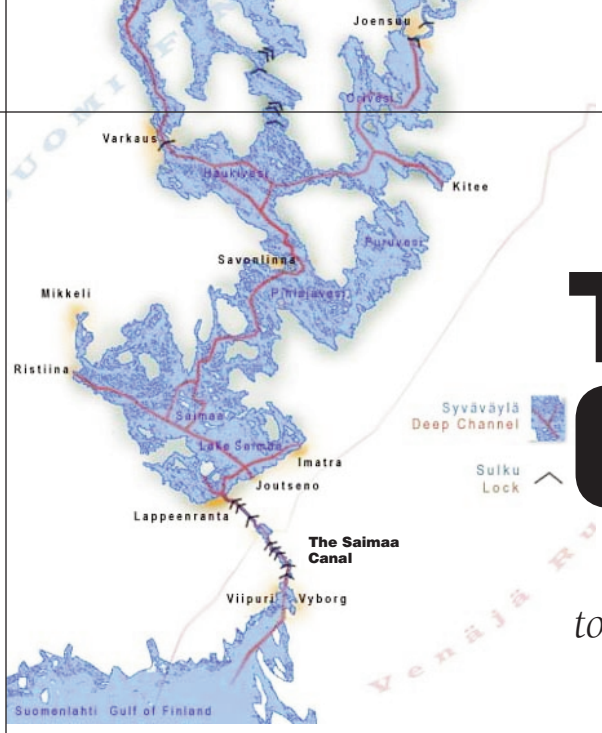


The Finnish CONNECTION

A Great Lakes maritime research tour to the Baltic Sea finds many shared interests

The Great Lakes and the Baltic Sea have a strong – and multi-dimensional - maritime kinship.Both water bodies represent vital marine trade routes that helped define their respective regional economies and cultures. Both play strategic geopolitical roles on their respective continents. The two share many physical similarities such as relative size, climate, hydrography and topography. And both share a number of pressing environmental issues including ballast-borne invasive species, the threat of toxic spills, non-point source pollution and nutrient loading.

Even the salinity difference is not as pronounced as many might think; while the Baltic is technically "brackish," its salinity is much lower than ocean water and in some reaches with heavy tributary inflow the water is almost as fresh as the Lakes.

Thus it was only natural that when two maritime researchers met in 2007, one from the Baltic nation of Finland and the other from the Great Lakes, they found much to talk about. It was a conversation that has since led to a growing number of collaborative efforts, including a recent week-long tour of Finnish maritime facilities by a Great Lakes delegation.

"This is a partnership we have developed and hope to continue to develop, involving student, professor and researcher exchange programs, and joint research programs," said Prof. Richard Stewart, co-director of the Great Lakes Maritime Research Institute (GLMRI) at the Universities of Wisconsin-Superior and Minnesota-Duluth.

Stewart and Prof. Jorma Rytkönen, research director of maritime and port operations for the Kymenlaakson University of Applied Sciences in Kotka, Finland, initially began sharing information in June of 2007 on project work Rytkönen has done involving vessel tracking and automated identification system (AIS) technology. The dialogue brought Rytkönen to the U.S. twice over the past year for presentations to the GLMRI Advisory Board, and at the 2008 Marine Community Day conference in Cleveland, and eventually led to the concept of an organized visit to Finland. Reciprocally, Steward has travelled to Finland twice, including the Great Lakes tour, when he took the opportunity to make a presentation to Kymenlaakson maritime students and professors on U.S. maritime education and research, and the state of Great Lakes shipping.

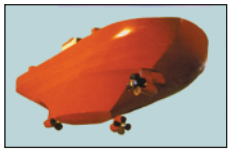
The Great Lakes delegation to Finland included (from left) Stacey Carlson, Research Assistant, and Richard Stewart, Co-Director of the Great Lakes Maritime Research Institute; James Frost, Senior Consultant with Halifax-based CPCS Transcom; Adolf Ojard, Executive Director of the Duluth Seaway Port Authority; Craig Middlebrook, Deputy Administrator of the Saint Lawrence Seaway Development Corporation; and Dave Knight, Special Projects Manager for the Great Lakes Commission.

