IceGoat1
USNA Polar Science Program
3APR2012
LCDR John Woods
MIDN 1/C Ben Aspholm
MIDN 1/C Nathan Kren
MIDN 2/C Rhyan Lange
Mr. Dan Rhodes
Mr. Bob Bruninga
Primary Mission

- Record and relay weather data.
- Present virtual tracking data.
- Send pictures.
- Science Technology Engineering and Math (STEM)
The undergraduate college of the naval service, the United States Naval Academy strives to accomplish its mission to develop midshipmen “morally, mentally, and physically.”

Core curriculum that includes courses in engineering, science, mathematics, humanities and social science.

World class laboratory facilities

All graduates serve minimum of 5 years in Navy and Marine Corps.

Graduate education opportunities are available.
USNA Polar Science Program

Arctic Buoy Project
Determining Ideal Solar Panel Configuration

Original Solar Panel Configuration

- PV Watts
- Summing and Plotting

Modified Solar Power Configuration

- Power budget displayed a shortage of available power
Build
Build
IceGoat 1 Power System

Lithium Ion Batteries
• Argos

Lead Acid Battery
• Charged by Solar Panels
• Powers
  – SBC
  – APRS
  – Camera
  – Iridium
Build
Build
IceGoat1

- Solar Panels
- Logitech Web Camera
- Iridium Antenna
- Barometer
- Coiled APRS Antenna Cable
- Watertight Hull
EPS Diagram

Zener Design: Max of 7 solar panels illuminated. At 2 Watts each (due to direct energy transfer) times .7 due to max 40 degree Sun - needs 10W dissipation. These BW are epoxied to Aluminum for maximum dissipation.

MAX471 Current Sensor (1 of 6)

Project: Arctic Buoy
Title: Schematic
Engineer: Bruninga
Date: 3 Feb 2012
USNA Satellite Lab
Dwg No:
Managing Computer

- Compiles Data and controls all of the functions for the Cameras and Iridium modem
- Also monitors, compiles and controls data to two top boards (Power Distribution Board and APRS)
- Pins connecting SBC and Power Distribution Board allow for data compiling and transmission

Partnership

- Todd Valentic, a Senior Research Engineer at Stanford University has done much of the programming for this system
Data Website

http://icegoat.datatransport.org/monitor#icegoat-1
Power
ADC Channels

USNA ICEGOAT Real-Time Telemetry Monitor

IceGoat-1 Raw TS9700 ADC Samples

- Voltages plotted over time from March 31 to April 1, 2012 (UTC)
- Graph showing data for various ADC channels
- Legend indicating different channels and their abbreviations
Deployment
Deployment
Deployment
Deployment
International Arctic Buoy Program
Buoys and NSIDC Ice Concentration
60-day Drift Track
29-Mar-2012

Note that NSIDC ice concentration available only for prior day.
STEM at USNA entails a different approach to recruiting and retaining technologists. We engage elementary, middle, and high school students and teachers in a wide variety of science and engineering activities.

STEM Camps and Mini-Camps, Tours of USNA technical laboratories, Teacher Training, Visits to local schools by USNA personnel to provide demos and displays, Science-fair judging, Competitions, contests, and showcases, Midshipmen Outreach Activities,

http://www.usna.edu/STEM/
Like us on facebook!

Special Thanks
Questions?
Deployment

• Wave energy instrument on future buoy.

• Figure out how to put accelerometers onto the SBC side of the buoy.

• Talk to people presenting on stuff in wave zones or measuring waves and then talk to todd about feasibility
APRS

- What is APRS?
- Required Modifications
- Application on IceGoat 1
International Space Station Footprint
PCSAT Footprint
USNA Polar Science Program (PSP)

- Interdisciplinary, project based, current, field activities
- Invited into International Arctic Buoy Program
  - Arctic Buoy Project “IceGoat1” will be deployed Spring Break 2012 at NASA JPL BROMEX field campaign out of Barrow, AK
  - North Pole 2013, ICEX 2014
Team

- Oceanography Dept
  - LCDR Woods, Jimmy Aisquith, MIDN 1/C Crowder, MIDN 2/C Lange
- Computer Science Dept
  - CDR Blenkhorn, MIDN X
- Aerospace Engineering Capstone Student (Iridium and Solar)
  - 1/C Kren, 1/C Aspholm
- Systems Dept **Future Students?**
- Hydro Lab (John Z., Louise, Dan Rhodes)
- Materials/Mechanics/Structures Lab; **Future Students?**
- LBI (buoy manufacturer)
  - Peter Legnos
  - Possible Visit Mid January
- SRI (Stanford Research Institute) **Possible Internships**
  - Todd Valentic
  - Computer Set Up, Iridium comms
- STEM Office
  - Education/Outreach
Research Support AY11

• ~$25K in end of year funds
  – Buoy $6K
  – Sensor Suites $16K
  – Gear $3K

• Continued Support in AY12?
  – Participation Support for BROMEX
  – Development for North Pole in AY13
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<tr>
<td>Transmitter</td>
<td>ARGOS PTT transmitter onboard computer and GPS</td>
<td>Iridium</td>
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<tr>
<td>Instrumentation</td>
<td>Single Unit Temp, Humidity, SLP (METOCEAN Pkg)</td>
<td>7602 Single Board Computer, Webcam, APRS</td>
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<tr>
<td>Lifetime</td>
<td>Proven 4 years continuous</td>
<td>Life of buoy</td>
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<td>Batteries</td>
<td>Lithium Ion Batteries</td>
<td>Solar Package, Lead-Acid</td>
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