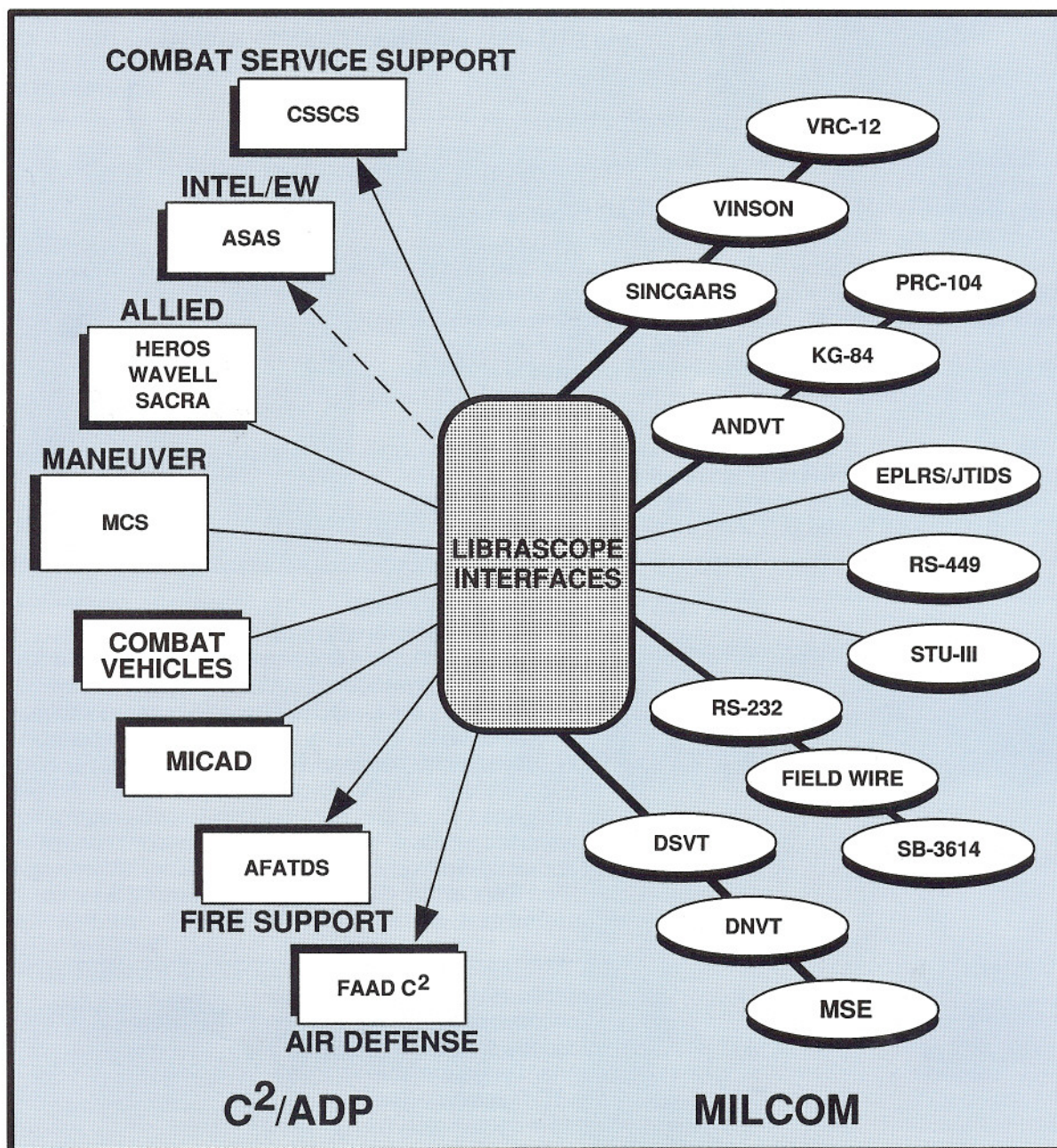


STATE OF THE ART COMMAND, CONTROL, AND COMPUTER INTERFACES TO MILITARY COMMUNICATIONS



EXTENSIVE DEVELOPMENT EXPERIENCE

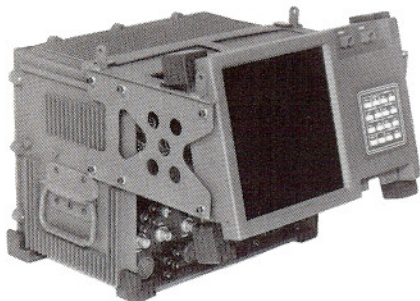


Programs like TACFIRE and TOS evoke memories of the early struggles to release combat command and control automation from the bondage of mainframe and fixed site communications. A 1974 Librascope funded R&D effort produced a breakthrough in six months by packaging a transparent plasma display, tape drive, keyboard, three MC6800 microprocessors and 94kb RAM into a DC powered Tactical Communications Terminal (TCT) for vehicle operation. Two software programmable modems for wire, radio and RS-232 devices were integral to this prototype. In 1981, TCTs were fielded in VII Corps as the initial MCS. By 1990, over 200 TCTs with MC68000s, 500KB RAM, 300 MB removable hard disks, Ada software, and new communications interfaces to MSE, SINCGARS and STU-III were ready for DESERT STORM.

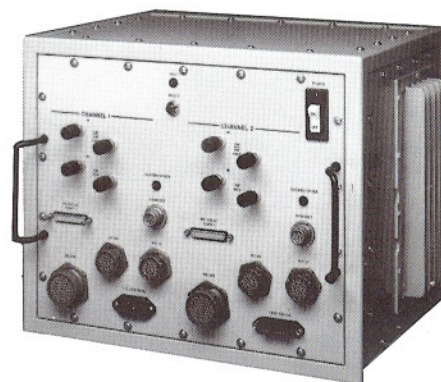
Concurrently with the C² automation effort, TRI-TAC began a program in 1979 to eliminate the "tyranny of the message center." Librascope was chosen to develop a Single Subscriber Terminal (SST) with composition and editing, downloading from non-volatile storage, and 32 kbps operation. Librascope's design featured a removable bubble memory cartridge, and the proven TCT multiple processor and plasma display technology. By 1983, the SST design had changed to add Ada software and MC68000 microprocessors for commonality with the TCT. Librascope built over 40 preproduction SST's which were fully tested by the military users. This development brought an ideal solution, however, to the PEACEKEEPER program requirement for a removable nuclear hardened non-volatile memory device which Librascope developed and produced for the U.S. Air Force.



The next communications interface that Librascope developed was a front end Communications Control System (CCS) for TACFIRE and the Advanced Field Artillery Tactical Data System undertaken in 1982. The CCS design contained: fifty-three MC68000 microprocessor; 45,000 lines of Ada code; 11,000 lines of assembly code; a fiber optic PCM distribution network for 40 remote, reconfigurable communications modems; THORNTON, VINSON, KG-30 and TRI-TAC COMSEC; a touchscreen EL operator panel; and 2 MB of non-volatile memory. Software was written for integrated voice and data nets, automatic routing, message format conversions, mutual support of remote communications data bases, an authentication scheme and net planning. After a successful user test at Fort Sill, OK, the CCS software became GFS for the AFATDS commercial terminals.

