Like a '4th Officer' Supporting Safe, Efficient Vessel Operation

Weathernews Inc.

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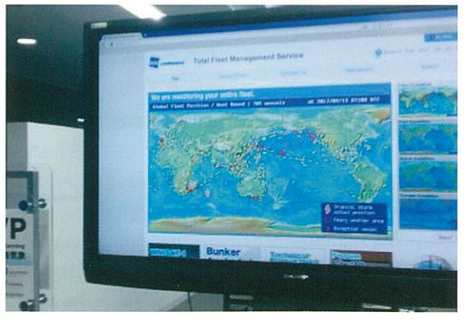
The global weather forecast company, Weathernews provides critical weather information to a wide range of industries, from sports to global transportation, including marine shipping, railroads, and air traffic. But its original mission is to support ships at sea and protect mariners' lives. In this issue of Mariners' Digest, we look at how Weathernews develops the services that help vessels all over the world operate safely and efficiently, no matter what the weather and sea conditions are like, and its plans for expansion in the future. Our editor interviewed Weathernews Executive Officer Hidenori Iwasa and Global Operation Leader Shingo Fukukawa.

Protect Mariners' Lives

—Weathernews forecasts are used in various fields, but its roots as a service go back to the ocean shipping industry, don't they?

Iwasa: In 1970, a freighter sank off the Port of Onahama, Fukushima Prefecture of Japan because of a rapidly intesifying low pressure system, resulting in the loss of 15 crewmembers' lives. Our founder Hiroyoshi Ishibashi, who worked in a trading company that chartered the freighter, decided it was time to examine the weather's role in such events, wondering, "Is this accident a natural disastèr or a man-made disaster?" If the forecast of this storm had reached the captain and the crewmembers in time, the vessel might have been able to avoid it. Ishibashi decided to go into the weather industry and to join Oceanroutes' Japanese branch. His experience and commitment live on with our company. As our employees enter the office, they see our motto, "Protect Mariners' Lives," and newspaper clipping of the accident that so moved and inspired Ishibashi. We have moved into various fields such as disaster-related services and smartphone-based information, in addition to assisting vessels at sea. But all our employees approach their work with the idea that our services are helpful in any emergency. Our founder Ishibashi purchased Oceanroutes in 1993, and seven years later he started Weathernews, Inc. Today, we operate on a global scale, providing 24/7 services for about 6,000 vessels.



—What are the characteristics of your weather services in comparison with other weather forecasting institutes?

Iwasa: Uniqueness is important, since we are a private weather company. We not only use weather information provided by the U.S. Weather Service, the Australia Bureau of Meteorology, Japan Meteorological Agency, and other public institutes all over the world, but also add data and analysis unique to our company. We provide a range of information essential to ship operation such as wind, wave, ocean current, and tidal current conditions using our unique forecasting models.

One of our services' characteristics is Risk Communication (RC). Forecasting accuracy is not 100%, so the key is three-way communicasion with vessel captains and onshore operators of the shipping company, while considering the risks of weather forecasts and how the vessel will avoid stormy weather and achieve its fuel consumption target. We set our services apart not only with a fleet management system that shows the route to be taken, but also with risk communicators who have knowledge of ships, ship operations, and shipping company practices.

Observation network covering 6,000 vessels.

—What do you do to increase weather forecasting accuracy?

Iwasa: To increase weather forecasting accuracy, you need an abundance of high-quality data. The