Vessel tracking/AIS was just one of the interest areas explored during the "Tour of Finland's Maritime Community" sponsored by GLMRI, the VTT Technical Research Centre of Finland and Kymenlaakson University.

Over a five-day period, the six-member Great Lakes delegation travelled from its base in Helsinki east to the Finnish ports of Vuosaari and Kotka, and to the Saimaa Canal near the Russian border; west to the port of Turku; and south across the Baltic to the Estonian port of Tallinn. In addition to vessel tracking, other topics explored included container feeder lines; icebreaking design and technology; ballast water management; port design and operations; canal and lock operations; and shipbuilding.

Maritime traffic in the Baltic can involve the movements of some 2,000 ships at any given moment, many in concentrated choke points and heavily travelled shipping lanes. The Finnish Maritime Administration – responsible for some 10,000 miles of navigation channels - thus implemented in 2004 a sophisticated new Vessel Traffic Ser-

Below top: The novel "oblique hull" design by AKER Arctic uses azimuthing thrusters to break ice going sideways. Below bottom: Azipod thrusters used in Finnish icebreaker design.



What's creating the most buzz in icebreaking technology today? According to Wilkman, azipod thrusters and vessels that break ice most effectively going backwards, or even sideways.

vice (VTS) Center and Gulf of Finland Reporting System (GOFREP) not unlike the AIS technology currently used in the Great Lakes/Seaway system.

While the Great Lakes do not have the same volume of traffic, Lakes mariners face many of the same navigational hazards - ice, shoaling, inclement weather and restricted channels – for which tracking systems like VTS and GOFREP can reduce risk, and enhance environmental safeguards.

"Initially our tracking system was based solely on improving maritime safety," said Olli Holm, VTS manager at the Finnish Maritime Administration. "But we have seen increasing emphasis on environmental protection, as well."

Ship traffic on the Baltic has grown explosively over the past three years – by some 64 percent - driven primarily by increased oil shipments from the Gulf of Finland. A total of 3,628 outbound oil-laden tankers were recorded in 2007, up from 1,436 in 2003. But, thanks to new tools like the VTS, GOFREP and a Baltic-wide AIS developed in 2005 by the Helsinki Commission (HELCOM), oil spills from accidents and illicit vessel discharges have steadily gone down.

HELCOM, formally the Baltic Marine Environment Protection Commission, is comprised of the nine countries surrounding the Baltic Sea, plus the European Community. According to data from HELCOM member states, 236 oil spills were detected in 2006 during 5,128 hours of surveillance flights over the Baltic, the second lowest total since 1999 when 488 discharges were recorded from 4,883 hours of aerial surveillance.

Monika Stankiewicz, manager of HELCOM's maritime office, attributed much of the credit for the improvement to the new AIS capability, saying, "The comparison of the time before we had AIS to today is like the difference between the Middle Ages and the modern world. Ships used to think they could go anywhere with impunity but that is no longer the case."

There has been interest among some Great Lakes states in the use of AIS technology for monitoring ballast operations on the Lakes for better control of ballast-borne invasive species, but this application is not yet a priority for HELCOM.

"We do not have requirements for ballast discharge reporting in place for the Baltic," said Stankiewicz, "We cannot make such requirements without IMO (International Maritime Organization) involvement, and if they are not globally enforced."

HELCOM's ballast policy is closely aligned with the IMO's Ballast Water Management Convention, which the nine HELCOM states have agreed to ratify by 2010, or 2013 at the latest. HELCOM is also joining an initiative developed by the OSPAR Commission, a 15-country European coalition for environmental protection of the northeast Atlantic, under which all vessels transiting the Atlantic or coming from the coast of West Africa voluntarily carry out an open ocean ballast exchange before entering northeast Atlantic waters or the Baltic Sea.

