

OPINIONS FROM DIFFERING BACKGROUNDS

Low-budget Hydrography

Low-budget Hydrography is the theme of this issue. Realising that different players in hydrography will have differing opinions on various aspects of low-budget hydrography and interested in exploring these divergent views on your behalf, HI asked representatives from various camps for their opinions on some leading questions.

The representatives interviewed are:

Jeffrey F. Marlow, Survey Technician, US Army Corps of Engineers

CDR Guy Noll, Commanding Officer, NOAA Ship RAINIER

LTCDR Richard Cullen, Staff Officer Quality Control AHS

Questions:

1. Can you briefly explain your position in the hydrographic world: your experience and present position?

Cullen:

I have been employed by the Royal Australian Navy for the past ten years as a hydrographic surveyor, the last three at IHO Cat A level. I was formerly Commanding Officer of two Royal Navy Naval Parties (NP) operating on the east coast of the UK. NP1008 conducted hydrographic surveys offshore using single-beam and NP1016 conducted activities inshore using an EM3000D.

Both units were producing data for the UK Civil Hydrographic Program maintained by the Maritime and Coastguard Agency. As the Charge surveyor for these activities, liaison with commercial industry and government authorities was fundamental to the efficient use of funding while producing an extensive product.

My present work at the Australian Hydrographic Office as Staff Officer Quality Control involves overseeing and conducting verification of hydrographic data. I am director of Hydrographic & Cadastral Survey Pty. Ltd, which offers a broad spectrum of surveying service, and Hydrography Commission representative for the New South Wales division of the Spatial Science Institute. I edit the Journal of Spatial Science for papers relating to land and hydrographic disciplines.

Houston:

I started work as a marine biologist in the UK Water Industry in 1974 where I was primarily involved in environmental and oceanographic studies required for their long sea-outfall programme. Following privatisation I moved to Wales as Survey Manager of a group performing the same function for Welsh Water, with aspirations to commercialise their services. The group gained a solid reputation for inshore hydrographic and geophysical surveying (amongst other services) in a diverse range of markets, undertaking much of the commercial inshore surveys conducted under the UK Civil Hydrographic Programme. I led a management buyout of the business in 2000 to form Titan Environmental Surveys Ltd; Gardline Marine Sciences Ltd subsequently purchased a controlling share in 2005. Within this organisation Titan is a leading UK inshore survey contractor, conducting hydrographic, geophysical, oceanographic and environmental surveys for a wide range of clients throughout the UK and overseas.

Marlow:

I began my career in hydrography thirty years ago with the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service. I was tasked (involved) with evaluating charts while on a mobile field party responsible for chart discrepancies in the Great Lakes,

and on the US east coast and Florida I performed basic hydrographic surveys. I joined the US Army Corps of Engineers in 1984 and have served with the Wilmington, North Carolina, Norfolk, Virginia and Mobile, Alabama Districts. I am currently with the Sacramento, California District as a Lead Survey Technician. In these Corps districts I have performed hydrographic surveys on a daily basis. I have also worked for three US dredging companies and several A-E firms in this capacity.

Noll:

I am currently Commanding Officer and Chief of Survey Party for the NOAA Ship Rainier, a 70-metre hydrographic survey vessel with six nine-meter survey launches, that conducts surveys for nautical charting in Alaska and the US West Coast. I have held many positions connected with the Office of Coast Survey, the National Hydrographic Office of the United States, including leading the implementation of new technology from 1999 to 2003. I began my career aboard the Rainier in 1987, acquiring data with paper-punch tape, microwave positioning networks, wet-paper side scan sonar, and vertical-beam echo sounders.

2. What do you consider to be low-budget hydrography? Does it exist?

Cullen:

Low-budget hydrography is the ability to produce output based on the requirement without using technology too advanced for the scope of the survey. These surveys do exist, but with good marketing and persuasive selling by survey equipment manufacturers the client can be driven into a more expensive option.

Houston:

We certainly see both high and low specifications in tenders for hydrographic surveys; these often tend to be generic to certain markets. Low-budget to me is where the scope of work is also minimised to match the funding available, rather than simply using older or cheaper technologies. The risk is that where funding is low both technical specifications and scope of work are reduced to a level where the data is not sufficient for purpose.

