Christian Rovsing A/S

Corporate Profile

Christian Rovsing A/S and its subsidiaries together comprise a diversified and independent electronics group based in Denmark but with an international business. The Group develops, manufactures and markets a range of advanced computers, large scale data communication systems for commercial and defence applications, business products and office systems, automatic credit card systems and other products. The Company also operates a computer data service bureau.

The Group is the fastest growing electronics group in Denmark. Its consolidated net turnover has grown from Dkr. 84.6 million ($ 9,6 mio) to Dkr. 414.3 million ($ 47 mio), during the five years ended 31st December 1982. During this period sales outside Denmark have increased from 43 per cent of the Group's total turnover in 1978 to 71 per cent in 1982.

Christian Rovsing A/S was formed in 1963 and started business in an advisory and consultancy role in the electronic data processing ("EDP") field.

In the late 1960's the Company's principal business was data processing, consulting and software writing, and included bureau and time-sharing services. Initially, the Company rented time for this purpose on another company's IBM computer, but by 1969 it had leased its own IBM and Burroughs computers. During the 1970's this business grew steadily and was the backbone of the Company, providing regular and steady cash flow which helped to finance the Company's electronics development activities.

In the early 1970's the Company entered into its first aerospace and defence contracts. In 1971 it undertook a number of technology studies on satellite operations and in the period 1973-75 won several production contracts relating to scientific and commercial satellite programmes. In 1974 it won contracts on the Spacelab and on the ARIANE programmes.

The Company's first defence contract was awarded in 1971 by the Royal Danish Air Force to supply data communication and display systems. A further contract followed in 1976. In 1975 the Company formed a joint venture with a subsidiary of the Great Northern Telegraph Company A/S of Denmark to enter into a six year contract with General Motors Corporation (Delco Electronics Division) for the joint production of a computer for the F-16 fighter aircraft programme. In 1976 the Company won an important contract with Litton Data Systems Inc. as a subcontractor supplying front-end computers to Litton for use in the NATO Integrated Communications System programme. This was the Company's first contract in the international defence communication field, which is an important part of its business today.

The experience gained on the F-16 and Litton contracts proved invaluable in establishing the Company's reputation in defence work. In the period 1978-80 the Company won three major contracts: the FIKS programme for the Danish Armed Forces, the NATO HAWK contract and the NATO CAMPS contract.

In 1979 the Company was awarded the LME-NET contract by Ericsson AB. This was the Company's first major communication network contract for a commercial customer and was followed by the Company obtaining the Air Canada and American Airlines contracts in 1982 and 1983 respectively.

Management for the Company is in the hands of Messrs. Christian Rovsing, Claus Jepsen and Lars Stig Nielsen.

Mr. Rovsing is the President and the founder of the company. He is a member of many government and industrial committees as well as professional societies related to research and data processing.

The Group's future business strategy is to remain an independent, advanced electronics group marketing its own proprietary products, principally those based on the CR80M minicomputer series for data communication uses.

To be competitive, the Group's products must, through their intrinsic design features, offer to the user benefits in terms of price/performance, reliability, security, protection of investment and compatibility.

Diversification within its business in the electronics sector will continue. Management believes that a wide range of products ensures that expertise in different technologies is fostered in the Group and enhances its development skills.

Over the past 5 years, the Group has experienced a strong growth rate in turnover and considerable additions to the workforce and premises. However, the Group is still a small entity compared with many of its competitors which are major multinational corporations. The markets for the Group's products are expanding rapidly, and the size of the markets is and will continue to be a stimulus for further expansion.

Christian Rovsing A/S
Administration and General Management
Copenhagen – Denmark

Introduction

The Group's activities are diversified within the data communication field. The majority of the Group's systems and products are based on the CR80M minicomputer, developed and manufactured by the Company. The principal business activities are the supply of communication networks both for commercial customers and for defense agencies, business products and office systems, electronics, microelectronics, process control systems and data bureau services.

Space Systems

Since the early seventies Christian Rovsing A/S has been actively involved in many of the major European Space Programmes and is a qualified supplier of flight hardware to the European Space Agency. Production and testing of space qualified hardware are carried out in our own "clean room" facility.

Space activities include:

- System Studies
- Electronics for Satellite & Launchers
- Check-out Software Systems for Spacecraft & Groundstations
- Electrical Ground Support Equipment
- Computer Systems for Groundstations.

For the OTS satellite, launched in 1978, we designed and manufactured the Priority Select & Interface Unit for the TT & C sub-system.

For the ECS, MARECS, TELECOM-1 and SKYNET IV satellites we have designed and developed the Priority Select & Interface Unit and a HIGH EFFICIENCY DC/DC POWER CONVERTER. These 2 units are today in series production in our clean rooms for a total of 11 spacecraft.

For the European launcher ARIANE, we are producing a servoamplifier for each of the three stages of the launcher. The current rate of production is 12 p.a., soon to be increased to 18 p.a. The Servo-Amplifiers form part of the guidance control system and constitute the interface between the autopilot on top of the third stage and the servo-valves and servo-motors which control the position of each rocket motor and hence the direction of flight.

In spring 1980 Christian Rovsing A/S acquired an interest in Arianespace, the company responsible for marketing, production and launching of Ariane, the European launching vehicle. Components supplied by our company include servo amplifiers for each of the rocket's three stages.

For GROUNDSTATIONS we supply computerised IMAGE-DATA HANDLING systems for Meteorological and Remote Sensing Satellites. Complete systems for the acquisition, pre-processing, rectification and archiving of METEOSAT image-data have been supplied to the ESA Operations Control Centre in Darmstadt, West Germany and to the CEMS groundstation in Lannion, France.

In connection with the European Remote Sensing Programme our company was responsible for the definition of the ground segment in the Phase A study for LASS (Land Application Satellite System). Over the last two years we have been awarded a number of critical study contracts by ESA and the EARTHNET office in relation to the ground segment of this programme.

Avionics

A dedicated facility has been established for the production of the Fire Control Computer for the F-16 multi-national fighter programme.

In partnership with another Danish company, Christian Rovsing A/S has entered into an agreement with Delco Electronics Inc. for the co-production of this computer.

Christian Rovsing A/S has been responsible for management in the proposal and preproduction phase and for overall Quality Assurance, Final Assembly and Testing of the computers throughout the total programme.

The co-production programme includes manufacture and delivery of 433 computers which are shipped directly to the F-16 assembly lines in the U.S.A. as well as in Holland. The FCC is the only Avionics "end-item" produced in

To the French company SFENA more than 1200 DC/DC converters: for the Autopilot in the European AIRBUS aircraft has been delivered in 1982.

Denmark under the F-16 co-production programme.

The value of the contract is approx. 300 million Dkr., which corresponds to a production of 10 computers a month.

