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Explorers Revisit Titanic

•HD cameras capture latest expedition •

by Robin Berger

NORTH ATLANTIC OCEAN

The National Geographic Society has supported research and exploration of the Titanic for 78 years and in 1985, it capitalized on Dr. Robert Ballard's discovery of the wreck with "Secrets of the Titanic," which aired on TBS one year later to record-breaking ratings.

Last month, the network revisited the scene with "Return to Titanic" produced by Partisan Pictures—the first TV crew that Dr. Ballard invited onboard an expedition.

The June 7 broadcast included live underwater images telecast from over 12,000 feet below sea level, captured primarily by two Remotely Operated Vehicles: Hercules and Argus.

Hercules, the larger and more sophisticated ROV, is about the size of "three refrigerators back-to-back," said Brian Doros, director of Technical Services at Mystic Aquarium's Institute for Exploration, whose "Immersion Project" sponsored daily Webcast updates from the ship to the aquarium, the University of Rhode Island and Wood's Hole Oceanographic Institution in Wood's Hole, Mass.

Designed for excavation, Hercules is equipped with mechanical arms that can lift, push and grab objects. It also captured close up shots, said Partisan Pictures Coordinating Producer Tina Ver, who produced "Return to Titanic" and four, 20-minute live daily shows for the Immersion Project, which ran from June 4 through June 9 over the Internet.

Argus, Ver said, is described as a "tow sled," and was used to capture the wide shots. It hung from a cable dangling from the ship, and was also tethered by cable to the Hercules below it.

Each ROV had a Zeus Plus high-definition camera, which is based on a Sony model and manufactured by Insite Pacific, a San Diego company that specializes in underwater video systems. Titanium cylinders house the cameras, and are specially mated to the lens to protect it from faults caused by pressure.

"These cameras are rated to 10,000 PSI [pounds per square inch]," said Jim Newman, adjunct engineer at the Institute for Exploration, who built and equipped the ROVs. "The optics work magnificently over a full range of pressure and with the difficulties of optically coupling into the water."

SCATTERING LIGHT

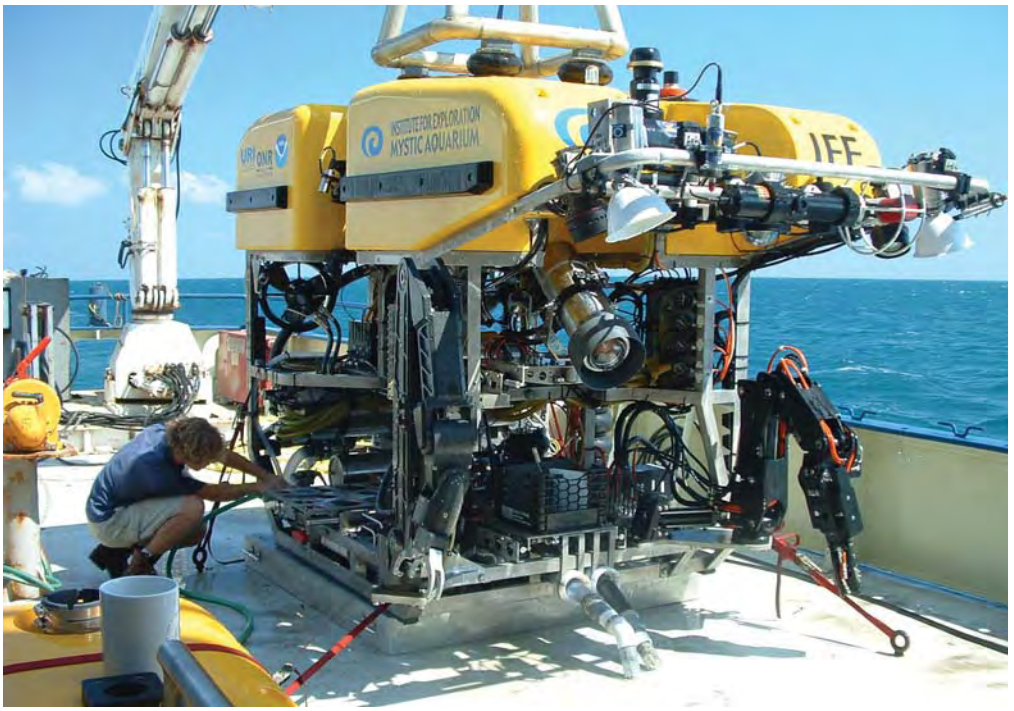
Newman resolved other idiosyncrasies himself, like dealing with the backscatter that occurs if lights aren't positioned far enough from the camera. He used the Argus vehicle, which hovered above the Hercules, as a lighting platform, explaining that underwater conditions were like driving in a fog: The

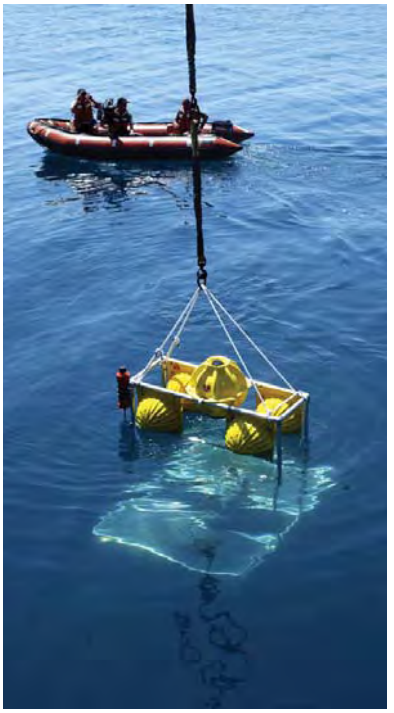
Argus' Deep Sea Power 1200 W HMI lights were like "streetlights," the Hercules 400 W HMIs like "headlights."

