



Optech President Don Carswell holds an early lidar instrument--the 2KHz Model 501--introduced in 1984.

## it's all about **imaging** Optech Innovative Lidar Solution Conference

**B**ringing together nearly 200 successful technology users from 30 countries around the world and the circuit of creative energy is palpable. Optech's first Innovative Lidar Solutions Conference, held in Toronto in June, was no exception. In his opening remarks, President Don Carswell was pleased to initiate a forum where Optech users could share

experiences and discuss challenges and solutions. This conference has supplanted Optech's ALTM user group meeting of previous years.

To kick things off, Optech brought in its longest serving employee, Doug Houston. Houston began with the company in 1974, building on lidar

experience he had been gaining since 1969 when he was involved in developing the first lidar instrument in Canada. The first instrument he worked with was capable of generating a mighty three pulses *per minute*. While at York University, they got it up to ten pulses per minute, but it

>> By Marc Cheves, LS



Attendees pay close attention at one of the terrestrial lidar track sessions.



Doug Houston, a long-time Optech employee, provides a fascinating history of the company.



Brent Gelhar, Vice President of Sales and Product Strategy, gives the opening remarks.

was still useful for detecting sulfur dioxide in smokestack plumes. By the early 80s, 100 pulses *per second* was possible, and in 1984, the 2KHz Model 501 was introduced. To me, this revolutionary handheld, single-shot instrument was the real beginnings of an instrument surveyors would use. Houston provided a fascinating history of Optech and detailed how the speed and capability increased by leaps and bounds over time. In his opening remarks, Vice President of Sales and Product Strategy Brent Gelhar, drew a

parallel with early day cell phones and the power available to users today.

The technical sessions were truly international in scope as Optech brought users from all over the globe. The sessions were divided into two tracks, terrestrial and airborne. Being interested in both sides, my only regret is that I spent all of my time attending the terrestrial track!

Nick Holden, a development manager for the UK Environmental Agency, explained how UKEA was using color-coded aerial lidar imagery

to map flood plains. The UK has had quite a problem with flooding in recent years, and a picture is worth a thousand words when it comes to convincing property owners of the need to call their politicians.

Clay Wygant, WH Pacific, and the first US buyer of the LYNX mobile mapping system, started his session by saying, "Welcome to the Revolution!" His company is having great success at performing work it normally would have subbed out in the past. This includes corridor mapping, freeway





Attendees take a close-up look at Optech's LYNX Mobile Mapper.



Clay Wygant, senior surveyor with WH Pacific, shared his company's experiences with LYNX.

mapping, riparian modeling, and construction management through as-building and progress monitoring. He says the LYNX has changed their business model and added, "Once you bring the pony out, someone will want to ride it!" Wygant told about scanning a ten-mile stretch of LA freeway (20 miles total). The work was done at night, in six passes (three on each side of the 4-7 lane freeway), with a rolling blockade provided by the California Highway Patrol. Wygant said the work included "finding a grade break somewhere between Lanes Two and Three," which they easily did, all at  $\pm 2$ cm accuracy.

Mike Leslar of Optech, told of how working together with Aerial Data Services (ADS) they used lidar as a "proof of solution" for railway mapping. From the data, ADS is able to derive track conditions, asset location,

vegetation encroachment, water ponding alongside the track, and volumes for new siding planning.

Several of the sessions pertained to historical preservation. Two of the sessions even delved into rocket science. The first was a York University project to enable better determination of tree canopy. Currently, resultant models only show the top layer of the canopy, but work is underway to allow people to "see into the canopy" between the top and the ground.

