

superconducting magnets for magnetic levitation transportation systems (electrodynamic MAGLEV), and has as a result generated a number of advanced designs for lightweight cryo-cooled superconducting magnets.

Ultrasonic Non-Destructive Evaluation (NDE) – CTF has been active in this field since 1975, carrying out research and development on behalf of the Canadian Department of National Defense with regard to a number of NDE problems. Projects of major importance include:

Naval Boiler Corrosion – a 3-mode system (manual to fully automatic) has been developed for rapid, thorough scanning of boiler tubes. The Model NDE-2 Analyzer contains a microprocessor which controls mechanical probe motion, data acquisition, storage and output, and features an ultrasonic transducer yielding clean unambiguous signals in small diameter tubes. Probe range is up to 8 feet (2.5m).

Acoustoelectric Transducer – a new phase-insensitive transducer has been developed for quality assurance applications in producing new high performance composites used in military aircraft. This new semiconductor transducer shows great promise for future routine aircraft inspection for micro-cracks and delaminations, and appears to be free of phase-related signal wash-out problems which plague piezoelectric transducers. Development of a production prototype is expected in the near future.

Applied Microprocessor Technology – Microprocessors have been exploited by CTF as an effective means of implementing complex measurement and control functions automatically and with minimal chance of human error. Systems which have resulted from this approach include – the NDE-2 Ultrasonic Tube Analyzer (described above); the XDC-1 (a portable dive support decompression calculator, which monitors and models various metabolic parameters using the "Kidd-Stubbs" hyperbaric exposure model); several instruments based on the XDC-1; and an automated SQUID rock magnetometer (being developed for the Department of Energy, Mines & Resources) capable of measuring magnetization, anisotropy of susceptibility and homogeneity of rocks, and including automated demagnetization.

CTF is now involved in developing a computerized biomagnetic scanning system for the Departments of Transport and National Defense, which will provide the capability of monitoring temporal and spatial variations in the evoked magnetic field patterns of the brain as a function of subject fatigue, stress and other factors. This is expected to have applications in such fields as personnel (e.g., pilot, controller) evaluation and in medical imaging. CTF's software-based environmental noise reduction system will be used to maintain high instrument resolution in the otherwise overwhelming magnetic environment.

As a result of much of the work undertaken in the past decade, CTF expertise in advanced signal processing techniques has grown considerably, and is now a major factor in the company's overall capability in data acquisition and software systems design.

Average Work Force: PhDs (Physics) – 4
Engineers – 4
BSc (Physics) – 3
Technical & Other – 15

Gross Sales: 1982 – \$1.1M

Plant Size: 9,600 sq ft

Equipment: CTF has a variety of general and specialized equipment and facilities necessary for electronic and cryogenic/NDT R&D. Some of the equipment/facilities are listed below:

Computer Facility:

- PDP 11-34; Dual 5Mb hard disks; 320 Mb Winchester; RSX-11m software
- PDP-8 E Intersil micro-6100 microprocessor development system

Electronic Equipment:

- Signal Generators (Audio, R.F.)
- Amplifiers (D.C., Audio, R.F.)
- Digital Multimeters
- Digital Counter/Timer
- Digital Logic Analyzer
- 10'x10'x8' RF Shielded Room
- Spectrum Analyzer
- Lock-in Amplifiers
- Microvoltmeters
- Oscilloscopes
- Power Supplies
- Filters, Mixers, Attenuators
- PC Board Assembly
- Wire Wrap Assembly

Cryogenic Equipment:

- Helium Leak Detector
- 100 Liter LHe Storage Dewar (2 units)
- 60 Liter LHe Storage Dewar
- LHe Transfer Lines
- Non-Metallic LHe Dewar Fabrication Facility
- Non-Metallic LHe Test Dewars

NDT Ultrasonic Facility:

- Multiple Frequency Ultrasonic Generator/Signal Conditioner/Receiver
- NDT Transducer Sensor Construction Facility
- Test Standards

Mechanical Equipment:

- Equipment necessary for in-house fabrication of most required items

General Equipment:

- Three Axis Helmholtz Coil (2m dia)
- Vacuum Deposition System (Fore-Pump, Diffusion Pump, Vacuum gauge to 10E-9 torr, High Current Heater Supply, High Voltage DC Sputtering Supply)
- Chemical preparation room with fumehoods and drybox
- Three Axis Micropositioners
- Shielded Room Facility

Special Test Facilities:

- A low magnetic gradient, low magnetic noise field test facility with associated instrumentation building
- High-order biogradiometer test and balancing facility

Equipment: CTF defense related experience has been primarily with the Canadian Department of National Defense. CTF has fulfilled more than 30 contracts with DND and with other Government agencies since 1971. CTF personnel also enjoy an active technical relationship with two local universities. Several dozen commercial systems and components have been sold to universities, governments, oil companies, hospitals, and research facilities around the world.

Keywords: 1 = Aircraft; 6 = Computers; 7 = Electronics; 16 = Security & Safety; 17 = Software Services; 19 = Testing/Test Equipment; 20 = Miscellaneous; Cryogenics = 7, 20; Superconductors = 20; SQUID Instrumentation = 16; Magnetometers = 16; Gradiometers = 16; Biomedical Instruments = 20; Ultrasonics = 19; Non-Destructive Evaluation = 19; Acoustoelectric Transducers = 1, 19, 20; Composite Evaluation = 1, 19, 20; Microprocessor = 6, 7, 20;