Projects in Electrical & Computer Engineering 2007-2008

Iceberg Differentiation (ID)

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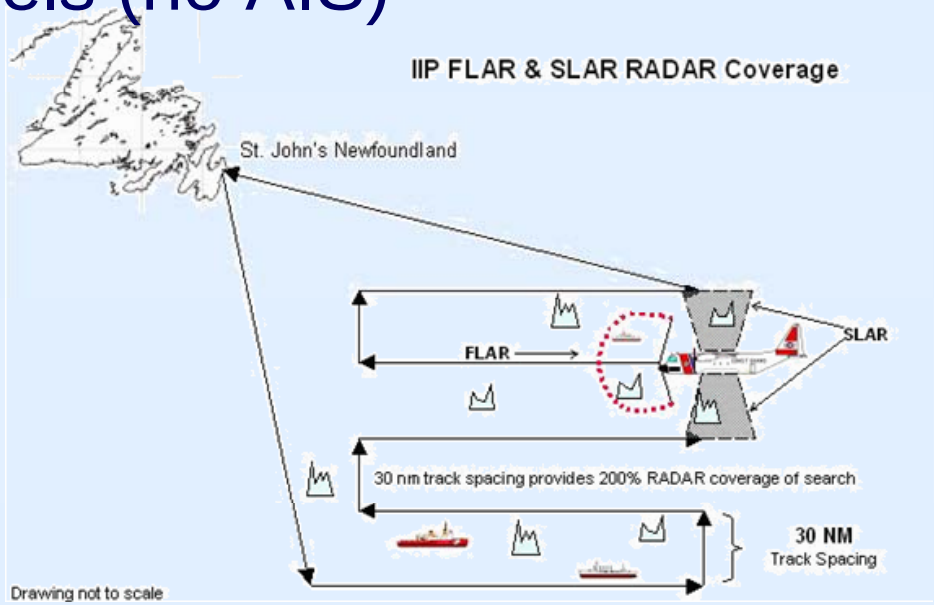
Sponsor: International Ice Patrol (IIP)

Presentation Outcome Goals

- IIP's Needs
- Technical Approach
- ALR 95(V)
- System Testing

IIP Background

- Grand Banks of Newfoundland
  - Foul Weather
  - 102 diverts in the 2007 ice season
  - Heavily rely on radar
    - APS-137 FLAR and APS-135 SLAR
  - Fishing Vessels (no AIS)



Objectives

- Request:
  - Cost-beneficial system
  - Not affected by adverse weather
  - Differentiation between vessels and icebergs using radar direction finding
- Plan:
  - Research signal detection technology
  - Explore availability and practicality
  - Evaluate integration aboard an C-130
  - Cost analysis

Technical Approach

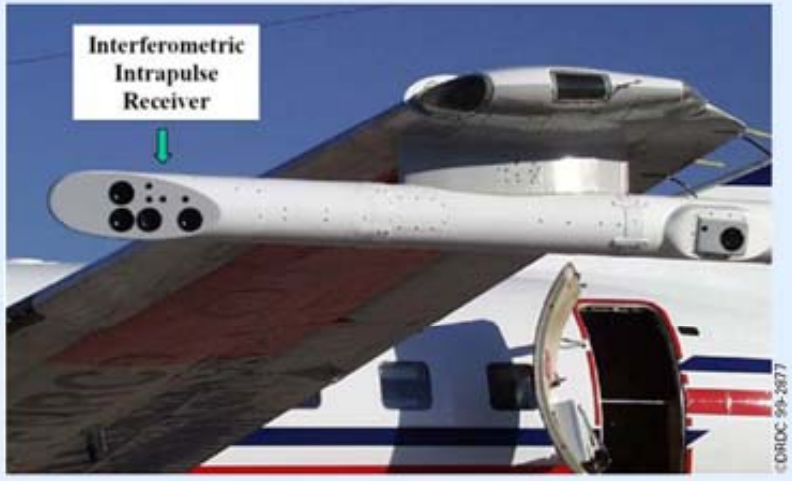
- Define Requirements
- Explore commercial systems
- Choose system
- Test system