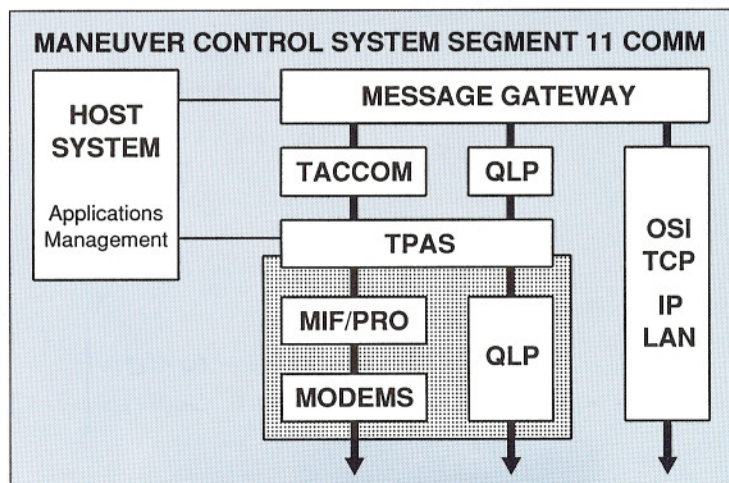
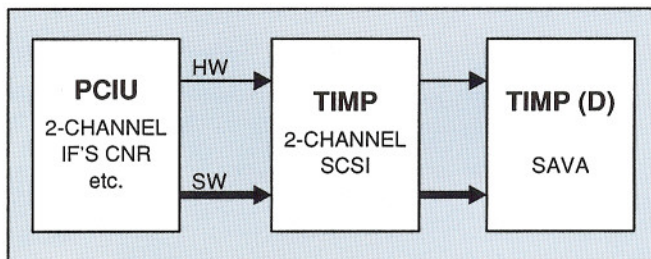


The rapid expansion of digital communications interfaces in the 1980s outstripped the capability of individual C² systems to accommodate them and remain interoperable with analog channels. Librascope foresaw this growth and developed, on internal funds, a two-channel Programmable Communications Interface Unit (PCIU) based on the TCT design. This ruggedized device with mostly commercial components was selected by the Army to be the front end communications interface equipment for the MCS AN/TYQ-43 Tactical Communications Processor. Librascope produced 749 PCIU's. These PCIU's were also used in DESERT STORM, particularly as an interface to the Common Hardware and Software (CHS-I) Tactical Computer Unit (TCU). The PCIU runs MCS Segment 10 or 11 communications software in Ada.



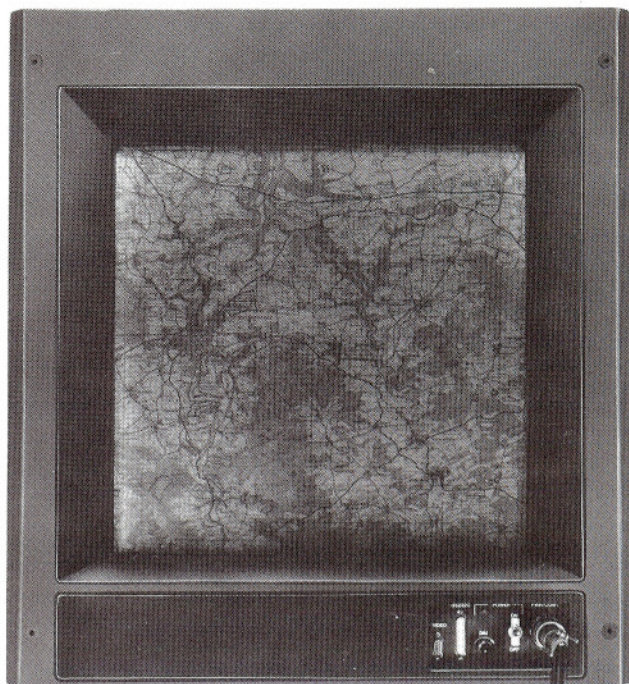
ADVANCING COMMUNICATIONS INTERFACE TECHNOLOGIES

C² users expect operators, sensors, and computers to converse among themselves from any location using mission bit streams tailored for transmission, reception and processing. This multimedia information exchange occurs in networks of hundreds of subscribers on platforms with downsized, busier crews. Librascope supports this goal by investments in technology to match the flow of the bit streams to military communications equipment. In 1992, a Tactical Intelligent Modem Processor (TIMP) will be designed to shrink the PCIU size and add an SCSI to speed up throughput. This effort will be followed by digitally processed signals for insertion in vetronics.



Librascope developed Communications Interface software for the PCIU which can be ported to the TIMP and TIMP-D. The TIMP will initially have MCS Segment 11 lower layer modem software and interfaces to host systems for mission bit streams using MCS protocols (MIF/PRO) or X.25 allied Quadrilateral Protocol (QLP). The TCP-PCIU Access Service (TPAS) will be the software interface for real time traffic, channel control, and service management between the TIMP and a host system. The message gateway will allow use of LAN, OSI or TCP/IP protocols and net relay.

