
An Initial Overview of Space and Aeronautics Assets in Maine

Participant Profiles

Prepared for and Edited by the Maine Space Grant Consortium



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Disclaimer

An Initial Overview of Space and Aeronautics Assets in Maine presents the findings from the Maine Space Grant Consortium's inventory of space and aeronautics related assets in Maine, completed in March 2000. The research project was conducted by Mark Farrah Associates (Kennebunk, Maine) with considerable support from Zentek Corporation (Alexandria, Virginia) and Blue Enterprises (Weld, Maine).

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Overview

David Whitten, who is president of the firm, founded AEC Engineering in 1982. The company designs and builds custom control systems for industrial and municipal applications. Control systems range in complexity from highly reliable solid state engine controllers to industrial computers with remote monitoring and control. These systems communicate over phone lines, cellular telephone, radio telemetry, or fiber optic and copper networks. AEC Engineering has supported remote systems online in many locations including the Far East.

AEC is an Underwriters Laboratory certified manufacturer of industrial control systems and can provide UL stamps on products as well as certify products from other manufacturers.

AEC has 12 employees and its facility covers approximately 10,000 square feet. AEC has the equipment and personnel in house necessary to design, fabricate and test control systems from small circuit board systems to large networked PLC and computer based systems.

Capabilities

AEC recently completed a turnkey modernization of a pharmaceutical company in New York which included manufacturing process control design, program development, material selection, and site work, including removal and installation of equipment, conduit and wiring. This was an extremely complex project in an industry that must operate in a highly regulated environment, where many levels of documentation and control are required well beyond that required in other industries. The project involved a mix of programmable controllers and networked PCs, with explosion-proof computer color touch screens located in the classified production area. The entire process will be monitored on the client's Ethernet system at selected engineering locations.

AEC has provided control systems for a number of ski resort areas, which involved development of process software to control the complex mixtures of water and air at extreme pressures to feed snowmaking guns. The software runs on programmable logic controllers with VGA quality graphic interfaces, where hardware and software are

configured for remote telephone access by modem. AEC's control system automatically starts and stops pumps as necessary to maintain constant pressure on the mountain, with a Variable Frequency Drive (VFD) primary pump to conserve power, and with back-up pumps used only when necessary.

AEC's projects reflect expertise in a number of areas that are of interest to NASA and the commercial space industry. These are described below.

Integrated Remote Monitoring of Sensors at Naval Air Station

AEC has recently designed and implemented a large network of 900 MHz radio data transceivers at a Maine Naval Air Station, at 30 sites throughout the base. This data collection system is linked to the fiberoptic network of PCs installed throughout the base, designed to monitor environmental, public works, and security operations at the base. The 900 MHz system is a "line of sight" technology, with a repeater site located at the highest point on the base, allowing data to be forwarded from several of the sites to the central computer radio. The system provides a real-time information system for engineers and managers responsible for these operations. Each of these functional areas such as public works (steam, water pressure), weather forecast, environmental services, security, are linked through a distributed PC-based system where information required by one functional area can be shared with other sites authorized to have the information.

Statistical Process Control for Factory Floor/Manufacturing

AEC has developed systems for integrating manufacturing processes so that every manufacturing process over the factory floor is monitored with the information fed to a distributed PC-based system or a mainframe in the front office. The data is used to control and monitor the production process, monitor safety systems, and monitor flow of critical materials (e.g. exotic gases), energy consumption, and inventory.

AEC developed a gas distribution and monitoring system for National Semiconductor for their multimillion-dollar foundry facility in South Portland. The system monitors critical production parameters and provides alarms for safety. The information is shared with a UNIX mainframe in the front office.

Programmable Logic Controllers/Computer Graphics

A Programmable Logic Controller (PLC) is a device that can be programmed to react to input signals, with enough sophistication to perform control tasks. PLCs are economically competitive with other control methods and have replaced conventional hard-wired relay and timer panels in many applications. AEC specializes in programming software inside the PLCs to specify outputs in reaction to inputs, create timers and counters, and perform complex math functions.

AEC also develops computer graphic control systems ranging from simple human machine interfaces to full blown supervisory control and data acquisition systems. These

monitor and control processes, set alarms based on process conditions, collect historical data, print reports, and make process data available to an entire plant network.

Simulators, Training and Control Systems for Department of Defense

AEC is an experienced contractor to the Department of Defense, with training and control systems in use by most branches of the Armed Forces. These include not only controllers, but also the design and production of complete systems. AEC specializes in ruggedized systems, and has in-house software engineering capability to support complex systems developments with graphical displays for monitoring system functions. These systems contain lightweight, solid state electronics that also meet stringent electromagnetic interference (EMI) and radio frequency interference (RFI) requirements.

AEC's defense work includes development for controls for both the U.S. Marine Corps and the U.S. Army. For the Marine Corps AEC designed and built the auxiliary power unit control panel for the Amphibious Assault Vehicle, including the vibration resistant solid state electronics circuitry in a sealed waterproof housing. For the U.S. Army, AEC built the tactical quiet generator control panel and power output panel.

AEC also designed and produced the U.S. Army M1A1 virtual battlefield data acquisition and relay system. This ruggedized system, with integral environmental control system, consists of 16 programmable inputs plus GPS (Global Positioning System) and a fluxgate compass, with an LCD self diagnostics readout. AEC has also designed a tank yoke simulator for personnel training. The yoke is the instrument in the hands of the tank driver, which controls the movement of the tank.

Space and Aeronautics Issues

AEC's expertise in integrated remote monitoring statistical process control, programmable logic controllers, and training simulators is directly relevant to space and aeronautics applications. The integrated remote monitoring system developed for the Brunswick Naval Air Station could have direct application to small or medium sized airports for airport security and management. Some of the statistical process control and programmable logic is applicable to aerospace manufacturing and perhaps to con-board controls on the space shuttle. AEC also develops very low cost hardware for simulation and training, which could be applied by NASA and the aerospace industry for specialized training.

Summary

AEC is a small but creative company that has expanded from development of simple controllers to a highly diversified company addressing a variety of specialized needs. These include high-tech controllers and the networking of sensors to integrate control of large and complex processes.