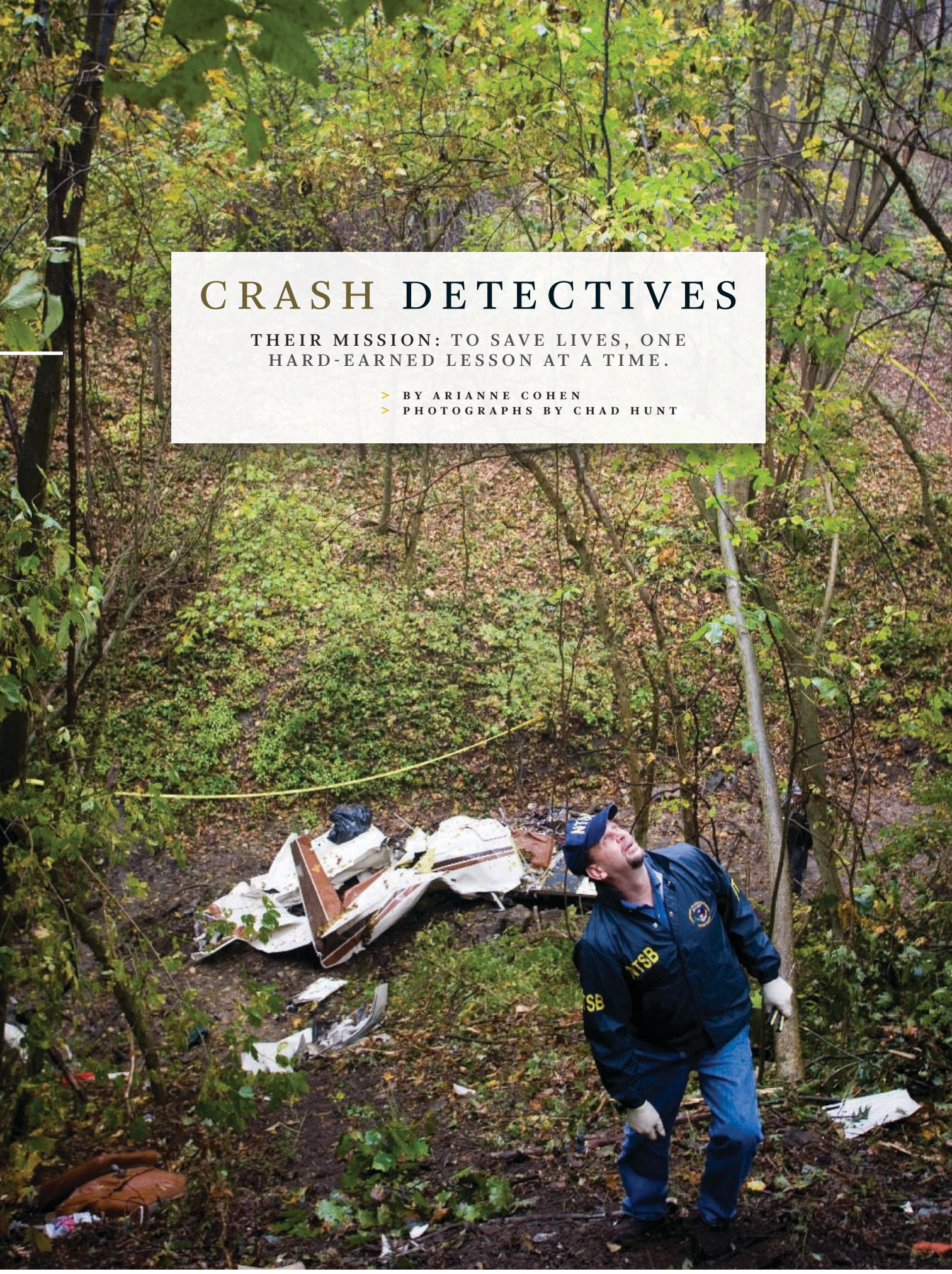



# CRASH DETECTIVES

## THEIR MISSION: TO SAVE LIVES, ONE HARD-EARNED LESSON AT A TIME.

> BY ARIANNE COHEN
> PHOTOGRAPHS BY CHAD HUNT


LAST OCTOBER, ON A CRISP MONDAY AFTERNOON, a pilot and his flight instructor took off in a single-engine Mooney M20F four-seater from Rostraver Airport near Monongahela, Pa. The pilot, 72-year-old Charles Schreiber, had four decades of flight experience; his instructor, Elaine Heston, 44, had logged 10,800 hours. About 17 minutes later, the Mooney crashed into the rolling hills of western Pennsylvania. The emergency locator went off on impact, transmitting at 121.5 MHz to summon help. A witness called 911, and

**National Transportation Safety Board investigator Paul Cox gathers data at the site of a plane crash in Pennsylvania.**

the operators informed the Federal Aviation Administration (FAA). Within minutes, locals on foot and all-terrain vehicles rushed to reach the plane. But Schreiber and Heston were already dead.