Other high-level sessions covered correcting for trajectory drift and the effect on vertical accuracies (more vertical control helps this), and the trials and tribulations of calibrating both the camera and the lidar unit. Other success story sessions involved using lidar for deformation monitoring, merging terrestrial lidar with bathymetric data for harbor and coastal mapping, using lidar



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Tom Greaves, President of Spar Point Research, gives a state-of-the-industry keynote.

for hazard assessments such as rockfalls, and recent advancements in the software that processes the data. Sineco, an Italian company and Optech's first Lynx customer, has accumulated 4Tb of data and scanned more than 7,000 kilometers of roadway. Sineco is extracting not only asset inventory, structures and 3D topo information, but also pavement condition and geometry as well.

Nick Holden expanded on the UKEA efforts during a keynote. He discussed the difficulty of getting the "purse-strings crowd" to make decisions, and reiterated the value of imagery. He said the value of 15-20 seconds of "eyeball time" to actually see the benefits is far better spent than the time it takes to read a 60-page report. Although the upcoming Olympics is driving much of the demand for digital data, Holden returned to the flooding issue. Even though roads become rivers during a flood, people are more interested in the elevation of their doorstep (the last defense

before floodwater enters the home). For this, he said they need  $\pm 1\text{cm}$  elevations versus the  $\pm 5\text{cmV}$  and  $\pm 1\text{mH}$  flood plain maps they are getting now. As an aside, he also mentioned that the agency is taking older computers and re-purposing them into server farms for parallel processing.

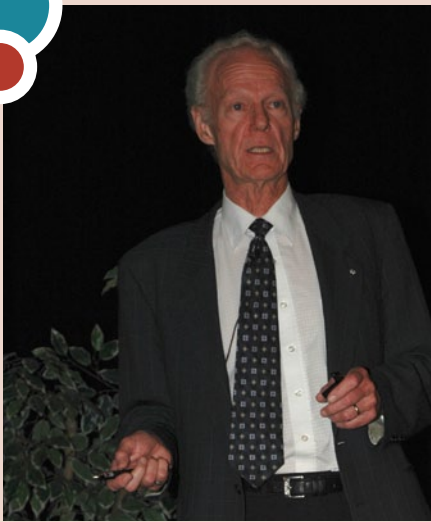
Tom Greaves of Spar Point Research gave another keynote and informed the audience that laser scanning had grown from a less than \$100 million market in 2003 to a more than \$400 million market today. He shared an interesting factoid: for the 10 million miles of roadway in the world, it would take 200 survey crews one year to survey it all. Scanning can provide a 25:1 schedule compression. Another benefit of mobile mapping is safety: data can be obtained by driving. Greaves said challenges include resistance from DOTs and how to create a 2D deliverable. He posed the question, "Will government entities or contractors drive demand?" and

discussed the inefficiencies present in the construction industry—for example, far too many change orders—and mentioned the large inventory of undocumented infrastructure assets worldwide. A potential growth area for scanning is risk management. If the pre-existing conditions have been scanned, it will be easy to disprove that construction activity caused damage. Because it also makes for good television, Greaves encouraged the audience to use historic preservation as a means to sell the public on the value of scanning.

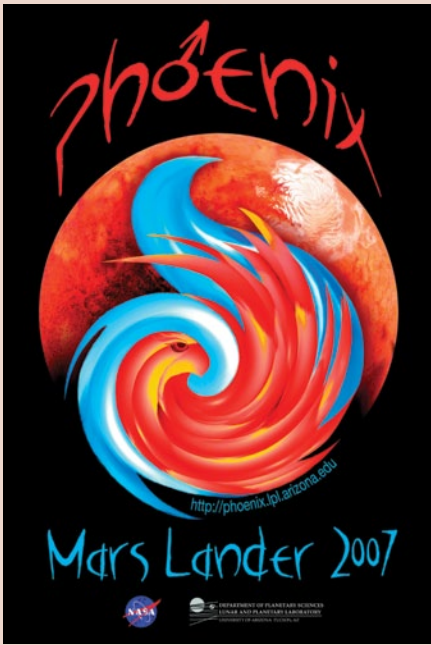
One of the technical sessions highlighted Optech's involvement in the Haughton-Mars Project. The Haughton Crater, located in the far north Canadian Arctic, is similar to the surface of Mars, and is being used to test rovers. The session pertained to correlating aerial imagery of the crater with ground-based rover scanning.

