



Ice Drilling Program Office

Dartmouth – University of New Hampshire

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Title:	SCIENCE REQUIREMENTS FOR AN INTERMEDIATE DEPTH WINCH		
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DOCUMENT APPROVAL

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Science Requirements for an Intermediate Depth Winch

Mechanical

- The intermediate winch must be capable of logging holes 1200-1500 m deep; the specific depth should be determined to be as deep as possible for the winch itself to be transportable by a single Twin Otter flight (shelter, generator, spare parts etc need not all fit on the flight with the winch).
- The winch must allow full-range speed control down to a complete stop, and allow a uniform logging speed as low as 2.5 cm/s.
- The winch must be able to operate at temperatures as low as -45 C. A higher temperature rating would be adequate for operation in a heated shelter, and should be considered if this specification drives up cost significantly.
- The winch system must allow for automatically respooling of the cable, using a level-wind system, fleet-angle compensator, or some other means.
- The drum should be larger than minimally necessary for a perfectly spooled cable, to allow the cable to respooled quickly in an emergency.

Electrical

- Since this winch is intended for general purpose use, the best cable choice is standard four-conductor logging cable (Rochester 4-H-181A or Schlumberger 4-18-ZT or equivalent).
- The cable should be headed with a standard 1" O.D. Gearhart-Owen variant.
- The winch must have a broadband slip-ring connector to transmit both analog and high speed digital signals from DC to ~10 MHz.
- The interconductor leakage along the entire signal path from the cable-head to the output of the slip-ring connector should be 0.1 ns (nano-siemens) or less.

Readouts

The winch must include a digital depth measuring system using a bi-directional counter, with a precision of 1 cm or better. Depth accuracy should be at least 500 ppm. Higher depth accuracy is desirable if it can be achieved at reasonable additional cost.



- The winch must include a cable-tension measuring system. For safety, there should be a cut-out for the motor on overtension. Ideally, there would also be an alarm on undertension.
- Depth and tension values must be available via serial communication to a computer, and also clearly displayed for the operator in case of computer failure.

Accessories

- If the winch itself is too heavy to be lifted by two people onto or off of a twin otter, a system providing mechanical advantage should be designed and constructed or acquired to accompany the winch for this purpose.
- A portable shelter for use of the winch in the field should be identified, specifications provided, and possible purchase source identified.
- Specifications for suitable generators should be provided to power the winch at any height between sea level and 4,000 m.
- The winch must be packaged for shipping in a way that protects against damage during loading/unloading for transport. When the winch is shipped via LC-130, it should be packed so that it would not be damaged in the case of a combat offload.

Clarifications/modifications to science requirements

- IDDO will identify issues and opportunities arising from the science requirements that significantly impact the function, cost, or associated logistics of the winch, and that could be resolved by modifications of the science requirements. Resolution of the issues will be coordinated with IDPO and users of the logging winch.