

APPENDIX F: SESSION 3 – E-NAVIGATION

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Panel Discussion

This session comprised a panel discussion on the concepts of ice information in e-Navigation systems, including ECDIS and others. It was not meant to be about the technical aspects of S-100 based products, but more about needed/possible content and what users expect/want.

Moderator:

- Jürgen Holfort

Panelists:

- Michael Bergmann (Bergmann Marine)
- Friedhelm Moggert-Kägeler (7Cs)
- Joseph Sienkiewicz (NOAA)
- Tim Oliver Burgold (University of Wismar)
- Jan-Daniel Stangier (University of Wismar)
- Ivan Sitnikov (NavDevelopmentCo)

Key Messages

- E-Navigation refers to *enhanced* navigation (not electronic)
- Ice should not be treated separately from weather and wave information – they need to be integrated for the mariner. We need to determine how to best serve the mariner, not only from our own work but by collaborating with other data providers.
- Adding more and more information layers to ECDIS systems is not helpful to the mariner. Even if it is easy to select among them, the mariner must still integrate all the information himself. Smart e-navigation systems could prioritize information for the mariner and push irrelevant data to the background.
- Shoreside information aggregators can assist the mariner in route planning and execution by preprocessing data so that the most important information comes to the top. But the master is still responsible for operating a vessel safely and must have the final say in navigation decisions. There must be a collaboration between ship and shore.
- In considering ice information for voyage execution, the ship's own radar should not be neglected as a data source
- Information for navigation should come from an authoritative source, such as national ice and weather services, even if it goes through a preprocessor or aggregator.

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Session Transcript

Russ White (co-chair)

There's a good flow of logic here between the discussion we've just had about training. And we're now going to move on to a session about e-Navigation - to the application of that information that the mariners have gained in the real world. To do that effectively, we all know we have to provide timely and actionable information. But we also have to disseminate that in a means that allows the client to use it in their decision making. So, we're going to progress into a discussion about a new navigation that was really initiated in Helsinki in 2019. Jürgen is going to be our moderator and introduce a panel that will talk about e-Navigation from the users' perspective as well as from the S-100 perspective. So, I'll pass over to Jürgen to introduce your panel.

Jürgen Holfort (BSH)

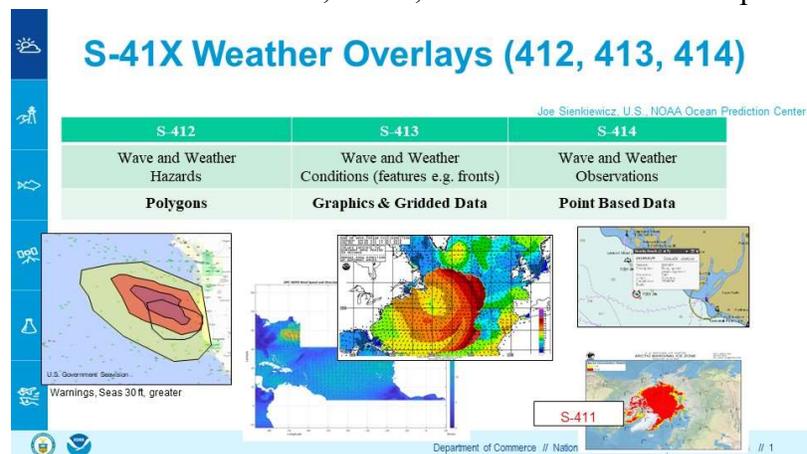
I have a few words of introduction. Yes, we started with e-Navigation years ago and we now have the capability to deliver sea ice charts in the new S-100 based format for ECDIS, which are available on the Ice Logistics Portal. For the ice chart producers - if your charts are not there, leave me a message where I can find your shapefiles and I can put them there for you. But S-100 based ice charts are really just like putting old wine in new bottles, although it's still a good old wine. Our goal is really to put new excellent wines in nicely designed new bottles. But the main theme of our discussion today is E-navigation - the boxes where we put on our products. We must always consider that we need new products - maybe ice forecasts or something else. We will also have to consider getting approval from IMO as well as doing some marketing to sell the products.

To begin, Joseph Sienkiewicz has a presentation about the new meteorological products they are developing in NOAA. And so, I would like to ask Joe if he can present his presentation.

Joe Sienkiewicz (NOAA)

Let me give a little bit of background. I'm going to talk about three different S-100 categories of weather overlays. We label them as S-41x and mean S-412, S-413, and S-414. I recall a couple of

recent incidents over the last five years - one of them is the loss of El Faro east-northeast of the Bahamas in Hurricane Joaquin in 2015. A second one, within my own nation's and office's responsibility, was the Anthem of the Seas, a modern cruise ship that experienced an explosively intensifying extra tropical cyclone. She was caught in the storm for an extended period of time, experienced hurricane force conditions with over 6000 people on board. As the report came out from the Bahamas, they also had engine issues due to the extreme conditions that the vessel was in. Both of those incidents had some things in common. One of them is they weren't necessarily relying solely on authoritative source information, for whatever reasons, and we're making decisions basically on third party information that doesn't necessarily have the same deadlines required by authoritative sources.



