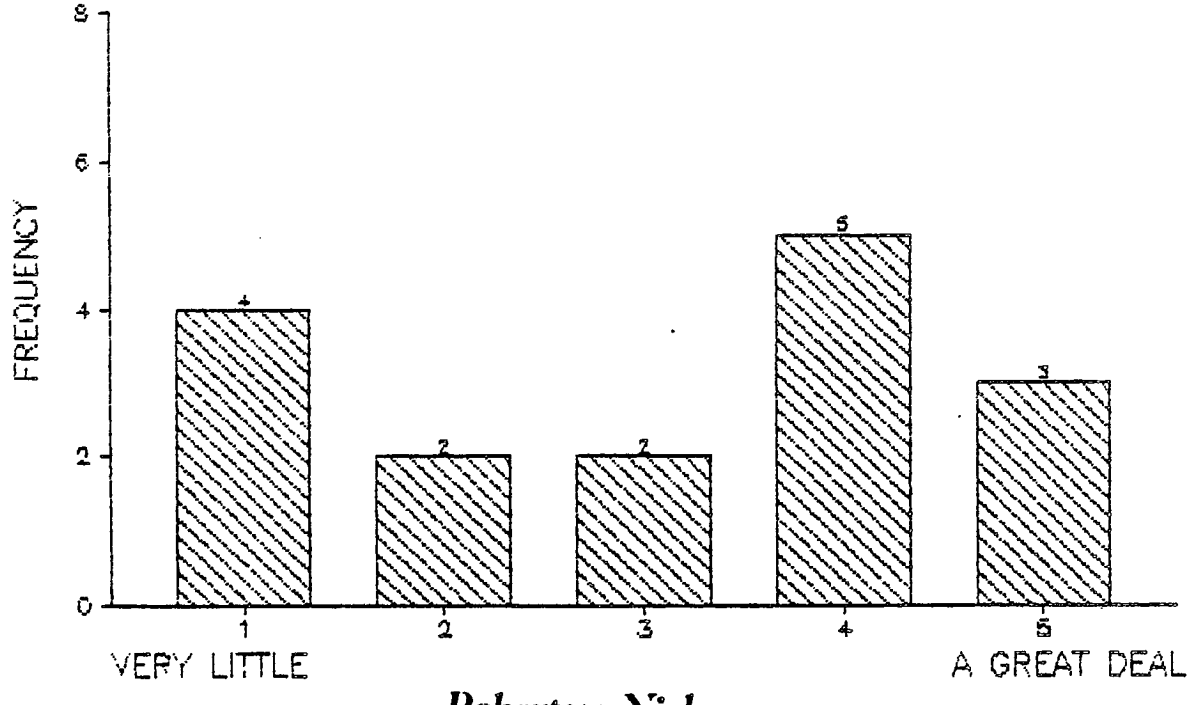
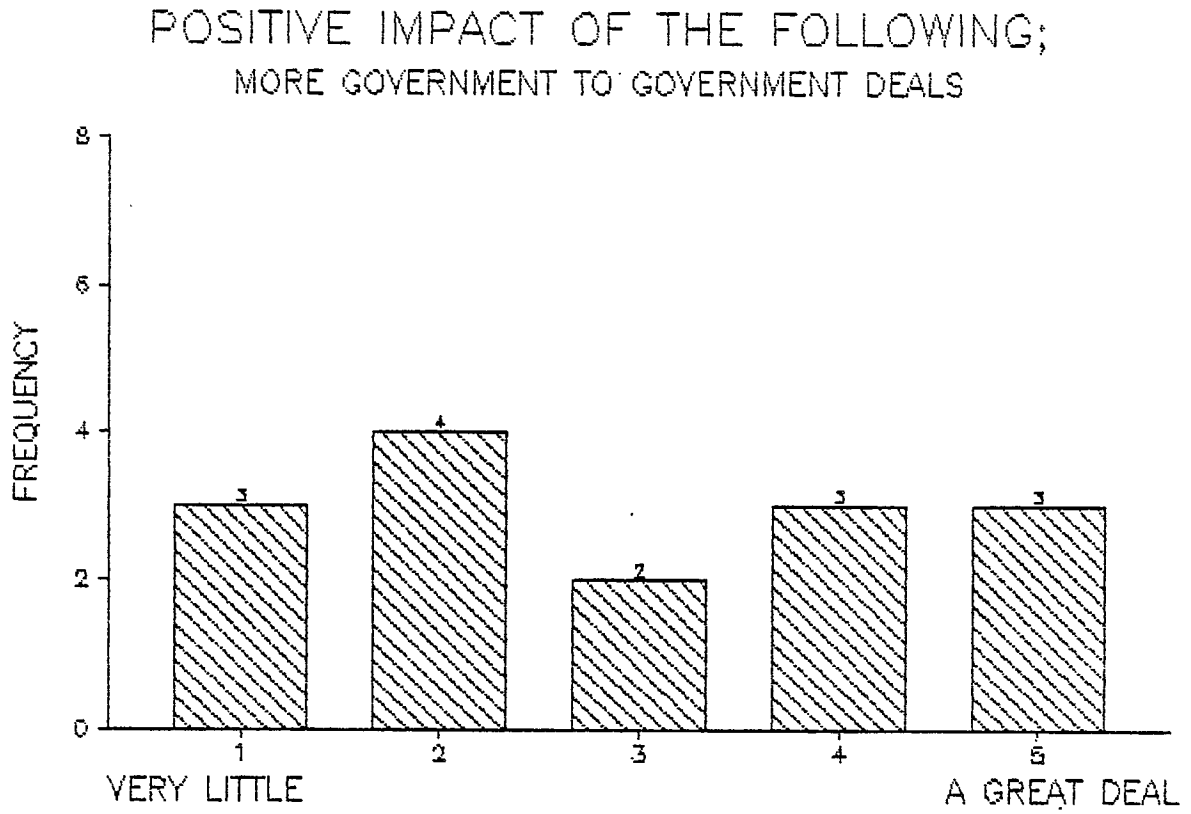
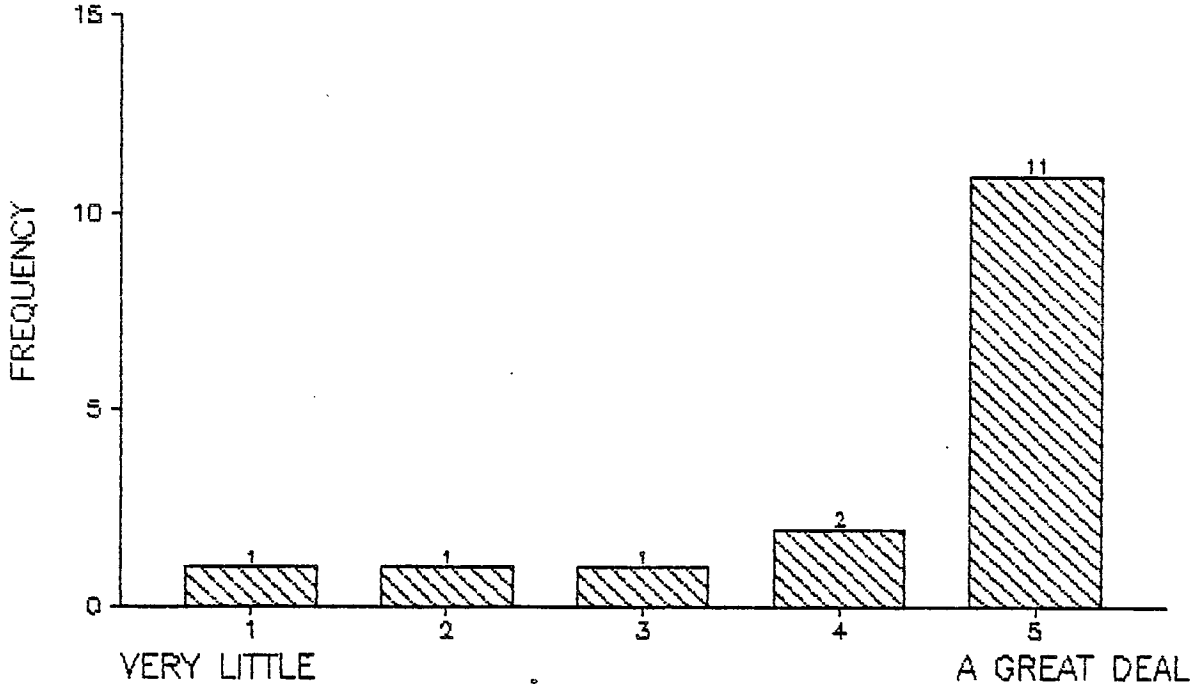


