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MARCH 2010

SINGLE ISSUE PRICE \$4.50

SEA TECHNOLOGY

www.sea-technology.com

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An Information Hub for Vessel Traffic Operations Aids Users in Newfoundland

The SmartBay Ocean Observing System Provides Users in Various Fields With Information to Improve Safety and Efficiency

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SmartBay is an ocean observing system that provides near real-time wave, wind and water data from buoys located in the ice-free waters of Placentia Bay in Newfoundland, Canada. What distinguishes SmartBay is its widespread use across multiple industry sectors and its integration into day-to-day commercial and industrial vessel operations. End-users include marine pilots, tanker and tug operators and others involved in supporting the oil industry, fish harvesters, recreational boaters, tourism operators, charterers, research scientists and the federal government.

This ocean observing system is an initiative of Memorial University of Newfoundland's Fisheries and Marine Institute's School of Ocean Technology, located in the capital city of St. John's, the "City of Ocean Excellence." SmartBay consists of one meteorological/oceanographic buoy, one wave buoy and two water-quality buoys; a public-access Web site that relays the buoy data and weather forecast information derived from these data; and automated identification systems (AISs) installed on eight vessels that operate in the bay to illustrate situational awareness between oil tankers and smaller vessels.

The Marine Institute collaborated with three St. John's-based industry partners in the development of SmartBay: AMEC Earth and Environmental generates the daily



SmartBay meteocean buoy being deployed at the mouth of the bay. (Photo courtesy of Eric Davis, Marine Institute)

weather forecasts; Earth Information Technologies (NL) Ltd. designed, developed and maintains www.smartbay.ca, which provides 24/7 access to the buoy information, forecasts and archived data; and ICAN Ltd. installed the electronic chart-integrated AISs.

SmartBay Development

Located approximately 200 miles west of the Hibernia oil field on the south coast of Newfoundland, Placentia Bay is one of the busiest ports in Canada by petroleum cargo volume (approximately 25 million tons annually).

The combination of fog (visibility is less than 1/8 of a kilometer 187 days of

the year), severe weather and navigation in a confined area poses challenges to mariners. Considering these factors and the extent of tanker traffic, in 1990 a report declared that "Placentia Bay is considered by many to be the most likely place in Canada for a major [oil] spill." This was a primary driver for selecting Placentia Bay as the site for SmartBay. Another consideration was the sensitivity of the ecosystem in the surrounding area, including 65 communities that ring the bay, and its proximity to the Cape St. Mary's Seabird Ecological Reserve, the most accessible colony of seabirds in North America.

In 2004, the SmartBay team engaged in a community consultation process

involving 30 stakeholders to define user requirements, and they subsequently continued to receive stakeholder input that informed the design and development of the buoy and Web portal.

Under the Oceans Action Plan, Fisheries and Oceans Canada provided \$2 million to develop and launch SmartBay. These funds were administered by the Atlantic Canada Opportunities Agency. Since then, the Province of Newfoundland and Labrador has contributed approximately \$700,000 to operations and infrastructure from the Department of Innovation, Trade and Rural Development's funding mechanisms, the Innovation Fund and the Ocean Technology Sector Development Fund. Contributions from industry have totaled \$100,000. The Marine Institute and the Canadian Coast Guard have made significant in-kind contributions in labor, equipment access, and buoy deployment and retrieval.

SmartBay was launched as a demonstration project in August 2006 and has since been operating around the clock. The buoys at the mouth of the bay and the pilot boarding station (PBS) have operated near continuously, and two new metocean buoys are in the process of being installed.

The buoys provide information on wind direction and speed, air temperature, humidity, dew point, barometric pressure, water temperature, salinity, current speed and direction, wave height and direction, and wave period.

SmartBay partner AMEC Earth and Environmental provides Web-accessible regional forecasts for Placentia Bay updated every six hours, as well as hourly site-specific forecasts for two high-interest locations, one being the PBS.

Pilots' Use of SmartBay

All tankers and cargo vessels in Placentia Bay must be directed by a pilot, who is dropped off at the PBS on exiting. When the Atlantic Pilotage Authority determines that the weather and sea state conditions indicate that it is unsafe for a pilot to board or disembark, vessels either remain in port or stay out at sea.

The PBS is 27 kilometers from the pilots' home base, and weather conditions at the two locations often differ considerably. With SmartBay, pilots can remotely assess the boarding conditions

at the PBS, eliminating the need to steam out there to determine if it is safe to board. This keeps the pilots out of jeopardy, saves three to four hours of their time, and saves between \$1,000 and \$1,500 in fuel costs per trip.