The basic contract runs for 6 years, but with additional orders as well as repairs a contract period of 10-12 years is anticipated.

The Fire Control Computer is a modular, microprogrammed, general purpose stored programme computer capable of installation in a lightweight, high speed, air superiority fighter, and is supportable in primitive forward operating base areas where skilled maintenance technicians are unavailable. The computer provides the performance capability required to implement computations for F-16 weapon delivery, energy management, serial digital bus control and navigation related functions such as steering and route point sequencing.

Our engagement in the F-16 programme has involved the implementation and maintenance of a MIL-Q-9858A Quality Assurance programme requiring quality management and planning, trend analysis & follow-up, quality audits, and the procurement & testing of MIL-qualified parts.

Software for testing MIL-M-38510 microcircuits has been developed and is utilised during inspection. Sample techniques per MIL-STD-1050 are used in testing passive components.

The production programme has required familiarisation with manufacturing procedures such as wavesoldering, pulse soldering of flatpacks, ultra-sonic lead tinning, and conformal coating.

The handling, segregation and disposition of non-conforming material to MIL-STD-1520 requirements is now a well tried routine.

A closed loop system for registration and corrective action for end-item failures has been implemented as part of the reliability programme requirements.

Experience has been gained in the Management and Conduct of environmental testing during production verification testing and reliability qualification testing.

Responsibility for Final Assembly, Testing and Programme Quality Assurance has required a detailed knowledge and understanding of the computer on the part of Christian Rovsing A/S personnel. The experience gained from the F-16 co-production programme is now widely applied to other programmes within the company.

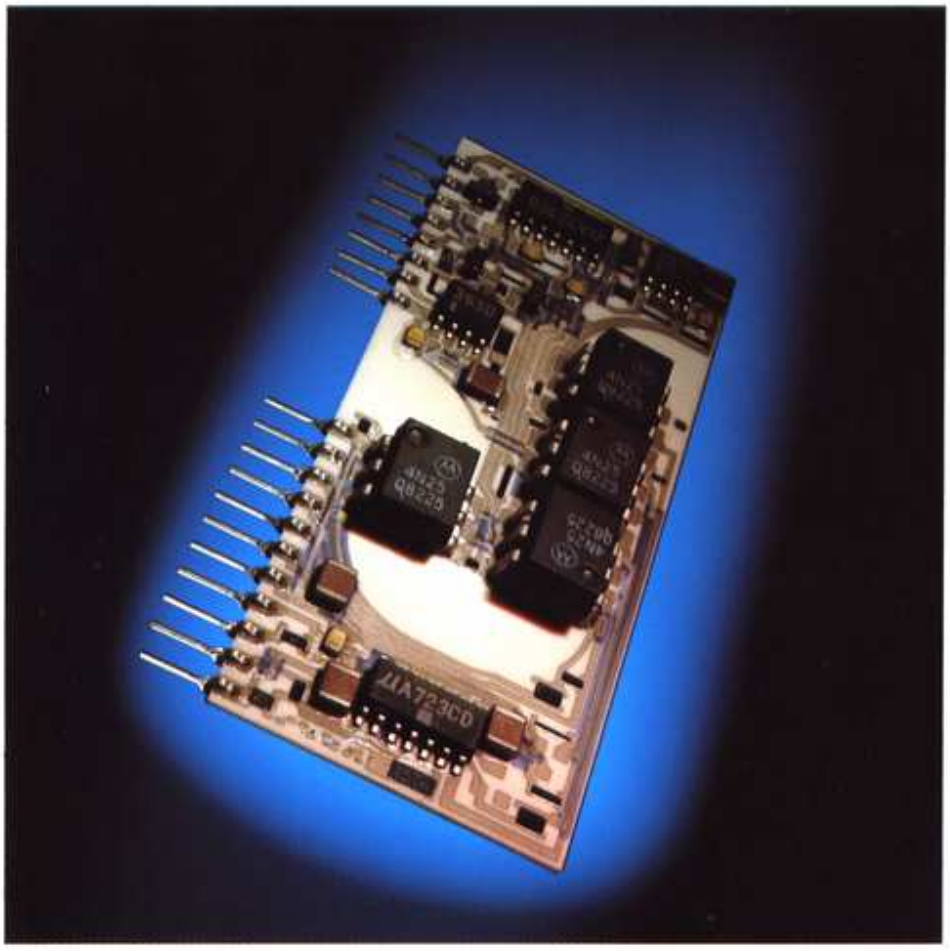
Airbus

A series of DC/DC converters for the Autopilot in the European Airbus aircraft has been developed and are now in production.
Christian Rovsing A/S has developed a family of regulating DC/DC converters for the French company SFENA. The converters are used in the autopilots and other computers produced by SFENA for the Airbus programme.

Switching Power Supply

In the field of computer related Power Distribution Christian Rovsing A/S has for years demonstrated an exceptional professional talent, which has been dedicated to design and production of Switching Power Supplies meeting specific customer requirements from Space and Military Standard to high-volume office automation.

For many years, Christian Rovsing A/S has demonstrated exceptional professional talent in the field of computer related power distribution. Efforts have been dedicated to the design and production of Switching Power Supplies to meet specific customer requirements from space and military standards to high-volume office automation state of the art technology and detailed understanding of systems requirements ensure products with a long technological lifetime. The exceptionally low component count makes the products highly reliable and price competitive. Several patents relating to power circuit design are held by the company.



A proprietary hybrid circuit containing the complete control regulation and monitoring circuit for a 100 khz line operated Power Supply.

CR80 and CR801 Computer

The CR80 Computer has been specifically developed and designed to meet the ever growing requirements in Data Communications, for reliability and speed.

The CR80 Computer has been designed with built-in fault tolerance. If a CR80 module should break down, a second module takes over without loss of data. The fault tolerance of the CR80 Computer enables un ultra-reliable system to be created.

The memory and processors provide incremental processing power up to 30 million instructions per second (MIPS).

In Data Communications, networking is a feature of many manufacturers computers, enabling the mutual interchange of data. The CR80 Computer can communicate with any manufacturers computer, because of the development of a large family of hardware and software modules for the purpose.

Up to date, more than 600 CR80 Computers have been on order mainly for Data Communication. The CR80 configuration also found a use in administrative EDP.

From mid 1981 Christian Rovsing A/S have introduced a complete new computer for administrative purpose designated the CR801.

The CR801 has been developed in co-operation with CR80 experts and engineers with a comprehensive knowledge and experience in applications of EDP in administration.

The long line of standard programs to facilitate administrative functions are contained in the program package designated CRMINI.
The programs concerned are as follows:

- Invoicing
- Debitor/Creditor
- Stock control
- Sales promotion statistics
- Financing

The CRMINI program package exist in an English language version.

All the programs are developed in COBOL for on-line purposes on the CR801. The COBOL is also applied in programing of specific systems.