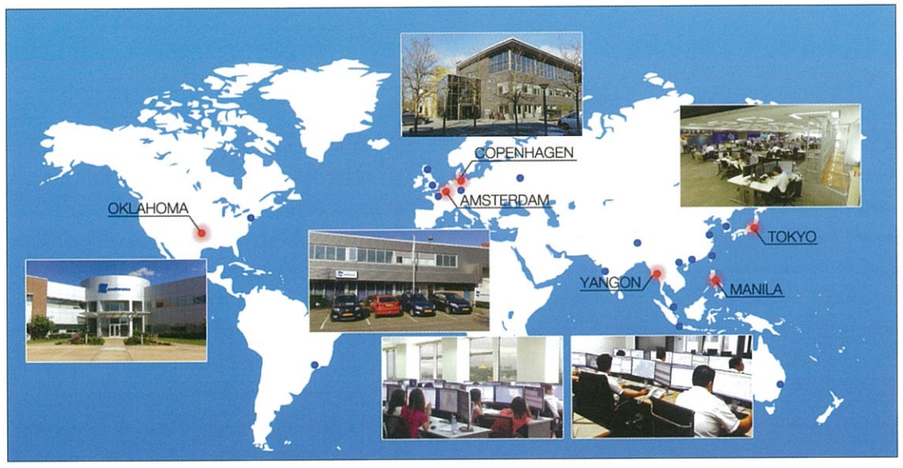
Global Network

Weathernews service centers are located in Japan, Copenhagen, and Oklahoma, USA, providing 24/7 services while transferring the operation hub of the service centers according to time zone. The operation centers that support the transfer of those service centers are located in Manila and Yangon.

The operation center in Amsterdam provides support services for the safety of offshore oilfield development and project schedule control.

Branches are located around the world, and in 2016, the Athens Branch was established in Greece, where many shipowners are based. Currently, we are developing and offering services that help clients conform to CO2 emissions regulations. Of course, the company also has a branch in Singapore, the mecca of the ocean shipping industry.

Weathernews also opened a subsidiary in Moscow, promoting cooperation with the Arctic and Antarctic Research Institute (AARI) to support the Arctic Sea route.



information we collect is not just weather data from weather satellites. We develop forecasts and then revise and verify them based on that data. In other words, we have an observation network covering 6,000 vessels.

—Is this sort of a Big Data initiative?

Iwasa: Weather data itself is Big Data. Every day, our company grasps actual conditions and forecasts by using 20,000 pieces of information, or over 100,000 if you include low-ranking categories.

Ships have been preparing for Big Data collection and analysis. For example, we can receive engine status data observed every minute by a real-time sensor, and relative wind speed data measured on the bridge. This allows us to determine a ship's real-time ship status and its surrounding conditions quite clearly.

—Do you change your services depending on the performance demand by each company?

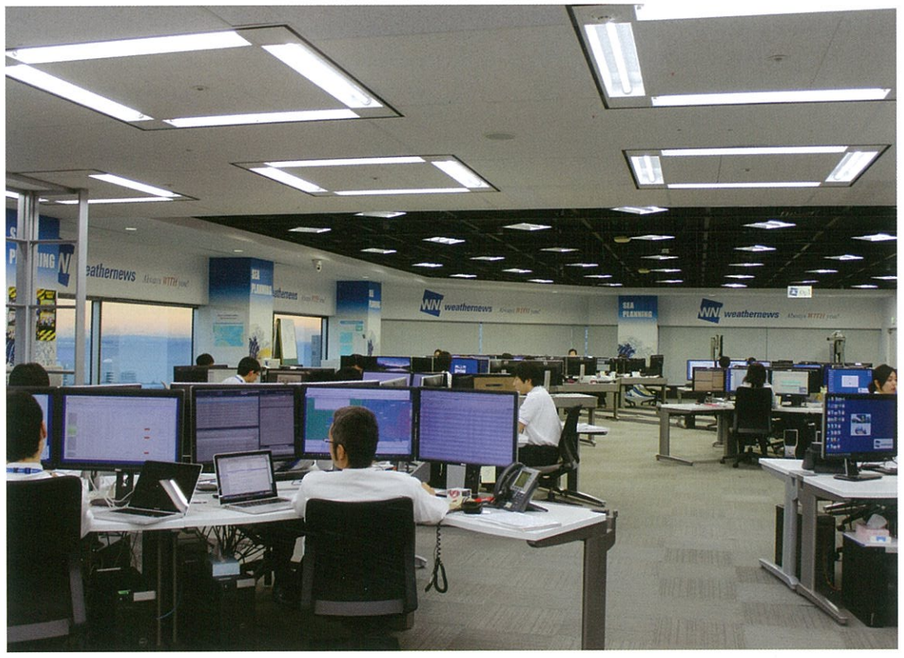
Iwasa: Of course, safety is critical to all vessels, but business performance priorities vary among ship types. Containerships emphasize punctuality, dry bulkers focus on profitability, and chartered tankers on speed and fuel consumption. The needs, scale, and performance of individual vessels affect the choice of optimal navigation.