System engineering, integration and testing at every stage of the development process are an inherent part of the Librascope Total Quality Management (TQM) program used to bring C²/ADP and military communications together in the most effective and efficient way. Every possible aspect of each development is examined in detail, especially performance in severe environments, with real host systems, and with oversight by user oriented senior staff. For example, the PCIU has been tested with every major communications system that the Army has produced and has passed FCC connection tests. Software for the TIMP and TIMP-D will be configured for use with several target computers. Runtime kernels, MS-DOS and UNIX have already been tested with several host computers and PCIU software interfaces through real tactical communications networks, including those of DESERT STORM. The signal processing associated with transmission, reception, and control of communications over disrupted, error prone channels is accomplished by Librascope in software rather than hardware. The use of digital signal processing is seen as the ideal way to speed up this processing while reducing TIMP cost. Integrating and testing the TIMP-D with weapons platform vetronics is a challenge that Librascope system, hardware, and software engineers can meet.



LABORATORIES AND LOGISTICS



Ada Software Center

ADA SOFTWARE SUPPORT CENTERS

Librascope is recognized as a very active company in implementing the Ada software language. Use of Ada as a standardized language enhances the portability, maintainability, and utility of the software products delivered to our customers.

To support major programs Librascope has installed a company-wide computer network consisting of seven local area networks.

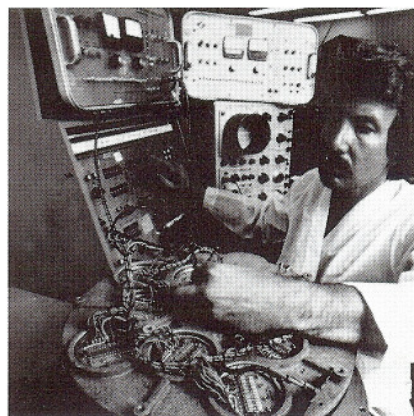
The installed equipment includes 12 Sun File Servers, 63 Sun Workstations, a DG MV10000, a DG MV8000, a Vax Cluster of 4 MV3600s and 10 VS2000s, and 17 PCs, 75 Sun Workstations/File Servers and 17 PCs.

The Army Ada Software Center uses the DGMV 10000 for software documentation and the Hewlett-Packard 9000/330 and PC's for Software development.

ENGINEERING LABORATORIES

Electronics laboratories exist throughout the company for new-technology research and for carrying out product design and development. The Laboratories are used primarily for circuit research, development and design. The laboratory is equipped to breadboard major electronic systems to allow designs to be functionally checked, and for advanced state-of-the-art research.

The Army Systems Laboratory is used for multiple purposes, including: Interoperability exercises, involving Librascope-produced U.S. Army C³I equipment for the Maneuver Control System (MCS) and interfacing C³I equipment of friendly international forces; field maintenance studies; software applications testing; equipment modification planning; new-technology experimentation; and demonstrations.



Engineering Laboratories

LOGISTICS: WORLDWIDE, WE SUPPORT WHAT WE BUILD

Librascope supports its products over their lifetime with a complete range of Integrated Logistics Support Services. They range from planning a complete logistics support program, to the rush delivery of a single spare part to a Field Service Engineer halfway around the world. A separate department exists to carry out these vital services. As a matter of policy, Logistics engineers participate in the engineering design process to assure an easily maintained product.

Customer Training

Librascope specializes in training of customer personnel in operation, maintenance, tactical deployment and theory of the Company's C³ systems. Training is accomplished on operational hardware and in the classroom either on-site, or at Librascope's facility.

Courses are designed to provide the capability to units in the field to receive, use, and maintain complex equipment with minimum outside technical aid and training support.

Worldwide Field Service Organization

Installations, modifications, emergency repair of combat systems as well as on-the-job training have been performed by Librascope's worldwide Field Service Organization in such diverse locations as Guam, France, Greece, Hawaii (Pearl Harbor), Italy, Japan, Scotland, Spain, Taiwan, Australia and throughout the continental United States. All Field Service Technicians are highly qualified and many have had prior service.

Librascope