NOAA Teacher at Sea
Jessica Schwarz
Onboard NOAA Ship RAINIER
June 19 – July 1, 2006

NOAA Teacher at Sea: Jessica Schwarz
NOAA Ship RAINIER
Mission: Hydrographic Surveys
Day 8: Monday, June 26, 2006

Science and Technology Log
So I hope everyone remembers what RAINIER's Captain, Guy Noll, told me last week before I went out on a launch: "We hit rocks so that you don't have to." When I first heard him say this, I kind of laughed, figuring it was somewhat of an exaggeration, he was only kidding with me. I found out this morning he actually wasn't.

An added component to running lines and collecting sonar data is doing nearshore feature investigation. If you are involved in feature investigation, your job is to either prove or disprove whether or not a feature (rock, ledge, islet, wreck, etc.) actually exists in the position it's been historically claimed to be. When I say "historically" I mean some of these features were last charted based on data collected in the 1940s or earlier. Therefore, NOAA needs to update the data used in developing their charts and resurvey various areas with updated technology.

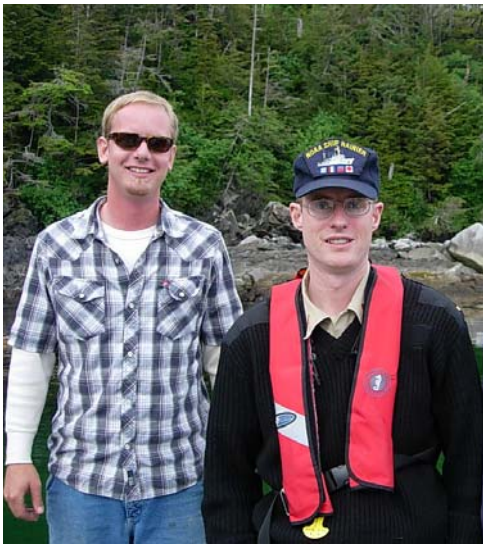
For the last several years, NOAA has been augmenting its ship-based sonar surveys with airborne bathymetric LIDAR (**LI**ght **D**etection **a**nd **R**anging) data. LIDAR uses high powered laser pulses (invented in 1962!) transmitted from aircraft. The laser sweeps back and forth across the earth's surface, and the reflections are detected by a receiver. Much like sonar, the distance to the ground can be inferred from the amount of time required for the light to travel from the airplane, to the earth, and back. If the position and altitude of the airplane are measured very accurately, the height and shape of features on the earth's surface can be determined.

NASA and the U.S. Navy were among the first to use airborne LIDAR. Later, with the involvement of NOAA, Airborne Oceanographic LIDAR was developed for use in the marine environment. After continued progress in development and technology, Airborne Hydrographic LIDAR (AHL) was invented. AHL uses a wavelength of light which penetrates the water rather than reflecting off the surface, allowing for measurement of water depths in addition to land topography. Keep in mind that although ALH was first developed in the mid 80s it was not practical for utilization on the Alaska Peninsula until the 90s.

Although an exciting new addition to NOAA's hydrographic survey "toolbox", LIDAR is not able to run nearly as deep as sonar. In shallow water close to shore, however, it can reduce the need for inefficient and potentially unsafe small boat operations. Both LIDAR

and sonar are used to assist in determining what features are navigationally significant to those at sea and essentially what features will end up being charted.

RAINIER receives a list of questionable sea features based on information collected from LIDAR, past hydrographic data, and in some cases reports made by mariners. Based on this collection of data, they are asked by the Pacific Hydrography Branch (the folks in Seattle who compile RAINIER's data for addition to the charts) to investigate certain features (i.e. rock, ledge, islet etc.) that cannot be resolved with certainty based on the LIDAR or other.



Rock hunters: SS Corey Muzzey and ENS Sam Greenaway after a productive morning of investigations. Corey, Sam and Jamie have been very giving of their time and are excellent at explaining data acquisition and processing!