FIGURE 5-14

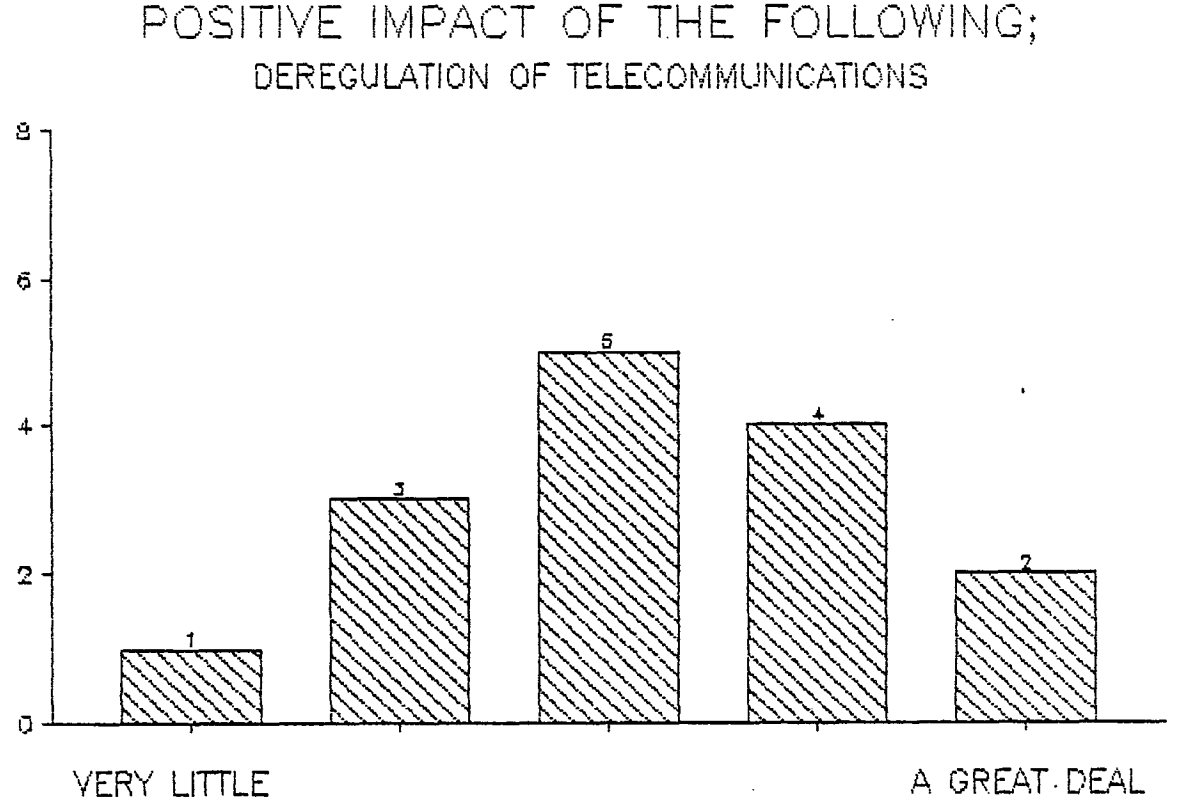

POSITIVE IMPACT OF THE FOLLOWING;
MORE GOVERNMENT TO GOVERNMENT DEALS
FREQUENCY
0
2
4
6
8
3
4
2
3
3
1
2
3
4
5
VERY LITTLE
A GREAT DEAL

