# Senior Design Project in Electrical & Computer Engineering

# ICEBERG DIFFERENTIATION (ID)

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Sponsor: International Ice Patrol (IIP)

## Project Goal

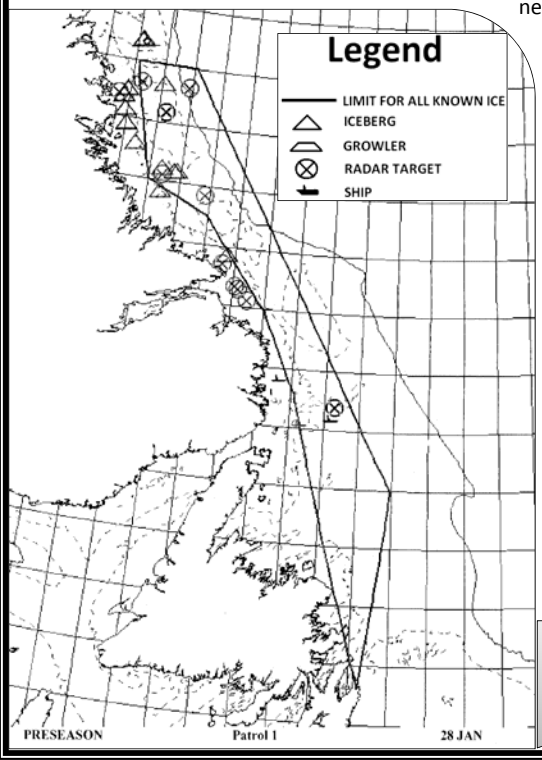
Research and recommend a radar direction finding device to differentiate between icebergs and vessels.

## Project Objectives

- Team must fully acquaint themselves with the literature and state of research associated with signal detection technology.
- Team must evaluate the chosen system to determine the practicality of employing such a system aboard a CG HC-130
- A cost benefit analysis will be conducted to approximate the expense of outfitting an HC-130 with that technology.
- Team will provide recommendations and the current status of the project to the IIP and HQ.

**Signals of Interest:**

S band (2-4 GHz) and X band (8-12GHz)




## Background Information

The United States Coast Guard's International Ice Patrol (IIP) flies hundreds of hours annually over the Grand Banks of Newfoundland performing iceberg reconnaissance. They report their findings on the locations of icebergs to local mariners, who cannot necessarily see the icebergs, in order to ensure safe navigation through the area. With a device that could help the IIP locate icebergs more easily, they will be able to maintain normal operating altitude instead of diving for a visual confirmation every time a target's designation is questionable.

## Methods / System Design

Deepwater has chosen EDO's ALR-95(V) maritime patrol system for the CASA. It has not been ruled out for the C-130J airframes. The CG has a requirement for the new C-130J airframes to have Electronic Support Measures (ESM) capability. There is no requirement or plan to support the older H-model, currently used by the IIP, with such equipment. Although the IIP needs the Electronics Intelligence (ELINT) equipment, the old H-model will eventually be replaced by the J-model, so updating old airframes may not be cost beneficial. It is expected that the ALR-95(V) will meet all system requirements and needs of the IIP and will actually exceed those needs in several areas.

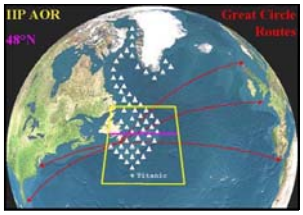
## Results / Future Plans

The main focus of the research team will be:

- Develop a test plan for the ALR-95(V) incorporating the mission needs of the IIP
- Test an ALR-95(V) system
- Report findings and recommendations

## Project Timeline

Flight with IIP → Late Feb/Early Mar
Test Plan due → Mid March
Test week with sector NNE and NAS Brunswick → Late March
Finish analyzing test results → Early April
Project Paper/Recommendation due → Late April
Presentation → April 30 or May 1

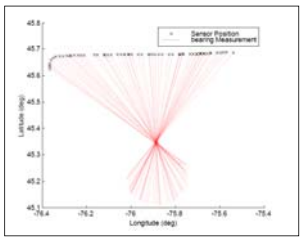



Typical drift pattern of icebergs originating off Greenland

Constraints:
- Cost
- Flight Deck Space
- Weight
- Operational Crew Size

Assumption:
- Vessels' Radar Systems Remain Active

**ALR-95(V) Spinning DF Antenna**



Geolocation of a stationary Radar Emitter

1 hour (C-130) ≈ $14,000

0.5 hr < Average divert length < 1 hr

5,500 ft < Normal Operating Altitude < 8,000 ft