Capt. Nelson Pittman, a Placentia Bay pilot for 15 years, checks the SmartBay forecast and buoy data four times a day. He finds it especially useful in inclement weather—anytime between September and May.

"With SmartBay, we can see the trend and know when the sea state is going down," Pittman said.

He added that SmartBay has also eliminated the incidence of a pilot accompanying an exiting tanker to the PBS, only to discover he cannot disembark, and having to remain onboard until the tanker's next port of call.

Capt. Andrew Rae, vice president Atlantic of the Canadian Marine Pilots Association, noted that the buoy at the mouth of the bay "gives the pilots a heads up because they know from the outside buoy to the PBS they have a four-hour lead time of the onset of weather. That gives them time to move if they want to get a ship out."

Rae and Pittman agree that there is a 20 to 25 percent reduction in vessel delay time due to SmartBay because pilots can reopen the bay sooner after a closure. That said, they both see efficiency as secondary to the safety factor.

"There is a definite need for a SmartBay in the Bay of Fundy," Rae observed. "They need that kind of data to support the tanker operations for Canada's first LNG [liquefied natural gas] terminal. We would like to see the full service available at the four major ports in Atlantic Canada: St. John's, Halifax, Chedabucto Bay [Strait of Canso] and Saint John."

He added that SmartBay is not as applicable on the West Coast, where PBSs are not as exposed as they are in Atlantic Canada. However, Ivan Lantz, director of marine operations for the Shipping Federation of Canada, sees applications for SmartBay outside of Atlantic Canada.

"Baie Comeau and Port Cartier could use it when there's no ice," he said, adding that the functionality could be customized to meet local needs, "and possibly Prince Rupert [on the West Coast] where the pilot boarding station is fairly far offshore and there's violent weather."

Lantz estimates there are five to seven occurrences per year when a large crude oil tanker is delayed from entering or leaving Placentia Bay, and figures that SmartBay could reduce the delay time, on average, by six hours.

At a vessel cost of \$75,000 per day, this can save operators significant expense.

Offshore Oil Transport Applications

Tanker traffic in Placentia Bay averages between 500 and 600 tankers annually. Canship Uglund Ltd. (St. John's) operates three 120,000-dead-weight-tonnage shuttle tankers between the Hibernia, Terra Nova and White Rose oil fields and the Newfoundland Transshipment Ltd. (St. John's) terminal. Capt. Reg Mullett was a master on the shuttle tankers for four years before becoming the company's senior safety officer last year.

"When we're proceeding to pick up a pilot and we know exactly what the wind and sea conditions are at the pilot station in real time, that's fantastic," he explained.

He also uses SmartBay to decide whether or not to bring the ship into the bay.

Knowing the weather window that will allow a departure from the dock is also key. Mullett recalls that in 2007, a two-hour weather window indicated by SmartBay enabled the company to make a Hibernia crew change just before Christmas.

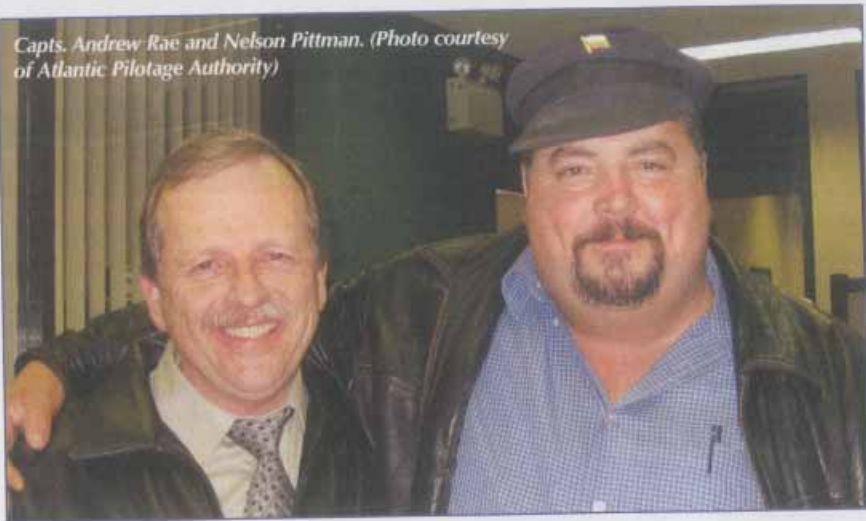
To access the SmartBay information at sea, the shuttle tankers are Internet-enabled.

"If I was looking at a nasty forecast, I'd check it before we left, en route and certainly before entering the bay," he said.

Just as with the pilots, the ability to accurately assess boarding conditions at the PBS helps save double pilotage and tug fees. For a shuttle tanker, the round-trip pilotage cost is \$19,000 and the tug escort cost is \$45,000.