In a round table discussion for terrestrial users, the overwhelming





Company founder Dr. Allan Carswell details Optech's off-the-planet successes.



## MISSION TO MARS

Company founder Allan Carswell gave a fascinating presentation on Optech's extraterrestrial involvement. Starting 12 years ago, and beginning with ground-based atmospheric research here on earth, the company has been involved in autonomous rendezvousing and docking of spacecraft, and safety and inspection (the Shuttles are scanned, on orbit, after every launch to look for damaged tiles). With the Haughton-Mars Project, Optech has contributed to remote vehicle guidance. But with the Phoenix mission, launched in 2007, Optech took its involvement one giant leap further.

To determine if there was ever water or life on Mars, NASA's strategy is: Follow the Water. NASA landed the Phoenix inside the Martian Polar Circle to investigate the discovery of near-surface ice by the Mars Odyssey orbiting spacecraft. To this end, Optech participated in the development of an onboard meteorological station that measures temperature, pressure, winds and humidity. Optech's contribution was a laser for detecting dust, ice crystals, particulates and clouds.

In May of 2008, the spacecraft safely landed on Mars. Because the Martian atmosphere is composed of 95 percent carbon dioxide, when the Martian winter occurs with temperatures approaching -130°F, the CO<sub>2</sub> precipitates out as dry ice, or snow. The occurrence of snow on Mars was a big discovery. Mars shares several similarities with Earth, including inclination and length of day, but one big difference is the length of the Martian year (nearly twice as long as Earth's). The Martian day is referred to as a "sol" for solar day, and Phoenix was only designed for 90 sols. But as of October, 2008, it had transmitted data for 152 sols. It has since been put into Lazarus mode, awaiting the arrival of the next Martian Spring, and this November an attempt will be made to "wake it up."

### PHOENIX ACHIEVEMENTS INCLUDE:

- First LIDAR on Mars
- First Canadian science instrumentation package on the surface of Mars
- First measurement of atmospheric structure from the surface up to altitudes of 20 + km (all results are new)
- First detailed polar weather record, with data on temperature, pressure, humidity and wind
- Mission-long observations of dust, clouds and ice crystals
- Atmospheric studies coordinated with simultaneous observations from above by NASA's Mars Reconnaissance Orbiter
- First geological studies of the Martian polar surface
- First studies of Martian sub-surface soil and ice properties
- Many new and high precision measurements over 150+ sol
- Investigation of Martian habitability for past or present life


Because two-thirds of the missions to Mars have failed, Optech is rightfully proud of the fact that it was able to participate in such a successful mission, and that one of its lidar instruments was responsible for a big discovery. Of course, given the increase of CO<sub>2</sub> on our own planet, the scientists are seeking to answer the underlying question: "Is Mars the Earth of the future?" At the end of his presentation, as a show of respect and admiration for Dr. Carswell, the audience gave a standing ovation for this Canadian Man of Science.

request was for better accuracy ( $\pm 2$ -3cm). Also mentioned was a need for spectral analysis and more sensors such as thermal and infrared, the need to educate top-level decision makers (surveying, for example, is often a sub to a sub), and security of equipment.

As with GNSS, scanning technology is taking off around the world. But as

Greaves pointed out, lack of awareness and necessary capital investment, along with resistance by surveyors and the construction industry are still impediments to progress.

I was impressed by the refreshing comment of one Italian attendee, who said, "Optech is less interested in selling me equipment than it is in

technology and providing solutions." Optech, with its long history of innovation, has pioneered the development of both ground-based and aerial scanning. "It's all about imaging," says Carswell. "Everything points to helping someone make a decision." 

Marc Cheves is Editor of the magazine.