"Headlights illuminate all the water particles between you and the road, which reflect the light back to you, making it hard to see the road," he said. "In contrast, streetlights, which are further away, don't have the same backscatter problem, so it's easier to see."

The Zeus camera had an internal converter that interfaced with Telecast Fiber Systems Viper II transmitter (model TX5292-1551), which conducted the video to receivers aboard the ship.

Hercules and Argus were also equipped to monitor sound, thanks to Bob Tyce and James Miller, professors of Ocean Engineering at the University of Rhode Island, and their team of graduate students. Sound was primarily used to monitor, pilot and check the vehicles, but Tyce said it was possible to patch the ambient sound into the video.





1: The video room aboard the Ronald Brown, 2: Dr. Robert Ballard, leader of the Titanic expedition, 3: Hercules, 4: Bringing up the equipment, 5: Location Map

"The speed of sound in water is about four and a half times as fast as it is in air," Tyce said. "So we placed hydrophones at the front of the vehicle, about 24 inches apart—about four and a half times the distance that your ears are apart—to try and determine where something is happening."

Each ROV had two Model HTI-90-U series three-wire (voltage system) hydrophones from High Tec Inc.—one on the port side, the other starboard. They connected to a digital signal processing board made by Analog Devices, which digitized the signal and sent it through a Prizm fiber-optics system as data. The data was converted back into audio in the image/control van aboard the ship.

Newman was quick to praise Prizm Advanced Communications Electronics.

"They give us great service," he said. "They understand how we operate and really cater to our needs—there's a lot of flexibility: it's a modular system and there's all sorts of different interfaces."

Communications for handling production between the ship, Wood's Hole and the Mystic Aquarium was coordinated through Telex intercoms, according to Doros.

"Telex/RTS equipment is quite extensively deployed in this current project, at Mystic, aboard the ship, and in the command and satellite vans at Wood's Hole, from where the live telecast originated," Doros said. "The project revolves around wherever Dr. Ballard is at any particular time at any of the locations, be that under the water, at Mystic, the University of Rhode Island, or at the Wood's Hole Oceanographic Instituition. This is why the intercom needs to be seamless and fully integrated between sites."

The Institute for Exploration's image/control van (a modified cargo ship container) converted the ROV images from HD to SD video. Designed very much like a standard broadcast facility, the van had a central router for multiple feeds, conversion equipment to accommodate various receivers, and custom designed racks to fit the tight quarters, Doros said.

Video was then sent by coaxial cable to the EDS uplink van at the other end of the ship, and was looped to and from a switcher at Partisan Pictures' Media Center.

"The switcher allows me to view the different feeds from the ocean and from fixed cameras on the aft deck," Ver said. About 50 crates of equipment were delivered to set up her on-board studio, including two full Avid editing systems.

At the EDS van the signal was encoded to an IP format, packetized and uplinked.

"We decided to make the ship a node on the Internet," said EDS Project Manager Mike Magers. "In order to do that, we needed to put all the feeds (video, audio, data) into an IP format. Tandberg (equipment) can encapsulate video in IP packets for the broadcast industry."

SATELLITE UPLINK

From the EDS van, the signal was uplinked to the Galaxy 4 satellite (C-band) and downlinked to EDS corporate headquarters in Plano, Texas.

"We strip off the video and audio and take out the IP format," said Magers in describing the process in Plano. "We then re-encode it into MPEG2 digital video and send it through our corporate network."

It was then beamed by KU-band to satellite receivers in Mystic, Conn., the University of Rhode Island, National Geographic Channel sites in Washington, D.C and Los Angeles, and to another EDS location, where it was re-encoded into an MPEG-4 format using a VBRICK Systems encoder and sent out across the Internet.

National Geographic Channel took the standard-definition feeds in with Scientific Atlanta 9223 decoders: The pre-produced feed in Washington (beginning June 2), and the live feed in Los Angeles, the network's uplink site. The feeds were recorded directly into the network's Avid Unity System and a tape backup.

"Because of limited space on the ship, we decided the best use of their [Partisan Pictures] time would be to do a submaster—like the truck feed from a sporting event," said Martie Kretchmar, National Geographic Channel's vice president of Broadcast Operations. NGC integrated the packaging graphics, music, and special effects.MVI post house was hired for color correction and to create a separate split track for live language customization. Kretchmar then flew the master tape to L.A. for the broadcast. ■