

20 = Miscellaneous; Cockpit Displays = 3; Data Handling = 1, 3, 7; Data Analysis = 1, 3, 7; Engine Controls = 1; Flight Data Recorders = 1, 3; Voice Recorders = 1; Instruments = 1, 3; Navigation = 1, 3, 15; Performance Measuring Device = 1; Engine Thrust Measuring Device = 1; Acoustic Sensing = 7, 20; C3 Systems = 7, 20; Computer Systems = 3, 6; Computer Parts = 6; Data Acquisition = 1, 3, 7, 20; Repair & Overhaul = 3, 6, 7; Video Display Systems = 3, 7, 20; Voltage Transformers = 7; Regulators = 7; Projected Map Displays = 1, 20; Intrusion Detection = 16; Signal Processing Systems = 1, 20; Ballistic Computer Systems = 20; ASW System = 1, 20; Fire Control System = 20.

Revised: Dec 83

CTF SYSTEMS Inc

Code: CTF

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History: CTF Systems is a high technology company created in 1970 by a group of young physicists from Western Canada. The primary goal of the company over the past decade has been the development and manufacture of instrumentation and systems allied to the fields of electronics and applied physics. This goal has materialized through various R&D contracts into three main areas of expertise:

- Cryogenic & SQUID (an acronym for Superconducting Quantum Interference Device) Technology.
- Ultrasonic Non-Destructive Evaluation (NDE).
- Applied Microprocessor Technology.

Capability: CTF's expertise is outlined below:

Cryogenic and SQUID Technology - CTF Systems has developed and/or advanced the technology through innovation in several areas of cryogenics and SQUID magnetometry. These areas include:

Cryogenic liquid containers (Dewars) with unusual designs such as:

Horizontal Dewar - a mobile, random orientation liquid Helium cryostat, suitable for airborne tests and designed to accommodate a 9-component gradiometer/magnetometer array using SQUID sensors.

Large Access Vertical Dewar - a non-magnetic, non-metallic 12 inch diameter dewar for ground testing the 9-component SQUID array.

Room Temperature Access Dewar - a two dewar combination with an "inverted" inner dewar to permit rock samples to be measured at room temperature inside a superconducting coil assembly.

Low Noise Biogradiometer Dewar - a cryostat with a 1 cm thermal gap at the lower end to allow positioning of the coil close to biomagnetic sources. Dewar tail materials are screened, selected and assembled so as to minimize the effect of environmental magnetic noise on the signal.

SQUID Sensor Design - The SQUID is an ultra-sensitive cryogenic device which exploits two properties of superconductors - the Josephson effects in tiny superconducting junctions and the quantization of magnetic flux in closed superconducting loops. A complete CTF SQUID system consists of a superconducting flux transformer; a basic SQUID sensor; RF amplifier/detector and analog feedback circuitry; and circuitry to digitize, filter, resample and transmit data to recording or signal processing equipment. The superconducting flux transformer (which is noiseless) can enhance the basic sensor flux sensitivity by a factor of 50 or more with true DC response. By appropriate configuration of this flux transformer, the SQUID system can sense specific magnetic field vectors, or 1st, 2nd, or 3rd spatial gradient tensor components. A number of specialized flux transformers have been designed and constructed by CTF in recent years, including the following advanced magnetometer systems:

Airborne Gradiometer - a 9-channel SQUID system (6 gradient tensor and 3 field vector components) suitable for mobile applications was designed and developed. Design work was guided by computer simulation to minimize intercomponent interference.

High Sensitivity Station Magnetometer - a 3-component vector magnetometer with a resolution of $10E-10$ gauss rms/SQR(Hz) and a 9-decade dynamic range, without range switching or external counting.

Third Order Biogradiometer - a biomagnetic sensor/dewar combination designed to detect the third spatial gradient with a high sensitivity only to very near sources, rejecting more distant ones. Low frequency (0.3 Hz) signals of the order of $10E-10$ gauss from the brain and other organs are detectable in the presence of more distant magnetic noise sources many orders of magnitude higher. A publication describing the Biogradiometer and its operations is available from CTF Systems Inc.

High Sensitivity Rock Magnetometer - a room temperature access design with sensitivity better than $10E-9$ gauss-cm³ rms/SQRT(HZ) moment for samples up to 7mm diameter, such as small rock samples or biological magnetite.

Digital SQUID Electronics - CTF is the only SQUID manufacturer presently making a digital SQUID control module capable of remote computer control of data sampling, digital filtering, and data transfer. Special features of this instrument, the DSQ-400, include a 9-decade dynamic range, a sophisticated second order digital filter with transient protection, and multichannel sampling synchronized to within 30 nanoseconds between channels. Up to 32,000 32-bit measurements per second can be recorded from each channel, and up to 15 channels controlled via one 16-line parallel computer I/O port. The DSQ-400's digital format and synchronized sampling permit multi-channel sensing with high temporal coherence. This makes possible advanced gradiometer compensation systems and the virtual elimination of coherent noise (e.g., 60 Hz) from data with the appropriate signal processing.

Designs for Cryogenic Elements of MAGLEV - Under contract to Transport Canada, CTF Systems has been analyzing cooling systems and