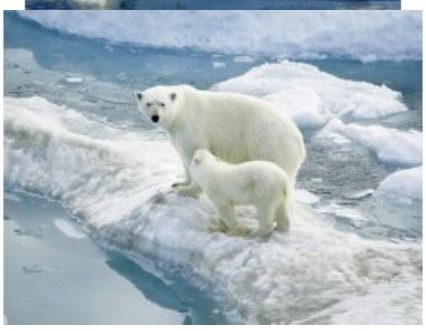
FORWARD-LOOKING SONAR AND POLAR NAVIGATION BY CRUISE SHIPS

The Pull of the Poles



The 2015 April issue of *Hydro International* considered the contribution of Forward-looking Sonar (FLS) to safer navigation in inadequately charted waters. Certain polar waters fall in this category; in recognition, some expedition cruise vessels have FLS. The extent of FLS provision in the current expedition fleet will be examined in this article as well as the trend for larger traditional cruise ships to extend their itineraries into higher latitudes. Two groundings in Arctic waters are also analysed. The implementation of the Polar Code will do nothing to prevent similar accidents.

Lindblad Explorer (73m), a purpose-built expedition vessel, took 104 passengers to Antarctica in 1970 initiating sea-based tourism in that region. Changes in climate patterns and sea-ice cover have since made it possible for cruise ships to visit previously quite inaccessible Arctic destinations such as the Northwest Passage (NWP) and the Northern Sea Route (NSR). The need for better charting of these areas is recognised; but the magnitude of the task challenges available surveying capacity. Degraded performance of navigation systems in high latitudes compounds this situation. FLS can reduce the resulting risks.

Growth of Polar Cruising Tourism

Lindblad Explorer was the prototype for much of the present expedition fleet of some 35 vessels, each carrying 50 to 250 passengers (an example is the *Ocean Nova*, Figure 1). Antarctica now has a well-established and well-regulated pattern of expedition cruising, with some 40,000 passengers visiting the region annually. Landing is not permitted from ships carrying more than 200 passengers.

There are no formal landing restrictions in the Arctic, which now attracts 70,000 cruise ship visitors each year, a fifth on expedition vessels. Svalbard and Greenland being the most popular destinations. Cruise ship tourism now represents a significant proportion of the reported vessel activity in the Arctic. In 2012, *The World* (196m) transited the NWP and in 2016, *Crystal Serenity* (250m), with an ice breaking capable escort, will make a similar voyage.

Larger traditional cruise ships, each with 500 to 3,000 passengers regularly visit both Arctic and Antarctic waters. Although ageing converted expedition vessels are being, or will be, replaced during the current decade by purpose-built vessels carrying 200 to 300 passengers, no significant increase in the total number of voyages is currently anticipated.

Status of Nautical Charting in Polar Waters

Destinations in the High Arctic Canadian territories and routes through the NWP invite ever more adventurous cruising. Given that ice retreat here is less predictable year on year both the survey task and voyage planning are much more challenging. Resources currently available to improve navigation in the region are limited. Charting efforts in Canada are now being focused on providing safe corridors. Some inshore areas and fjords on the west coast of Greenland are also being surveyed by Denmark for the benefit of cruise ships. The office of US Coast Survey, concerned about the rise in vessel traffic in the Arctic and the inadequacy of the charts, is increasing its survey efforts off Alaska (Figure 2**).**

The anticipated measures to improve hydrographic surveying and charting in Antarctica recommended in 2008 and again at the 2014 Antarctic Treaty Consultative Meetings have yet to be successfully implemented. One exception was the French Hydrographer's mobilisation of MBES in the expedition yacht *Xplore* for surveys of anchorages and safe havens. This use of the vessel is being extended

to the Arctic. The arrival of ever larger cruise ships in the region (Figure 3), is a concern. This has in part led to calls for vessel routing and limiting access to unsurveyed or inadequately charted areas.

Initiatives to develop and systemise the collection and dissemination of Crowd Sourced Bathymetry (CSB) in critical polar waters are gaining momentum. However, prudent cruise operators are advocating the complementary use of FLS. Despite the increased survey efforts indicated above, these self-help measures will remain necessary for the foreseeable future.

