

# Marine Surveillance

Safety, Security, and the Ice-Class Revolution



# Introduction

The global economy could not function without the shipping industry. It is a bold statement, but one hard to argue with when you consider that 90% of world trade is carried by sea.

The single biggest cargo is crude oil, which accounts for approximately a quarter of all products transported at sea. Equally important to our global trade infrastructure is container shipping – a fact reflected by continued investment in new vessels. In 2014, the CSCL Globe became the world's largest container ship, capable of carrying 19,100 twenty-foot shipping containers.

The protection of vessels, cargo, and crew is an international priority, and the reason why industry experts predict that the maritime security industry will be worth around \$20 billion by 2019. Wider adoption of surveillance technology will play a key part in this security-focused growth.

Yet when it comes to shipping surveillance, 'security' is only part of the equation. Increasingly, surveillance technologies are also being specified based on 'safety' benefits. This trend is heavily influenced by growing industry interest in new shipping routes. Most notably, Arctic marine transportation networks.

This white paper explores this trend of surveillance for safety and security in more detail and highlights the vital role that surveillance cameras and management solutions can and will play in marine safety, navigation, and security, with the market poised for an ice-class revolution.



# Why Northern Shipping Routes Are Changing the Way Operators Use Their Surveillance Solutions

## Mitigating Risk at Sea – New Challenges

The mitigation of risks to crew, vessels, and cargo, as well as to the environment, is an international priority.

In 2014, the International Maritime Organization (IMO) adopted the safety provisions of the Polar Code and SOLAS amendments rose to prominence. As did the 'connected ship' concept, which saw a call to action for operators to utilize technology to improve all aspects of shipping safety. These are all clear indications that the industry is striving for safer, more secure operations.

The Polar Code is particularly relevant as it reflects international recognition that Arctic routes, once virtually impassable, are now predicted to be a key feature of the shipping industry in coming years.

The Arctic Ocean passage that has opened up north of Russia enables ships to travel from Asia to European destinations up to two weeks faster than traditional routes. Faster deliveries plus reduced time at sea, and therefore lower fuel consumption, will clearly appeal to global operators.

In fact, figures from the IMO suggest that traffic using Northern Sea Routes has already increased ten-fold in recent history. A 30-fold increase for shipping in the Arctic is predicted by 2020 with the Arctic Institute highlighting that by this time, 15% of China's trade value could pass through the Arctic.

While the shipping industry is no stranger to operating in dangerous conditions, these emerging routes present very specific dangers in terms

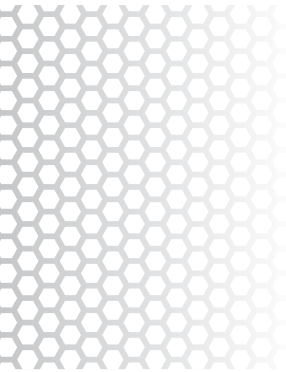
of floating ice, storms, near-zero visibility, and sheer remoteness for emergency support.

The challenges are such that insurers such as Allianz and Marsh have been keen to stress the need for heightened awareness of safety precautions. Marcus Baker, the Chairman of Marsh's Global Marine Practice, has talked specifically of the threat cold and ice damage poses to vessel engines and has raised concerns over the efficacy (and reliability) of GPS in such remote locations.

The good news is that marine surveillance technology, particularly when integrated with other essential ship or port systems, has evolved to address many of these challenges.



## Surveillance and Navigational Safety



Camera capabilities for this sector have improved dramatically in recent years.

Specially designed to withstand salt corrosion, operate at extreme temperatures (high or low), counter the impact of vessel motion, and capture high-definition imaging night or day, all in the face of fog, storm conditions, or solar glare, today's marine-ready cameras ensure visual data is 'always on.'

For those voyaging through northerly routes, thermal imaging cameras are particularly important. In addition to providing imaging in complete darkness, they enable crew to detect floating ice hazards and assess surface ice thickness (a crucial resource for ice-breaker vessels).

Combining this visual data into an integrated surveillance command and control platform can assist with safer navigational practices at sea. A solution that unifies on-board systems - radar, visual, audio, communications, and positioning data - provides a complete situational overview that enables much safer routes to be plotted.

When rapid support and emergency response crews are simply not feasible due to sheer remoteness, navigational benefits become hugely important. It's one of the reasons why marine operators need to be clear what to look out for in the camera stations they specify.

## Port Navigation

Integrating high-quality visual feeds with ship systems for improved at-sea navigation is not the only benefit modern surveillance systems can offer – safer navigation in and out of port is also possible. Increasingly, major operators are training their crews to use surveillance camera technology to mitigate potential vessel damage during port entry and exit.

