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### New technology could revolutionize the black box

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Special to The Globe and Mail

*Calgary firm's data-streaming system would enhance safety. But what's really caught the airlines' attention is the cost-saving properties*

The staff of AeroMechanical Services Ltd. watched the fruitless search for flight-data recorders of Air France Flight 447 in the South Atlantic from afar earlier this year knowing that their technology could have helped to reconstruct the tragedy.

All 228 passengers and crew on board died in the crash en route from Rio de Janeiro to Paris on June 1. It has proven impossible to recover the flight-data recorders, commonly known as black boxes, from the depths of the ocean, thereby slowing the investigation.

The loss of Flight 447 has focused attention on other ways of collecting flight data - before a pilot reports an emergency. This is where AeroMechanical of Calgary believes it can play a vital role. Its technology can collect most of the black-box information by transmitting the data in real time, via satellite.

"It's high tech, it's energy-efficient, it's green, it's exactly the right kind of company in the aviation sector that you want to have in your back yard," aviation industry analyst Rick Erickson says. "It has all kinds of wonderful upsides."

The fact that the technology already exists will probably cause some regulatory authorities to consider AeroMechanical's product carefully as either a backup or a primary system, Mr. Erickson says.

Airbus, the manufacturer of the doomed airplane, has added to the speculation by saying the company is working toward improving flight data recovery. It has established a working group that will look at a number of options, including data transmission, deployable recorders and enhanced beacons. It will take at least six months for the group to make initial proposals.

Quoted in the newspaper Le Parisien, Mr. Enders said: "The most important flight data could, for example, be transmitted in real time by satellite as is already the case for information concerning aircraft maintenance."

That's an accurate description of the system offered by AeroMechanical, known as AFIRS - Automated Flight Information Reporting System.

It takes information being recorded on the black boxes and, at pre-set intervals, compresses that data and transmits it via satellite to ground stations. In case of an emergency, real-time streaming of data can be initiated automatically, by the pilot or by the ground crew.

The information sent is enough to build a full animation of events on the aircraft and would allow experts to reconstruct them, says Matt Bradley, AeroMechanical's vice-president of operations. "With current bandwidth [you have] almost all of the information you need to provide a decent post-flight analysis for an accident investigation."

The system also allows the ground and crew to communicate with each other in real time, either by texting or by satellite phone, giving the air crew access to another source of advice in an emergency.

"The clever portion is identifying a subset of the parameters of the black box that are critical and then taking that and compressing it into a small file and then sending it out by short-burst signal," says Mr. Bradley, a former fighter pilot with Canadian Forces and a commercial pilot and instructor. "That's the innovation."

However, despite the recent attention given to supplementing or replacing black boxes, there is another reason why airlines may be interested in AeroMechanical's technology.

The AFIRs system costs an average of \$50,000 to install on existing aircraft, but it offers a quick return on that investment in a number of ways, Mr. Bradley says.

Mr. Erickson adds that the system may deliver 3- to 4-per-cent fuel savings. This is done by tracking how an aircraft is being operated and identifying ways to cut fuel use (for example taxiing on one engine instead of two) and making sure fuel-reduction protocols are maintained.

Preventing unscheduled maintenance is another benefit, Mr. Bradley says. For example, an aircraft might develop a problem that requires maintenance, but may be stuck where there are no maintenance facilities or needed parts. "Some operators quote an unscheduled maintenance event as costing as low as \$20,000 per event, up to \$100,000 or \$150,000, depending on the size of the airline," Mr. Bradley says.

However, monitoring information from the engines means some problems can be identified before they happen. The aircraft can then be diverted to a better location for repairs, or have the appropriate parts waiting for it.

Then there is what's known in the industry as OOOI times - Out, Off, On and In Times. AFIRs allows an airline to track exactly when an aircraft moves - when it takes off, lands and pulls in. "There is roughly a two- to three-minute error on almost every leg of a commercial aviation flight when you are not using electronic forms of data. Believe it or not, some airlines have made the justification for cost based on that alone."

Mr. Erickson adds: "They can do some really, really nifty stuff. Some of the sensors of the airplanes can detect magnetic anomalies on things they are overflying. Geophysical and mining companies like that kind of data. As well, some of the parameters [measured] on the aircraft are very useful to the meteorology people. They are able to package that up and basically sell it off."

Jacques Kavafian, vice-president of Research Capital Inc., is also impressed by AeroMechanical. He owns stock in the company and Research Capital has a relationship with the company as an investment banker. "[The technology] is attractive because it helps airlines save a lot of money by tracking fuel consumption and by also tracking maintenance occurrences and alerting the airlines in real time of any problems that occur. No one else really can do that in a way that is economical like AeroMechanical does. Their technology is essentially the cheaper way to transmit the data in real time from the airplane to the ground. ..."

"That \$50,000 [installation cost] will save airlines anywhere from \$100,000 per plane per year up to \$500,000 per plane per year. It's a savings amount that no one can ignore."

AeroMechanical, which has about 50 employees, already has the appropriate supplemental-type certificates for their equipment to be used on a number of Boeing and Airbus aircraft, and Mr. Bradley says it is compatible with all major aircraft manufacturers. Mr. Kavafian says AeroMechanical has installed 180 AFIRs units on aircraft at various airlines.

"We see ourselves as being in the right place at the right time, with the right product," he says.

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Gas-saving potential

\$3.4-billion

Air Canada's 2008 aircraft fuel bill

3 to 4 per cent

Estimated aircraft fuel savings

using AeroMechanical's AFIRS system

\$119-million

Potential savings for Air Canada (using sample 3.5 per cent figure)

Sources: *Air Canada*, and *Rick Erickson*, aviation industry analyst

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