Requirements

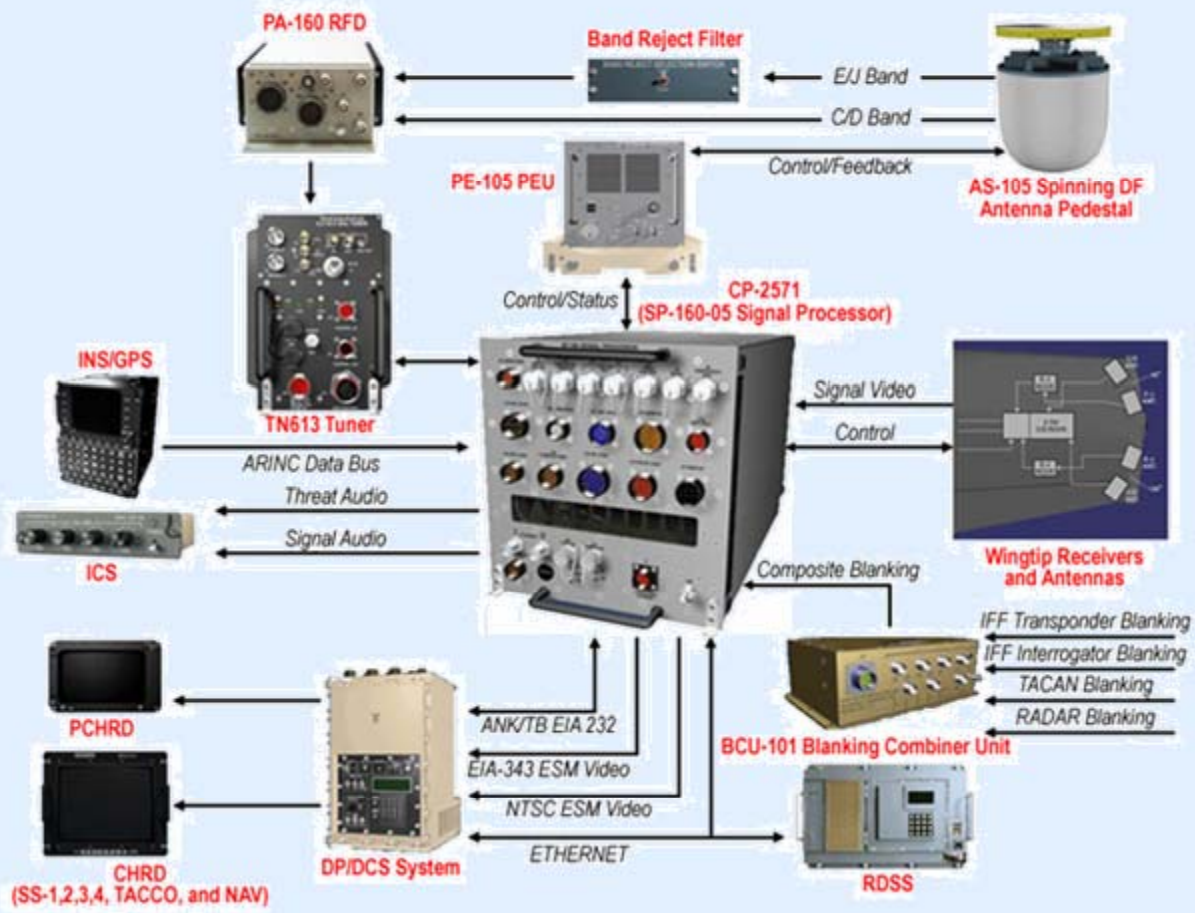
- Visual Interface
- X-Band, S-Band
- Altitude (5500ft to 8000ft)
- Attainable and Testable