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So, electronic navigation. My own office has responsibility for two METAREAs – METAREA-4 and METAREA-12. One of the challenges that we're having as forecasters issuing warnings and producing information that is actionable, is the level of detail that we now see with the imagery that we have and with the numerical models that we have. We are really challenged producing information in the required text bulletin formats that is actionable, that can be used in decision making relatively quickly. So that's the background that the S-41x is working from. S-412 is wave and weather hazards, basically warnings. The concept is that this could be polygons with attributes. The example here, in the left, is a of a storm system approaching the West Coast of the United States. The yellow area shows Gale Force conditions. This is a 24-hour composite of conditions. So, this is a descriptor of warnings over a time period and not an instantaneous snapshot as we do now. There is way too much information that falls in between the time steps that we do now. The orange area is storm force conditions expected and the darker reddish-brown area is hurricane force conditions expected. The other contour is seas of 30 feet or greater. This is just a prototype for an example.

S- 413 is conditions - basically graphics and gridded information. HDF-5 is the gridded format that's been chosen and GML is the graphics format. The examples here are standard graphics that we issue of wave period and in the lower left is an HDF-5 example of grids produced by the US of wind speed and direction. S-414 is wave and weather observations - point based data. We have been quite cognizant that iceberg sightings and reports would actually be point based data for this group. In the lower right, I have S-411. That is there because we had a change in the US that the NOAA portion of the National Ice Center is now part of the Ocean Prediction Center within the weather service. So, we have a growing interest in the success of S-411 in the overall success of the S-41x series over time.

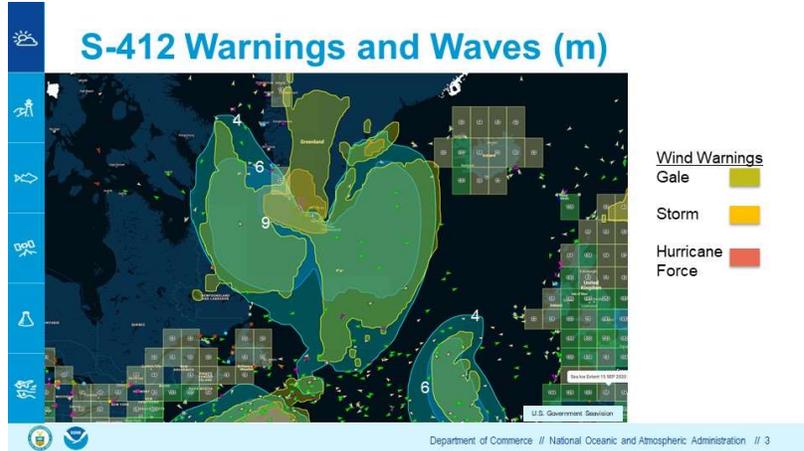
Look at this. This is a challenge. These are warning polygons. This is a prototype directly out of numerical model output. In the upper right-hand corner, you can see a little portion of ice on the east coast of Greenland. This is just an overlay over a program called Sea-Vision that displays ship positions at any given time. It has a history that allows you to go back in time. This is what we're trying to describe in text



right now. The nice clean example I showed earlier was a very, very good example. This is the reality. This is a 24-hour composite of wind - yellow being gale, orange being storm-force, and hurricane is the reddish-brown, pinkish color. It gives you an idea of the potential that, within a 24-hour period, conditions will meet the criteria as defined in WMO pub 558, gale, storm and hurricane force winds. This is the complexity of the beast that we're dealing with. And down in the lower portion, you can see similar polygons for a tropical cyclone and then another area of gales to the southwest of Ireland. Just to give you a visual of some of the challenges that we're dealing with.

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To this, this adds waves on to the warnings. And it illustrates the challenges that we're going to have in the future as we tried to portray the weather conditions and have them in some integrated form. This is winds, waves – four meter, six meter, and nine meter seas. This better defines where areas of various criteria are going to be based on our predictive systems. But think of the challenges that this is going to be for the mariner.



So, there are opportunities here. One of them is an opportunity to streamline and standardize outputs on a global scale. The end user that we are serving is global. Especially now that we can see where ships are, where they came from, where they're going, the density of vessels and where they are relative to hazards, whether it be ice or weather. There's an opportunity to have integrated information

The slide is titled "Future Considerations" and is divided into two main sections: "Opportunities" and "Challenges".

- Opportunities**
 - Streamline and standardize outputs on a global scale
 - Integrated information into ECS & other applications
- Challenges**
 - Technology
 - METAREA providers
 - Collaboration
 - Dissemination
 - Implementation
 - Training

On the right side of the slide, there is a world map showing maritime traffic with a color-coded density scale. The bottom of the slide contains the text "Department of Commerce // National Oceanic and Atmospheric Administration // 4".

directly into electronic charting systems. Instead of just restricting it to ECDIS, I'm trying to say it more broadly because more users would have the opportunity to use this information - and other applications. And that's important, because that means that the mariner at sea is not the only customer. There's a weather enterprise that provides information, especially the S-412 information - from authoritative sources. There's another market that would be able to take and have a consistency in messaging. But with that come challenges - one is technology. The challenge to the METAREA providers is how are we going to implement, in the future, a transition to polygon-based warnings uniformly across the global ocean. Also, in collaboration, boundaries become a challenge. In text bulletins, that can be separated. You don't necessarily have the overlap, whereas communicating a consistent message across an ocean with several METAREAs is going to be a challenge and must be considered. Dissemination is a challenge. There are assumptions that we will have global bandwidth in the future that will allow the dissemination of such information. International implementation is also a challenge. And the last one is training. And that's multifaceted - not just training for the METAREA providers, but also training for the end user. We need to train them as to what the information means, how to use it, and how to be adaptive to interact so that the information is in a format that can easily be used for decision making, which is the whole intent. Thank you.