The CR801 Computer is easy to operate, requires no specific operator training and may be installed in normal office facilities.

PAM line of products

The PAM products form a complete line of general purpose, wide area, data acquisition and control systems and provides high performance solutions for centralized and decentralized environments.

The unique design gives cost effective solutions even for small scale systems with only a few process data points. By adding extra hardware, not replacements, a small scale system can be expanded to cover an almost unlimited area with thousands for process points.

Data acquisition and control is performed by distributed process interface modules, the so-called PAM modules. The PAM modules are sited right where the data is available, thus eliminating cabling and costly instrumentation problems.

All process data is available in a user-friendly way by use of Central Microprocessor Unit(s), i.e. CMU's. Highly efficient software tools and a standard software package provide optimal solutions for the fulfilment of advanced man/machine interface requirements.

Communication between the CMU and the PAM modules is achieved via a two wire cable, up to 4 km long. Power is superimposed on the data bus, whereby central power back-up of the whole system is achieved. The CMU controls all data exchange to and from the PAM modules by a highly sophisticated polling procedure. The polling procedure provides extensive on-line supervision and fault detection of all components and interconneting wire. A defective PAM module or cable stretch is detected automatically and identified.

Our administrative minicomputer, the CR801.

CR80 Computer with built-in fault tolerance

CR80 Multiprocessorsystem

The PAM line of products has been developed to meet a broad range of system application requirements. Common to all systems: They support the individual solution. Turnkey Easy to install, maintain and expand without ever reaching system expansion limitations.

The PAM Products are available as:

- Building ad Energy Management System
- Sewage Treatment and Water Supply System
- Production Supervision and Control System
- Process Monitoring and Industrial Control System
- Security and Surveillance System

Applications

The first PAM system was announced in 1979 and the system has since then proved its strength as one of the most flexible and user-friendly systems on the market, meeting or exceeding all requirements at time of installation and fulfilling expansion requirements.

Below, a few PAM applications are explained.

Security and Surveillance System

- Fire alarm
- Intruder alarm
- Access control
- Site surveillance
- Closed circuit television

Building and Energy Management System

- Preventive maintenance
- Energy savings
- Optimal use of technical installation
- Improved indoor comfort
- Burglar and fire alarm
- Reduction in working expenses

Sewage Treatment and Water Supply System

- Supervision of water levels, pressure, oxygen, pH, etc.
- Control of pumps, valves, boosters, etc.
- Process optimization
- Effective control of technical installations
- Reduced risk of environmental pollution.

Production Supervision and Control System

- Operation safety
- Material handling
- Preventive maintenance
- Blending machinery control
- Energy savings.

Process Monitoring and Industrial Control System

- Measuring and alarm
- Regulators
- Sequence controllers
- Preventive maintenance
- Energy savings
- Process optimization.

PAM System

X-Net System Concept

X-Net offers a complete resource sharing solution based on a unique virtual terminal approach. This means that from the one and same terminal, a user can access any other terminal, printer, mainframe, minicomputer or other device on the network.

Several hundred nets may be interconnected into a long haul net, allowing distant sites to communicate with each other.

X-Net provides both protocol conversion and screen format handling for many different computers from a wide range of manufacturers.

The multi-vendor integration aspect means not only investment protection of existing equipment for customers, but also total freedom in their future dp equipment purchases.

The screen format handling enables any given terminal to emulate different manufacturer's terminals on different sessions – say a DEC terminal will appear as an IBM terminal when connected to an IBM host, then the same terminal would respond exactly like an NCR terminal merely by typing the command to connect it to an NCR computer on the network.
In other words, you have full protection of user familarity (with IBM, DEC, NCR, etc.).

All terminal users are constantly guaranteed access to the net, since there is no degradation even under heavy load.

Dynamic bandwidth allocation ensures that any connected device uses only as much of the total throughput on the net it needs at any given moment.

In addition, X-Net guarantees end-to-end data delivery with no data collisions ever on the transport media.

Built-in centralized network management provides the dp manager with transport statistics, network configuration tools, password protection, and electronic mail administration capabilities.

X-Net is optionally offered in a dualized version for ultimate reliability.

System Architecture

The topology of X-Net is the branch rooted tree structure with each net covering an area up to 4 km diameter. Intercommunication can take place between up to 256 offices, each site having up to 2.032 terminals on the net.

The Christian Rovsing A/S X-Net consists of one or a dualized set of controllers, a twisted pair, coax cable, compact terminal adapters, ports to connect computers or to interconnect nets, and wall outlets to plug in the terminals.

The heart of the network is the X-Net Controller (XCT), which centrally commands the data transport system by means of a roll-call scheme.

X-Net employs time division multiplexing (TDM) to share the use of its two busses between the terminals. But in traditional TDM schemes, each user has a fixed share of the available bandwidth, which can obviously be very inefficient, since data requirements vary greatly even over short time periods.

X-Net overcomes this problem by adjusting the bandwidth dynamically in accordance with each device's current throughput need; known as Dynamic Bandwidth Allocation (DBA).

The XCT and all other devices connect to the net by means of X-Net Wall Outlets (XWO). The XWO is a small, wallmountable outlet containing galvanic isolation circuity, so no damage can happen if it is short-circuited.

The terminals are attached directly to any XWO via an X-Net Terminal Adapter (XTA), a stand-alone unit operating baud rates from 50 to 19,200 bps. The module comes with its own ultra-compact power supply.

The Standard XTA converts between the RS 232C terminal protocol and the HDLC frame protocol on X-Net. The 32 Kb RAM processor inside the XTA also facilitates a 2 Kb buffer capacity.

X-Net's XTA software can emulate virtually any terminal on the market provided that it supports the ANSII X.3-64 standard, such as Televideo 970, DEC VT-100, Hazeltine, Executive 80, Tandberg TDV 2230, and many others.

For IBM synchronous terminals, i.e. 3278, 3279 and 3178, a XTA with 2 Mbps video interface is available. The IBM PC plugs directly to X-Net by means of an interface board placed in the card cage of the PC.

The X-Net Transparent Port (XTP) is a low-profile cabinet module which connects 4, 8 or 12 RS 232C serial interfaces from a host, typically a mini, say, DEC, Prime or DG, to the net. The XTP then communicates simultaneously with any of the up to 12 terminals attached.

The X-Net Emultator Port (XEP) is used to interface up to 32 async./sync. serial terminal lines from a mainframe to X-Net. It is an integrated unit including emulator board, I/F, map function, the serial ports and power supply. The emulator board is based on the MP Square board, a powerful dual processor developed and manufactured by Christian Rovsing A/S.

The XEP is typically used with computers that employ multi-dropped lines which poll the terminals sequentially. This module exists in a range of protocol versions, say IBM 3270 BSC, NCR 796-301 or ICL 7502/CO3.