Commercial Systems

- Canadian System
  - On the Convair 580
- ALR-66
  - USN
- ALR-95(V)
  - USN



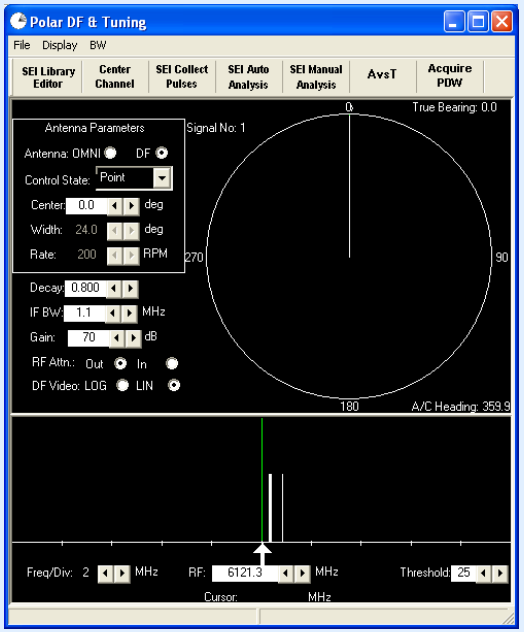
EDO/ELTA ALR 95 (V)

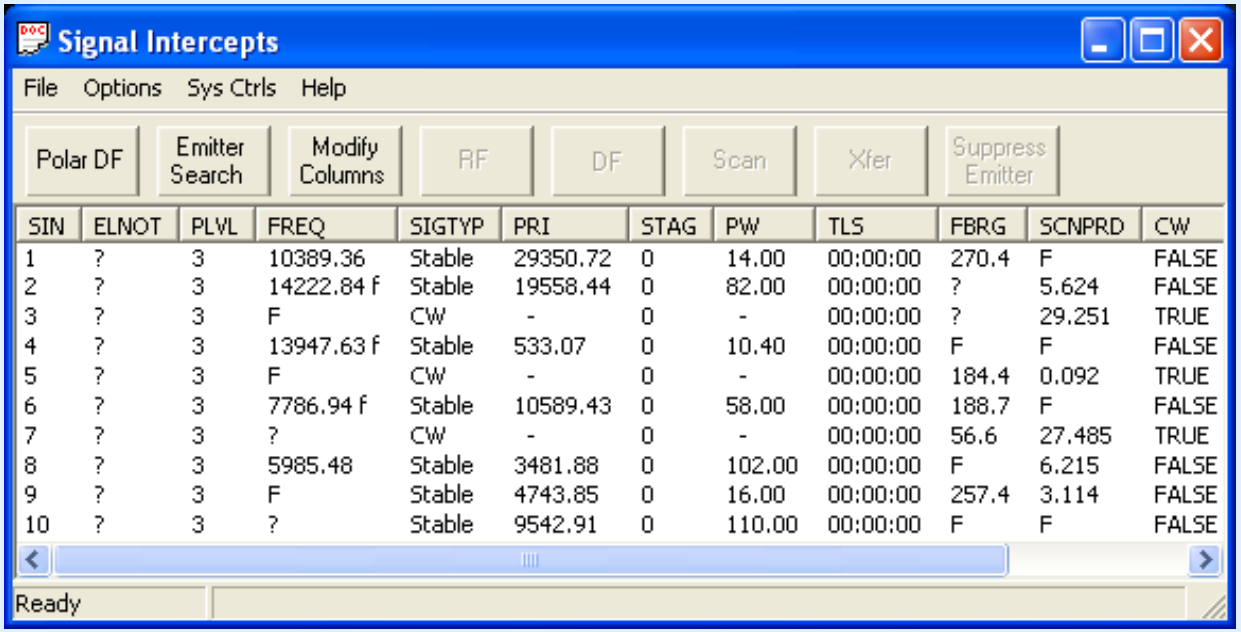


AS-4439 Spinning DF Antenna

- Two bands
  - L band (vertical)
  - S, C, X, Ku bands (horizontal)
- Turntable mounted
- Location

