In dense wilderness, downed airplanes can be virtually impossible to find, so the government requires almost all aircraft to carry emergency locator transmitters. But their failure rate is astonishing. A different approach, breadcrumb tracking, shows promise, but the government has been reluctant to endorse it.

In time to save him. Under legislation passed by Congress 35 years ago and enforced by the Federal Aviation Administration, virtually every aircraft in the United States must have an ELT. But when an airplane with an ELT crashes, its location is transmitted only if the device calls for assistance. And there are any number of ways the device can be stopped from sending those alerts.

There are two types of ELT: the older models, which were introduced in 1973, transmit over 121.5 megahertz, an analog frequency, while newer beacons, which debuted in 1999, use 406 megahertz and broadcast digitally. The 406 ELTs are an improvement over the 121.5s because the digital signal can carry GPS coordinates, along with beacon registration data, such as the airplane’s owner and contact information.

Most organizations that are invested in aviation safety believe that 121.5 ELTs should be replaced with 406s. Searchers can get a fix on a 406’s position in a little over five minutes, though gaps in global satellite reception can extend that to 15 minutes, and if the unit doesn’t have an optional GPS accessory, the delay can be as long as three hours or more.

The older ELTs are so unreliable that as of February 1, 2009, Cos pas Sarut, the multi-national entity charged with monitoring ELT transmissions, stopped listening to 121.5 megahertz. If an airplane outfitted with a 121.5 unit gets in trouble, its cities will now almost always go unheard. The FAA had hoped pilots would swap their 121.5 units for 406s. But no federal law requires them to, and installation of new units costs up to $2,000. Says agency spokeswoman Alison Doughtie: “The FAA’s position is that 406 ELTs are superior, but their cost [to the pilots] would not justify mandating them.” To date, only
about 25,000 general aviation aircraft have upgraded units. Translation: Of the 224,172 active general aviation aircraft in the United States, about 90 percent operate with an emergency beacon that transmits its distress signal over a frequency that is not listened to. If one of these aircraft should crash, bearing its ELT is a matter of pure luck. A passing pilot might pick up the signal—but only if he or she happens to be tuned to the frequency.

**EMERGENCY BEACONS ARE USED IN MANY ENVIRONMENTS** aviation, marine, and terrestrial. Coas-SatSat relays distress alerts to the Air Force Rescue Coordination Center at Tyndall Air Force Base in Florida, which coordinates searches in the United States among various federal, state, and local agencies. In theory, ELTs should enable authorities to rapidly locate downed aircraft. In practice, they fail miserably. In the last five years, the AFRC has been directly involved in 416 crashes in the United States that required some manner of search and rescue (often hundreds more occur, but are usually handled at the state and local levels). Each of these airplanes carried (or by law should have carried) an ELT yet in these accidents, just 124 ELTs activated. A five-year NASA study that analyzed the performance of 121.5 ELTs (comparable data from the 406 transmitters isn’t available) in 2,120 crashes shows that in 75 percent of accidents, the beacons are disabled on impact or destroyed in a fire, and never activate. The units are installed inside the cabin near the tail, where they’re most likely to survive a crash. Their exterior antennas—mounted to the top of the fuselage, usually behind the wing, or forward of the tail motor on helicopters—can easily snap. In 2009, 49-year-old New Zealand billionaire liquor magnate Michael Eriog crashed his helicopter in IC2 country near Auckland, and a passenger were killed. The ELT antenna broke, so the distress pings went unheard. The ensuing hunt for Eriog would become one of the largest and most expensive search and rescue operations ever conducted in New Zealand.

Four years after Eriog died, Spidertack enthusiasts enlisted the support of his widow, Lynne, in a marketing effort to help subsidize the price of Spiders for New Zealand pilots. The pitch to aviators: Breadcrumb trackers like the Spidertack don’t use an external antenna. Instead, they affix to the dash and transmit through the windscreens. Even if the crash leaves an ELT and its antenna intact, the unit can’t transmit if the aircraft is upside down, under water, or concealed in dense foliage. And if the pilot, trying to lessen the crash’s impact, lands too gently, the G-switch can fail to arm.