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Jurgen Holfort

Yeah, thanks, Joe. And now we have seen there can be quite a lot of information and we have only seen, ice and meteorology - there will be also other overlays. So, I have a question to Tim and Jan, who are the new generation. Do you see the possibility of information overload? Can you really work with all that information?

Jan Stangier (University of Wismar)

Okay, thank you for having us speak on this panel. Yes, there definitely is an information overload if you put all the layers above each other. Our main idea was to have a lot of different projectors or workstations on the bridge where you have, let's say, three different computers. On one, you can do the planning. On the second one, you can choose to overlay as much information as you want. But you have to be able to not see the S-400 standard but see what it stands for. That was the first idea. In the picture, so long as the information is simple it looks very beautiful. But if you're putting you too much information together, it would completely overload.

Jurgen Holfort

That would bring me to a question to Friedhelm. There is so much different information. Not only ice and weather but also currents, sea levels, mammals, etc. all flowing into one system. What are the important things to consider and how do we harmonize them? Is combining them all somehow into a defined traffic light portrayal a good idea?

Friedhelm Moggert-Kägeler (7Cs)

I think it's not really possible to display everything in one system. And in the end, it's not all just about displaying. In the end, it's about functionality - about interaction. If you present the mariner with all this information on one screen, the problem is either clutter or information overload. And even if you found smart ways to display all these different products in a way that's acceptable, the mariner still has the challenge to mentally merge all this information to take a decision. The proposal that was made just before to split it up on different screens would probably help to declutter the situation and to focus on specific tasks. But it wouldn't solve the problem of the mariner having to mentally merge all this information to make a decision. We think the approach should be different. Rather than trying to send all this information on-board, we are working on approaches where the data can be pre-processed ashore and then, based on all this data, provide a recommendation for a voyage which is based on the initial route request or the initial route. For the mariner to understand this proposal, you could send data along with it. But you do not have to display the data all the time because you have a preprocessed voyage plan which relieves the mariner from doing the mental merging of all this data. There is not much time on board so, the more information we put on board, the more difficult it will be to take a qualified decision.

CHAT LINE

Bjørn Kay

Friedhelm - correct - automated routes and monitor them - no need for overlays - just pump ups on the screen! Is already in place for wind and wave heights!

Richard Hall

Every map is designed for a specific purpose - what is the main reason - is it to choose the safest route?

Bjørn Kay

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Safest and environmentally friendly route -Richard!!!!

John Falkingham

Do Friedhelm's comments not suggest a fundamental change in the clients of the Ice Services - from mariners to the information integrators proposing the voyage plan?

Zagon, Tom (ECCC)

I think some companies are already doing that.

Bjørn Kay

No, not in my opinion, because the OWW will push the button on board like an aircraft pilot! - John! But he needs to get right and correct information!

Michael Bergmann

John F. I think is a combination and as such Friedhelm and you are right that the group shouldn't forget about the growing user base on shore, which are advising the navigators on the ship.

Bjørn Kay

I know at least 10 operational control centers and one in Mumbai for controlling ice navigation-.....

Greg Stuart

John Falkingham: I think you need both and would use a construction analogy to explain. No matter how good you are in the design phase of a project there will always be changes during construction. Just as conditions can change at sea and the voyage planners won't be able to foresee everything.

Joe Sienkiewicz

Potentially a more established use of shoreside provided information. A lacking exchange in the El Faro loss.

Bjørn Kay

In some countries, the digital data from Met-office is possible to get - that means with the right tool everybody can do a multifunctional nav weather display for ships - with automated routes and still I, as a OWW (navigator), can make good decisions on the operational level and management level - driving a vessel like a Ferrari in Le Mans! This will be the future!

Folomeev Oleg (AARI) (зость)

On our courses, we constantly talk with mariners about the fact that we, as an ice center, are an offboard part of the crew. Is a very important part of our discussion for more trusting relationships between us.

Michael Bergmann

Oleg F. this is a good viewpoint. a ship is no longer an independent object. The "crew" i.e. those which are supporting the ship and help it to execute the voyage safe and efficient are both on board as well as on shore, same as in aviation.

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Jurgen Holfort

It's really doing the planning on land. But I have a question to Michael Bergmann. We focus mostly on the mariner at sea, but the e-Navigation concept also includes other parties like traffic control systems and pilots. Do they have very different needs compared to Mariners? And do we have to address them more strongly in the future and in the development?