Modes & User Interface





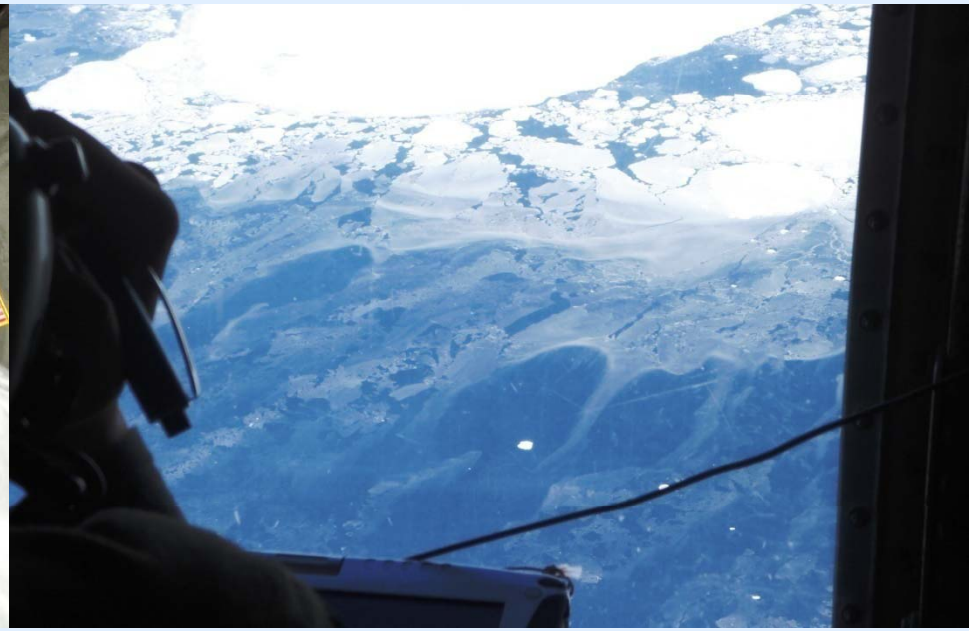
SIN	ELNOT	PLVL	FREQ	SIGTYP	PRI	STAG	PW	TLS	FBRG	SCNPRD	CW
1	?	3	10389.36	Stable	29350.72	0	14.00	00:00:00	270.4	F	FALSE
2	?	3	14222.84 f	Stable	19558.44	0	82.00	00:00:00	?	5.624	FALSE
3	?	3	F	CW	-	0	-	00:00:00	?	29.251	TRUE
4	?	3	13947.63 f	Stable	533.07	0	10.40	00:00:00	F	F	FALSE
5	?	3	F	CW	-	0	-	00:00:00	184.4	0.092	TRUE
6	?	3	7786.94 f	Stable	10589.43	0	58.00	00:00:00	188.7	F	FALSE
7	?	3	?	CW	-	0	-	00:00:00	56.6	27.485	TRUE
8	?	3	5985.48	Stable	3481.88	0	102.00	00:00:00	F	6.215	FALSE
9	?	3	F	Stable	4743.85	0	16.00	00:00:00	257.4	3.114	FALSE
10	?	3	?	Stable	9542.91	0	110.00	00:00:00	F	F	FALSE