As technology evolves, it is highly likely that we will also see greater connectivity between port and ship solutions, with system integration enabling port authorities and vessel operators to work more collaboratively together to improve the security of ships and cargo, and realize operational efficiencies.

Through increased integration with systems such as AIS, on-board crew and port authorities can improve safety procedures on and around arriving / departing vessels at the port. In addition, port operators can maximize berthings and improve profitability through increased automated workflows and vessel tracking. Berthings can be scheduled for shorter timeslots and collaboration with the unloading / loading cargo systems will assist with smoother transitions through the port.

## Camera Station Check List



### ✓ TEMPERATURE RANGE

For marine surveillance applications, particularly for northern/Arctic routes, it is crucial that cameras are fully operational at a wide range of temperatures, from as low as -55°C to +70°C. For low-temperature applications, ask your supplier about operational start-up. Though cameras may function at a low temperature, powering up in extreme cold can cause issues so look out for pre-heat modes that mitigate complications.



### ✓ NATIVE IP H.264 ENCODING

Saving space, time, and facilitating greater levels of system integration, native HD IP encoding streams high-quality footage directly from the camera station. However, always ensure that any features like this are certified to operate at extreme temperatures.



### CERTIFICATIONS

- It is important that camera stations are certified to recognized and reliable international standards. A key certification is DNV Type Approval\*, which subjects marine surveillance equipment to rigorous testing for performance, vibration, humidity, and EMC. Vibration testing is of particular importance for equipment operating on vessels, particularly ice-class vessels where vibration experienced is higher than on vessels that navigate more standard routes. Ratings, such as IP66 and IP67, are also important for these applications, which relate to a camera station's ability to withstand both dust and water ingress.



### ESSENTIAL FEATURES

- Camera stations should be manufactured from 316L stainless steel for maximum corrosion resistance; sea conditions can accelerate wear and tear so high-quality material ensures longevity of operation. Manually maintaining camera clarity is very demanding, so wipers and wash systems are another essential feature that can make a big difference.

\*Standards for Certification No 2.4 Environmental test specification for instrumentation and automation equipment.

## Crew Safety

Life at sea is dangerous and while experienced crews will be trained accordingly, it will take time to adapt to the operational and logistical challenges that will be presented when operating in newer Arctic routes. On-board duties and activities become even more challenging when dealing with temperatures as low as -55°C, poor visibility and ice-hazard threats. With the added pressure of limited accessibility for any kind of emergency response (from external agencies), maintaining on-board situational awareness to protect crew and respond quickly to escalating situations is crucial.

### Man Down / Man Overboard

On-ship situational awareness is easily achieved with modern surveillance solutions. For example, the James Clark Ross research ship uses its surveillance command and control platform to provide the bridge with real-time audio and visual information regarding the positions and activities of the deck crew, science team and testing equipment, while simultaneously detecting ice hazards to guarantee safe navigation – preventing collisions or jolts that may endanger ship and crew.

It is also possible to integrate 'man-down' detection. Body worn monitors can be

programmed to recognize and alert the bridge via the surveillance system, when a crew member is no longer vertical and not moving. The system can also be set up to ensure that in this scenario, the feed from the nearest camera station is prioritized for viewing to verify crew safety and status, and determine necessary action.

Similarly, in a 'man-overboard' situation, the system can be programmed to prioritize feeds from thermal cameras (or automatically switch multi-mode cameras to thermal settings) to aid casualty location and retrieval from the water. Integration with ship radio systems ensures that crew members monitoring visual data can guide the rescue personnel accordingly.

### Safety Efficiencies

Integrating ship systems via a surveillance command and control platform also has efficiency benefits that can impact on crew safety. Operations, such as cargo loading and unloading, can be monitored from inside the ship via camera stations, which enables the number of personnel required on the dock supervising in extreme weather conditions to be reduced.

### Protection from Cargo / Operational Malfunctions

Threats are not always purely linked to shipping conditions. Often – particularly in oil and gas transportation – it is the cargo itself that presents a risk to crew. Should a fire or gas leak occur on a vessel traveling an Arctic route, help is not close at hand.

Heightened situational awareness to constantly monitor operational areas and alert teams to anomalies becomes vitally important.

Integrating emergency and security systems into a single monitoring and control environment allows crews to be immediately alerted to a range of different threat scenarios, including fluctuations in temperature, humidity, gas levels, or water ingress, all accompanied by real-time visual data to verify risk. Hazardous-area camera stations are typically used in high-risk locations to help mitigate this risk through constant surveillance such as in the engine or boiler room.