Michael Bergmann (Bergmann Marine)

Yes, first, I think it's important to understand when you're talking about e-Navigation. We are not talking about electronic navigation, but *enhanced* navigation. That was made quite clear by IMO. Let's talk about situational awareness. I would like to show you one picture. And that is the pyramid of competence. And that's exactly what Friedhelm was talking about. We have various data and ice data is important information when you are sailing in icy conditions. But you only can digest the data if it is turned into digestible information which you can process, increase your knowledge, and create the necessary intelligence to gain the competence which you need. It's important that we are actually in e-Navigation which, in essence, is about collaboration between shore and ship. The competencies on the shore side and the competencies on the ship side are joining and creating a situational awareness for the decision maker, which is usually the navigator on the ship. The maritime service 13, which is about ice navigation isn't the most important aspect we need to take in consideration. What the IMO is actually talking about is the collaboration between shoreside and shipside.

Going back what Friedhelm was saying, yes, there are two phases- the phase of planning and the phase of execution of the voyage. During the planning phase, whether for ship operations, vessel traffic services, or others, shoreside services are of great benefit for the navigators, to get information to best plan the voyage. During the voyage, you need the necessary information to have a situational awareness to navigate safely in a certain area. And we just heard in earlier discussions, how difficult it sometimes is to detect icebergs when you are navigating. And that goes back to what Tim and Jan were saying. If you get more and more information on the actual voyage, you need to decide what you need to actually display. So, creating the information needs an algorithm - which information is to be shown, which information is currently not relevant, or not so relevant - with the vast amount of information which will come to us with e-Navigation. Not only is there S-411, S-412, S-413, and S-414, but also bathymetric information as S-111, S-112, S-114, S-124 - all of this information coming together. You need to decide, during the voyage, what do you actually want to present to the mariner? I think that is what we have in organizations like ours here, a responsibility to think, not only about what data we try to promote, but also when can data be omitted and the logic behind it. Leaving that to the OEMs, to the six manufacturers, I think is not the right way. So the discussion I would like to see is not only what data can we make available but, as data is integrated, when can we actually omit certain data because it is not of highest relevance to ensure the necessary information comes to the mariner and increases his competence.

CHAT LINE

Cathy Geiger

For mariners, the primary perspective is Lagrangian. They are traveling through a system. And that system is one with many scales. And so there is a need to separate the relevant products at the relevant scales and, for the mariner, they are thinking Lagrangian (local object moving within a field) versus the data products coming at them in an Eulerian framework (a gridded set of fields that are fixed with reporting of the movement of "stuff" through little gridded boxes. The brain of a navigator is being

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trained to digest across all of this. Extraction of relevant pieces is therefore the key. In short, decision making is actually more about effective storytelling to make a good decision rather than the total mass of information.

A.J. Reiss (USA - NOAA)

algorithms could read the metadata associated with the warning polygons so as to alert a vessel when a warning is relevant.

Bjørn Kay

AJ Reiss - agree!

Michael Bergmann

AJ this is one of the algorithms we need to define. Thanks

Richard Hall (RICHH)

The algorithms discussed by AJ exist - these are spatial analyst algorithms to calculate risk assessment. The output is a risk assessment map

Michael Bergmann

Absolutely right Richard H. ESRI is offering those now for years. How they are to be applied for ice information needs to be defined.

Richard Hall (RICHH)

Are we discussing two different tasks?

1) Planning (strategy)

2) Tactical (operations)

Two different time scales, two different display systems and users

ECDIS is a tactical decision-making tool

Can you / should you use the same tool or screen for two separate tasks?

Yes, they use the same data (must use the same data)

Cathy Geiger

I like Mike B's point. It is hard to make decisions with too much information on a busy ship. In the 1980's we used to do a lot of science support with a land coordinator who would pre-digest the huge amount of data down to the relevant pieces that the user really needs - with the pre-condition, that the land based team is preparing information that the customer actually wants. and this is the key. Every mariner thinks differently, and so choices are the real challenge. How do we provide products with choices so that skilled workers at sea can access the tools that they choose to make the best decision? This is the fundamental approach at the start is the flexibility of choice.

Jurgen Holfort

Thanks for that information. And I would then pose a question to Ivan Sitnikov. We are also working with very diverse customers. Do we really need individual products for each customer, like Michael Bergmann said, or is it possible to have one set of integrated products for everyone that can be specialized later on?

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Ivan Sitnikov (NavDevelopmentCo)

Thanks, Jürgen. It is a not-so-easy problem to integrate all the information in one screen. There are a lot of variants. So, we can imagine what kind of information is most applicable for mariners in some region where ice navigation is required. We have some experience with ice information e-Navigation systems in conjunction with the Arctic and Antarctic Research Institute since 2005. Initially, there were layers that could be easily switched by the mariner. There are two different kinds of selection because, not only is the current image interesting, but so is the history as well as forecasts provided by the Institute. I agree with the previous speakers that a timestamp over the information is absolutely necessary.

Another problem working with real customers is that most ECDIS systems don't have current ice information. Transas and dKart do but most do not and changing ECDIS systems is practically impossible. We designed a really easy application based on web services that uses the browser as the main processing system. It can present to present ice information including vector charts and raster charts and is the latest in our practice.

Another thing that I didn't see in your list, Jürgen, is the own-ship radar information. When a ship is working in an ice channel, it is very important to understand the ice in the channel in detail. The satellites don't have such detailed information up to the moment. There is a time delay. But a working ice radar can give details about the ice region. We have tested it and it was really interesting to share it with other navigators in the same area. A very high resolution radar is 10 times more detailed than a satellite image and can be used with navigational chart scales. Satellite information is not so good for the real navigational ECDIS scales. The 100,000 scale is for navigation but the satellite pictures are not so detailed.