While touring the greater port of Helsinki, the Great Lakes delegation saw some familiar sights, such as towering piles of coal aside a electrical generating plant, and some decidedly unfamiliar ones like stacks of containers, multiple cruise and ferry terminals, and an entire fleet of icebreakers, each of which would dwarf the marquee icebreaking vessel on the Lakes, the U.S. Coast Guard's Mackinaw.

Finland's proficiency in icebreaking is broad and pride-filled, as befits a maritime country located entirely above the 60th parallel. Nowhere is that proficiency more evident than at the AKER Arctic Research Center in a newly developed port complex in the eastern Helsinki suburb of Vuosaari. Under the AKER corporate umbrella since only 2005, the Center's roots go back over half a century to 1954 when it was part of the storied Finnish firm Wärtsilä and delivered its first icebreaker, VOIMA.

The Center has since been involved in arctic navigation projects for over 100 clients in 20 countries. It has run over 400 hull test series and designed 60 percent of all the world's icebreakers, including the U.S. icebreaker/oil tanker Manhattan, the first commercial ship to transit the Northwest Passage in 1969. It was also involved with the Great Lakes Winter Navigation Demonstration Program in the 1970s, which its current sales and marketing manager Göran Wilkman recalls working on personally.

AKER was consulted on the recent design and construction of the USCG's Great Lakes icebreaker Mackinaw commissioned in 2006. Said Wilkman of that project, "It was a real challenge because the Coast Guard wanted to include so many functionalities in the beginning, and then kept adding more."

AKER Arctic's view of the world is perfectly captured by the wall-sized map in its conference room: it depicts the globe looking straight down from the North Pole. It is indicative of the burgeoning international interest in arctic resources that in only its third year, the AKER-sponsored Arctic Passion Seminar in March attracted some 1,800 participants.

The centerpiece of its new laboratory facility at Vuosaari is a 229-foot long, 24-foot wide, 6.4-foot deep model ice testing basin, the only such privately-owned facility in

the world, which is capable of testing scale model hulls, propulsion units and other arctic maritime structures in realistic ice conditions. Researchers can monitor performance from above the ice, and from below using windows beneath the tank.

What's creating the most buzz in icebreaking technology today? According to Wilkman, azipod thrusters and vessels that break ice most effectively going backwards, or even sideways. Using azimuthing propulsion, AKER's novel "oblique icebreaker" design uses a ship's entire length to break ice, allowing a relatively narrow vessel to open a wide track for larger, wider ships.

From the AKER ice lab, to the container cranes and ro-ro ramps, to the access highway tunneled under a forested ridge line to preserve wildlife habitat, and even a golf course, everything about the port of Vuosaari is new. It was conceived in the early 1990s to relocate cargo operations from the congested and ever-more-gentrified center city port of Helsinki. Construction on a 620-acre greenfield site started in 2003 and the port was scheduled to open for business in November.

When the Great Lakes delegation visited in September, container cranes were still being floated in by barge from the Netherlands, and an empty ro-ro ship was practicing its docking maneuvers.

The project represents an investment of €660 million in infrastructure alone, and is a model 21st century port in every respect. Serving Finnish trade exclusively, the facility is designed to handle up to 12 million metric tons a year, including 450,000 teu's worth of containers, 65 percent by ro-ro vessel, and 35 percent by container ships. The import/export balance will be nearly even, with consumer goods inbound and forest products and steel outbound, most moving to Germany.

The "double-acting" icebreaker Mastera breaks ice while going backward.

"All of our traffic will be from short sea shipping," said Kari Noroviita, Director of the Vuosaari Harbour Centre. "All will be scheduled liner services and feeder lines, with average vessels in the 900-teu range, transporting containers from the major container ports of Rotterdam and Bremerhaven. We will not have much direct overseas traffic. But we have integrated the Container Security Initiative (CSI) developed by the U.S. Bureau of Customs and Border Protection so we can handle any containers bound for the U.S. and perhaps even the Great Lakes."

