

HYDRO INTERNATIONAL INTERVIEWS CAPT. A. ARMSTRONG, NOAA (RETD)

Crossing Thresholds in Seafloor Mapping

US Hydro 2007 Conference takes place this month in Norfolk, Virginia, organised by the Hydrographic Society of America. It will be the eleventh event of its kind, celebrating the two hundredth anniversary of the founding of US Coast Survey. The conference will include technical sessions on the latest developments and applications in hydrographic surveying, multi-beam and side-scan sonar, data management, electronic charting, marine archaeology and related topics. Hydro International took this opportunity of interviewing president of the Hydrographic Society of America and regional correspondent for HI, Andy Armstrong.

Can you give our readers a brief summary of your career in hydrography?

I began my career in hydrography in 1974 when I entered the NOAA Corps and was assigned to *Rainier*, one of NOAA's hydrographic survey vessels. In NOAA I have served on several hydrographic ships and mobile survey units in the Pacific, the Atlantic, the Gulf of Mexico, and the Great Lakes, including a tour as Commanding Officer of NOAA ship *Whiting*. I have also had several shore-based positions in hydrography, including an assignment as chief of NOAA's Hydrographic Surveys Division. I came to New Hampshire in 1999 when the NOAA/University of New Hampshire Joint Hydrographic Center and Center for Coastal and Ocean Mapping (CCOM/JHC) were formed.

The titles of the technical sessions at this conference reflect its very broad scope. Can you reveal any developments in technology and hydrographic processes to be presented and exhibited?

Our technical programme committee has worked very diligently to create a programme covering a broad scope of hydrographic applications and one that stresses new developments in hydrography and ocean mapping. The technology of multi-beam and swath echo sounders continues to advance rapidly, with the ability to record water-column data and high-resolution seafloor backscatter data for new mapping applications becoming increasingly important. These capabilities, the challenges of processing and analysing the massive amounts of data involved, and the new insights and products that result are topics that appear in many of the sessions. Airborne Lidar survey is another technology that is growing in use and application and will be the topic of a session at the conference. Vertical datums are becoming increasingly important to all our surveying and mapping work, and several papers will address the new approaches being developed for seamless vertical transitions in our data. Many of these technologies will be shown by nearly sixty exhibitors displaying the latest in hydrographic systems, software and services. A special feature of the conference will be the presence of NOAA hydrographic survey ship *Thomas Jefferson*, with its suite of hydrographic systems on display and open for tours by conference attendees.

The May issue of Hydro addresses the environment as theme. Will such topics appear on the agenda at Hydro 2007? Could you elaborate on the importance of hydrography in environmental studies?

It is no coincidence that the theme of the May issue is the environment and that environmental topics are a significant part of Hydro 2007. Environmental applications are the biggest growth area in hydrography and seafloor (and lakebed) mapping today. In the United States we are moving toward an ecosystem-based approach to management of our waters and the resources they hold. It is impossible to understand a marine or coastal ecosystem without a good map of the shape and character of the seafloor. This is what hydrography provides and why we are seeing increasing demands for habitat surveys and for sonar and Lidar systems capable of characterising the seafloor in addition to measuring depths.

Global warming has become a topic of international debate in the aftermath of Al Gore's Oscar-winning film "An Inconvenient Truth". What do you feel about the significance of hydrographic information for the global warming debate?

I will admit that this is not an area of my expertise, but I have been told that the shape and relief of deep ocean seafloor features have significant impact on global circulation and mixing of water masses in the ocean, and hence on the global climate. If we are to fully understand how the ocean works, and thus understand its impact on climate, we surely need to have good seafloor maps. Closer to shore, we also know that the depth and shape of the coastal seabed has an important role in the degree and extent of coastal inundation that results from storm surge. We also know from our historical tide records that sea-level has been rising relative to the land. Rising sea level has its own major implications for our coastal environment. These key areas of hydrographic information, ocean and coastal bathymetry and tide data are clearly going to be important in our planning for the future.

Is the Hydrographic Society of America involved in the global warming debate?

No, THSOA is not involved in the debate, nor do I think that it should be. But our members are involved in acquiring the hydrographic data that will be essential to a complete understanding of the global environment.

In your assignment to the JHC you oversee the hydrographic and ocean-mapping education and training programme at UNH. What, in your opinion, should be the role of the national hydrographic societies in education?

The national hydrographic societies have an important role in education. Education is, in fact, the central mission of THSOA. We support hydrographic education in a variety of ways. THSOA as a whole offers a student membership and outreach programme to encourage students to become members of our profession. Continuing professional education is a significant responsibility. In this vein, Hydro 2007 includes a full range of educational workshops. National hydrographic societies should encourage the programmes necessary to educate school-age children in the basic sciences and mathematics essential for entering any scientific field, including hydrography. While I think we could do more in this area, we have recently taken some significant action in the aftermath of Hurricane Katrina. With the financial support of individual and corporate members, and many hydrographers from other nations, we have created a special disaster-relief fund. Much of the money we dispensed in the hurricane-damaged area was directed at re-establishing science and ocean education programmes in badly damaged schools.

