Drones support seismic acquisition

The use of drones to check up on seismic equipment will save money and provide HSE benefits.

Steve Wilcox, Sercel

The emergence of civilian drones, or unmanned aircraft systems (UAS) as they are more properly known, has gained a high public profile in recent years, and this has not escaped the attention of innovators in the oil and gas industry, who have proposed numerous applications for them. Among these innovators are the managers of land seismic crews operating cableless systems who have a set of particular challenges that they hope to address by operating drones alongside their seismic acquisition systems.

Drones are being employed to provide health checks on cableless seismic units. (Source: Sercel)

Cableless recording systems typically use autonomous field units that record seismic data into their embedded memory without any means of having their operational status monitored by the system operator. The field units of some of the most common systems are equipped with short-range wireless transceivers that allow them to be interrogated from within a few hundred meters on the ground but do not have a long enough range to transmit their status back to the recording vehicle. For the operator to identify damaged, faulty or missing field units, personnel are typically deployed on the prospect to interrogate the field units with wireless transceiver-equipped portable computers, which are transported on foot, by all-terrain vehicles or where possible by truck.

To make this operation more efficient, especially in areas with difficult access, crews operating cableless systems have at times used aircraft to lower the manpower effort and improve the frequency of gathering the state-of-health data. Since at least 2008 some crews have been using helicopters or small fixed-wing aircraft to harvest this state-of-health data from Sercel UNITE systems—methods for which Sercel holds two current patents.

Drones

With the emergence and developing technical sophistication of drones, seismic crew managers have been considering how they might be employed to lower costs and decrease risk in acquisition projects. Their use instead of helicopters and light aircraft would greatly reduce operating costs, enabling a far wider take-up of airborne status harvesting. Furthermore, supplementing ground-based state-of-health data collection with drones would greatly reduce the number of times that field personnel are required to travel around the prospect, with a subsequent substantial reduction in HSE exposure.

Without doubt, the world's biggest market for cable-free systems is the U.S., where the Federal Aviation Authority (FAA) has lagged behind many other jurisdictions in providing a regulatory framework for the commercial application of drones. Indeed, while it works its way through a multiyear program aimed at developing regulations for the safe integration of drones into U.S.

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airspace, the FAA has applied a blanket ban on drone operations for commercial purposes, which clearly presents an enormous barrier to their introduction into the seismic industry.

Nevertheless, the FAA has on occasions granted individual exemptions to the ban based on usage scenarios and safety cases proposed by the applicant, and recently a newly founded company—Blue-Chip UAS—was granted such an exemption, which specifically allows it to commercially operate drones in support of a range of services to various industries, including the seismic exploration industry.

Working in partnership with Paragon Geophysical, a seismic exploration contractor, Blue-Chip UAS will be trialing the services that it plans to offer to the land seismic industry over the next few months. Alongside the harvesting of seismic field equipment status data, Blue-Chip UAS will offer aerial surveying and photographic recording services, which are also of value to seismic contractors.

With a license from Sercel to use its patented methods, Paragon and Blue-Chip UAS will operate a Sensurion Magpie UAS on a Sercel UNITE crew, initially on a trial basis, but will extend operations to all of its UNITE crews when field-testing is complete and the benefits of the service are proven.

Jeff Logan, vice president of operations at Paragon Geophysical, said, "We are extremely excited to finally be able to get the drone in the air and prove that we can make great gains in efficient use of our personnel and at the same time reduce the HSE exposure of our people by greatly reducing the amount that they will need to move around the prospect by foot and all-terrain vehicle."

> The aircraft can stay airborne and operational significantly longer than alternative designs.

The system

The Sercel UNITE system is particularly suitable for this application, incorporating a sophisticated Wi-Fi transceiver with an antenna that has an excellent aperture profile for communications from above. The system's central unit interfaces transparently with the harvesting equipment, and it incorporates features that give the operator a clear overview of the status of the equipment once the status data have been received from the harvesting equipment.

The FAA-certified Sensurion Magpie is a small, fixed-wing UAS propelled by an electric motor and equipped with an autonomous navigation system and a live camera feed to the ground station. The design of the aircraft means that it can stay airborne and operational significantly longer than alternative designs such as multirotor aircraft, allowing the entire spread to be covered in one flight operation.

The camera system allows the operator to record and document landscape and culture features within the survey area, allowing the project manager to perform pre-project surveys. This information can then be used in conjunction with maps and satellite images to plan details of the project. Furthermore, a post-project survey can also be undertaken to provide evidence of the impact that the project has had on the landscape and infrastructure, simplifying discussions with landowners, etc.

An additional feature is that the GPS position of the aircraft is transmitted every few seconds on the telemetry link from the aircraft to the ground station, where it is recorded. This allows the operator to verify that the drone has flown only its pre-planned route over permitted land and, if the need arises, the operator can provide evidence of this should there be any dispute about its flightpath.

For Blue-Chip UAS, the next stage after the benefits of using drones in seismic have been established with Paragon is to begin offering its services not only to other seismic contractors operating Sercel UNITE systems but also to companies operating in other sectors and industries that can benefit from aerial surveys over a wider area. An example of a potential application is wildlife surveys. The lesser prairie chicken is a grouse-like bird that is listed as an endangered species and whose habitat often coincides with areas in the U.S. where oil and gas, wind power, and transmission line developments frequently take place. To halt the decline of this species, the U.S. Fisheries and Wildlife Service has created a conservation plan that under certain circumstances requires that a species population survey is performed before any work commences. Blue-Chip UAS believes that it is extremely well placed to be able to offer this service in a highly cost-effective manner.

With these developments, it seems clear that a new era of efficiency and safety of operations is beginning for the land seismic industry in North America. Drones may soon be a common sight flying over a seismic prospect, while the sight and sound of all-terrain vehicles traversing the land may become much rarer. E&P