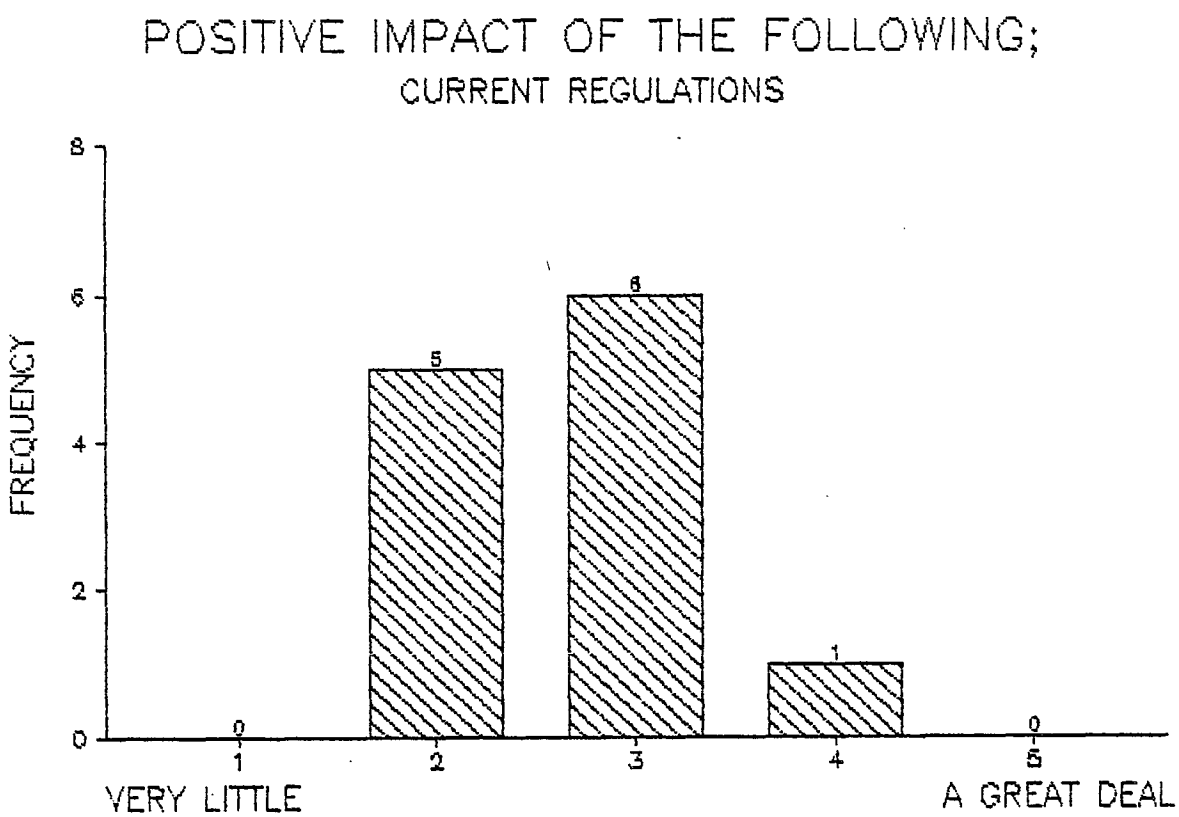

POSITIVE IMPACT OF THE FOLLOWING;
MORE TAX BREAKS
FREQUENCY
0
5
10
15
1
1
1
2
11
1
2
3
4
5
VERY LITTLE
A GREAT DEAL

This is somewhat suprising as many companies in this industry, with its very heavy R&D, are often unprofitable during their growth years and as such, would pay little tax anyway. However, the OCS industry is heavily reliant on venture capital and the stock market. As such, firms are very sensitive to their investors' perceptions of the tax implications of companies' current and future profitabilities.

Figure 5-15 shows the attitude within the OCS industry to the impact of "Current Regulations" and possible "Deregulation of the Telecommunications industry". Deregulation is supported at Level 3 and above, by about 73 percent of the respondents, as having a potentially positive impact on the OCS industry. However, support is not overwhelming, with few indicating the impact would be at Level 5, i.e., "a great deal of impact". The industry is positive but cautious. The industry's perception of the impact of "Current regulations" is also cautious. A slight majority (58 percent) believe that current regulations are OK and have a somewhat positive impact on the industry. The rest (42 percent) believe that current regulations have a slightly negative impact. There is obviously no consensus on "current regulations", although most still agree that deregulation would be the best policy option.

FIGURE 5-15


POSITIVE IMPACT OF THE FOLLOWING;
DEREGULATION OF TELECOMMUNICATIONS
8
6
4
2
0
1
3
5
4
2
VERY LITTLE
A GREAT DEAL


POSITIVE IMPACT OF THE FOLLOWING;
CURRENT REGULATIONS
FREQUENCY
8
6
4
2
0
0
5
6
1
0
1
2
3
4
5
VERY LITTLE
A GREAT DEAL

CHAPTER 6 - CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 6

Table of Contents

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Office Comminications Systems (OCS)

The North American OCS market will be worth $10.7 billion in 1985, for the industry and government sectors being analyzed. Growth is high resulting in a forecast market of $17.0 billion by 1988 (in constant dollars). The Canadian market is relatively small at about 5 percent of the U.S. market (some specific sectors are larger). Almost all the market growth is for integrated office systems. The non-integrated systems market begins to decline by 1986 and by 1988 will be slightly below the 1983 market (in real terms). Within the industry sectors being studied, the largest market is in manufacturing with a little over three times the market size of any other sector.

Most firms in Canada and the United States are currently at the "Partial" automation level, but almost 30 percent still remain at the "Early" level. However, automation is proceeding quickly and about 75 to 80 percent of all organizations expect to achieve "Full" automation within five years. The factors currently impeding the progress of office automation are, in order of importance:

- Financial and product compatability factors
- Corporate motivation and user acceptance factors
- Technology

Generally, most organizations did not feel that technology was a very significant problem.

The general approach to office automation by most organizations indicates a "do-it-yourself" philosophy. They neither expect to simply purchase a complete offering as recommended by one supplier, nor to hire an outside consultant to do the whole job. As a result, this does not appear to offer a very good market for total systems integrators. Only 12 percent of organizations in Canada and 5 percent in the U.S. would engage a consultant to do the complete systems integration. The wording of the question however, should be kept in mind. This does not mean that there is no market for consultants or integrators, only that they will be engaged to do specific pieces of work rather than a total project. This result was consistent across all industry sectors in both Canada and the United States.

In purchasing office automation systems, organizations ranked "maintenance/reliability" as the most important factor, followed closely by "product/compatibility". Other factors in their order of importance were:

* Maintenance/reliability
* Product/compatibility
* Company support
* Product scope
* Manufacturer's reputation

* Price

* Advanced technology

* Product availability

* Sales personnel/marketing

There are opportunities for Canadian manufacturers to compete in specialized niches in the office communication systems market. Expertise exists mainly in communications, word processing, local area networks, and software. Some expertise is being developed to deliver systems for the integrated electronic office, primarily by Northern Telecom, but also by others. Threats to the Canadian industry include increasing competition from U.S. vendors, and in certain areas, from Japanese vendors.