When ELTs do work properly, rescue is virtually guaranteed. “There are no open [accident] cases in the U.S. that I’m aware of where an ELT activated but for whatever reason we haven’t found the wreck site,” says Shawn Maddock, a Coas-SatSat operations support officer. But when ELTs transmit improperly—and that’s the majority of the time—the result is a lot of wasted labor.

I’m standing next to Dan Conley, the Air Force Rescue Coordination Center’s chief of operations, inside Tyndall’s Air Operations Control Center. The facility occupies a $15 million data wall—a 90-foot-long assembly of 16 screens that displays a real-time map of U.S. airspace, extending several hundred miles into Canada and Mexico and over international waters. I’m here to learn how the AFRC handles an incoming ELT distress alert.

Since aviation accidents are rare, I’m not expecting much activity. But the two AFRC controllers on duty are energetically making phone calls, sending e-mails, scribbling notes, and tapping on keyboards. It’s 11 a.m. and already there are seven ELT distress signals. A Learjet is sending a 406 alert. A call to the phone numbers associated with the ELT reveals that her husband was a Marine helicopter pilot. He’s been missing for two hours and it was driving him crazy, so he ignored it and turned down the sound.

Investigators do succeed in tracing 406 devices to their owners (who sometimes have no idea their ELT is chirping). But 60 percent of pilots who have purchased the newer beacons have never bothered to register them, and of the units that have been, the number associated with the manufacturer is sometimes out of date, and investigators then have to track down the new owner: “It’s garbage in and garbage out,” says Conley.

COLONEL EDWARD PHELKA is in the wing commander for the Civil Air Patrol in Colorado. He has been with CAP for 24 years, participating in dozens of searches for air planes in seven states. But he hasn’t had much experience with breadcrumb devices. When I meet him at the Boulder Municipal Airport, it’s the first time he has seen a Spider. I’ve brought along the S/1, a newer, smaller model that runs about $1,000. Our goal is to test the tracker’s performance.

It’s early March, and the winter sun is strong—“perfect flying weather,” declares Phelka. He completes his preflight of our Cessna 182 Turbo Skylane and we get airborne. There’s barely a jostle as we climb and then bank north along the Rocky Mountain foothills, flanking snowbound summits that pierce 12,000 feet. Stacks of saucer-shaped plumers hover above the Continental Divide. “Lenticular clouds,” notes Phelka. “A sign of turbulent air. We’ll keep our distance.”

Before departing, I’d loaded onto the Spidertack Website and entered my brother’s home and wife as emergency contacts. (Users can add local first responders, who then get notified along with your loved ones that your aircraft has had an emergency.) My brother and wife are in on the experiment, but they have no clue when and where I will manually set off the Spidertack. They have been told that if they receive an alert, they should phone my mobile number.

A few miles north of Horsetooth Lake, I activate the SOS. Within a minute, my phone rings. It’s my brother, in Seattle. He received my SOS, along with a URL that linked him to a Google Map showing our exact location. “You’re near Fort Collins,” he informs me. Another incoming call. My wife. She dits the data.

“Time elapsed from sending the signal to receiving both calls: 57 seconds.”

“Absolutely, absolutely amazing,” Phelka says, then asks where he can buy one.
When a Super Cub ran out of fuel and had to land on uninhabited Kayak Island in Alaska last May, the pilot and passenger tried both low- and high-tech alerts. In addition to the “SOS,” they activated a SPOT beacon, and were rescued by the Coast Guard.

CURRENT FAA RULES State that pilots must carry an ELT or “other equipment approved by the secretary of transportation.” To gain that approval, the equipment must have undergone testing that meets an established standard. The standard applied to breadcrumb trackers is the one used to certify ELTs; it requires stress tests that simulate what can occur during an impact. But a breadcrumb tracker’s performance is predicated on the device not surviving an impact. Unlike ELTs, breadcrumb trackers don’t have to weather a crash. In fact, that’s their strength. It’s when they stop tracking your location that your emergency is revealed.

The senior FAA official I interviewed, who asked not to be quoted, said that for the agency to consider breadcrumb trackers acceptable emergency transmitters, the manufacturers would have to devise appropriate standards, then persuade Congress to modify the existing legislation.