—It seems that your services go beyond what shipping companies can practically do.

Iwasa: We analyze ship performance, too. We look at the weather conditions each vessel can withstand, and how much fuel is consumed under different types of weather. I think this helps companies judge the asset value. Furthermore, using about 1.5 million items of past data, we can calculate the operating costs for a

Voyage Planning Operation Room

Each team, specialized by ship type, calculates the optimal voyage for about 6,000 contract vessels in real time by collecting and analyzing information and contacting each vessel. Teams need to adjust the optimal route in response to changes in weather and sea conditions. Pressure patterns and currents in the ocean are complicated, and movement even dozens of kilometers away can sharply change conditions. That means precise calculation of the vessel's present position is critical to selecting the optimal route.



vessel on a specific route and during a specific season. We provide services that help companies to develop business plans and increase operating profitability.

Arctic sea route operational support

—Will global warming and increasing weather abnormalities demand more real-time weather information and more accurate weather forecasts?

Fukukawa: Standard routes, which are based on seasonal weather patterns, have been inherited in 30-plus years of accumulated operations. But for example, in recent years, extreme El Nino and La Nina conditions change how stormy weather starts and how it continues, creating situations that we can't cope with by relying on our past common knowledge and conventional theories. So we have to take into account recent changes while drawing basic routes and amend those routes as needed.

—Does your company also forecast sea conditions in Arctic sea regions?

Iwasa: We can see the effects of global warming since the ice areas of Arctic seas show a decrease every year. Ships can sail on the Arctic sea route. Currently only ice-class ships can pass through the route, but in the future, various types of ships might be able to use it throughout the year. We monitor the Arctic sea routes, too. Satellite image analysis and forecasting technologies have continued to evolve every year. With these technologies, we support 50 voyages a year, and forecast the movement of sea ice and the time of route opening and closing. As we build on these achievements, it seems that Arctic sea route operational support service is becoming one of our

advantages, too. Starting this year, we are analyzing ice breaks and so on, meeting the challenges of sea ice navigation.

—Aside from weather, what initiatives do you take to address tsunamis?

Iwasa: We have two roles. One is to unfailingly deliver tsunami alarms and warnings given by relevant agencies to those onboard as well as land-based ship management companies. The second is to place tsunami radar stations at 30 coastal sites in Japan to monitor tsunamis. When one of these devices displays a tsunami echo, we can deliver a warning to nearby vessels and local residents as the tsunami gets closer.

—It seems that you assume the occurrence of possible crises and then develop your approaches.

Iwasa: We think the most important thing is to provide a sense of expectation and sense of security — "Weathernews always watches crises, and can always give advice if any risk occurs." A function called "Monitor and Inform" is included in various service menus to reflect this approach. We can forecast phenomena themselves to forecast the weather, but time and range of the occurrence may be "deviated." In this case, we provide updated information and advice to avoid risks. So it's essential to know the precise position and status of vessels.

—What problem will you have if you don't accurately determine a vessel's current position?

Fukukawa: Since a forecast of stormy weather on the route we recommend may differ from the previous day, we need to confirm where the vessel is on the route, to consider changing the route. The vessel may deviate from the original course by the captain's own judgement. But in this case, if we provide the voyage plan with speculation based on the initial information, without confirming the vessel's position, our recommendation will be unrealistic, and this can leave the captain confused. As we have to recommend rational and practical routes, we always call the vessel directly to ask about its status if we don't receive a Noon Report for one or two days.

More accurate decision-making flow chart

—What businesses do you plan to expand?

Iwasa: We are basically a weather company. We cannot meet your expectations if the accuracy of our forecasts is not ensured at or above a certain level when we have a full line of Big Data on weather and sea conditions. So our ongoing mission is to increase accuracy.