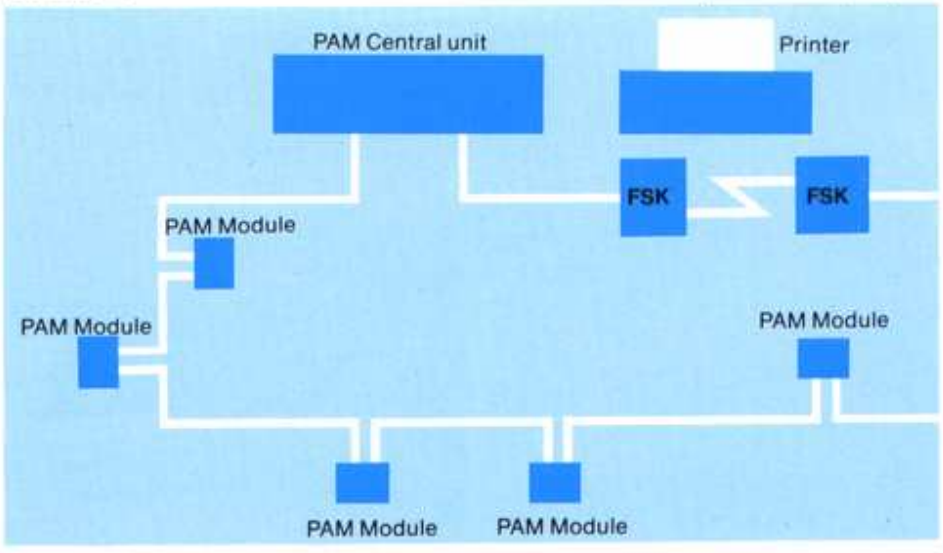
The purpose of the X-Net Communication Port (XCP) is to inter-connect geographically distant sites via up to 19.2 Kb modem links. The XCP handles the interchange between X-Net's HDLC frame protocol and X.25 level 2 packet switching protocol or X.21 public datanets on the link site.

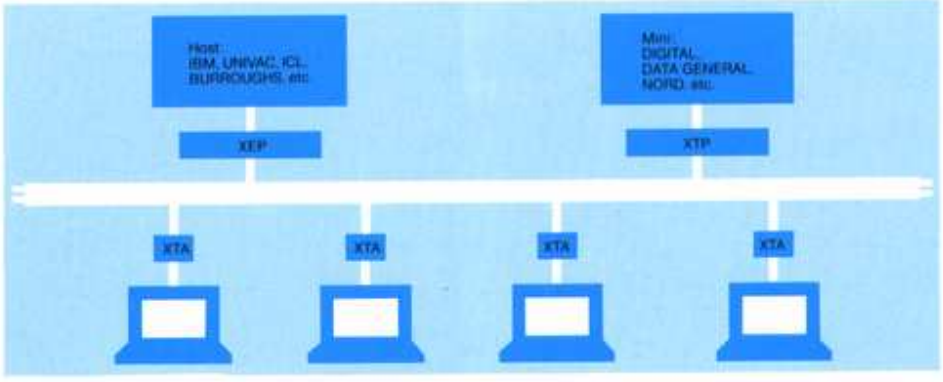
On each local site the nets can be configured in tree-type structures with X-Net Amplification and Branching (XAB) units, allowing for flexible solutions to even complex dp equipment installations.

Technical Summary

- Data transfer media
  Screened twisted pair 95 ohm coax cables
- Topology
  Branch rooted tree
- Maximum inter-station distance (diameter)
  4 km
- Number of stations per site
  2.032
- Number of inter-connected nets
  255
- Internet protocol
  CCITT X.25 and
  Public data net X.21
- Bit rate per site
  1.843 – 14.746 Mbit/sec.
- Data link layer
  Distributed duplex HDLC-like protocol
- Packet protocol
  Variable sized packets with guaranteed end-to-end data delivery
- Standards supported by X-Net
  RS 232C serial interface
  ANSI X3.64 terminal compatability

PAM System – Principal layout





X-NET Local Network

XTA: X-Net Terminal Adapter.
Standard asynchronous serial workstation interface for terminals, microcomputer and wordprocessing equipment.

XTP: X-Net Transparent Port.
Standard asynchronous serial interface, 4-12 lines, for attachment to microcomputer.

XEP: X-Net Emulator super Port.
Standard async./synchronous serial interface for mainframe attachment.
Emulates and maps up to 64 terminals.

Data Communications

Christian Rovsing A/S has gained significant experience in computerised telecommunication and data switching networks which places it among the top ranking European companies in this field.

We believe that we have available exceptional professional talent totally dedicated to advanced computerised information techniques. Furthermore, the company excels in applying current technology to modular equipment design. It has no outdated product lines to support, its hardware is not 1960 vintage but second-generation LSI technology.

Systems are configured around the company's "CR80 Computer" which has proven itself particularly suited to this type of application.

System contracts won by the company are typically worth several millions of dollars and demonstrate the company's ability to manage large projects.

A summary of the company's overall related experience is presented overleaf. One side of the table lists the communications disciplines in which the company has considerable expertise, the other lists major programmes either proposed, in-process, or completed which demonstrate our data communications capabilities.

On the following pages on-going military data communication programmes are described in sufficient detail to permit the reader to assess the company's qualifications and competence. A summary of other completed programmes is also given.

Summary of related experience

Communication disciplines

Message Switching
- Preparation and Distribution
- Format Conversion (ACP127/128)
- Protocols (LITSYNC, CCITT X.25)
- Storage and Retrieval

Line Switching
- Signalling and Supervision
- Routing Algorithm
- Synchronisation and Timing
- Multiplexing and Trunking

Dualised Systems
- Configuration Control
- Switchover and Recovery
- Reliability Performance
- V24/V28 Interfaces
- TEMPEST

Security
- SPECAT Handling
- Red/Black Interfaces
- Crypto Interface (DOLCE)
- Privileged User State

* CCIS = Command and Control Information System.

Major Programmes

Message Switching
- NICS-TARE
- FIKS
- CAMPS

Front-End Processor
- ICL-UNEMPLOYMENT BENEFIT
- METEOSAT
- I-HAWK

Data Networks
- TOSCA
- AMERICAN AIRLINES
- AIR CANADA

Line Switching
- LME Network
- CRISP

Command and Control
- ACE-CCIS *
- ACBA-CCIS *
- AFNORTH-CCIS *

Avionics
- F-16 Fire Control Computer

Production

CR80 Crate with module pulled out

Principle Contracts Summary

- Project: NICS-TARE
  Communications Front-end Processors for Message Switching Network
  Customer:
  NATO Integrated Communications System Management Agency, Brussels, Belgium

  Prime Contractor:
  Litton Data Systems Inc. Van Nuys, California

  CRA sub-contract Value:
  Approx. $ 6 Mio.

