- The manufacture of "hot section" components for jet engines, afterburners and exhaust systems under contract to GE, Pratt & Whitney, and Rolls Royce.

- The complete restoration of "hot section" components for jet engines, afterburner assemblies and exhaust systems.

- The manufacture of light alloy structures for major aircraft including the DHC-8 and the P3/CP-140.

- The repair and overhaul of military and commercial fixed wing aircraft, sub and supersonic, and rotary wing aircraft.

- Wire Strike Protection system for rotary wing aircraft.

- The manufacture of CANDU reactor in-core components.

- The manufacture and design of high altitude research rockets.

Bristol's present involvement in engineered product manufacture includes – rocket engines and solid fuel propellants; electronic data instrumentation for payloads and satellites; and remote automatic inspection systems for steam generators. Bristol's services encompass mechanical, electrical, aeronautical and propulsion design and development engineering. Other services include – precision welding of high temperature, corrosion resistant materials including nickel alloys, cobalt alloys, carbon steels and other exotic material such as titanium and zirconium; vacuum brazing; vacuum heat treatment; and facilities for testing of helicopter transmission assemblies.

Bristol's past achievements include the manufacture of light alloy structures for the DHC-7 and L-1011 aircraft; and design and manufacture of electronic data instrumentation for remote site applications and vertical axis wind turbines. Bristol's proprietary products include – Black Brant (high altitude research rockets); CRV-7 (Air to Surface Rocket); WSPS (Wire Strike Protection System for helicopters); CANSCAN (Remote, Automatic Inspection System for nuclear and conventional steam generators); DCP (Electronic Data Collection for remote site application); and READAC® (Automatic Weather Station for unattended use in airport applications).

Average Work Force: Salaried – 463
Hourly – 599
Technical – 100

Gross Sales: N/A

Plant Size: Production – 451,000 sq ft
Warehouse – 6,000 sq ft
Office – 57,000 sq ft

Equipment: Complete facilities and equipment for metal forming, welding, machining and metal treating. Numerical Control Machining Center with equipment such as the Sundstrand S-80, S-60, and OM-2A, a Raycon NC EDM, Mazak V5 and V20 machine center, and 4 Giddings & Lewis 48" NC VTL. Also included is a PDP 11/70 computer with MDSI. "Action Central" McAuto CAD/CAM System with six design stations. Devine autoclave – working pressure of 132 psig and temperature of 400°F max; and working area of 6 ft diameter by 18 ft long. Special facilities include a helicopter transmission test cell, non-destructive test laboratory, and an electronic test laboratory.

Rockwood Propellant Plant – produces HTPB solid propellant for sounding rockets, JATO's drone booster motors, and small military rockets. Present annual propellant production is 1,000,000 pounds.

Experience: In 1981, approximately 30 percent of Bristol's sales were to the US, with over 85 percent of these sales to the US military. US business includes the manufacture of combustion and exhaust components for the J85, J79, T64, T58 and TF39 engines, and the remanufacture of the TF30 afterburner and general component repair and overhaul.

Other customers in the US include – the Navy, NASA, Pratt & Whitney Aircraft Corp, Lockheed Aircraft Corp, Grumman Aircraft, Fairchild Hiller Corp, and General Electric.

Canadian customers include – DND, DSS, CCC, National Research Council, Pratt & Whitney of Canada Ltd, Atomic Energy of Canada, Boeing Canada Ltd, Canadair Ltd, DeHavilland Aircraft of Canada Ltd, and others. International clients include – Dornier GmbH, Germany, Royal Netherlands Air Force and the Swedish Space Corporation.

Bristol has been approved by the Canadian Ministry of Transport for Canadian Aircraft maintenance, and the Canadian Forces for manufacturing testing and overhaul. The quality requirements of MOT and FAA and the Canadian DND 1015 or MIL-Q-9858A are met for manufacturing, repair and overhaul.

Keywords: 1 = Aircraft; 2 = Armament; 7 = Electronics; 8 = Energy; 9 = Environment; 12 = Machining; 14 = Protective Equipment; 19 = Testing/Test Equipment; Airframe Components = 1; Airframe Structures = 1; Engine Components = 1; Engine Systems = 1; Helicopters/Subsystems = 1, 19; Hydraulics = 1; Repair & Overhaul = 1; Nuclear Reactor Components = 8; Wind Turbines = 8; Meteorological Stations/Equipment = 9; Remote Inspection Systems = 8; Metalworking = 12; Heat Treating = 12; Coating = 12; Stamping = 12; Spin Forming = 12; Titanium = 12; Tooling = 12; Die Fabrication = 12; Rockets = 2, 9; Rocket Propellant = 2, 9; Rocket Engines = 2, 9; Helicopter Wire Strike = 14; Non-Destructive Testing = 1, 19; Instrumentation = 7, 19; Transmissions = I, 19; Gear Boxes = 1, 19; Data Collection = 7; Laboratory = 7, 19; Gas Turbine Components = 1.

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CAD/CAM GRAPHIC SYSTEMS Ltd

Code: CGS

Address: 700 Industrial Avenue
Ottawa, Ontario, Canada K1G 0Y9

Contact: Mr. A H Jarvis, General Manager – (613) 526-0620

History: CAD/CAM Graphics Systems Ltd is a small Canadian owned high technology company incorporated in May 1979. There is a branch in Toronto and the company is incorporated in the US as CAD/CAM Graphic Systems Inc.

Capability: CAD/CAM Graphics is an engineering design group specializing in computer aided graphics design and artwork generation for printed circuit boards and/or hybrid microcircuits. They also offer consulting services to assist clients in the development of design standards/criteria to suit their special needs. Their product services include: (1) Design from schematic to color-coded layout, (2) Digitizing of color-coded layouts for single, double or multilayered boards (prepared by either the customer or CAD/CAM), (3) Photoplotting of the following artwork masters – component and solderside, drill graphics, solder resist mask, silk screen and assembly, (4) Numerical control drill tapes to suit either Excellon or Digital Systems format, (5) Documentation packages and, (6) Prototype and production quantities of printed circuit boards.

Average Work Force: Total – 20

Gross Sales: 1981 – $1.0M
1982 – $1.4M
1983 – $1.5M