Presently, the FAA tests a technology called ADS-B (Automatic Dependent Surveillance-Broadcast), commonly under development, as “bringing the precision and reliability of satellite-based surveillance to the nation’s skies.” ADS-B satellites capture positional data from aircraft, then relay it to other flights in the vicinity, or to ground receivers, which forward it to air traffic control. ADS-B gives pilots a three-dimensional awareness of their airspace, a view once available only to air traffic controllers. But ADS-B is designed primarily as a tool for managing scheduled commercial flight traffic, and requires an onboard avionics suite that can total more than $12,000, a cost many general aviation pilots would find prohibitive. More importantly, it is not meant for hunter-rising aircraft. Says ARCC program manager David Fuhrmann, the principal intermediary between his agency and Cospas-Sarsat: “The problem with ADS-B is it still uses a radio signal… You can still have terrain masking. There are not going to be towers all over the U.S. so in remote areas, it won’t work. It will work at altitude, but if you descend, you could go many miles before crashing, and may not ever be visible by ADS-B.”

In an email, FAA public affairs spokeswoman Alison Duquette, who agreed to speak on the record, says: “The FAA is investing in the infrastructure for ADS-B, which serves the entire U.S. aviation community. The FAA requires ELTs for general aviation airplanes. While breadcrumb tracking may have some applications for aviation, it is not a substitute for ELTs or ADS-B.”

Duquette’s assertion that ADS-B “serves the entire U.S. aviation community” is true only if the nation’s general aviation pilots pay for the pricey avionics needed to get the ADS-B’s full benefits. Without a breadcrumb tracker on board, the average private pilot whose airplane goes down in a remote area will remain at significant risk of going undiscovered.

Task Duquette “Can you tell me what specifically can ADS-B and ELTs do that breadcrumb tracking cannot?”

She answers “We’ve already provided you an interview on the subject. I think we’re done.”

FROM A PRELIMINARY NTSB REPORT:
“On August 13, 2011, about 1940 [7:40 p.m.], a Cessna 207 airplane, N9099, impacted mountainous, brush covered terrain, about 37 miles west of McGrath, Alaska. Of the six people aboard, the pilot and one passenger died at the scene, and four passengers received serious injuries… During a hospital mor interview with the National Transportation Safety Board investigator in charge, on August 16, a passenger related that the purpose of the flight was to transport a group of school teachers to Anvik… Her wife and two children were also aboard the accident airplane. “The passenger stated that he was seated in the front, right seat, next to the pilot. He said that about 20 minutes after leaving McGrath, low clouds, rain and fog restricted visibility. At one point the pilot told the passenger, in part: ‘This is getting pretty bad: ‘The passenger said that the pilot then descended and flew the airplane very close to the ground, then climbed the airplane, and then it descended again. Moments later the passenger said that the airplane entered ‘whiteout conditions.’ “The next thing the passenger recalled was looking out the front windscreen, and just before impact, seeing the mountainside suddenly appear out of the fog. He said that all of the survivors lost consciousness during the impact, and he was the first to regain consciousness.”

“The passenger noted that while boarding the airplane in McGrath, he happened to notice a SPOT satellite personal tracker clipped to the pilot’s sun visor. He said that after the accident, he was able to find the SPOT device in the wreckage, and began pushing the emergency SOS button. About 3:10, family members in Wasilla, Alaska, the pilot’s hometown, received an emergency SOS message from the pilot’s SPOT device. A family member then immediately called the operator in Anvik to alert them of the distress message.”

The author of this report, NTSB senior air safety investigator Clint Johnson, says that the Cessna was carrying a functioning 121.5 SELT. However, it could only lead Alaska Air National Guard pilots to within five miles of the aircraft, and could prevent the rescuers from finding the site that day. The next morning, an HH 60G helicopter from the Air National Guard’s 210th Air Rescue Squadron located the crash site, landed, and evacuated everyone. The breadcrumb tracker’s GPS data took rescuers “right to the doorstep of the accident,” says Johnson.

The same week, Johnson was assigned to five other aviation accidents. “Out of those,” he says, “more than half involved SPOTs—that’s how they found them.”

“We have a situation,” says NTSB survival factors investigator Jason Feick, “where you have the most technologically advanced country in the world that is basically allowing a large segment of the pilot population to fly unprotected by any sort of real technology. It’s patently ridiculous.”