Jurgen Holfort

It is quite interesting what can be seen on ship radar that are also on ship systems. In e-Navigation, there is also the idea of ship-to-ship communication. So, it's not just getting the information from the shore but also from other ships in the region.

Russ White

Perhaps I can bring your attention to some of the questions that are that are being raised on the chat and perhaps we can give them to the panel. In response to some of the comments from Friedhelm, the question is: Who are the clients of the ice services? We are hearing a discussion about the increasing role of shore side planning activities. From the perspective of the ice services, do we actually have two types of clients emerging - the mariners on the bridge of a vessel in ice waters and the shore-side planning services? And if that is the case, how do the ice services engage in producing products that support decisions potentially taken in different timescales and in different places?

Jurgen Holfort

So, what really are the products that the ice services, or the meteorological services, to deliver? We still have the idea that we are delivering ice charts and they should look a certain way. We probably have to go away from that idea and put them into a portrayal understood by many users. So, what are the products we deliver and to whom do we deliver the products? I will ask Tim and Jan- What do you as navigators want to have from the shore?

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Tim Burgold (University of Wismar)

I prefer it when the vessel is getting the same information (perhaps in a shorter version) as the shoreside. If a voyage is planned on shore and the ship does not agree, there must be a back-and-forth communication causing more workload. If a voyage planned on the ship is not approved by the shore, there is more communication needed to understand the reasons. If the navigation officer could evaluate the same information as on shore, even if shortened or compressed, there would be better cooperation between the vessel and shoreside.

Jan Stangier

I definitely agree. I mean, in the end, it's simply the captain who has the responsibility for the ship. He has the last word. Together with his officers, he should be the one who makes the decision. On board, it would be very helpful to have a person ashore who takes the data and gives suggestions. That's a good idea. But I would never take away the actual process of planning the voyage from the mariner himself. I think that is his job and he should be able to merge all the information himself. At the beginning of this session, there was the idea that, aside from the problem of bringing all the data together and displaying it, if you have the ability to display it like you want, I think you are able to merge it yourself on board.

CHAT LINE

Bourbonnais, Pascale

Interesting discussion about who should be using wx / ice information. Tim and Jan are exactly on the point. Shore-based information providers should be there to support the mariners and make their job of decision-making and route planning easier, by providing them just the level of information that they need without overloading them with info.

Michael Bergmann

I just want to highlight two things that Tim and Jan were just saying. The first aspect I want to bring to your attention is the lesson we could take from aviation. Yes, the pilot is responsible for the aircraft and he makes the final decision. But the pilot knows that air traffic control has a much broader data availability and tools available to make recommendations, what to do, and how to navigate. And when I consider the discussion we just had yesterday in the IALA VTS committee, that's also something which is boiling up on the maritime side - that the shore-side has more capability, power in the computers, access to data, and ability to merge data and get an assessment. So, they can actually advise the mariner, in a good way, on his planning. The second aspect is, considering the lessons learned in the disaster of the Concordia, the ship operation centers of cruise lines are actually planning the voyage. The master has to validate it with his ECDIS systems, as required by IMO. But, due to the expertise and knowledge and data available to the ship operation centers, which are doing fleet operation and fleet planning, they provide mariners with information on trip planning. They also monitor it and make the mariner aware if he is leaving course and ask the reason for that? So, there are certain things which you need to consider as we are moving forward.

CHAT LINE

Bjørn Kay

When in the future would it be possible to have automated weather routing to polar regions to save fuel as we can do today on a voyage from Europe to US? In relation to the environment and hybrid ice-classed ships (green shipping) ...???? How fast is the update rate in the future for ECDIS ice information with POLARIS?

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Greg Stuart

I agree Anna, we have had the same interactions with the aviation sector in Australia. Very close collaboration between our operational meteorologists and pilots, flight dispatchers and operational airline staff has greatly improved safety and efficiency of Australian aviation.

Bjørn Kay

Greg and Anna that is what we have to do in the future!

Tatiana Alekseeva

Anna, I agree with your comment. Close interaction between captains and ice specialists is a key point, and that is what the AARI specialists have been doing since foundation of the Institute. Drawing of sea ice charts is based not only on satellite imagery, but on operative information from captains, polar stations etc.

Richard Hall (RICHH)

Agree - Aviation approach is a good example. Offshore and onshore can be a good partnership

Greg Stuart

I agree Michael Bergmann , there are some very strong overlaps with activities and services mandated by ICAO.

Bjørn Kay

We need this in the maritime sector : <https://www.youtube.com/watch?v=q50wJpUXpyU>

Cathy Geiger

Bjorn Kay, your youtube definitely hits the nail on the head.

