Robotics prompting shift in class surveys

By Julie Pray, ABS Senior Engineer

Maritime interest in advanced inspection technologies is on the rise as the growing complexity of marine and offshore assets and the associated operational changes are prompting a shift in how classification services are delivered.

These new robotic technologies include tools such as unmanned aerial vehicles (UAV), crawlers and remotely operated vehicles, and 'wearable' technologies, all of which can be programmed to capture and share a richer array of 'live' information from the survey site. They have the ability to deliver significant enhancements in the efficiency of surveys while being less intrusive to the asset.

Unmanned aerial vehicles

UAVs — or aerial drones — can be remotely controlled, or programmed to fly autonomously on routes which are informed by historic data on a specific asset's condition, targeting known areas of concern. They can collect visual data — such as still images, live-stream and recorded video — from difficult-to-reach structures and areas, minimizing the risk that surveyors face when working in potentially hazardous areas.

Aerial drones can improve the efficiency of inspections and surveyor safety by remotely examining confined spaces and elevated areas, replacing riskier conventional means of access like staging, scaffolding and rafting.

At present, UAVs are best suited for general visual inspections to conduct condition assessments, quickly collecting visual data from the asset. They can also be used to monitor — through the photographic evidence or other data they collect — the known conditions of assets, periodically examining temporary or recent repairs in hard-to-reach areas, or known damage that does not require immediate repair.

But they currently have operational and remedial limitations. UAV-enabled remote inspection techniques need to be considered on a case-by-case basis if any of the following conditions exist or are found during the course of the survey process:

- There is an historic record indicating abnormal deterioration or damage to the structure.
- The condition of the structure or item affects the class of the asset.
- If an inspection reveals damage or deterioration that requires immediate attention.
- The condition or colour of the coating on the structure does not allow for a meaningful examination.

Experience has shown that, while the UAV is an effective way to detect defects and unsatisfactory conditions such as corrosion, other means of access may be required for a proper assessment and to determine which repairs to undertake.

In terms of class surveys, UAVs at present remain a tool to assist the attending surveyor when a visual examination of the structure is required. They hold significant promise and ABS is working with industry to evolve and adapt these technologies to maritime applications.

When they are utilized, compliance with regulatory requirements — in particular the International Convention for Safety of Life at Sea (SOLAS) and the Enhanced Survey Program (ESP) Code for bulk ships and tankers should be considered.

Remote-controlled drones have the ability to deliver significant enhancements in the efficiency of surveys.

In addition to any generic risk assessment that an independent UAV operator may follow as part of their safety management system, a case-specific risk assessment should be carried out to identify any hazards and the requirement for additional risk-control measures.

The next step in the UAV's operational evolution is for industry to determine the full scope of a drone's ability to support close-up inspections. With technological advancements in onboard modules, for example, UAVs will be able to collect more data — such as gauging the thickness of materials during corrosion assessments, comparative image analyses, or mapping assets to create 3D models.

In general, robotics is supporting the trend towards the non-destructive examination of increasingly high-value marine assets and the parallel emergence of a less intrusive class survey process.

The challenge for asset owners and their independent technical advisors is to fully understand the potential that robotics has to change inspection regimes and asset-lifecycle management, and then develop the supplemental technology to deliver on that vision.

Ultimately, these automated inspections will be integrated to support "smart" assets — featuring sensors, barcodes and chip technology — to encourage more informed and rapid decision-making.

Wearable devices

Like UAVs, significant advances in wearable inspection devices, particularly eyewear, are supporting the real-time sharing of survey information.

Wearable technology allows surveyors to collaborate with experts in remote locations, bridging the constraints imposed by time and distance to encourage accurate and timely decision-making. With advanced visualization and augmentation, data can be superimposed on the assets, allowing them to be evaluated through the lens of their inspection history, with a hands-free, digital capture of records, narratives and targeted inspection applications.

Classification organizations such as ABS are in the process of validating the application of augmented reality, artificial

intelligence and automation technologies to enhance the services they provide.

Pilot studies are assessing the ability of an array of wearable technologies to improve operational efficiency, streamline information capture and the visual display of information, and to create a collaborative environment for real-time interaction.

One objective is to evaluate how wearables could be used to provide onsite access to technical resources (manuals, Rules, etc.) to drive efficiency into the inspection process and expand the knowledge base with newly captured information. Another goal is to use wearables to create a real-time interface between back office and field personnel, allowing for live consultation with technical specialists.

Over the course of a recent three-month pilot study with offshore clients, ABS was able to take away some key lessons from applying wearable technologies in the field. By deploying surveyors to assets and setting up remote support teams, we tested the flexibility of processes, resulting in new methods of collecting information and enabling multi-party communication.

Ship owners see the value in wearable technologies and are excited about the potential application of these technologies to allow for more transparent and secure collection, storage and use of information.

In applying wearable technologies, class can improve data collection and sharing to create an environment where specialists in remote locations collaborate with field teams in real time to make faster, more informed decisions. Using wearables can dramatically change how classification services are carried out, expanding the capabilities of individual workers and streamlining operations.

In short, wearable technologies have the potential to change the way class societies work, how decisions are made and how technical specialists interact.

Remote, real-time communication can reduce operational downtime and other related costs by improving the subject-matter specialists' access to practical information. By leveraging less intrusive inspection options, personnel and assets are exposed to fewer hazards.

Combining these technologies with effective data collection and applications will transform the way surveys are conducted, shifting from prescriptive to a risk-based inspection regime, and allow finite resources to be focused on known problem areas.

ABS is leading class societies into the digital future by advancing innovation in data and advanced-inspection technologies to support a more predictive and less intrusive survey process, as well as a safer work environment.

Wearable devices allow for real-time sharing of information.