Conference topics focus on developments in technology and processes. One issue seems to be missing, human resources. What is the status of hydrographic staffing in the USA? Do companies have difficulties in hiring and keeping staff?

I know from the enquiries I receive at UNH that there is a continuing need for qualified personnel in the US hydrographic industry. Government agencies in the US also have a continuing requirement for people to staff their hydrographic ships, boats and offices. Although the readers of this magazine know how personally rewarding a career in hydrography can be, we haven't done as good a job as we could have in spreading the word.

Do you have any recommendations as to how to attract young people into the hydrographic profession?

In the past we have often argued about whether the best hydrographers were sailors who learn surveying or surveyors who learn seamanship, but today neither of these sources is providing a large enough pool of new hydrographers. We need to think about the hydrographic profession in a broader context. It is difficult to convince some people, young or not, that they will enjoy time spent at sea and away from home. Some people want to go to work in the morning and come home every evening. While these people will not be the ones who go to sea regularly, there are still opportunities for them in the hydrographic profession. We must work to attract bright young people with a range of technical skills who may rarely go to sea but upon whom our profession will become more and more dependent: for example, engineering, computer science, statistics, geophysics and cartography are all essential elements of the profession. We need to think in these broader terms when we seek to attract new people into hydrography. Indeed, the opportunity to go to sea occasionally may very well be an attraction for some. When we are looking for people who will be at sea more regularly we need to reach those young people who will enjoy travel, working outdoors and being on the ocean. In the US many of these young people are now choosing education in the life sciences: zoology, ecology, wildlife biology, forestry and so on. Ironically, the job opportunities there are not as good as I believe they are in hydrography. So I believe that, in addition to our normal recruiting of engineering and physical-science graduates, we need to reach out to these young people in the life sciences, convince them to take the necessary math and physical-science courses, and harness their enthusiasm for environmentally related activities.

Is there any focus at the US Hydro Conference on students seeking a career in the hydrographic world, and if so, how?

Hydro 2007 includes a student outreach programme that awards several promising university students the expenses to attend the conference. At the conference we arrange for them generally to see what hydrography is all about, and specifically to learn about the companies and government agencies with career opportunities in hydrography and meet members of the profession. Hydro 2007 is our third US Hydro conference with a student outreach programme and it has been enjoying the continually growing interest and support of our corporate members.

What sort of message would you like to pass to youngsters seeking a career in hydrography?

The world of hydrography is growing. Larry Mayer prefers to call this broadening set of activities "ocean mapping" and that term may have a wider appeal to young people, but, whatever you call it, the applications of hydrographic data and hydrographic technology are expanding. Just as the applications are expanding, so are the areas of expertise that bear on hydrography. At our centre at UNH engineers from the full spectrum of engineering disciplines, physicists, earth scientists, physical oceanographers, cartographers, computer scientists, marine archaeologists and marine biologists, work together on a variety of ocean mapping projects. The message that I would like to pass on is that there are lots of opportunities for people with lots of different backgrounds to work on interesting and challenging hydrographic and ocean-mapping problems and projects.

Hydro international is celebrating its tenth anniversary this year; the THSOA Hydro

Conference is holding its eleventh meeting. What do you consider to have been the significant developments of the past decade?

I think that the most important developments in hydrography over the past decade have been related to multi-beam and swath sonar. As these sonars have advanced in sophistication and capability and simultaneously become more affordable, the range of uses in which they are employed and the value of the data they produce have grown amazingly. Similarly, positioning and attitude sensors have proliferated, improved and advanced to a remarkable degree. In a context beyond hydrography, advances in positioning and attitude have had an even greater impact. As often happens, technologies complement one another, and these two technologies of multi-beam sonar and positioning/attitude sensors have combined in a way that has immensely benefited hydrography and ocean mapping. We had multi-beam sonar ten years ago, and we had positioning and attitude sensors ten years ago. But the level of precision and advances in signal and data processing that have been applied to both technologies working in an integrated manner have pushed seafloor mapping across a threshold beyond improvements in degree toward fundamental improvements in the nature of their use.

What do you expect will be important developments over the coming few years?

I expect we will continue to see improvements in the capabilities of multi-beam sonar, particularly in the areas of water-column and seafloor backscatter mapping. These are areas that with regard to multi-beam sonar are beginning to win more widespread attention and offer the promise of new mapping applications. I also think that we will see major improvements in vertical control, particularly in the development of greatly improved connections between traditional terrestrial and marine datums and satellite-based vertical reference surfaces. These improved connections will significantly increase the value of hydrographic data for a broad range of users.