The list of Vuosaari's designed-in green features would be the envy of many an environmental engineer: noise berms, catch basins for leaking containers, radiation control systems, closable storm water drains, and the afore-mentioned highway and rail tunnels deliberately designed to preserve native woodlands. Even the golf course clubhouse has a green roof of living vegetation.

Asked whether a "cold ironing" capability was considered (for ships to use shore-based power while berthed allowing them to turn off diesel generators for cargo handling equipment), Norovita said the port's designed cargo handling efficiency of up to 35 container lifts an hour, made turnaround times so short that cold ironing was deemed unnecessary.

At Vuosaari, later at the port of Kotka, and finally at the ports of Turko and Tallinn, the Great Lakes group saw a recurring pattern: ports with largely diversified and high-value cargo profiles, served by carriers with well-maintained, up-to-date fleets and equipment, linked together as an efficient, short sea, maritime transportation network supported by healthy public and private investment in technology and infrastructure.

In other words, something to which Great Lakes/Seaway interests have long aspired and from which they can take encouragement, having now seen it work so well in the Baltic setting.

For her part, the Helsinki Commission's Monika Stankiewicz was direct in her assessment of what drives such an effective system, and it is not a complicated formula.

"In the Baltic," she said, "Transportation means prosperity."

David L. Knight ■

Linking lakes to the sea, Scandinavian-style

A man-made shipping route running through two countries, utilizing a series of locks, linking a vast inland lake system to the ocean, and open about nine and a half months a year. Sound familiar? It could be the Great Lakes/St. Lawrence Seaway system…or the Saimaa Canal.

Though smaller in scale, the Saimaa shares many characteristics of the Great Lakes/Seaway system, and thus was of keen interest to the Great Lakes delegation on its recent tour of Finland.

The modern Saimaa Canal was completed in 1968 to connect the Lake Saimaa inland waterway system to the Gulf of Finland and the Baltic Sea. It replaced an earlier, smaller version built in the mid-1800s. While the engineering challenge of the new canal was formidable – 26.6 miles of 13.7-foot draft channel with eight locks lifting vessels almost 250 feet above sea level – the political accomplishment represented by the Saimaa seems almost more amazing.

Its construction was made possible by an treaty struck between Finland and the then Soviet Union in 1963, during one of the frostiest eras of the Cold War. Under the agreement, Finland signed a 50-year lease for all sections of the canal in Russian territory, including the main entry to the Gulf of Finland at Vyborg, Russia, and five of the eight locks. Finland controls and operates the entire system.

"Negotiations are currently underway to renew the lease with Russia, which expires in ten years," said Kari Jämsen, supervisor of the Saimaa vessel traffic control (VTS) center. "We think there will be little difficulty in reaching a new agreement."

The total Saimaa Canal/Lake Saimaa system includes 504 miles of deep channels with 13.7 foot draft, 967 miles of main channels with 7.8 foot draft or more, and 745 miles of branch channels at 7.8 feet or less. Maximum vessel size for the locks is 270 feet in length, 41-foot beam and 14.2 feet draft. The canal serves five main Finnish ports, with bulk carriers (mostly Russian) hauling forest products, pulp and paper and raw iron and steel in and outbound. It closes for winter from the end of January to April, for an average 211-day navigation season.

The Saimaa Canal has truly lived up to its expectations; traffic projections made before work began in the 1960s estimated annual volumes ranging from 700,000 to 1.2 million metric tons. In recent years, canal tonnage has averaged 1.5 million tons and in 1990 a record volume of 1.83 million tons was set.

Most impressive to the Great Lakes delegation, however, was the technology used by the Finnish Maritime Administration to operate the canal. It is all done remotely from the Saimaa VTS center in Lappeenranta, with operators monitoring and controlling each vessel transit using video cameras, remote censors and AIS. Vessel crews are responsible for securing their ships in the lock chambers, so the eight locks and seven lift bridges on the canal are all virtually unmanned. Thus a vessel's seven-hour trip from the sea to the Lake Saimaa is entirely under the control of one lockmaster sitting at an array of screens, monitors, joysticks and toggles.