*AFTER EVERY CIVIL AVIATION* accident in the United States, the National Transportation Safety Board (NTSB) assigns a team to determine what happened, and ultimately to extract lessons that may save lives in the future. The NTSB is allowing Popular Mechanics to accompany a pair of agents on a typical case. Investigators Paul Cox, 55, and Jill Andrews, 29, arrive at a hotel near the Pennsylvania crash site by midnight; I join them in the lobby at 6:45 am on Tuesday. "I never sleep the night before an investigation, anyway," Cox says, his leg bouncing. "Do you, Jill?" She shakes her head calmly. Cox shrugs. "We're always kind of wired."

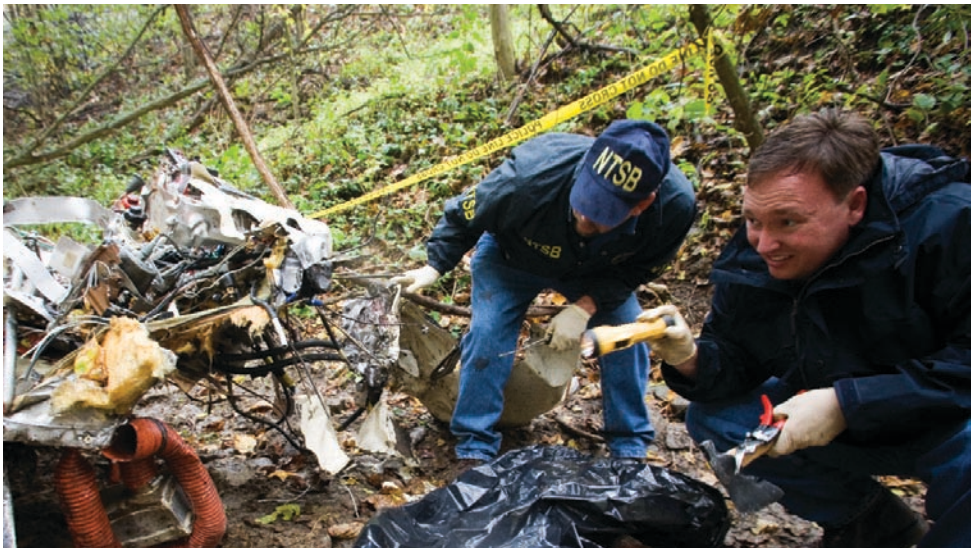
The seemingly mismatched pair could have stepped off the set of a Hollywood buddy flick. Cox was a longtime Navy pilot before moving to the NTSB; Andrews methodically rose through the ranks from NTSB intern to investigator. Such agents combine the roles of gumshoe detective and egghead analyst. "Their independence is pivotal in that they are not affected by politics or industrial interests," says William Voss, CEO of the Flight Safety Foundation, a nonprofit organization. "Their recommendations shape much of the industry."

Plane crashes rarely occur in convenient locations. It takes us 30 minutes to reach the craft, which is located near the rural enclave of Brownsville, Pa., about a mile past the end of a dirt road. It lies 20 yards from a trail, up a steep, thickly wooded hill, its engine exposed, body and wings crumpled. Just beyond the yellow police tape swarm two dozen local men. Earlier today, some of them helped the county medical examiner remove the bodies of the victims.