In addition, Mullett estimates that not having to go back out into open water saves 15 tons of bunker fuel at \$600 per ton, a total of \$9,000, which used to happen once or twice a year. He estimated there were two to three anchorages a year when the shuttle tankers could not dock due to weather conditions and added that there was the potential to damage the dock or break mooring lines.

Capt. Andrew Rae and Nelson Pittman. (Photo courtesy of Atlantic Pilotage Authority)



Mullett also emphasized the safety benefits of SmartBay over efficiency.

"Considering the close proximity to one of the most pristine land masses in North America, including bird sanctuaries, and the master's own connection to the island, you certainly want to have all the information you possibly can, because you certainly don't want to be part of any major incident."

He points out that in the northern waters off Scotland and the English Channel there have been a number of incidents involving ships and tankers grounding and colliding, and so far, in 30 years, there has not been a major incident in Placentia Bay. Mullett attributes this to integrated management, which includes the pilots' local knowledge; the information and services provided by the Canadian Coast Guard's Vessel Traffic Centre and the shipping agent, Canadian Maritime Agency Ltd. (Come By Chance, Canada); terminal cooperation; and SmartBay.

Other Uses of SmartBay

In its continuous very-high-frequency broadcast to mariners, which is updated hourly, the Canadian Coast Guard's Vessel Traffic Centre broadcasts information from the SmartBay buoy at the mouth of the bay.

"From our perspective," said Ray Brown, regional director of maritime services for the Canadian Coast Guard, "SmartBay provides information to the marine community to allow them to make better decisions and better choices about how they would perform operations on a daily basis. When you're able to do that, it makes your job more efficient, but it also adds some safety value to your operations."

There are approximately 500 fishing enterprises in and through Placentia Bay. Earl Johnson of North Harbour, Canada, 59, has been fishing in the bay for cod and lobster since he was a boy. He checks the SmartBay Web site at night looking for the next day's predicted wave height and wind speed and direction.

"I like to have less than 20 knots to handle my crab gear, or 10 to 15 knots if the wind is from the southwest," he said. "And if the wave height is three to four meters, I won't go."

He also drives 80 miles to St. Lawrence, Canada, and steams 30 miles offshore to fish for crab.

"If it's calm in the morning and there's a seven to eight-hour weather window, I'll go and get my work done."

He noted that the previous week, SmartBay had predicted the weather would pick up at 2:00 p.m., and that's just when the wind started blowing hard.

Johnson said the weather forecast has gotten more accurate over the past couple of years.

"We check our forecasts to see how well we did based on current conditions," explained Stephen Green, AMEC's marine and weather services development lead. "That's when the buoy data becomes absolutely critical. Our accuracy has increased, thanks to being able to use SmartBay to test what we've developed."

In light of SmartBay's success, the Marine Institute is looking for a way to make the project self-sustaining.

"In all ocean observing systems, the holy grail is operational sustainability," said Bill Carter, SmartBay project manager and manager of ocean observation

for the School of Ocean Technology, Marine Institute. "In the case of Placentia Bay, approximately \$8 million in fees is paid annually by users of the bay. It would appear logical that a small percentage of those fees be dedicated to SmartBay, given the role it plays in marine safety and efficiency. Although the Marine Institute is committed to this, we do need to define that model."

The Placentia Bay Integrated Management Committee uses SmartBay to navigate in a different way—through discussions.

Fishermen, oil companies, industrial developers, regional development boards, aquaculture interests, educational institutions, and the municipal, provincial and federal governments meet four times a year to address common issues.

"SmartBay adds an element of accuracy to the information that's discussed," reported committee chairman Calvin Manning. "I've sat around tables over the past 25 years, and a lot of the discussion has been: What are the facts? With SmartBay, we know the facts, so time is not wasted."

One proponent of SmartBay who doesn't own or operate a vessel is Bill Hogan, the mayor of Placentia. He's concerned a major incident could occur. Having worked for 47 years in the occupational health and safety field, Hogan is calling for a safety management plan for Placentia Bay.

"I would think one of the strong foundations on which this could be built would be SmartBay," he said. "It's a very integral part of the use of the bay."

He suggests that the mandatory use of SmartBay could be a component of the safety management plan. ■

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A freelance writer and communications consultant, Andrew Safer specializes in the business perspective on the application of new technologies. He has contributed the following articles to Sea Technology: "Canada's Multibeam Platform: Advantages and Applications," "Spatial Visualization of the Marine Environment" and "MEPS: A Prototype for the Study of Coastal Dynamics."