Joe Sienkiewicz

Let me just say a couple of things concerning the planning and the strategy. I know that the slides that I put together are basically from the perspective of a METAREA provider, a contracting government in the language of SOLAS, that is meeting a requirement to warn ships of gales, storms, and tropical cyclones. I think that role will continue with a growing reliance on shoreside capabilities. I still want to add that one of the things clearly lacking in the El Faro loss was engagement with shore-side capabilities. There was no engagement of any significance until within an hour of the of the vessel being lost. So, the industry certainly is preparing for that. I purposely did not have ECDIS in mind because I believe that the information can be used broadly by the vessels themselves - the master still has the final say for his vessel - and by shoreside engagement representing an authoritative source - this is what the authoritative source thinks conditions are going to be for this area. And the last thing I want to say is, there's an opportunity for customized information based on the vessel characteristics, cargo and all, that does not fall within the authoritative sources responsibility but is certainly within the best interests of the safe operation of the vessels.

CHAT LINE

Richard Hall (RICHH)

ice should be treated as a weather layer, not a separate, independent layer.

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Jurgen Holfort

These products that are really made for one special ship, similar to what we did with the risk index assessment with Polaris, who should do that? Is it an authoritative source? Should we try to incorporate IMO with the regulations? Or is it better to just produce it?

Joe Sienkiewicz

So, could I at least start a response? Yes, I think the IMO certainly has to be engaged as we move forward. On the weather side, we have requirements that we meet the by producing very long text bulletins that are getting longer and longer because the way that we're viewing weather now is much more detailed. We're meeting a requirement by producing them every six hours or every 12 hours globally. But are we actually meeting a need? I think that we're getting farther and farther away from that by producing the types of bulletins that we're producing now. And so, yes, the WMO and IMO will need to get together to decide what are marine services? And certainly, the model that everyone looks at is aviation because they are ahead of us in many different aspects.

Michael Bergmann

I want to support what Joe was just saying. I think it's important for us to realize that we need to look around and ask what does the mariner really need at a certain given time? And what do they not need? Going back to what I raised at the beginning, we need to define how we can best serve the mariner, not only with our own work but also collaborating with the other data providers to make sure that the necessary information comes across. I think it is this combination of the data that is the essence of e-Navigation as we are moving forward. And as we do the combination of data, we need to define how it should be combined. That means, not only the collaboration on the ship and the ship operation center, but also with everybody involved. To see how we can gain the greatest effect and not just pull additional data over and over.

CHAT LINE

Richard Hall (RICHH)

Joergen it's a collaboration: between user, regulator, knowledge expert (ice / weather forecaster) and the IT experts

Иван Сутников

Web applications in local onboard use will share information and more people will be familiar with ice information

Michael Bergmann

Very much agree Richard. It's about collaboration of all involved actors.

Jurgen Holfort

Who would be the best to do this? The ECDIS producers or the information producers? Or is it the IMO or IALA?

Michael Bergmann

Well, perhaps I can have a quick answer on that. The IMO already moves in that direction with the IMO expert group on data harmonization. IMO has a facility there to look into those potential overlaps. The maritime services have been put in place to define the different data streams, how they interact, and how they can collaborate with each other. So I see the IMO giving us the

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guidelines but we, as the ice experts, need to decide how we want those data to be combined for MS-13 ice navigation, to bring it over in the right way and in the most beneficial way. And just one other aspect. In projects where I'm working, where we are combining sea state information without ice information, it was clear from the end users that they want to see how the conditions are at a certain point in time. They don't necessarily want to see how the conditions are now when they will be there in six hours. So, forecasting services are something that are of great importance as we are moving forward so a Mariner could estimate when he is planning the voyage. And when is executing the voyage, what can he expect, to a certain degree of accuracy, in eight hours when he is at a certain point?

Jurgen Holfort

Yes, that is planning but we also see that if we really combine everything, we have a training issue. I can tell the mariner what an ice chart looks like and how they should interpret it. But if we make a lot of combinations, is it really beneficial? We have to think a lot of about the kind of training needed to interpret looks in different data sources and how to interpret them.

Friedhelm Moggert-Kägeler

Maybe I can comment on this. You are addressing a point which was, to my taste, neglected a long time ago when the IHO started with the development of S-100. When particular working groups started developing product specifications for the electronic chart, bathymetric products, weather, ice, around this framework, all these working groups were looking at their own specific domain in isolation, not considering that, in the end, we want to achieve an interoperability between all these products. It's only five years ago or so when the IHO recognized this and initiated a new working group that would deal with the interoperability. And within this working group, they started defining the minimum products we want to see in future ECDIS. Unfortunately, ice is not one of them yet. What this specification tries to do is to describe all the technicalities of how different products can interact, how they can be merged with overlays, underlay, interleave, suppression of objects and so on. It's still not finished. This is a very, very complicated process. So maybe there's another mistake they're making. Once this is in place, there may be rules on how to merge and visualize all these products, and maybe everyone is happy. But there is the assumption that this way of presenting the data is good for all cases, for all situations for, all kinds of ships. And I think that's not the case. We need a means for the Mariners to adjust the display or the behavior of the data, according to a particular situation, according to a particular maneuver. I'm not saying that I have a solution for this. But the more data we try to include, the more important it is that we can react individually on this combination of data. A particular data set should not always have priority. It really depends on the situation. And this is where we need the flexibility. I'm not sure if this is, in the end, the OEM that adds this flexibility to the standards from the IHO and IMO but I think that it's an important point. The big benefit of ECDIS is not only the visualization of the data but we can connect functionality with the data so the system can interact with the data. It's not only the mariner that's looking at the chart display. The more data we have, the smarter functionality an ECS system could integrate to make the best use of this combination of data. The necessity to have a proper display will be less important if we can trust the smart functionality, which can deal with all these kinds of data. And one thing I want to add to my initial comment - I was not saying that the mariner or the crew on board on bridge and the Master should not be responsible for voyage planning or whatever. What I was suggesting is that with this potential information overload, it

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should be considered to have additional assistance for the master on board from the shore-side, it could be a useful add-on.

