

**Toine Barten**

Netherlands

Q1

Some of the most important evolutions in the history of hydrography for the Netherlands are the addition of the multibeam-echosounder and the implementation of GNSS on board of our hydrographic survey vessels. For a seafaring nation such as the Netherlands, that is so reliant on the ocean, being able to map the ocean detailed and accurately gives a huge boost to safety at sea. Our adoption of these systems has helped the Netherlands hydrographic service become a reliable and respected partner and a valuable addition to our national infrastructural management.

Q2

The advent of new technological advances in hydrography has the potential to change the way hydrographers will work in the future. Some of the most influential changes I expect to see in our own fleet are the use of drones, remote surveying, AI, and the implementation of S-100 standard. As a naval hydrographer, hydrography is split into two categories for me; military hydrography and civilian hydrography and therefore I will look at the future of both.

Military hydrography: One of our main military tasks is conducting rapid environmental assessments in, or close to, hostile territories. The improvement and further implementation of autonomous vehicles will make it easier and safer to operate in these environments. Especially the development of high-tech and reliable UUV's that can travel further away from the operator has the potential to be very important for military hydrography. Being able to operate closer to shore without being seen, as well as not risking any personnel means that it will be easier to use specialized hydrographic knowledge without the hydrographers themselves becoming a liability. Thus making both our work as well as the work of the forces we support easier and safer. Further developments in this area will create an increasing demand for the use of hydrography in the frontlines of any amphibious operation.

Another important development is the use of drones and deep learning/AI object detection in seabed warfare. Subsea cables and pipelines are vital infrastructure that has often been neglected in maritime warfare. However, the recent incident with the Nord Stream pipeline proves how vulnerable our subsea infrastructure really is. The implementation of autonomous drones with automated object detection would give us the ability to protect our cables and pipelines

Civilian hydrography: The use of autonomous vehicles, AI and the introduction of the S-100 standard will not only change hydrography, but will change shipping in general. The use of these autonomous systems will potentially accelerate the shift to online-hydrography thus changing the way hydrography has traditionally been carried out. Furthermore, these developments can facilitate an increase in survey speeds as well as the production of even more reliable data. This could prove vital for the advancement of autonomous shipping, which comes even closer with the new S-100 standard. When looking at it from a larger scope, these developments have the potential to reduce shipping costs and increasing efficiency – having an impact on the global economy.

Q3

While it is always difficult to pick a favorite, a very important article for us is: "Survey Plan Improvement by Detecting Sea Floor Dynamics in Archived Echo Sounder Surveys" by L. L. Dorst in the Vol. 5(2) released in August 2004. One of the main tasks of the Netherlands hydrographic service is charting the North Sea and Dorst's research gave us a better understanding of what is necessary to achieve this goal, on which other research projects have built further. It also gives us an understanding of why we approach surveying the way we do in the Netherlands and creates a solid foundation for our current operating procedures.