Marlow:

Were you to ask me this twenty years ago I would have said that it was non-existent. However, with the incredible leaps made in just the last ten years with the introduction of GPS and user-friendly software, low-cost hydrography has come within the grasp of many A-E firms willing to make the necessary initial capital and personnel investments. Previously, a substantial outlay of capital would have been necessary to procure the needed positioning equipment (microwave or radio), and software to acquire and plot data in an industry-acceptable format. Today, an ambitious A-E firm could ramp up with the necessary equipment and software methodologies to satisfy many of the IDC/IDQ (Indefinite Quantity/Indefinite Delivery) contracts as promulgated in the US Commerce Business Daily for the US Army Corps of Engineers and National Oceanic and Atmospheric Administration.

Noll:

Low-budget, to me, is a phrase used to describe spending the minimum amount of money to acquire, process and ensure the accuracy of data required to meet a specific need. Not all projects require expensive and complicated equipment, but when they do proper funding to hire commensurate expertise is also needed. It is easy to collect bad data, and very hard to make bad data good.

3. Do you foresee further cost-reduction possibilities or trends, and would you recommend any dedicated R&D on these aspects? Please elaborate on some of these, e.g. reductions in personnel costs (by making systems more advanced, requiring fewer personnel), equipment cost-cuts by combining systems, using new techniques etc. or reduction of survey-sensor platforms (ships, AUVs, airborne techniques, satellite imagery)?

Cullen:

The farther technology advances the greater the costs become in personnel training and salary. Advancing the technology can reduce the number of personnel at the front end but the level of IT and engineering support increases at the back end. Hardware costs, software costs, insurance costs and operating costs due to various time-line events all expand. These costs are eventually passed on to the client. Perhaps budgets will simply increase to cope with the costs and then surveys will appear to become comparatively cheaper as technology grows.

Houston:

I see little scope for reducing costs in "low-budget hydrography" but overall I believe commercial pressures will continue to drive improvements in 'value for money'. Hydrography is no different from any other service sector and we are seeing ever-increasing amounts and quality of data produced for little or no increase in cost. This is largely due to technological advancements, both in equipment and IT. Advances in instrumentation result from the R&D undertaken by equipment suppliers, and I don't see this changing. IT developments

(both hardware and software) will continue to drive down the time costs for data processing and charting.

Marlow:

Though it is a safety issue, I have in the past performed low-budget, single-beam hydrographic surveys alone. I do not endorse such an effort; however, the austerity of the firm that I worked for dictated this. I can foresee the day when low-budget hydrographic surveys will be performed by ROV much like the AUVs employed within the industry. A technician would remain stationary, either aboard a mother vessel or ashore, and perform the survey using a joy-stick and a monitor. After the initial capital outlay, an obvious benefit in production and reduced personnel would be realised.

Noll:

I would rather focus on increasing the value-added benefits from striving to meet national hydrographic surveying requirements than discuss cost reductions. The added value in data that is possible with the newer equipment and software, the new users of this data and the potential for new applications of the data as we acquire full-bottom coverage over large areas of the ocean is tremendously exciting. If we were only surveying for least depths on shoals we would not be preparing for the hydrographic future. Surveyors should strive to maximise their cost-effectiveness by acquiring as much information while on site and using all available sensors. Software must allow us to integrate all the information as quickly and automatically as possible while maintaining full resolution and recovery of raw data. This integrated data pool will apply the vessel's costs per day, including personnel, across a broader and deeper customer base. The challenge to the vessel administrators is how to realise that added value and amortize it.

4. Is diminishing hydrographic knowledge creating an insuperable hurdle for choosing those technologies fit for purpose?

Cullen:

It is not the hydrographic knowledge diminishing, it is the knowledge required to ensure the validity of the data by interrogating setup and output files from source and experimenting with technology. Above all, the hydrographic professional needs to understand what is happening in the hardware and software they use so as to make an informed decision on which technology is fit for purpose.

Houston:

I hope not. Government and regulatory organisations need to have the knowledge to specify data requirements that are fit for purpose. Commercial survey companies need to have the knowledge to invest in technologies that will meet these most cost-effectively, while those assessing tenders need to understand the differences in equipment proposed. The range of technologies has never been greater so it is now very difficult for commercial companies to offer both "low-budget"™ and "top-end"™ services. It has never been more important to focus on chosen markets and invest in new equipment appropriately.

Marlow:

In the US the de facto standard hydrographic software is HYPACK. With their excellent methodologies and annual training conferences, a computer-literate trainee can grasp the complexities of data acquisition and processing. There are several colleges in the US that offer training in this discipline. Mind you, we are talking about low-cost hydrographic surveying.