IBM, DEC, and Wang are the leaders in the move to full integrated multifunctional systems. IBM's strategy is to provide full corporate office automation facilities based on their mainframe offerings, and to provide multifunctional workstation systems used in a LAN configuration, with mainframe connection capability. DEC's strategy is to provide integrated systems directly to the larger companies and to their installed mainframe customer base. Wang's strategy is to build upon their very strong office presence with user-friendly, integrated multi-functional systems and become a major departmental system niche vendor.

Most Canadian vendors fall into the niche or commodity categories. Northern Telecom is the only Canadian firm with the capability to be a total system supplier. To achieve this, they have acquired two U.S. data processing firms and are entering into agreements with the major mainframe companies. Only through this strategy will they be able to offer complete systems, short of eventually purchasing a major mainframe company. In addition, they are also positioning themselves as a niche supplier, with the "Open World" concept. With this strategy, Northern Telecom will be able to supply PABX and other subsystems, capable of integration with either the total system supplier's offering or with subsystems from other suppliers. Northern Telecom will also shortly introduce a multifunctional voice/data workstation and integrated office system. With their technical and financial strength, Northern Telecom will be a major contender in this market. (Mitel also has a voice/data workstation but it is a stand alone and Mitel has no apparent plans to continue its development as part of an integrated system.)

Mitel is a major niche supplier, capitalizing on its experience in telecommunications. Before the collapse of its agreement with IBM, it was moving towards a very powerful niche position, with its equipment being part of IBM's total system offering. AES Data Ltd. and Micom (a division of Philips Information Systems) are also both niche suppliers, currently struggling to move from being dedicated word processor suppliers to multi-functional workstation and integrated system suppliers. AES has some way to go but, if it succeeds, it will be a departmental system niche vendor serving the smaller to medium

sized firms. Micom is likely to integrate its Canadian manufactured product line within the overall Philips systems offering, and also become a major departmental system niche vendor. Galdalf, Develcon and several others are successful niche suppliers, using their telecommunications base to develop subsystems for use in overall office communications networks. Canstar communications and others are niche vendors with LAN offerings. On the software side, Officesmiths, OCRA, Communications and Systemhouse are niche suppliers, with Officesmiths providing electronic filing subsystems and OCRA and Systemhouse offering systems integration software and facilities. GEAC, the only Canadian mainframe manufacturer in the OCS market, is basically a defensive supplier, providing office automation systems to protect its installed base in the library and financial sectors. Most other Canadian vendors are commodity suppliers. These and the above companies are outlined further in the sections of this report dealing with their product categories.

Canadian firms, by world standards, are generally quite small. The most successful ones have usually carved out a very specialized product area for themselves and are not directly competing against the larger multinationals. Other firms are assemblers of foreign technology; or build custom equipment and systems; or provide systems in local geographic areas, where sales and service can overcome competition from the larger suppliers. In the software secor, with a very few exceptions, most firms are providing custom software services, or non-integrated packaged systems, usually in the area of financial

and accounting software. There are no large Canadian vendors with significant sales of packaged software for office systems.

All the major multinationals have offices in Canada but few manufacture office communications systems here, other than on a commodity basis. IBM and DEC have manufacturing plants in Canada, but are not manufacturing the products covered by this report. Control Data manufactures a super microcomputer in Toronto, but apparently do not intend to enter the office systems market. Micom (a division of Philips) has been previously discussed; Memorex (a division of Burroughs) is producing storage peripherals in Canada; Dysan Corporation of the U.S. is expected to start manufacturing in Canada shortly, and several other Canadian suppliers are outlined in this report. However, there is a great deal more manufacturing which could be done in Canada by the multinationals, particularly if they followed the world product mandate strategy endorsed by the Canadian government. Such a strategy allows the Canadian operation to concentrate its R&D, production and manufacturing resources towards a specific product sector, for which it has a mandate to sell worldwide. This is distinct from a branch plant strategy by which the Canadian organization produces a variety of foreign designed products only for the Canadian market.

In general, with a few exceptions, the OCS industry in Canada is relatively weak. If this trend is allowed to continue, the resulting trade deficit will grow into the billions. This, combined with the lost export potential, will result in a lost opportunity to create tens of thousands of well paying jobs in a

growing technological market. With a few exceptions, the size of the industry is too small to be able to compete in the open market without government assistance. Generally, this has taken the form of a variety of government funding programs, mainly to support R&D costs. While these have assisted the industry in the creation of products, the OCS market place is characterized by a need for financial and marketing strength. Many smaller Canadian firms have the technological capability but lack the resources to bring their product to market. Without neglecting R&D incentives, a greater focus should be placed on an organization's overall financial requirements to penetrate and sustain itself in the market place. It is of little benefit to encourage firms to develop products which they cannot sell.

Given that the first priority should be to develop the Canadian owned sector of the industry, it must be recognized that large parts of the market are held by large foreign multinationals. The prospect of Canadian firms penetrating some of these sectors is dim, not because of a lack of technical capability, but because of a lack of size. In some sectors of the market, only very large, well financed firms can survive and grow. Therefore, government policy should be directed at helping smaller firms achieve the rapid growth necessary to bring them to a competitive size as soon as possible. Such growth curves necessitate high levels of financing, primarily from venture capital sources.

The second priority should be foreign investment. In many areas, the only practical strategy for increasing the size

of the industry in Canada, lies in encouraging foreign companies, already dominant in the market, to establish operations in Canada. Many already have plants here. However, the industry cannot function on a branch plant basis. With a market of only 5 percent or so of the U.S. market, all industrial strategy in this sector must be aimed at exports. Therefore, a world product mandate strategy for the OCS sector would be appropriate. Governments can assist in building such a strategy by encouraging major multinationals to allow their Canadian subsidiaries to stake out unique positions in the market place, fitting within their parent's overall corporate strategy. In most cases, R&D tax credits and other tax incentives are the best way to do this, since the firms already have the necessary financial and marketing strength.

