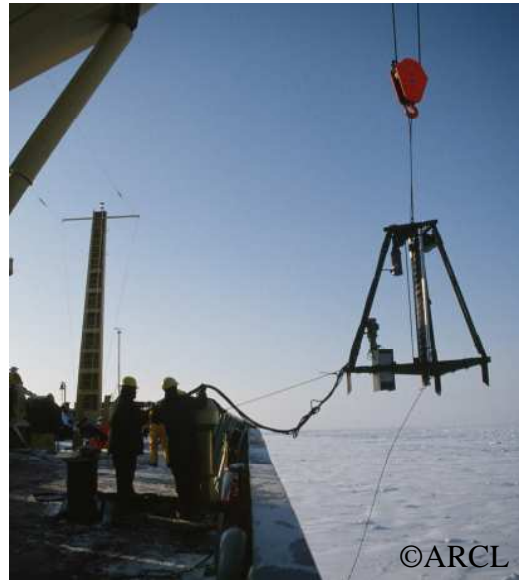
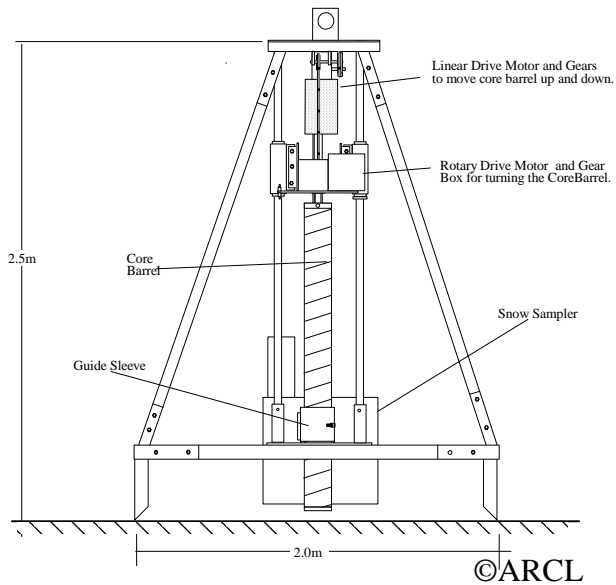


## RAPID-CORE - Ice Measurement and Properties System Sponsored by Canadian Coast Guard, Arctic Ship Safety



FRONT VIEW

An understanding of the strength and thickness of ice is essential to assess ship performance in ice. The ice and snow samples required are not particularly difficult to obtain and have been routinely obtained during ship trials. The sampling procedure followed in the past is, however, very time consuming. It involves the transfer of personnel and equipment to the ice, manually taking a core, sampling the core, repacking and returning to the ship. It may take more than one hour to obtain a single ice core, and this has often led to limited amounts of ice and snow data being collected. As a result, it has often been difficult, if not impossible, to characterize the ice and snow properties encountered by a vessel.

The Canadian Coast Guard approached several contractors, through a bidding process to research and develop new methods for collecting the required ice data. Avron Ritch Consulting Ltd. in conjunction with Canatec Consulting Ltd of Calgary and Can-Polar of Toronto were awarded a contract to research and develop a system which is composed of a remotely operated ice corer and snow sampler which can be deployed from the ship deck.

The main concept was to completely eliminate on-ice work and to do all the sampling from the ship. To accomplish this, an unmanned coring device was designed. It can be lowered onto the ice with the ship's crane, drill a core, and then be brought back on board the ship. All ice and snow properties' measurements can then be carried out on the deck of the vessel. Field trials have shown that with this device, only about 5 minutes of ship time will be required to recover one ice core and one snow sample.

The advantages of this system are:

- 1) **Speed** - Since the system eliminates the need for on-ice work, the time required to obtain the required physical samples is greatly reduced, causing fewer delays to ship operations.
- 2) **Higher chance of obtaining data** - Since personnel do not need to be on the ice, there is little exposure of personnel to poor weather, ice failure, and polar bears. Cores can be taken under conditions which would not be possible using the conventional techniques.
- 3) **Safer method of drilling.** - There have been a number of serious accidents using standard ice coring techniques. An unmanned system eliminates these risks.
- 4) **Proven techniques for physical properties measurement** - Measurements of temperature, salinity, and density are made using standard techniques and are therefore comparable to previous studies.
- 5) **Higher accuracy** - The physical properties' measurements can be performed on board in a well organized mini-laboratory, resulting in better working conditions for the scientific staff and higher measurement accuracy. The system minimizes the time between taking the ice core and the measuring of its properties, which reduces the measurement error due to brine drainage
- 6) **Fewer personnel required** - The equipment can be operated by one ice specialist (rather than two, as generally required).

The system was successfully developed and tested under the contract. Since then, the system has been used on the 1994 Louis S. St. Laurent North Pole Expedition, the 1996 Oden North Pole Expedition, and the 1994 Polar Star Antarctic Expedition.