

Aviation Thinks Outside the Black Box

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Hundreds of pieces of wreckage have been pulled from the Atlantic Ocean in the 15 months since Air France Flight 447 inexplicably fell from the sky, but so far the doomed airliner's flight data and safety recorders remain somewhere on the ocean floor. That has many in the aviation industry wondering if it's time to retire the industry-standard "black box" and adopt a satellite system that streams data in real time.

Such technology would provide instantaneous flight information, allowing those on the ground a chance to fix problems before they become catastrophes and providing investigators with more complete data in the event of a crash. Without Flight 447's black box, it will be all but impossible to know what caused the Airbus A330-200 to go down on June 1, 2009, [killing everyone aboard](#).

It's not as if the commercial aviation industry isn't already all over satellite. The Federal Aviation Administration is rolling out a satellite-powered [air traffic control system called](#)

[Next Gen](#), airlines are deploying [satellite-based passenger Wi-Fi](#), and Alaska Airlines is [testing a satellite-powered system](#) that makes landings more fuel efficient.

So if the technology is there, why isn't it being used to stream black box data?

For one thing, old-school flight recorders have a solid track record. According to Air Transport World, there have been [26 over-water commercial aircraft crashes](#) between 1980 and 2009. Of the 52 voice and data recorders that went down with those flights, 49 eventually were found. The National Transportation Safety Board says that in the past 20 years only three recorders could not be read once found.

“From an engineering standpoint, it has been difficult to justify spending money on something that wasn't a problem,” William Voss of the Flight Safety Foundation told Wired.com.

But the Air France crash highlights limitations of the current system. Airlines currently use VHF data link technology called the [Aircraft Communications Address and Reporting System](#). ACARS transmits bare-bones maintenance messages – not detailed flight data or cockpit audio files – and Flight 447 sent just 24 of them in the ten minutes leading up to the crash.

“Bandwidth constraints limit the amount of information that can be conveyed,” Voss said. “With just another handful of data fields, those messages could have been so much more effective.”

International search teams using robots and submarines teams have trolled 1,200 square miles of the Atlantic searching for Flight 447's recorders. At least one deep-sea expert is [confident they will be found](#). If they aren't, the cause of the crash most likely will remain a mystery.

“After the Air France crash, it became apparent that we need to move more data,” said Matt Bradley of AeroMechanical Services. “To understand it, you need access to thousands of different parameters.”

Working with black box heavyweight [L3 Communications](#), AMS has developed a system that allows antenna- and transmitter-equipped aircraft to relay high volumes of encrypted flight data and cockpit chatter to a satellite. The satellite transmits it to secure servers that can be accessed by airline and safety personnel. This data dump can include everything from flight tracking, fuel management, engine monitoring and OOOI (out of the gate, off the ground, on the ground and in the gate) information.

So far, the AMS system has been [installed on several hundred aircraft](#) operated by 31 airlines, including North American Airlines, Canadian North and Northern Air Cargo. With their relatively small fleets, these smaller airlines are more willing than big carriers to make the initial investment.

As a supplement to traditional black boxes, satellite-relayed data would prove invaluable to investigators when flight and voice recorders are unrecoverable and could help prevent accidents.

“People on the ground would be alerted to events as they happen,” Bradley said. “They’d have time to call the pilot and say ‘There’s a situation up there you need to deal with.’”

But until now cost has been the big hurdle. The hardware required to make an aircraft satellite-ready might cost \$50,000 to \$70,000 per aircraft, but the real expense is in the data transmission. Collecting all the information generated by a plane’s cockpit voice and data recorders could run as much as five bucks a minute. Multiply that by the tens of thousands of flights made each day and you’re talking serious money – more money than any airline is willing or able to spend.

So AeroMechanical and companies developing similar solutions let the airlines decide when, and what, data gets streamed. Flight recorders capture and store data, but also can be programmed to stream data under certain conditions, such as a loss of cabin pressure or an engine shutdown. Airlines and air traffic controllers would know of major problems in real-time, but the airlines wouldn’t end up paying to stream routine data.

“You need to apply a dose of common sense along with the new technology,” says Voss. “There’s no need to stream every bit of data.”

“Build the right triggers, and the whole system becomes much more viable,” adds Bradley.

Regulators are taking notice. According to the [The New York Times](#), the European Commission is testing the feasibility of a wide-scale satellite system, testing it on flights operated by Airbus, Air France and Air Europa. In January, the FAA [tore into airlines and aircraft manufacturers](#), saying it was “seriously disappointed” that they were moving so slowly to embrace the technology.

Meanwhile, there’s a push to improve the current system. Voice recorders are now required to have battery backup power and store up to two hours of cockpit chatter. The *Bureau d’Enquêtes et d’Analyses pour la Sécurité de l’Aviation Civile* (France’s version of the National Transportation Safety Board) wants new rules requiring black boxes to have underwater [beacons that work for 90 days](#), up from the current 30.

That’s likely little comfort to friends and families of the hundreds who perished in the Air France crash. But perhaps it’s a first step toward insuring that another such accident doesn’t happen again.

Photo: Brazilian Air Force via / Associated Press. Brazil’s Navy soldiers recover debris from Air France Flight 447 in this photo taken on June 8, 2009.