—The probability of making a correct weather forecast is increasing, but in principle, long-term forecasting is difficult, isn't it?

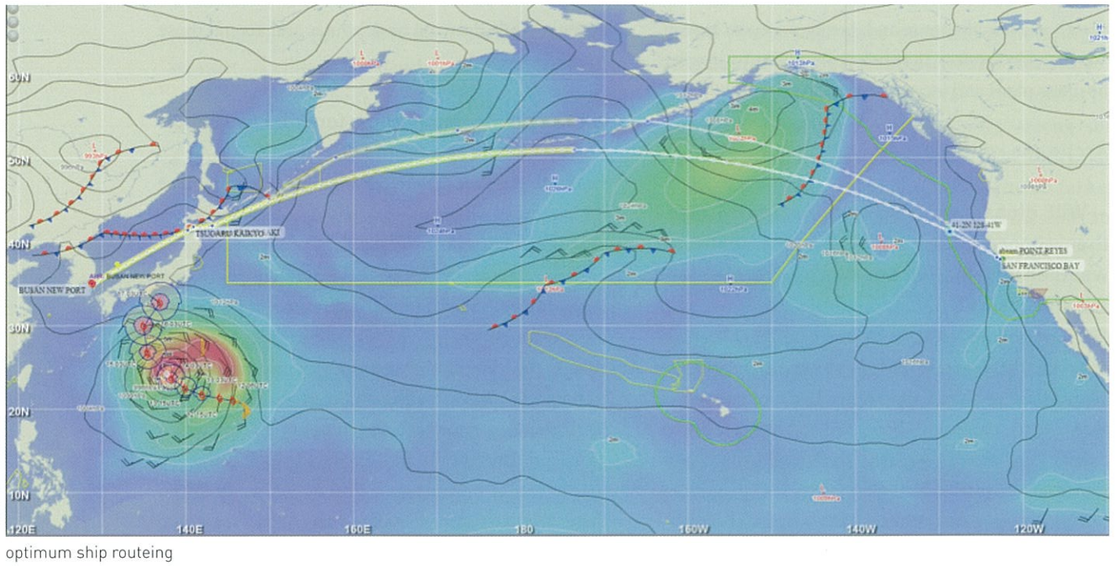
Iwasa: Yes it's certainly difficult, and we cannot avoid deviations. But the range of forecasting deviation equals risk, so we have to analyze that range and increase accuracy within that range. We need a change in mindset.

Fukukawa: If it takes one to two weeks for a vessel to sail from departure to destination, it is unthinkable that the forecast would not change from the departure until arrival at its destination, except in the summer, when the weather is stable. In particular, when supporting voyages in the Pacific Ocean during the stormy winter season, we measure the deviation from the initial forecast in a three to five-day range, and plan a way to change a recommended route as we evaluate our own forecasting accuracy. For example, in the case of voyage from the U.S. to Japan, if there is a possibility of encountering a typhoon on the route five or six days later, we assume various possibilities such as detouring with higher speed at one point, or taking a different route at another point if the typhoon picks up speed. That is, if we draw a decision-making flow chart in advance, the decision making will speed up if that assumed phenomenon actually occurs. Deepening dialogue with shipping companies to make the flow chart more accurate—this is our future direction.

—What message do you have for our readers?

Iwasa: The best service would be for a weather expert like Fukukawa to actually go aboard a vessel and directly give advice about the weather. But this is not realistic. Therefore, we provide services from our offices. However, we want to work as closely as if we were onboard the vessel, like the fourth officer. Our staff has no officer's licenses, but they are the group of marine officer-minded staff. So they can respond anywhere, anytime immediately after anything occurs on board the vessel.

The data volume the ship receives and the volume we have used to be vastly different, but now, in broadband era, we can deliver weather and sea condition information two weeks ahead through our advanced onboard system. I hope young officers look at this information and make good use of it. I hope it helps them correctly understand weather-related risks and how they affect safe navigation.



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