So, today, ENS Sam Greenaway, ENS Jamie Wasser, Seamen Surveyor (SS) Corey Muzzey, and I went out looking for rocks☺. That doesn't sound nearly scientific enough does it? There's a lot involved in looking for rocks actually, and it's not nearly as easy as it might sound. For me, as someone new to hydrographic surveying, my big question was, "Okay, and then what happens when we find one?" What's this whole, "hitting rocks so you don't have to" idea? Do we really hit the rocks?

I rode today in launch RA1 to do investigations. RA1 is unique because it is a jet propelled boat. This means it does not use a rudder and propeller, like you would expect to find on most power boats. Instead, RA1 is propelled (and steered) using water that is sucked in through a grill in the hull of the boat, accelerated by an impeller driven by a diesel engine, and expelled out a nozzle in the boat's transom. Changing the direction of the discharge nozzle is what steers the boat. This allows RA1 to go into much shallower water. In fact it only needs 1 foot of water to stay afloat and move around. Also, don't be fooled by me saying "jet propelled". That might give someone the impression these boats are extremely fast. RA1 is actually quite slow, with a cruising speed of 12 kts, which I figure was good for the crew while I was at the helm.

There are different ways of investigating features and doing a disproval (determining if a feature is there or not). One is to use RA1's single-beam sonar. This is different from multi-beam sonar (like what I've discussed before) because instead of sending out between 140-250 pings of sound over an area of between 120°-150° from the boat, single-beam sonar sends only one ping directly beneath the hull to the ocean floor. While single-beam sonar is running, the echosounder printer draws an outline of the sea floor features. Check out the picture of ENS Jamie Wasser with the echosounder to get an idea of what it might look like.

ENS Jamie Wasser, monitoring the Echosounder onboard RA1 during investigative surveys.

If you're wondering why they aren't using multi-beam instead, it's because they're in shallow water, extremely close to rocks, and it would be much too easy to knock off the multi-beam transducer attached to the hull. Multi-beam sonars cost around $300,000 so it wouldn't be very cost effective for NOAA to lose or damage one. The single-beam sonar is imbedded in the hull and won't be knocked off if the boat does happen to hit a rock.

Not all survey boats were running item investigations today. In fact today three survey boats were launched, two launches were running main scheme lines with multi-beam sonar (what I've participated in on past days) and one, the launch I was involved with today, was running investigations.

In order to do this, the launches need to get extremely close to shore and extremely close to these "hypothesized" features, often times physically nosing the boat up to them to check the positions (remember, "we hit rocks so you don't have to"). Depending on the sea conditions, this can be a very difficult process.

Personal Log

Today was an excellent day. It was beautiful and sunny all day. We stopped the launch and had lunch in one of the little bays. On our way home, SS Corey Muzzey let me drive. The jet drive boats drive much differently than the boats with rudders and propellers. The helm didn't feel nearly as touchy and seemed more forgiving of my exaggerated turns of the wheel ☺. We saw several humpbacks out there today…around the time whales started showing up near the boat was when I lost interest in driving.

After finishing investigations, TAS Jessica Schwarz is getting a feel for steering a jet-propelled boat!

The landscape here is so incredible. I keep trying to take digital pictures of it and am always disappointed by what little justice the pictures serve. Tonight is a crew beach party. Everyone on the ship who wants to go can get a ride to a nearby beach to spend some time on land for a change. I'm looking forward to it!

Soon we'll be crossing the Gulf. I've been hearing some horror stories about this crossing, not just from the crew, but also from some of the people I met while I was in Sitka before I came onboard RAINIER. I'm actually looking forward to being on the open ocean. We've spent a lot of time anchored and well protected in the bay. Crossing the Gulf will be a new experience. I'm excited!

Until next time…

Jessica Schwarz

Also, some of the staff at West Hawaii Explorations Academy has let me know that my NOAA e-mail address is sending back e-mail messages. Hopefully this will be fixed soon, but in the mean time anyone interested can e-mail me at schwarzie@gmail.com.

Sorry about the mix-up!

Calling All Middle Schoolers-We Need Help Answering a Few Questions!
Sonar technology wasn't utilized for hydrographic purposes until the 1940s. Before this, how did surveyors chart the sea floor?

Remember, hydrographic surveying and the development of nautical charts, dates all the way back to 1807 with Thomas Jefferson.

So, how did they do it back then? Let me know what think!