CHAT LINE

Michael Kingston

There is a current 'Existing Output' from Maritime Safety Committee Meeting 96 (MSC96) for a POLARIS review to take place 'within 5 years'. POLARIS is due to be reviewed next year and it is being considered at present as to how it will be actioned at IMO - probably in the SDC (Ship Design and Construction) Sub-Committee. This will be discussed at the Arctic Shipping Best Practice Information Forum virtual meeting (24th -25th November) as to how it will be proposed (States / affiliated IMO Organization's) and actioned, and IICWG work here will be very relevant.

Jurgen Holfort

I think we have reached the end of the time. What we have seen is that there's still a lot to do. And not only from the services side or from the producer side, but we really have to work together to look at, not only the portrayal, but also the functionality, which Friedhelm says is quite interesting. I hope we have made a start for a lot more work to do. Thanks to all the discussions.

Appendix F1: Session 3 Background Paper

The IICWG has been struggling with the problem of getting ice charts accepted into general practice by e-Navigation systems for many years. We have developed the tools to communicate ice chart information to Electronic Chart Display and Information Systems (ECDIS) including a transfer and portrayal standard, S-411, registered with the International Hydrographic Organization (IHO). We have developed software to convert ice charts from our own SIGRID-3 format to S-411. As recently as last year's survey, we have heard that mariners' need for scalable ice information is increasing. What then is the challenge for the ice services? Is it the level of detail in the ice analyses or the lack of forecast products? Is it a poor representation of shorelines? Is ECDIS the wrong system to be targeting?

At IICWG-XIX in Helsinki, we held a plenary session on Ice Chart Portrayal and Visualization in which we discussed this issue. Some take-away messages from that session:

- *most current ice charts have a scale of 1:1 Million or coarser; we really need charts at a scale of 1:250,000 or better based on SAR imagery*
- *ice charts on an ECDIS must co-exist with other ENC displays and not violate IMO regulations for displays*
- *navigation chart displays are very often at much finer scale than ice charts so displaying the ice information as an overlay does not work too well*
- *need to investigate the need for dusk and night portrayals, the possibility to generalize symbols as the scale changes, explore interaction with weather portrayals (S-412), and include ice egg portrayal*
- *to determine the best portrayal for ice information on an ECDIS, we really need to determine how ice information is used on the bridge and what is most appropriate to meet that need; traditional ice charts may not be the answer – a new type of product is needed*

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- *a lot of data is available to ice navigators but often not in convenient formats; navigators need “actionable information” – in future, that could be just a route in which they have confidence*
- *need integrated view of information; need automated delivery of information*

The goal of this session is to hear directly from mariners and ECDIS users to better understand the evolving needs and to identify some concrete areas where work should be targeted. Perhaps we need to re-think the concept of ice information for e-Navigation and broaden the discussion to incorporate needs beyond electronic ice charts. For example, under Polar Code regulations, risk assessment systems such as POLARIS are becoming of great interest to end users.

Panel Discussion

The panel discussion is not meant to be about the technical aspects of S-100 based products, but more about needed/possible content and what users expect/want. Although the ice services (as providers) are mostly looking at S-411, users most probably have a wider need for met-ocean information on the bridge (be it in ECDIS or other electronic means).

The discussion will start with a short overview on the users need and, from producer side, where we are and where are we going with respect to individual S-100 based met-ocean information (S411- sea ice, S-412/413 weather, S-111 currents, S-104 water level, etc.). The main topic for the panel is what the possibilities are and ways forward to give the mariners a more integrated met-ocean information view on the ship’s bridge in the future - what is this? how does it look and feel? etc.).

Following the overview, the moderator will direct a number of prepared questions to the panel. Experience with virtual meetings suggests that it is important to direct questions to individuals rather than to all – while still allowing others to chime in. We will use the chat function of the videoconference software to field questions and comments from the audience. An assistant to the moderator will be charged with monitoring the chat and bringing these forward.

Panel Discussion: S-100 based Met-Ocean information in ice-infested waters

Moderator: Jürgen Holfort (BSH)

Panelists:

- Michael Bergmann (Bergmann Marine)
- Friedhelm Moggert-Kägeler (7Cs)
- Joseph Sienkiewicz (NOAA)
- Tim Oliver Burgold (University of Wismar)
- Jan-Daniel Stangier (University of Wismar)
- Ivan Sitnikov (NavDevelopmentCo)

Prepared Questions

Some topics that from my view could come up in the discussion (but I am only the moderator and hope that the panelist come up with more and/or more interesting topics):

1. Are mariners asking for information to move away from ECDIS and towards other e-Navigation tools?
2. Are ice services making tools for planning, awareness, and/or warnings? Should they be?