  Programme Duration: 36 months

- Project: FIKS
  Defence Integrated Communications System
  Customer:
  Danish Ministry of Defence

  Prime Contractor:
  Christian Rovsing A/S

  Contract Value: Approx. $ 7 Mio.

  Programme Duration: 48 months

- Project: CAMPS
  Computer Aided Message Processing System

  Customer: NATO-SHAPE

  Prime Contractor:
  Christian Rovsing A/S

  Contract Value: Approx. $ 30 Mio.

  Programme Duration: 46 months.

■ NICS/TARE

The NICS/TARE Project comprises design, manufacture, and installation of 20 CR80 communication processors interconnected in a nodal network. In each node, the CR80 communication processor interfaces to a Litton L3050 message processor.

The contract consists of hardware as well as software integrated in a turnkey system, one for each node.

Each system has two redundant CR80 computer systems which each contain two central processor units. Microprocessor controlled "Line Interface Units" will handle the connections to the communication lines as well as the protocol. A maximum of 163 duplex lines will interface to each node and can be programmed to transfer data at various transmission speeds.

As a result of this programme, the CR80 computer has been approved by NATO. This implies contractual requirements in regard to reliability and quality control. Furthermore, the CR80 communication processor system must have an availability of 99.9996%.

■ FIKS

Christian Rovsing A/S has been awarded a contract by the Danish Armed Forces to supply a communication network system.

This network is fully implemented and is capable of:

- Message switching
- Packet switching
- Line switching

The nodes contain dual CR80 systems. The network is fully code transparent and interfaces to a large number of greatly different types of terminals. Among the features of the system can be mentioned an automatic re-routing of signals in case of transmission line malfunction. Also the nodes which all are unattended have automatic switching to standby processors in case of malfunctions. In addition the nodes have automatic recovery and restart without loss of data.

FIKS

FIKS – A typical installation

The network utilizes HDLC corresponding to X-25 level 2 between the nodes.

As additional backup, the possibility exists to connect to another Scandinavian data switching network through use of X-21 (X-25 level 1) protocol.

At the Node level data communication lines connect remotely located terminals to the system.

The overall system specification for the network emphasizes two aspects:

- Reliability
- Data Security

The reliability is achieved by means of redundancy on the computer level as well as transmission line level. Furthermore, only MIL qualified components are being used. The CR80 system therefore exhibits reliability not experienced with conventional, commercial computer hardware.

The data security is achieved by means of cryptography.

The FIKS system will be one of the first data transmission networks adhering to the CCITT X – series of recommendations calling for packet switching, message switching, and line switching on the same network.

■ CAMPS

Christian Rovsing A/S has contracted with NATO (SHAPE) to deliver CAMPS, the Computer Aided Message Processing System, on a turn-key basis to a number of sites within the NATO theatre.

CAMPS has two essential functions:

- CAMPS assists the user in message handling, that is, preparation, dispatch and receival of messages, and
- CAMPS communicates with data networks, and other systems such as SCARS II (Strategic Command and Alert Reporting System) and ACE CCIS (Command Control Information System).

There are naturally high demands for reliability and security in a system like CAMPS. These demands are met by the hardware and software as an entity.

The hardware system is based upon the company's CR80 computer. In designing this computer new proven technology has been employed. Reliability is further secured by using MIL quality components and by subjecting all electronic modules to a burn-in cycle.

The CAMPS software consists of system programmes and application programmes. The software engineering profits from the many experiences the company has obtained through the participation in other complex message processing and communication systems.

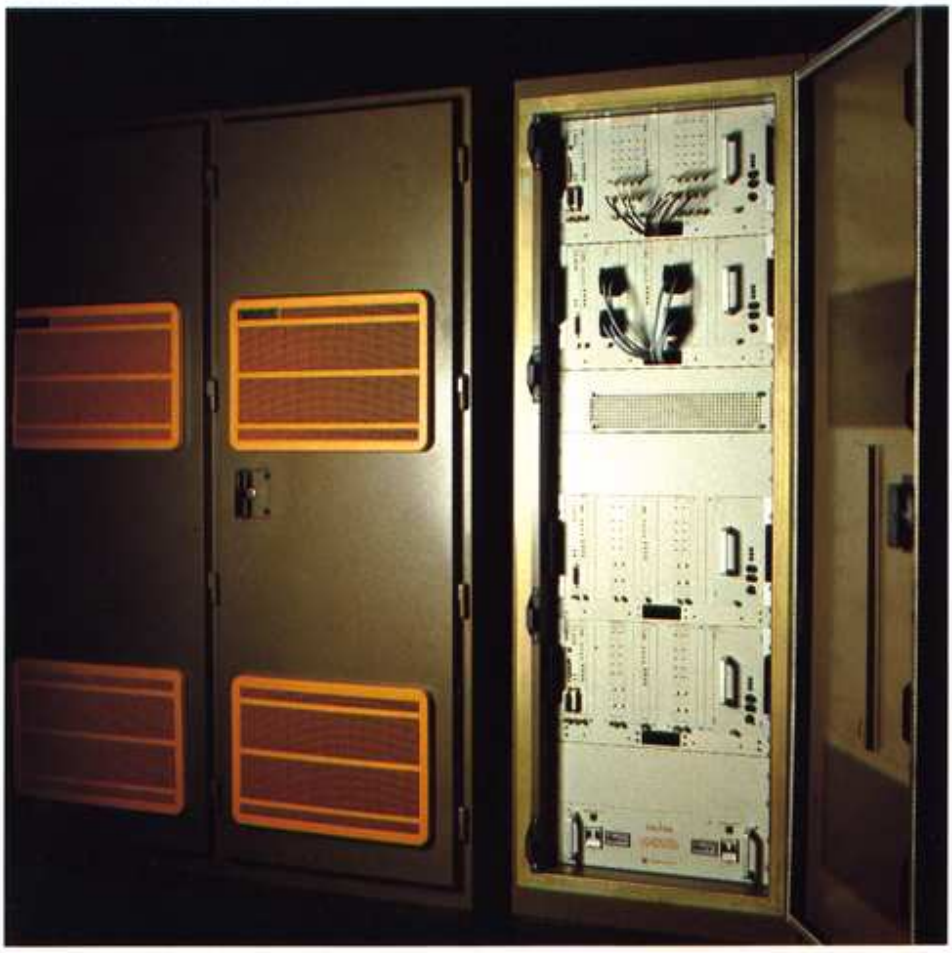
CAMPS will exchange data with other computer-assisted handling and communication systems. Interface systems which exist or are being developed include NATO-TARE and Tape Relay Centers plus SCARS II and ACE CCIS.

The interface design is structured to permit the accomodation of new evolving systems as they are introduced.

The primary format for messages will conform to ACP-127 NATO SUPP-3 for all interfaces.