6.2. Workstations

The workstation market was analyzed for six industry sectors plus government. The North American market is large at over $7 billion (1985) and is growing rapidly. The main growth is in networked microcomputer based workstations. The standalone and clustered word processor market is declining and the stand alone microcomputer market is only growing slowly. By 1988, networked microcomputer based workstations will hold over 50 percent of the total workstation market.

Limited opportunities exist for Canadian manufacturers in the standalone market. The market is microcomputer based and the only two major Canadian manufacturers of microcomputers have recently ceased production. Some niche suppliers remain (e.g. educational microcomputers) and it is likely only in specialized products of this nature, that future opportunities may arise. Currently, there is intense competition in the workstation market and the industry shakeout is continuing. Only major suppliers capable of also offering the workstation as part of an integrated office system will survive.

The competition for workstations is predominately from American vendors. The Japanese have had problems penetrating this market because of the English language barrier and lack of software development by independent software firms.

Typical Japanese firms now entering the market include Sanyo, Canon, Sony, Epson, Panasonic, Seiko, and NEC Corporation. However, the Japanese are not expected to excel in producing multifunctional workstations, unless the workstation becomes a great deal more generic in nature than at present. Competition is expected to remain primarily American.

It is unlikely that any future manufacturers of multifunctional workstations or microcomputers will emerge in Canada, in light of current competitive pressures. All current suppliers are attempting to hold their own.

We expect that the future market will be dominated by IBM and the major multinationals. Position in the market place will be decided, not so much by technology, as by marketing, price and financial strength. Smaller firms will only survive if:

1) They are very low cost suppliers, primarily manufturing IBM compatible machines in low wage countries.

or

2) They serve very specialized niche markets with low to medium volume production and with a high technology content e.g. vertical markets, mobile/ ruggedized units, specialized military equipment, workstations for explosive/corrosive environments.

Most workstations will either be procured as part of an integrated system or will be bought with the objective of integration into a system. Companies offering integrated office systems (either corporate or departmental) will be able to sell their workstations as part of the integrated system offering. Vendors without system offerings, will sell lower cost workstations, designed to fit within the integrated systems of the larger vendors e.g. IBM, Dec, Wang.

IBM standards will continue to dominate the industry. All other vendors will trend towards IBM compatibility. Workstations will be multi-user, multi-tasking, real time systems with increased memory (1 Mbyte) and storage (5 to 20 Mbytes). Prices will drop at the low end for standalone units, and an entire IBM PC will be reduced to a single chip.

Canadian companies interested in this market should proceed with care. Generally price, distribution and marketing/sales strength are likely to be greater factors for success, than technological strength. It is expected that Canadian firms would only enter this market in a very specialized niche, with a high value product in low to medium volume production, and with a high technology content. Examples of such products are those by Electrohome, Spectrex and Dy-4. (See Section 4.2 of Chapter 4 for details.)

The Canadian word processor industry is in the process of transition. It is attempting to move from the dedicated word processor market, which is in decline, to the

integrated, microcomputer based workstation and office systems market, which is growing rapidly. The major firms involved are AES and Micom. Since it is unlikely that other Canadian firms will be able to enter this market, the focus of government policy should be directed at assisting the existing industry to make the necessary transition. If they do not, the likely result will be a trade deficit in this product sector of over $600 million annually by 1988. Although forms of R&D assistance are desirable, the primary factor for success in this market will lie in achieving wide North American distribution, brand name recognition, and automated low cost production. The technical configuration of the offering must be integrated, multi-user, multi-tasking, with an emphasis on higher and higher levels of memory and storage. Systems must be IBM plug compatible and capable of networking in a multi-vendor environment.

A Canadian industry operating in this market must be large scale with sales directed primarily at the U.S. As such, it would be desirable to eliminate all U.S/Canadian tariffs so that Canadian operations could achieve the necessary scale required for lower cost production. Even then, it should be expected that much production would be done "off shore" to maintain price competitiveness. However, engineering, R&D, parts production, assembly of certain higher value models, and installation/servicing are all large components which would remain in Canada.

6.3 PABXs

The market is large at about $5 billion (1985) annually, but is relatively flat. Instead of new installations, the market is becoming predominantly a replacement one, i.e. upgrading existing installations. While the largest market is in the over 250 line segment, the fastest growing market is in the under 100 line segment.

The market is virtually all digital, with few manufacturers producing any analog systems. The technology trend is towards voice/data PABXs handling voice and data in digital form.

Canadian PABX manufacturers have established themselves as leaders in digital technology and should be in a key competitive position to meet the opportunities of the integrated electronic office market. Northern Telecom is in the best position to take advantage of the demand for voice/data PABXs. They have a good reputation, extensive distribution network, experience and good technology.

The most recent major event of importance to Northern Telecom and the other Canadian PABX manufacturers has been the AT&T divestiture. This allows AT&T to diversify into new unregulated markets, such as computer manufacturing and the information industry. As a result, AT&T, along with its PABX manufacturing subsidiary, Western Electric, may now strategically

position itself to be a totally integrated office systems supplier. This presents both a threat and an opportunity to Canadian firms. The opportunity was created by the separation of AT&T from its twenty-two Bell operating companies. Previously, these companies acquired almost all their telecommunications equipment from AT&T. As a result of the divestiture they are now free to buy from other manufacturers.

The most serious threat to Canadian manufacturers lies in the competitive allegiances now forming between key PABX manufacturers and major computer hardware and software vendors. Most notable is the purchase of Rolm by IBM. To date, Northern Telecom has taken a different strategy with its "Open World" concept. Instead of acquiring an interest in a major mainframe manufacturer, it is attempting to develop PABX equipment and system compatability with all mainframe manufacturers. In addition, it has acquired DP expertise through the purchase of two relatively smaller DP firms in the U.S. With these moves, Northern Telecom will be able to:

1) Sell a completely integrated office system, connected to the installed mainframe base of any computer manufacturer.

2) Sell PABX equipment to mainframe manufacturers (except IBM) for incorporation into their integrated office system offerings.

3) Maintain the viability of their own installed PABX base, by allowing the integrated connection of other mainframes and other integrated office systems.

From a purely technical viewpoint, this places Northern Telecom in a reasonable position to compete with the IBM/Rolm threat. However, it does make for a weaker overall marketing position, since it will be extremely difficult to place its PABXs within the IBM dominated mainframe world. IBM's marketing strength will tend to "pull" Rolm with it.