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3. Is there a problem with information overload on the bridge? (ships' officers do not have much time available along with other duties)
4. Can we make a clean, combined portrayal of several met-ocean parameters? What is interesting at different chart scales?
5. Do we need to maintain "old" products like ice and weather charts in electronic media?
6. How should we portray new products like sea ice forecasts?
7. Should we consider combined Met-ocean "traffic light" warnings based on ice, swell, waves, winds, etc.
 - a. E.g. Transparent for normal open ocean conditions; shades of green (you can go there, but you will encounter ice/heavier seas/stronger winds/...); shades of yellow (if you really want to go there be very careful due to); red (don't go there).
 - b. going from 10/10 to 0/10 of ice in windy weather ice situation improves while waves gets tougher. However, maximum risk for an ice-going vessel probably is somewhere in between, with ice in still heavy seas.
8. Should we combine or change safety contours (depth) with sea ice/ waves/ winds/?
9. Are there products that ice services like but are, at most, a small niche product for mariners?
10. Is ice information self-explanatory? If not, how much training is necessary?
11. Do ships' officers really have to know? Could all planning be shore based and the crew (or in future the autonomous ship) just get fixed waypoints?

Appendix F2: Session 3 Bios



Jürgen Holfort

Jürgen is the leader of the German Ice Service and the German Baltic Sea Water Level Service. Following PhD studies in the South Atlantic and equatorial west Pacific, Jürgen shifted his focus to the North Atlantic and Nordic Seas and joined BSH in 2006. He is the IICWG resident expert on electronic navigation charts and the S-411 standard for ice information. Jürgen also oversees the Ice Logistics Portal providing convenient single point access to ice charts from the world's ice services in various formats including S-411 and shape file.



Michael Bergmann

Mr. Bergmann worked for 27 years in the international company Jeppesen with responsibility for international teams in the aviation and maritime sectors. He has focused on data usage agreements, industry relationships, standards and regulations in the maritime sector. He owns the maritime consultancy company BM Bergmann-Marine and works for Federal Ministry of Transport and Digital Infrastructure, Safebridge GmbH, Marine Fields, SeaReq and others. He is an author and guest lecturer and has held many positions including with the "Straits of Malaga and Singapore e-navigation Alliance", advisor to the IMO, IALA, IHO, Director Comité International Radio Maritime, Fellow of the Royal Institute of Navigation, Associated Fellow of the Nautical Institute,

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council of the German Institute of Navigation (DGON), advisory board of the Institute for the Protection of Maritime Infrastructures of German Aerospace Centre.



Friedhelm Moggert-Kaegeler

Friedhelm’s educational background is Geodesy/Hydrography and he holds a degree in each of these fields. He joined SevenCs in 2000. Since then, his variety of roles has ranged from S-57 data production and training, customer support, and research and development, to product management. Now his responsibility is to develop strategies and solutions for products and services used to manage, analyze, and distribute Maritime Spatial Data. Through long-term experience, Friedhelm has specialized expertise in the domain of electronic chart production and also in-depth knowledge of relevant IHO standards. He regularly represents SevenCs at IHO working group meetings, industry conferences and exhibitions.



Joseph Sienkiewicz

Joe is a meteorologist with the NOAA / National Weather Service’s Ocean Prediction Center (OPC) in College Park, MD. He serves as Chief of the Ocean Applications Branch and is in charge of science and technology infusion to ocean weather warning and forecast services. He holds a B.S. in Meteorology and Oceanography from SUNY Maritime College and M.S. in Atmospheric Science from the University of Washington. Prior to graduate school Joe worked as mate and relief captain on tugboats based out of NY. The OPC is working to develop the S-412, 413, and 414 portrayals for weather warnings, graphics/grids, and observations under the S-100 IHO standards for e-navigation.



Ivan Sitnikov

Ivan is CEO of the Nav Development Co Llc, (NavDCo), Saint-Petersburg, Russia, working on marine electronic chart display and information systems. NavDCo works with customers from shipping, fisheries, port authorities, oil and gas, and other marine industries. Ivan is assistant professor in the First Electrotechnical University, St. Petersburg. He has held various positions with research and development divisions of Morintech, C-MAP, and Jeppesen. He has worked in over 10 countries with shipping, fishery, hydrographic companies, and port authorities on marine electronic chart display and information systems. NavDCo provides the dKart family of electronic navigation chart systems including the Ice Port Monitoring System and Ice Navigator designed in accordance with the Polar Code.

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Tim Oliver Burgold

Tim finished his studies in nautics at the University of Wismar. During this time, he collected one year of service onboard several ships of Aida Cruises and Columbia Shipping Management and worked as an assistant in the Hochschule Wismar Fachbereich Seefahrt (Wismar University of Applied Sciences, Maritime Department).



Jan-Daniel Stangier

Following several years as an apprentice ship mechanic and deck hand on TT-Line ferries, harbour tugboats and a catamaran, Jan-Daniel received the “NWO 500” license of competence at the technical college of Warnemünde. He studied nautical sciences at the University of Wismar and graduated in 2020, recently defending his bachelor thesis on “Development of a Simulator-Based Shiphandling Training for the Qualification of Search and Rescue Personnel”. He is currently studying for the Master in “Operation and Management of Maritime Systems” and works as an assistant at the Maritime Simulation Center Warnemünde.