CCIS and SCARS II will utilize the X-25 data communication protocol (CCITT) when interfacing with CAMPS.

CAMPS – Computer equipment



A typical CAMPS installatin consists of the following elements:

- Processors and Mass Storage (3-bay Rack)
- Line Interface Equipment (3-bay Rack)
- Supervisory Console (varying from site to site)
- Software Maintenance Equipment
- Spares/Tools Cabinet

Above equipment complement, which does not include the terminal option for remote locations will be installed in a secure area dedicated CAMPS.

The computer equipment is installed in multi-bay EMI-racks with front and rear doors to allow normal maintenance. The shielding effectiveness of the EMI-racks is approved by COMSEC.

Other Programmes

Brief descriptions of a number of other programmes, commercial and military, undertaken by the company in recent years are given here to illustrate the company's involvement in complete communications systems and to demonstrate its accumulated experience in related applications.

■ LME NET

The L. M. Ericsson Data Network is being developed as a private data communication network, to cover the need within the organisation with regard to data communication between data centres and terminal users.

LME NET is based on the CR80 computer and the first phase consists of (ref. fig. below):

LME NET CONFIGURATION (phase 1)

- a network control centre,
- a host interface processor system for connection of IBM and UNIVAC computers.
- 10 switching nodes where traffic is collected and directed to the receiver.
- a number of leased lines between the nodes, eight of which are in Sweden, one in Copenhagen and one in Madrid.

In the later phases, the network will be enlarged with:

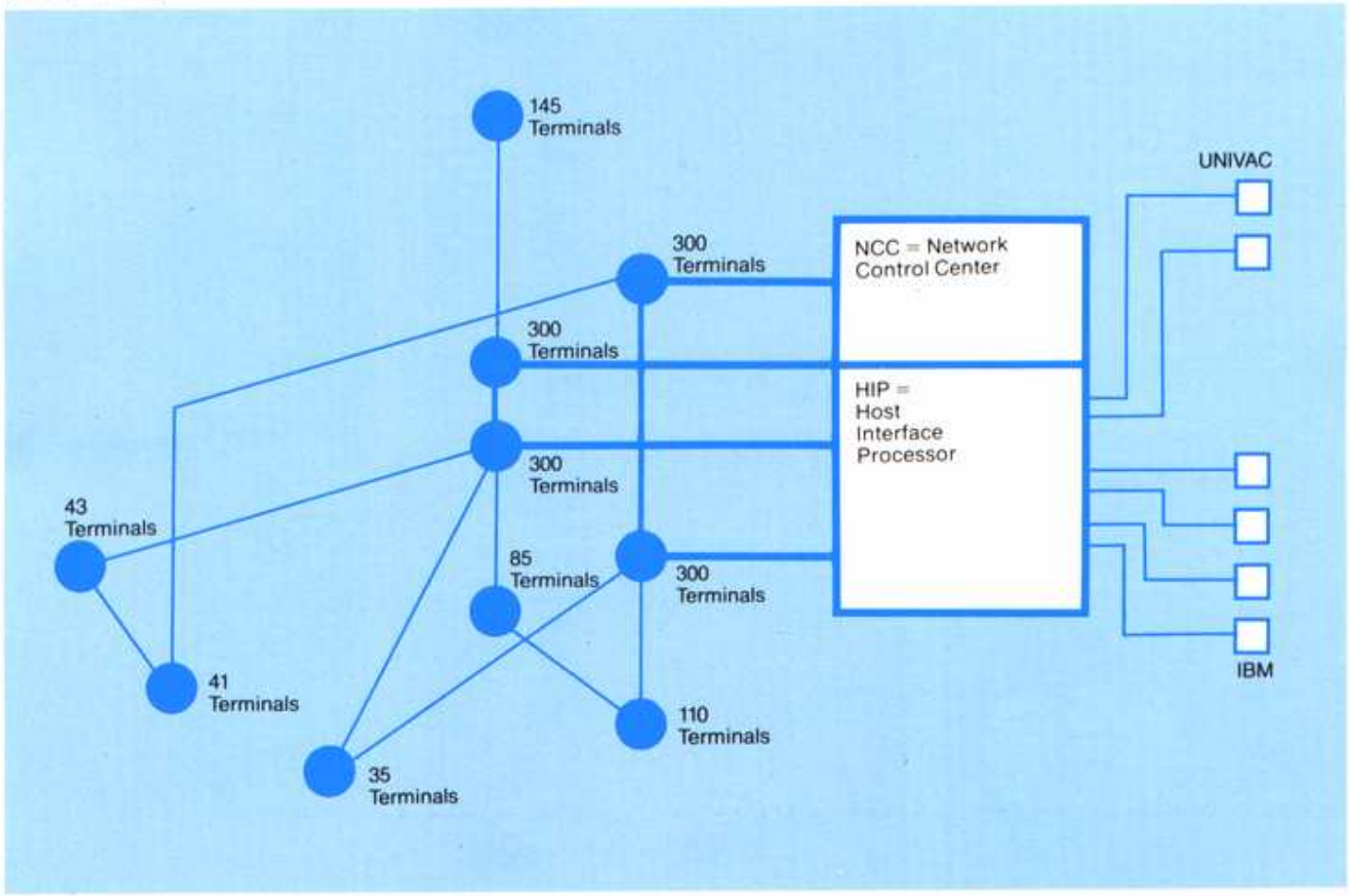
- more network control centres, which will enable certain distributed control parts of the network,
- more geographically distributed host interface processors, perhaps with interfaces to other machine types (e.g. ICL),
- connection via satellite to new nodes (e.g. in Brazil).

The LME NET architecture is based on the following concept:

- A general standardised transport facility is provided. The network will follow international standards for packet switch data networks, as defined by CCITT in the recommendation X.25. This shall enable a later connection to public networks and ensure the adaption of LME NET to future standards.
- Existing makes of computers and terminals will be connected to the general network by means of mechanisms in the network which do not require modifications of the existing system.

The above concept will enable a layered construction of LME NET following recognised principles of system construction in general, and network constructions in particular (acc. to ISO's seven-layer model for network: Open Systems Interconnection Reference Model).

LME NET Configuration



LME NET has the following functions:

- a complete monitoring and control of the network independent of host computers connected,
- emulation of a network complying with IBM's Systems Network Architecture (SNA) in order to establish communication between the IBM user programmes and the SNA terminals and certain non-SNA terminals,
- emulation of a network complying with UNIVAC's Distributed Communication Architecture (DCA) which enables a communication between UNIVAC user programmes and terminals,
- direct programme to programme communication,
- different traffic types with different resource requirements,
  - dialogue traffic
  - batch traffic
  - transparent traffic.