In a scenario where the temperature of the engine rises beyond set parameters, for example, the system can be programmed to alert dedicated safety personnel, trigger area evacuation procedures, and lock down affected areas.



## Monitoring Environmental Impact

Growing emphasis on Arctic routes and the increasing interest in utilizing them, has also given rise to environmental concerns, particularly in relation to the transportation of fuels or potentially hazardous materials.

An oil spill in Arctic waters would have a significant impact on a highly unique ecosystem. Clean-up operations would be extremely difficult due to the location and conditions so early detection of a spill to minimize the negative environmental outcomes is essential.

Integrated emergency and security systems, as outlined earlier, can provide a valuable detection mechanism. Through integration with radar and use of thermal imaging camera stations, a spill can be identified and tracked to gather a complete situational overview and provide vital information to assisting authorities.

It is also worth noting here that many vessels have already adopted surveillance technologies as part of their proactive operations in waters of ecological sensitivity. For example, usage of thermal imaging to detect and avoid wildlife – such as whales or seals – is not uncommon.

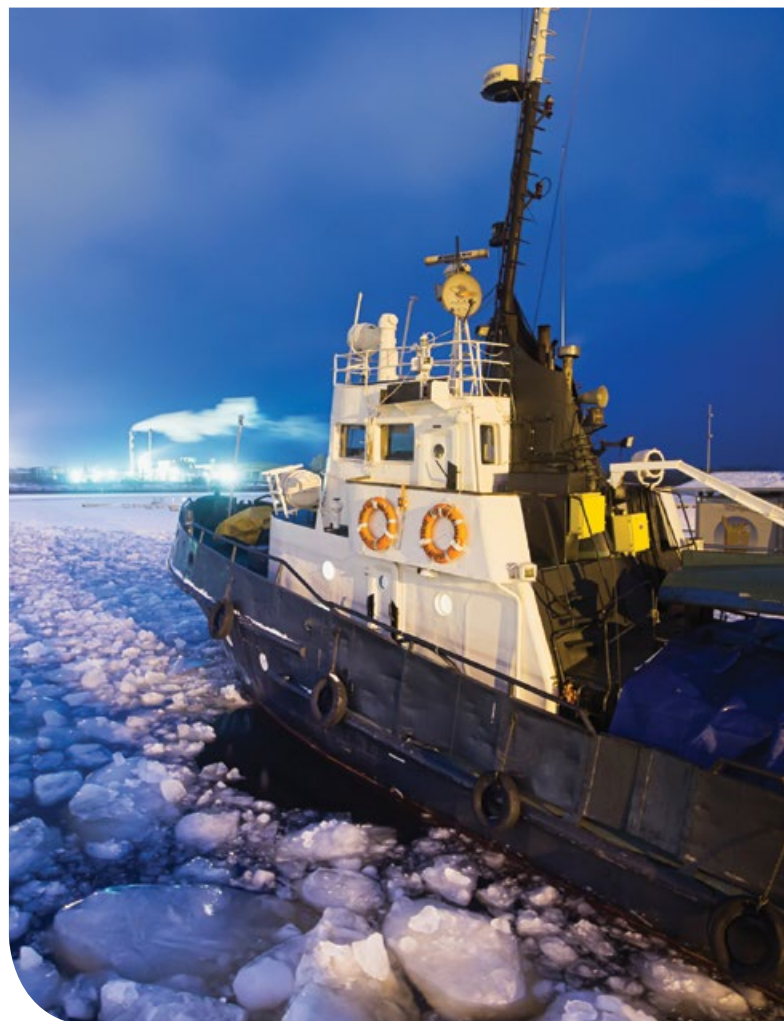
## Technology Today

The extent to which new Arctic routes will be used is yet to unfold but early indications are that a distinct market will evolve. Factor in the northerly shipping routes already in operation and it is clear that ice-class vessel safety is rapidly going to evolve as a major sector focus.

Technology solutions are already available today that can help protect ships, crews, and the environment in which they operate. From state-of-the-art safe and hazardous area camera stations, developed specifically for extreme and marine environments, to cutting-edge software platforms that unify ship subsystems for greater operational control, there are many options available to the industry.

For future consideration is the potential development of oil and gas projects in what were previously inaccessible locations. The same technology advancements that have made the shipping routes more accessible have opened up opportunities for the exploration of oil and gas in these areas. Ice-class vessels will become more commonplace due to the extreme environments these projects will be based in and, as a result, will require the same levels of safety and security considerations covered in this paper.

**For more information about Synectics technology solutions, visit our website: [synecticsglobal.com](https://synecticsglobal.com).**





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