- Scan
- Sweep
- Point

Costs

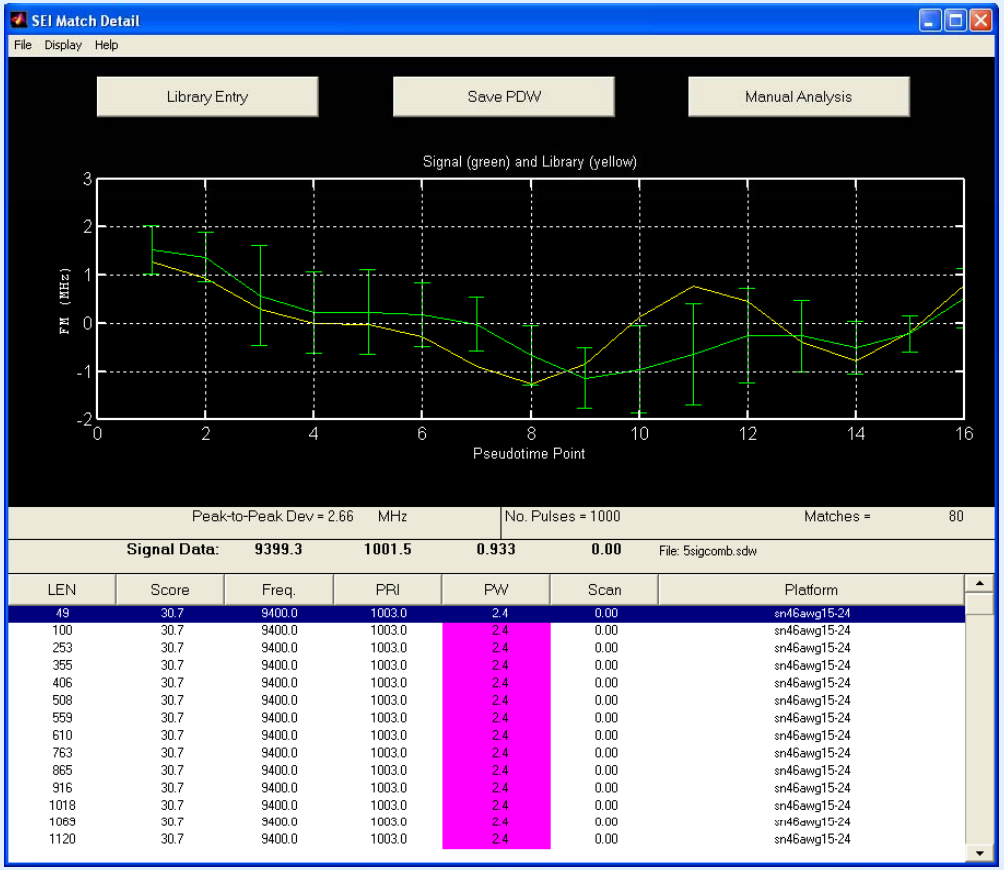
- $14,237 per hour for IIP Ops
- System Cost: $17M
- Casa (Training & Maintenance)

IIP Familiarization Flight



- Antiquated system

Specific Emitter Identification



LEN	Score	Freq.	PRI	PW	Scan	Platform
49	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
100	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
253	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
355	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
406	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
508	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
559	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
610	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
763	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
865	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
916	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
1018	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
1069	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24
1120	30.7	9400.0	1003.0	2.4	0.00	sn46awg15-24

Test

- *Assets:*
  - *Naval Air Station Brunswick (NASB), ME*
  - *Sector Northern New England (SNNE), ME*
- Test Site: Gulf of Maine
- Altitudes: 5500ft, 8000ft

Track Pattern

Results

UNCLASSIFIED

Position Marking:	Positive
SEI:	Positive
Ease of Use:	Negative
Cost:	Positive

Conclusion

- Thorns:
  - Ease of Use
- Roses:
  - CG will have the necessary operations platform
  - Positive Results
  - Technology is much needed in many CG missions

- Thank you to our Project Advisor (seen below)
- Thank you to the IIP, NASB, SNNE, and LCDR Dolan
  - Pictures were acquired from the IIP website and the USCG website
  - Images for ALR 95(V) from Navy's "ALR-95(V) capabilities brief_new.ppt"
- Thank you for your attention!

Fearless Leader: