ROV Exploration of the RMS Titanic

May 26 – June 12, 2004

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Why Go Back

- **Science/Archaeology**
  - Microbiology of “rusticles”
  - Natural impact of shipwreck on ecosystem
  - High precision photomosaic of wreck
  - High definition images/video

- **Preserve Cultural Heritage**
  - Assess natural vs. human impact
  - Promote Memorial nature of site

- **Promote Ocean Exploration and Awareness**
  - Regular live broadcast to Immersion/Jason programs
  - Extensive web coverage
  - Daily radio interviews
  - National Geographic Channel Program
  - National Geographic Society Magazine
  - National Geographic Society Book
NOAA Ship Ronald H. Brown
Depart Boston May 27, 2004
North Atlantic

3 days out, 12+ foot seas, 35+ knot winds
Life at Sea, home
Life at Sea, the commute
Life at Sea, the office
Life at Sea, the scenery
The Vehicles
The Control Van, front row
The Control Van, back row
The Challenge

- Imagine dangling a YoYo
  - from a Helicopter flying 30 stories high.
  - move the YoYo around a car wreck
  - limited visibility
  - strong winds blow your cable and helicopter
  - 30 minutes for helicopter motion to reach the YoYo
The Navigator’s Duties

• Complete three dimensional spatial awareness
  – Position of *Ronald H. Brown*
  – Position of Argus
  – Position of Hercules
  – Position of wreckage

• Command interface
  – ROV control to *Ronald H. Brown* bridge (OOD)
  – ROV control to deck (launch and recovery crew)

• Mission Planner
  – Calculate launch points for each dive
  – Calculate *Ronald H. Brown* moves to translate Argus over wreck
  – Advise Pilots on course to targets
The Navigation System

USBL
Range & Bearing Transducer to Herc & Argus

DMS
Heave/Pitch/Roll Transducer

P Code GPS
XYZ Position
*Ronald H. Brown*

Gyro
Heading
*Ronald H. Brown*

Calculation
Relative Range & Bearing Ship to Hercules & Argus

Calculation
XYZ Position (WGS-84)
Hercules & Argus
Ultra Short Baseline Navigation
The Transducer Pole
USBL Software
Navigation Software
What is it good for?

- Only 20-40 Meters absolute accuracy
- Insufficient for closed loop ROV control
  - Autopilot to hold XYZ position
  - Fine movements (cm) in mosaic surveys
- Need more precision on the bottom
ROV Navigation Aids

Gyrocompass
Ultra-precise heading

Doppler Velocity Log
Velocity over ground (30m)
Velocity relative to water
Relative Precision ~ 5 cm allows mosaics to be built

Images Courtesy IFE/URI
So When everything is done right . . .
Control Room
Heading home
June 8, 2004
Heavy seas
Got in the way
Really!!!
June 11, 2004 almost home

Image Courtesy Bert Fox / National Geographic Society
“The 1500 souls lost here still speak, reminding us always that the unthinkable can happen but for our vigilance humility and compassion”
Questions

• about the technology

• Pictures of the wreck to follow