After Northern Telecom, the next largest Canadian PABX supplier is Mitel. Despite its difficulties, Mitel is now delivering its SX2000 switch. However, the delays, financial losses and the termination of their IBM agreement have had a serious affect on their potential. At the moment Mitel is left with the worst of two worlds. They have not as yet achieved Northern Telecom's "Open World" concept of compatibility nor are they aligned with a major integrated office systems supplier like IBM. It further appears that they will have no multifunctional workstation system offering of their own, unless further work is done on the Mitel KONTACT to build it into an office system. As a result Mitel will likely remain a niche vendor of PABXs. A major factor in their future success in office communications systems will depend on how fast they can achieve compatibility with systems vendors such as Wang and DEC. The Japanese PABX manufacturers also appear to be another serious threat on the horizon. According to a Frost and Sullivan report, Japan's

share of the PABX market will jump from 15% to 32% between 1983 and 1987.

The other major PABX vendors, Microtel and TIE/ Communications are subsidiaries of multinationals. Both are primarily telecommunications niche vendors in Canada and will not be major competitors in the integrated systems market, from their Canadian base. However, both have manufacturing facilities here and, with their parents' resources, could become major niche suppliers if they adopted a world product mandate strategy.

Good opportunities exist for Canadian firms manufacturing specialized data communications equipment and systems. The market is growing rapidly and the industry has a good technological base from Canada's traditional strength in telecommunication equipment. The U.S. market for modems and multiplexers alone totalled over $1.2 billion in 1982 and by 1987 is estimated to be worth nearly $3 billion. Canadian firms have mainly entered this market as niche vendors, such as Gandalf and Develcon, who have beem major innovators in the limited distance data set market.

The key characteristics essential to success in this market are:

1) the need for continuing technical innovation;

2) the need for compatibility of products both within a vendor's product line and with other types of communications equipment;

3) the need for a clear market approach, i.e., total communications system supplier vs. niche or commodity supplier;

4) the need for efficient economies of scale in both manufacturing and distribution, to withstand the price pressures caused by intense competition.

The data communications market is not seriously affected by competition from Europe and Japan. This is largely due to the systems and service requirements of data communications. The importance of the service aspect was stressed by a Gandalf staff member recently commenting on the introduction of their PACX system to the U.S. market.

> "... We didn't even attempt to sell it in the U.S. until we had the appropriate base of technical people trained to maintain the PACX, and until we had sufficient test equipment, spare parts and organization so that we could service a customer quickly..."

A few Japanese firms such as NEC and Fujitsu have participated in this market on an OEM basis. However, the unwillingness of large businesses to use products from new vendors will be another key barrier to foreign competition.

Success in the PABX industry will depend upon:

1) Technology and marketing strength.

2) Offering value added features, such as voice mail.

3) Providing PABX compatibility with the office systems offerings of the major vendors (e.g. IBM, Digital, Wang).

4) Developing the PABX as a "gateway" to the integrated office system and providing a PABX-LAN hybrid network for integrated systems.

5) Developing the voice/data PABX with value added features.

Northern Telecom has already positioned itself as a PABX supplier, capable of providing an integrated office system based on its PABX and integrating its offerings with others in a multi-vendor environment. However, it has not yet positioned itself as an office communications systems supplier, despite its acquisition of two U.S. DP firms. It needs to do so since, as systems integration proceeds, it is likely that more and more linkages like the IBM-Rolm connection will take place. This will begin to break down even further the distinction between the office systems PABX and the computer. Once that distinction becomes blurred, the market edge will tend towards suppliers like IBM-Rolm with both converging technologies within one corporate group.

Mitel must position itself as a major PABX supplier to a multi-vendor system world. It must either follow Northern Telecom's "Open World" concept or link with a major computer vendor, as it tried to do with IBM. The latter course would be the most successful. As indicated previously the converging technologies of computers and telecommunications will make it necessary for major firms to develop both technologies within their corporate organization.

The other major PABX vendors, Microtel and TIE/Communications, are subsidiaries of foreign multinationals. A branch plant operation in Canada is unlikely to be successful. With de-regulation in the U.S. and a trend in a similar direction in Canada, the Canadian market is opening up to intense competition. The industry must export to survive and must base its strategy on a North American market. Current foreign multinationals in Canada should therefore adopt a world product mandate strategy for their operations here. Governments could encourage this through assistance in negotiations with the multinational's parent firms, combined with financing incentives for R&D in Canada.

With the traditional strength of the Canadian industry in this sector, government must consider it a high priority within the OCS industry. In this competitive market place, Canada needs to build on its strengths. The PABX market is dominated by Northern Telecom, who needs little direct assistance from government. Northern Telecom's policy has consistently been

oriented towards the creation by government of an environment conducive to investment in R&D and technology, with increased tax credits. However, besides tax credits, government procurement policy could also have a significant role to play. A policy emphasizing the PABX and PABX-LAN hybrid network as the core to OCS systems in government, combined with a multi-vendor (Open World) procurement policy, would do much to ensure the future success of the industry. Further, since Canadian firms must base their strategy on the total North American market in order to achieve the scale necessary to compete, it seems apparent that government policy should be directed toward a tariff free border in this product sector.

6.4 LANs

The LAN market was analyzed for six industry sectors plus government. The North American market is, relatively speaking, not large ($1.1 billion in 1985), but it is growing rapidly ($2.0 billion in 1988). The Canadian market is relatively small and the industry must aim its strategy at the U.S. market place, if it wishes to survive.

We expect the market for LANs will develop very similar to that for personal computers, although the size of the market is much smaller. Despite the high market growth rate, the current proliferation of firms will result in a shakeout within a few years, as the technology matures and standards begin to evolve. The entry of IBM into the market within the next couple of years will drastically reduce the available market for the remaining firms. Survivors will be:

1) Large firms selling LANs as part of their overall system offerings.

2) Smaller firms selling very high performance LANs for specialized applications.

3) Firms selling low cost LANs, with a strategy primarily based on price and distribution strength, rather than on the technological strength of the offering.

Opportunities exist for some Canadian manufacturers of local area networks. There are several strong Canadian contendors such as Canstar and Crowntek/Waterloo Microsystems. With respect to the PABX versus LAN controversy, a hybrid system will undoubtedly evolve within a few years. In the small office with a number of work stations and peripherals, the digital PABX will be adequate. Maximum transmission rates are in the area of 9.6 kilobytes and are within the capabilities of available digital PABXs. It is also more cost effective to use the installed base of telephone cable, than install coaxial cable, or fibre optics. In an office where there is a requirement to have access to the mainframe (for major file transfer and data manipulation); to use graphics and video; to handle high speed peripherals such as laser printers, and so forth; a LAN is the most effective solution.