■ TOSCA

TOSCA is a data communication system delivered to the Royal Danish Airforce in 1972. The system consists of a number of computer controlled nodes configured in a ring structure. The network at the nodes is connected to special purpose CRT terminals. Alphanumeric data appearing in a tabular form are constantly being updated throughout the network.

At each node 4 types of terminals can be connected via the communication lines.

The system has since its installation been operating round the clock with a high degree of reliability.

■ RITZAUS BUREAU

A telegraphic news distribution network consisting of 130 terminals located throughout Denmark. The network used 24 hours a day, is computer controlled and operates in a 8-bit ASCII code via dedicated public telephone lines and 300-baud asynchronous modems.

News compiled at the main office in Copenhagen, is converted to ASCII-code, before transmission on a multi-dropped network. At the user, data received in ASCII code is converted into TTY-code used directly to control the type-setting machine. The system features automatic selection of users for each message as well as remote control of printers and tape punch for the type-setting machine.

■ ICL UNEMPLOYMENT BENEFIT

A CR80 front-end processing system interfacing 20 ICL host computers to more than 5000 intelligent terminals. The initial configuration was successfully tested at the Regional Computing Center in Edinburgh in July, 1978.

Ultimately, a network comprised of 15 nodal switches using CR80's as communications front-end processors will computerise the entire social security service throughout the U.K. The network will feature the use of CCITT recommendation X.25.

■ METEOSAT

A ground computer system installed at the European Satellite Control Center at Darmstadt, Germany. It consists of a dual main frame computer interfacing with a series of special purpose computers. Christian Rovsing's participation in this programme included the delivery of preprocessing and rectification subsystems. Each subsystem employs CR80 computer configured as an array processor. The CR80 computers have been in continuous 24-hour service since the installation in 1975, so far without a single interruption of the operation.

Christian Rovsing A/S was also responsible for the archiving subsystem where satellite image data is stored on high density tape recorders and can be output to a real-time laser based photo-plotting equipment which produces pictures of the cloud formations over the earth frequently shown on television. The complete subsystem is controlled by a CR80 computer system.

I-HAWK Protocol Converter

The I-HAWK ATDL/MBDL Protocol Converter is a CR80 configuration designed to convert between the new ATDL protocol introduced in the I-HAWK batteries in connection with the Performance improvement Programme and the MBDL protocol used in the existing TSQ-38 Batallion operating centers (BOC). For this purpose a track-file containing all relevant information is maintained in this ATDL/MBDL Protocol Converter.
This information may be extracted from the track-file for display on a PPI to improve operator's overall situation comprehension.
Furthermore this protocol converter can be reprogrammed to convert between ATDL and LINK-1. This can improve the information exchange capability, where the new BOC-type TSQ-73 is introduced and communication with NADGE is required.

Computer Integrated Manufacturing

Computer Integrated Manufacturing – or CIM – refers to the overall and systematic computerization of the manufacturing process. CIM represents the complete integration of computers and/or automatic control systems at all levels of operations, thus leading to the automatic factory.

A CIM system integrates Computer Aided Design (CAD), Computer Aided Manufacturing (CAM) (including robotics, numerical control, sequence and servo control), Computer Aided Engineering (CAE), Computer Aided Testing (CAT), Intelligent Warehouse Systems (IWS), and Operations Management Systems (OMS). As a consequence of the involvement of the CR Group in these fields, the company offers turn-key CIM systems built around CR-PROCOS.

The CR-PROCOS Process Control System

The company has during the last years undertaken substantial development within the computerized production control area. The result has been the release of CR-PROCOS, which is one of the most advanced process control systems in the world today.

The benefits of CR-PROCOS may be utilized in all areas of industrial process control. However, its power, flexibility, and reliability makes it especially well suited to processes which require flexible production with many product changes and high reliability. This has been proven by installations in chemical, petrochemical, glass, pharmaceutical, and paper industries.

CR-PROCOS is easily tailored to meet the customer's specifications of today, and its architecture allows easy adaptation to required modifications of tomorrow.

CR-PROCOS uses the CR local network which interconnects the various elements of the system, i.e. the System Control Center with the Local Control Centers and the Industrial Process Controllers.

- **The System Control Center**

  The System Control Center – or SCC – is used for primary management, control, and strategy planning.

  From the SCC all sections of the plant may be supervised and controlled. The SCC serves as a back-up for the distributed Local Control Centers.

- **The Local Control Center**

  The Local Control Center – or LCC – is the local operator station allowing the operator to supervise and control one section of the plant. A CR-PROCOS system may consists of one SCC and a number of LCC's.

- **The Industrial Process Controller**

  The Industrial Process Controller – or IPC – is an autonomous controller performing continuous, discontinuous, batch and sequential control of its section of the plant. The IPC is based on a microprocessor system.

- **The Process Interface Units**

  The Process Interface Units – or PIUs – constitute the interface between the IPC and the plant instrumentation.

Proven Results

CR-PROCOS has proven its advantages in a number of installations. All customers have experienced high return on investment (in some cases amortization of the original investment within one year), increased productivity and higher quality of the finished product.

The CR-PROCOS system comprises a distributed system monitoring the production from arrival of raw materials to storage of finished product.

Examples of CR-PROCOS installations are:

- Superfos Glasuld A/S – a Danish glass wool plant.
  CR-PROCOS has enabled the factory to run continuously – 24 hours per day every day in the year with no hiatus in production. In this installation a 30% productivity gain was achieved.
- Van Houtum & Palm – Dutch paper manufacturer.
  At this installation CR-PROCOS is integrated with administrative and security functions.
- CNES – Centre National d'Etudes Spatiales – the French space agency.
  CR-PROCOS is used to monitor and control the fuelling of the ARIANE launch vehicle. The system is configured to be fault tolerant, and is installed in Korou in French Guyane.
- NOVO Industri A/S – a Danish pharmaceutical company.
  NOVO Industri A/S has installed CR-PROCOS at two of its new factories (an enzyme purification plant and a fermentation plant). Using the powerful features of CR-PROCOS, the company itself has defined all controls.
  CR-PROCOS has offered the company benefits such as flexibility in product changes and efficient reporting facilities.

Air Canada Data Network (ACDN)

The ACDN will provide the connection between Air Canada's large, widely distributed terminal population and its computer services concentrated through three geographically separate locations: Toronto, Montreal and Winnipeg.

Initially, the baseline ACDN will serve more than 10,500 existing air Canada CRT's and 3,200 printers growing to a projected 1991 population of 18,700 CRT's and 5,700 printers.

The ACDN consists of the following entities:

- Three Nodes
- Geographically backed up Network Control Centres
- A Gateway to connect the existing ACNC (Collins FEP)
- A Network Management Host
- An Electronic Mail Host

The underlying qualities of the new Air Canada Data Network by Christian Rovsing A/S are:

INVESTMENT PROTECTION
EXPANDABILITY
FULL SUBSCRIBER SERVICES
HIGH AVAILABILITY

Investment protection is ensured by providing access to existing main frames – IBM, UNIVAC and HONEYWELL – and by providing an architecture which will allow future development of interfaces to support hosts from other vendors, whether mainframe or minicomputer. Heterogeneous terminal populations and networks, existing and future additions, may also be accommodated.