Hazards of Polar Cruising

Expedition polar cruising has not been without incident. Following her 1970 pioneering cruise, the *Lindblad Explorer* experienced serious groundings in Antarctica in 1972 and 1979. She eventually sank in the Bransfield Strait in 2007, while attempting to force her way through thick ice. Other less spectacular but equally disturbing incidents have been recorded in both Antarctica and the Arctic, the latter may have led to the fitting of FLS in some ships from 2006 onwards. Even so, since that time at least two Expedition ships fitted with FLS have still run aground. *Clipper Adventurer* (101m) was severely damaged in the Canadian Arctic in 2010 and *Le Soléal* (142m) suffered minor damage in eastern Siberian waters in 2013.

The most likely causes of major damage to ships in polar waters stem from encountering severe ice conditions or submerged rocks. These factors might fatally combine when vessels are forced to depart from a charted corridor or previously determined safe track. The danger is increased by the degradation in performance of satellite (GNSS) navigation and communication systems in higher latitudes. This has potentially adverse consequences when attempting to follow a previously sounded track.

However, the successful completion of several hundred polar cruises each year suggests that the associated risks are generally being managed. A number of cruise operators have also recognised that they can be mitigated by FLS in combination with prudent navigation and access to CSB. At the same time, bridge teams remain at risk by providing their passengers with a unique polar experience by venturing too close inshore or into poorly charted areas. Such ventures cannot be justified without the wider adoption of FLS. The investigation report into the grounding of *Le Soléal* commented: *Le Soléal* operated for cruises, which led her to take unusual routes and passages as expected by the passengers, sailing as close as possible to coasts.

Analysis of Groundings

At the time of her grounding the FLS on the *Clipper Adventurer* was defective. The carriage of forward-looking sonar is not mandatory by Canadian Regulations, nor was it a recommended requirement in the IMO Guidelines for Ships Operating in Polar Waters. However, accident investigators commented that: “The unserviceable condition of the forward-looking sonar deprived the bridge team of an additional source of valuable information. Forward-looking sonars are designed to provide safety critical information regarding underwater obstructions ahead of ships and provide automatic navigation alerts to bridge teams”.

An enquiry into the *Le Soléal* grounding revealed that although her FLS was operational at the time it was not being actively monitored. Because the use of FLS is not an IMO recommendation the investigation made no comment about its use, other than that the sonar had a range of 300m. In fact, the system as installed had range options of 330m and 440m. Had the longer range been in use and the sonar properly monitored, the grounding might have been avoided. *Le Soléal’*s operators are now upgrading the sonar software in their ships to provide a range of 500m.

Forward-looking Sonar

The Polar Code enjoins masters to take account of any limitations in the hydrographic data when considering a route through polar waters, but overlooks the potential of FLS. Regardless of this, FLS is installed in several expedition vessels, where it is used mainly when exploring a new anchorage or closing the shore for photo opportunities. The master of *Ocean Nova* makes extensive use of FLS when anchoring and repeating earlier tracks in unsurveyed waters. Significantly, the benefits of FLS are being cited in the advertising literature of some expedition cruise operators.

The short-range systems that now predominate require constant monitoring and are unsuitable for use at normal passage speeds. However, longer range sonars are starting to be specified, and these are certainly needed in larger vessels. Significantly, *The World* had sonar with 930m range for her NWP transit and *Crystal Serenity* will also reportedly have FLS. Unfortunately, as mandating the installation of FLS would require an amendment to the Polar Code and an addition to the SOLAS carriage requirements, provision will remain voluntary for the foreseeable future.

Conclusions

An increase in cruise tourism is likely following the improved access to Arctic waters with all their scenic and wildlife attractions (Figure 4). This may encourage some cruise ship companies to let their ships venture farther north, while also extending their cruising itineraries into Antarctic waters to fully exploit the rising demand for polar voyaging.

Given the unsatisfactory state of nautical charting in many polar cruise destinations these trends give cause for concern, with a grounding being the most likely major marine incident. The provisions of the Polar Code may mitigate the consequences of such an incident, but will not prevent one. Some of its provisions will not apply immediately to vessels currently in service. There is therefore a compelling argument for the installation of FLS in all expedition cruise vessels and for restrictions to be placed on the routing of traditional cruise ships unless also fitted with appropriate sonar.

Any prudent mariner will be aware that the ‘nearest land is usually underneath the keel’. A view that the informed use of FLS can only serve to reinforce.

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More Information

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