Hybrid systems involve an interface between the local area network and digital PABX. Through this interface, terminals connected to the PABX have access to all of the computer and peripheral ports just the same as those which are directly connected to the LAN. Another advantage to this system is that both terminals on the PABX and on the LAN have access to a common modem pool for connection to the external worldwide communications system.

With the emergence of a PABX-LAN hybrid network, the PABX will provide the gateway. This means that LAN vendors must design their networks to be compatable with the major PABX

suppliers. This presents another rather dangerous threat to LAN vendors, since it is likely that PABX suppliers will also enter the LAN market with a PABX-LAN hybrid offering. As in the situation between PABX and computer vendors, independent LAN vendors will have to seek arrangements with one or more PABX suppliers, as it is likely that the merging of these technologies will favour the PABX supplier of a PABX-LAN network.

Despite the high growth rate, Canadian firms should be cautious about entering this market. Unless they fit the "survivor" criteria in 1) to 3) above, it would be wiser to stay out. Canadian firms already in the market should concentrate on high performance LANs and seek links to the major PABX and office systems suppliers. Canadian firms should also concentrate mainly on penetration of the U.S. market since the Canadian market is small and will be slower to develop.

Government should encourage the growth and development of this industry only in the high cost, high performance LAN networks, which do not compete on price and distribution but on technology. The industry should avoid the "retail" type LAN market which is developing along similar lines to the PC market. Government should also support the industry in developing the PABX-LAN hybrid and in developing links between LAN, PABX and office systems vendors. A government procurement policy aimed at utilizing a PABX-LAN hybrid network, with PABX gateway, in a multi-vendor workstation environment would assist the industry to develop and enhance its capabilities in this area of technology.

6.5 STORAGE PERIPHERALS

The North American storage peripherals market is large and growing. It was about $3 billion in 1985 and will be $5 billion in 1988 (within the sectors being analyzed). The Canadian market is large and will be about $385 million in 1985, growing to $764 million in 1988. The largest market is for magnetic based systems. Optical disk systems will begin to penetrate the market in the next few years but will still only achieve about a 20 percent market share by 1988.

The mainframe market remains the largest with about a 60 percent market share (1985). Both the mainframe and the non-mainframe market for storage peripherals exhibit good growth. In the non-mainframe market, the trend is towards high disk storage at the workstation. By 1988, over 50 percent of all workstations will have fixed storage. About 70 percent of these will have a fixed storage of between 5 and 20 Mbytes per workstation.

In this sector, the technology trend is towards 5.25" floppies with 1 Mbyte storage and 3.5" microfloppies. R&D into vertical magnetic recording is continuing and may show promise in the late 80's, but current cost and technical difficulties remain to be resolved. Winchester drive technology displays the same trend as for floppies i.e. high densities at lower cost (e.g. 5.25" drives at 100 Mbyte capacity and 3.5" at 12 Mbyte capacity). As previously indicated, optical disk technology is advancing rapidly and promises great advances in mass storage,

with capacities of 1 to 10 billion bytes per single 14" disk. In addition to increasing mass storage capacity, prices per million bits of storage will be reduced by several orders of magnitude.

Opportunities exist for Canadian manufacturers in the production of storage peripherals. The most important are floppies and microfloppies, Winchester disks, and optical disks.

The microfloppy diskettes and regular floppies are considered opportunities because of the participation of Memorex, Didak and possibly Dysan. Currently the industry is growing at about 45 percent per year. The trend is towards the 3 1/2" microfloppy with 0.5 and over megabyte capacity. These units will capture the market where data portability is most important. At a few dollars a diskette, it's as cheap to use a diskette as a file, especially when they can be carried in the pocket.

Winchester disk systems also appear to be an opportunity. The first Winchesters that came on the market used 14" disks and these are still being used on mainframe systems. The market is moving down to standards of 5 1/4" disks and the even smaller 3" sizes are now emerging to suit the personal business computing market. It is here that the greatest growth is foreseen. Tallgrass Technologies Canada Inc. is a newly incorporated Canadian distributor of their U.S. parent's hard disk for microcomputers. They project sales of $12 to $14

million for 1984. There are no Canadian firms with Winchester disk technology. However, the market in Canada will soon develop to a size sufficient to support production, and possibly with Canadian government encouragement, firms such as Tallgrass can be persuaded to start manufacturing here.

Optical disk technology is on the threshold of becoming a viable alternative to magnetic recording for the mass storage of information. It will be used for the storage of large volumes of information in much the same way that paper is used today. The reason is the low cost of storage promised by optical disk technology, coupled with the speed and convenience with which the stored information can be handled. Optical disk technology is expected to be a complementary system to the spinning magnetic disk and megnetic tape drive. Memorex, Philips, and Control Data are all strong in optical disk technology and there are opportunities for specialized applications. For example, Dexter Technology Corporation of Mountainview, California has manufactured wallet-sized read-only cards that use an optically modified surface. These cards are read by photo diode arrays. The advantage is the cost (about $1.50 each, manufactured in volume, at 100,000 units per day). Each card can handle about two million characters or about 800 pages of text.

With the large R&D expeditures required, it is unlikely that new Canadian firms will be able to enter this market as niche suppliers of optical disk systems. Currently, the major contenders are all large multinationals. However,

there are many opportunities for applying optical disk technology to office systems and for using this technology in innovative ways to produce other systems and products (e.g. systems for technical manuals and maintenance). In addition, there will be opportunities for manufacturing in Canada by the multinationals, most of whom already have other plants here. Essential to this is the adoption of a world product mandate strategy by these firms, to produce in Canada as a commodity supplier for domestic and export markets.

The greatest threat to Canadian mass storage suppliers is the fierce competiton that can be expected from Japan. Weak marketing and cultural differences have so far inhibited the Japanese suppliers from major penetration of the computer market. As a result, they have followed a strategy of concentrating on peripheral equipment and are investing heavily in optical disk technology and other areas such as input/output devices.