Expandability is achieved by addition of existing modules to the multiprocessing configuration which implements the backbone network and allows expansion well beyond 1991 within the proposed framework.

Required subscriber services are effected by fully exploiting available standard software and firmware for host and terminal device support.

High availability is achieved by fault tolerant, redundant hardware and through a unique network control capability – yielding optimum service.

The ACDN supports datagrams and virtual connections. According to overall user need, the best mixture of network capacity and speed is provided, while meeting the required level of end-to-end service for individual users.

Environments served

As the outmost layer in the ACDN is the user environment, providing transparent connection independent of host, terminal or attached network idiosyncrasies. The ACDN makes any user appear to a host as a valid end user of the host itself. Connection between

ACDN and a host is by means of mainframe data channels. Other networks and terminals are interfaced by communication line access methods. Thus, a cost-effective and efficient overall computing environment is achieved.

The external network environment accommodates the SITA, ARINC, and CNT networks. A Gateway provides connection to the internal network environment during the migration from the existing ACNC (Collins Front End System) to the ACDN network. The terminal environment comprises a multitude of heterogeneous multivendor equipment: CRT's, FIDs, IBM 3270 compatible terminals, printers, and other device types. All environments are accommodated by a nodal point in the ACDN. This allows minimising changes when enhancing the network.

Network Control can be carried out in either Toronto or an another nodal location. Control functions are distributed. Many types of failure are handled without operator intervention allowing unmanned operation of the nodes. Thus, network survivability is ensured.

Network management includes all functions necessary for administrating the ACDN: subscriber services, installation, support for costings and billings. Statistics, and network performance evaluation. Flexibility is augmented by allowing management functions to be carried out at a central or remote site.

American Airlines Data Network (AADN)

The general network structure is illustrated by discussions on the network topology and the generic elements, considered building blocks of the network.

Initially, the AADN will provide a connection and transport services between American Airline's widely distributed terminal population and its computer facility in Tulsa currently supported by 11 large host processors, 7 real-time and 4 commercial, all IBM 370 compatible.

Four of the real-time host processors will execute the majority of the AADN enquiry/response traffic, a total of more than 1000 transactions per sec.

AADN will provide connections with resources belonging to several external networks, including ARINC, as well as to other airlines computer facilities. A substantial number of terminals are located on the SITA network throughout the world. These terminals will enjoy nearly the same level of service as domestic terminals.

An indirect service is provided to directly connected SABRE terminals enabling agents to use AA transaction procedures even though being served by foreign airlines reservation systems. This service is provided by SMART systems enables AMEX terminals direct access to the AA real-time host complex.

The network topology of the baseline AADN is a star network with the hub located in Tulsa; 14 network processor sites are connected with the hub via internodal trunk groups; generally, high speed, wideband connections; each network processor terminates a substantial local terminal population.

The terminals are widely spread over the entire U.S., in Mexico, the Caribbean and Canada. Also, a substantial number of terminals are located on the SITA network throughout the world.

The baseline AADN will be equipped to support more than 65,000 devices, this total is the projected end-1984 terminal population.

The American Airlines terminals provide service to several different classes of users, and are consequently located in different environments, among others:

- Network Operations Center (NOC)
- SABRE Field Services
- Airport
- City Ticket Offices
- Consolidated Reservations Offices
- Travel Agencies
- Corporate Locations
- Freight Offices
- Administration

CR-Videotex System

The CR-Videotex system is an information retrieval and display system, which will not only provide instant access to a wealth of information and services, but will do so in a way that is both simple and efficient.
The concept behind the CR-Videotex system is to give immediate access to up-to-date information to a great deal of people in different organizations enabling them to do their jobs more effectively. Imagine Your sales executives planning calls, entering orders and receiving messages, your office staff accessing files for bulletin board notices, electronic mail, agendas of meetings, timetables, catalogues – all at the press of a button.

The CR-Videotex has made a significant impact within banking, insurance, mail order, hotel, travel, manufacturing and public services.
There are literally thousands of pages of practical and relevant up-to-the-minute information for the successful and efficient running of both large and small businesses.
The business executive with a videotex terminal in his home as well as in his office, will also be able to hold a user dialogue with the CR-Videotex system. That is, after having selected the information, for example on hotel and travel availability, he can also make the required reservations.

The CR-Videotex system allows your office staff to choose the information they wish to see; for many professional organizations, such as banks, brokers, public services, accountants, and the multiple retailers seeking information on sales, store performance and market trends – management information is at the heart of their business.

The private CR-Videotex user has the convenience of banking and shopping from home, besides gaining access to a wide range of leisure guides, such as: theatres, cinemas, sporting events, exhibitions...

CR-Videotex

Display

Customer List

Christian Rovsing A/S has acquired considerable experience in the Defence and Aerospace field. This is a result of close co-operation on a wide variety of programmes with major, international companies and organisations on a subcontractor or co-contractor basis.

A list is presented below of European, U.S. and international companies and organisations with whom our company has co-operated.

■ European Companies

Aerospatiale France
Avions Marcel Dassault, France
British Aerospace Dynamics Group, U.K.
Dornier System G.m.b.H.
ERNO (VFW-Fokker), W. Germany
Hawker Siddeley Dynamics, U.K.
Kongsberg Vaapenfabrik, Norway
L. M. Ericsson, Sweden
Marconi Space & Defence Systems, U.K.
Matra, France
Messerschmidt-Bölkow-Blohm, W. Germany
Saab-Scania, Sweden
SFENA, France
SMITHS Industries, U.K.
Lufthansa Airlines, W. Germany

■ European Organisations

Centre Métérologie Spatiale, France
CNES = Centre Nationale d'Etude Spatiale, France – ARIANE launcher Program.
Institute of Meteorology, Denmark
Danish Roadtraffic Research Organisation
Danish Ministry of Defence
Flyvevejrtjenesten – (The Weather Service for the Danish Civil Aviation Authority)
Förenade Fabriksverken (Supplier of Defence Equipment to the Royal Swedish Army)
ICL for Ministry of Health and Social Security, U.K.
The Royal Danish Airforce
The Royal Danish Navy
Radio Denmark – Data-assisted recording, editing and transmission system
European Economic Community Software Studies.

■ US-Companies & Organisations

Delco Electronics Inc.
Hughes Aircraft Company
JET Propulsion Laboratories
Litton Data Systems Inc.
TRW Systems Inc.

■ International Organisations

European Space Agency (ESA)
NATO – HAWK Management Office
– NICSMA
– SHAPE

ARIANE.

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