Noll:

An interesting question "how do you know if you are using the right tool for the job? There is rapid change in available tools for hydrography and the surveyor cannot afford to have one of everything in event of a special situation. I believe that a well-equipped surveyor can apply the technologies currently owned to accomplish most jobs, but data quality control and procedures for ensuring a robust final survey are the critical knowledge that overlay the tools. Training and apprenticeship-style skills development are a requirement in this field for these reasons. A set of hardware and software that produces standards-based data while creating opportunities for enhancing customer satisfaction is a priceless addition to a surveyor's kit. A few spares help too.

5. Can you mention some examples of low-cost hydrography of your own experience, pennywise, pound-foolish examples included?

Cullen:

From experience in the UK, the example of single-beam (SB) survey versus swathe systems in shallow water, mobile seabed areas for charting purposes is of note. The SB method is far more expedient and cost-effective than the swathe system if the only use of the data is for charting. Considering that the seabed may be significantly different within a short time period after completion of the survey, the cost per nautical mile is higher for swathe. Increased processing time, complex tide infrastructure and sea time to provide 100% bathymetric coverage increases cost. Because the resultant depth difference caused by mobility outdates the product within such a short timeframe for both systems, it is cost-effective to use a more affordable survey method. If the data has uses other than charting, swathe could well be worth the greater cost. Again, it comes down to the use of the final data.

Houston:

I could, but I don't want to appear critical of some of our customers. There have been many cases in which survey work scope has been reduced to meet budgetary constraints only to result in expensive re-work later because data did not meet the needs of regulators, designers, construction contractors etc. Alternatively, I could cite cases where survey work scope is over-specified, incurring high levels of unnecessary cost. Thankfully we have many knowledgeable clients with a good appreciation of their data requirements, while others are open to discussing with us survey designs that best suit their needs.

Marlow:

While endeavouring to establish a low-cost hydrographic survey capability within an A-E firm ten years ago, I was chagrined that the principals of the firm did not recognise the potential that this enterprise could yield. With the passing of the recently amended Brooks Act of 1972 requiring nominally 25-30% of Surveying and Mapping within the federal government to be contracted out to the private sector, I believed the time was right to pursue this. After much research and market analysis I felt that we could prevail in this area were we to launch an ambitious effort. After a presentation to the firm's partners, I was chagrined to receive a memo indicating that we needn't purchase a boat until we had a contract in hand. Bravado and hype does not make a convincing hydrographic effort, as one must make the commitment in time, equipment and personnel. Were I not to have threatened to purchase the boat that I had located on the firm's behalf, I am convinced that they would not be enjoying the lucrative government contracts that they have today!

Noll:

A few years ago this ship (Rainier) accomplished a shallow-water multi-beam survey of a crude-oil-tanker corridor in Washington State, thus requiring a very accurate survey. The previous survey was accomplished by a six-member field-survey party with two vertical-beam echo sounder survey boats, one towing an analogue side-scan sonar to achieve 200% coverage and position over one thousand objects. I am very pleased that the high-confidence least depths from the new multi-beam survey did not find significant discrepancies with my less-expensive survey from the prior decade.

Another example: in the days before widespread differential GPS, established horizontal control was a time-consuming and sometimes difficult task. NOAA Ship Rainier surveyed bays and harbours in Alaska's Prince William Sound following the T/V Exxon Valdez incident and the existing horizontal control was not adequate for a modern hydrographic survey. There was no time to do the usual regressive network of observations of directions and distances, so we used dead-reckoned time and course between prominent geographic features for positioning our vertical-beam echo sounder data in hand-written logs and plots. It was a successful survey in that we found most of the critical features that were fully surveyed in the late 1990s.

6. Do you have any other comments on this subject for our readers?

Cullen:

Don't be swayed into an expensive decision by the great technology if the output it provides is beyond the requirement of your final needs.

Houston:

Carefully designed and performed hydrographic surveys can be delivered at low cost and meet client's needs, albeit not all clients.

Marlow:

Yes, in my considered opinion and based on my personal experience having worked in both the public and private sectors of this industry, and this may go against doctrine, I feel that in the present fiscal climate here in the US, our citizens would be better served by contracting more hydrographic surveying to the private sector with the capabilities that I have seen them display.

Noll:

Methodology will prevail over technology because a good tool used poorly will not provide the accuracy of an adequate tool used well.