Despite the competitive pressures this is not an area which Canadian industry or government can afford to ignore. Without competitive Canadian production, the trade deficit in this product sector would be over $700 million by 1988. Since optical disk technology will play such a large role in future mass storage, an effort needs to be made to encourage R&D and production in Canada. This could best be done by encouraging the firms already in the business (all foreign multinationals), to adopt a world product mandate strategy for their Canadian operations. This strategy will need to be aided by government incentives for R&D or possibly an industry/government co-operative R&D program.

In the magnetic disk sector, there is already a small but growing industry in Canada. Given the size of the North American market, this industry should be encouraged and assisted in its growth, with strategy targetted at the U.S. market. Assistance needed will be primarily in the area of marketing, distribution and automated production.

6.6 Input/Output Peripherals

OCR, FAX, and Laser printers were analyzed for six industry sectors plus government. The total market in North America is large (over $2.5 billion in 1985) and growing. The largest and fastest growing segment is in Laser printers, particularly in desk top printers of the under $10,000 price range. Growth rates are also good in the $10,000 to $100,000 price range.

Competition in the production of input/output devices is intense. Canadian industry is weak in this market and is expected to remain that way. There do not appear to be opportunities for new Canadian vendors unless they have a very unique product, or are multinational subsidiaries with major financial and marketing capabilities. While Canada has one firm (Delphax) with a unique product in non-impact printing, the market will be tough with such established firms as IBM, Siemens, Xerox, Hewlett-Packard, Datapoint, and Canon being the major U.S. manufacturers. Japan is also rapidly entering this market, with such firms as Hitachi, Fujitsu, Minolta, and NEC.

Growth of the facsimile market is expected to be encouraged by the introduction of advanced CCITT Group IV machines. There are no Canadian manufacturers and stiff competiton in the market is coming from Japanese vendors. Leading Japanese competitors include Hitachi, Matsushita, GEC,

NEC, Ricoh, and Toshiba. Frost and Sullivan predict that the Japanese market share of facsimile equipment will increase from 54% to 85% in the 1983-1987 period. As a result there appears to be no opportunities for Canadian manufacturing except under licence from one of the established firms.

Opportunities do exist in the merger of OCR and facsimile technologies. HiTech is currently the only Canadian company in a position to take advantage of this market. HiTech is relatively small and may lack the financial strength to make the very large investments needed to be a major player in this field. However, the firm does have the technological base to develop into a strong specialized supplier, particularly if it were able to obtain the required resources through association with a larger corporation.

The lack of Canadian manufacturing in this sector will lead to close to an annual $600 million trade deficit by 1988. Therefore, it needs to be viewed with some concern by governments. That size of deficit could, if eliminated, create 5,000 to 10,000 new jobs in Canada. There are several options:

1) Encourage manufacturing in Canada by the current multinational leaders in the market place.

2) Identify interested Canadian firms and assist them to enter the market through a combination of licencing and R&D.

3) Target laser printing technology as a priority item and develop an industry/government approach to new market penetration.

4) Some combination of all of the above.

Certainly, the current leaders in the market place should be encouraged to manufacture in Canada. Adoption of a world product mandate strategy would ensure that such manufacturing is not solely on a branch plant basis. To place new Canadian firms in a position to enter this market would take a longer term effort. However, given the potential size of the deficit, it would be worthwhile. Probably a combination of options 2) and 3) above would be the way to go. Canada does have leaders in laser technology although their capabilities have not as yet been applied to this market place.

6.7 Software

This report only covers the following "packaged" office automation software:

* PERSONAL MANAGEMENT
  Calendars/datebook, schedules/time control, telephone directory, file handling, and report generation.

* DECISION SUPPORT
  Spreadsheets, business graphics, financial modelling, database management.

* CLERICAL/ADMINISTRATIVE
  Electronic mail, word processing, electronic filing.

The North American market will be worth about $800 million in 1985 for the six industry sectors plus government, being analyzed. The market shows a very high growth rate with the best market being for Decision Support software, closely followed by Clerical/Administrative.

Canada has a strong consulting software industry, developing custom systems, but is weak in this "packaged" software sector. There are no major Canadian suppliers of the most common packaged software for office automation. However,

there are several smaller companies producing specialized software. For example, Logo in educational software, Officesmiths with their electronic filing cabinet and others with a variety of accounting and financial systems. Even in these areas though, much of the market is moving towards integrated software, and there are no major Canadian suppliers. There are two reasons for this:

1) The market requires large expenditures on marketing and distribution. Canadian firms have the technical capability, but do not have the financial resources to market the product.

2) As software requires more and more integration, the market for individual specialized software packages is declining.

The best opportunity is in integrated software packages for the international market. However, this market is dominated by U.S. firms. There is already a shakeout in this industry and it is generally agreed that it would be extremely difficult, if not impossible, for a new firm to enter the market at this time and produce applications packages to compete with the major firms, like Microsoft. The exception would be very specialized software targeted to a specific vertical market sector, e.g. forestry related business applications.

Canada's weakness in office communications systems software means increasing dependence on foreign vendors, in an information dominant society. This will not be good for Canada and may retard the development of the Canadian OCS industry. However, it is unlikely that a Canadian industry will develop in this sector in the near term. It is also doubtful that this should be a high priority for government encouragement. There are many other areas with similar problems but with greater impact and Canada cannot be in them all. Canada's overall software industry, working on customized systems or larger volume "packaged"systems is quite strong and it may be better to build support in that area. In particular, there are a number of firms developing "packaged" fourth generation productivity tools, and these hold good promise of a market not so highly competitive as the above sectors. Other areas would be specialized "packaged" software such as that by Logo Computer Systems Inc.; large scale OCS software such as Officesmith's electronic filing cabinet, software for electronic mail and other types of storage systems; systems integration software for specialized applications (e.g. field trials software) and so on.

If government desires to develop a Canadian industry in this sector, it will require a very large scale firm to survive. Such a firm would concentrate primarily on the U.S. market, and would have major financial and marketing strength. Technical strength is essential but secondary. A firm could not survive or develop in this market by technical strength alone. The best industry candidates for such a move by government,

would be a current large Canadian distributor such as Crowntek, with North American operations. Such a firm would produce software themselves but also act on behalf of the smaller software houses in Canada, which have the technical capability but do not have the marketing strength. An entry into this market, even by such a larger firm, would require government financial assistance. There is really little incentive for any company to do the final extensive work which would be necessary to put such a Canadian group together. With industry co-operation, and government taking the initiative and financially supporting the development of a group effort, it might be done.