

Equipment: The equipment presently in use at CAD/CAM is a CALMA GDS I Interactive Graphics System that consists of: (1) Data General Eclipse CPU, (2) Four 48x60 inch digitizing tables with dual 19x11 inch CRTs, (3) Color design/edit station with tablet and CRT, (4) CALCOMP 970 pen plotter (on-line), (5) GERBER 4432 Photoplotter (off-line), and (6) Kodak film processing laboratory.

Plant Size: 5,000 sq ft

Experience: CAD/CAM has contract experience with various departments of the Canadian Government, including the Departments of National Defense and Transportation. Canadian industrial experience includes such companies as Northern Telecom, Bell Northern Research, Litton Systems, and AES Data Ltd. US industrial experience includes ITT Aerospace and IBM.

Keywords: 7 = Electronics; 17 = Software Services; Circuit Layout = 17; PC Board Design = 7; Thick Film Hybrid Parts = 7; Thick Film Hybrid Design = 7; Thin Film Hybrid Parts = 7; Thin Film Hybrid Design = 7.

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CAE INDUSTRIES Ltd

Code: CAE

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History: The company was incorporated in 1947 as Canadian Aviation Electronics Ltd to engage principally in the repair and overhaul of electronics and electro-mechanical equipment and devices. The name was changed to CAE Industries Ltd in 1963 to more accurately reflect its expanding interests in many diverse fields of industry. Diversification and acquisition began in 1961 with the formation of CAE Electronics GmbH in West Germany. Other subsidiaries include CAE Electronics Ltd, Northwest Industries Ltd, CAE Fiberglass Products Division, CAE Aircraft Ltd, Canadian Bronze Company Ltd, Welmet Industries Ltd, CAE Machinery Ltd, Webster Mfg (London) Ltd, Accurcast Die Casting Ltd, CAE-Montupet Diecast Ltd, CAE Morse Division, CAE Lubricators Division, Cleveland-CAE Metal Abrasive Ltd, USP Industries Inc, and CAE Magnesium Products Division. All are Canadian-based except the one subsidiary located in West Germany. This profile will concentrate on CAE Electronics Ltd.

Capability: CAE Electronics Ltd designs and manufactures sophisticated commercial and military aircraft flight simulators and airborne magnetic anomaly detection equipment. They have also become a major producer of computer-based data acquisition and control systems in the areas of electrical power generation and transmission, oil production, gas transmission, air traffic control, and space.

In the simulator area, they are a leading designer and producer of flight simulators. They have produced the first FAA approved phase III commercial aircraft simulator for United Airlines. Their simulators include state-of-the-art technology such as hydrostatic six-degree-of-freedom motion, general purpose computers, and CRT-based instructor's facilities. They reproduce aircraft performance in all flight regimes and, in particular, the critical landing phase. Digital flight simula-

tors have been developed for the A-300, B727, B737, B747, DC-8, DC-9, DC9-80, DC-10, L1011, F-28, CL-600, and the new generation A-310, B757 and B767. A wide range of simulators has also been supplied to different countries for various types of military aircraft, including tactical jet fighters, jet trainers, antisubmarine patrol aircraft, and transports.

They selectively pursue the US military flight simulator market. CAE also designs and produces simulators for helicopters such as the Agusta AB-205 and AB-212, Bell UH-1D, Boeing-Vertol CH-47, Sikorsky CH-53, and Westland Sea King MK41. In addition to flight simulators, CAE Electronics produces training simulators for nuclear power plants. They are used to train operators to develop experience in responding to all normal, abnormal and emergency conditions as well as to learn required operating procedures and techniques. In the avionics area, CAE Electronics develops and manufactures magnetic anomaly detection (MAD) systems used in antisubmarine warfare. Their cesium magnetometer system, which has been traditionally mounted in a stinger at the rear of the aircraft, can measure changes in the earth's magnetic field as small as one part in 5 million. The company now offers an integrated MAD system for inboard use on fixed wing aircraft and helicopters.

They have developed a "JETS" joint enroute/terminal data processing and display system for air traffic control. The system is modular and the displayed information is tailorable to user requirements. They are active in the space area as they are part of a Canadian consortium, responsible for developing and manufacturing the complete Manipulator Arm system for the NASA Space Shuttle. They have designed and are manufacturing the display and control panel, plus the rotational and translation hand controls that operate the manipulator itself. They have also designed and developed the simulation subsystem which is used as a design tool to test hardware and software modules of the system.

Average Work Force: Total (CAE Electronics) - 1,700
Technical Staff - 650

Gross Sales: CAE Industries - \$300M
CAE Electronics - \$ 90M

Plant Size: 300,000 sq ft

Experience: CAE Electronics customers include United Airlines, Air Canada, British Airways, KLM, Lufthansa, Swissair, TWA, FAA, Douglas Aircraft Co, Lockheed California, the Canadian Forces, NASA, US Navy, and other departments of the Canadian Government. Current R&D activities include working with the USAF (AFHRL) on a joint program - Design Project for the development of a Wide Field of View, Helmet-Mounted, Infinity Display System, incorporating Area of Interest high resolution imagery slaved to the pilots eye movements; a recently completed study of the LAMARS Air-to-Surface visual system for the USAF; a study for the CAE for a Turret Interactive Crew Simulator; development of computer-based training (CBT) and computer-aided learning technique (CAL); and a recently completed NASA study and development of a six-degree-of-freedom hand controller.

Keywords: 1 = Aircraft; 3 = Avionics; 6 = Computers; 7 = Electronics; 8 = Energy; 15 = Radar; 16 = Security & Safety; 17 = Software Services; 18 = Space Systems; 20 = Miscellaneous; Flight Simulators = 1, 3; Magnetic Anomaly Detection = 3, 16; Data Acquisition Systems = 1, 8, 18, 20; Data Control Systems = 1, 8, 18, 20; Training Simulators = 8, 20; Air Traffic Control Systems = 20; Control Systems = 18, 20; Repair & Overhaul = 3, 7; Video Display Systems = 7; Simulation Programs = 17; Air Traffic Control Simulators = 7, 20; Computer Graphics = 17; Graphics = 17; Hydraulics = 20; Nuclear Simulation = 6, 7, 17, 20; Simulators Training Simulators = 8, 20; Air Traffic Control Systems = 20; Control Systems = 18, 20; Repair & Overhaul = 3, 7; Video Display Systems = 7; Simulation Programs = 17; Air Traffic Control Simulators = 7, 20; Computer Graphics = 17; Graphics = 17; Hydraulics = 20; Nuclear