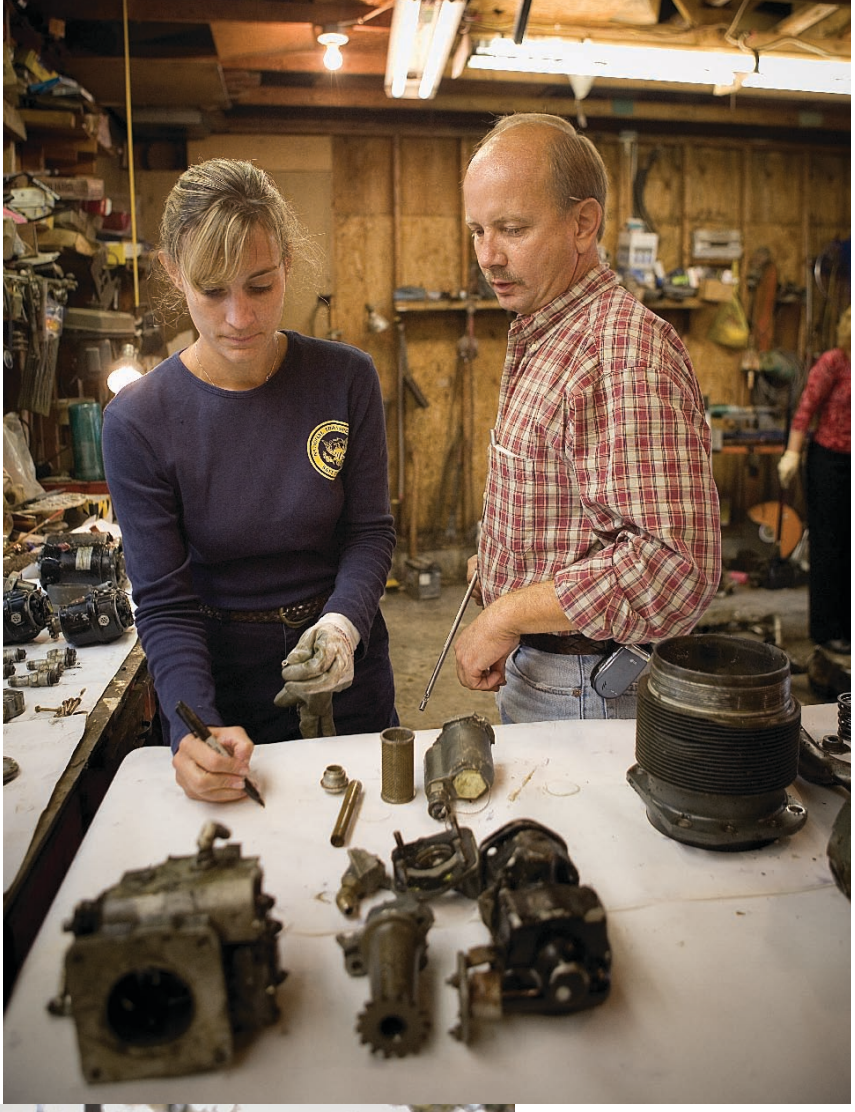
Andrews approaches, notebook in hand, and half the men step forward to recount what they saw the previous day. The plane was spinning as it fell, they agree. One man reports that the engine seemed to "shut down and start up again." Another says the engine sputtered as the plane turned. Andrews records their statements and flips closed her notebook. "A witness has a perspective that I don't have," Cox tells me later. "But I won't put something in my report if it's inconsistent with other facts."

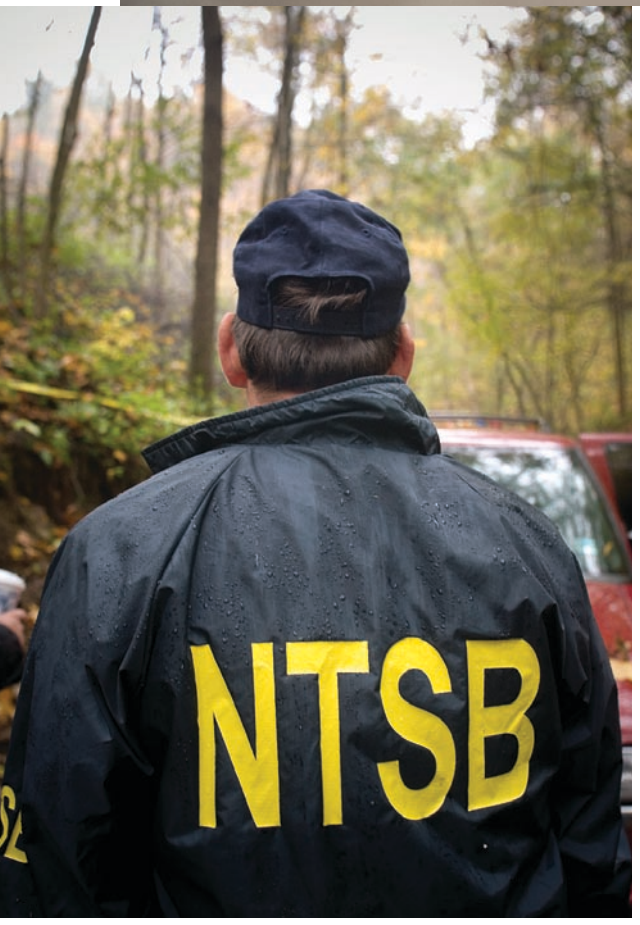
Andrews pulls on latex gloves and joins Cox in front of the wreck. The team will need just a few hours to capture "perishable" evidence, which

**Right: Engine failure accounts for a small number of aircraft accidents. NTSB investigator Jill Andrews and Textron Lycoming engine expert Ed Rogalski examine the plane's engine, confirming that the magnetos supplied power to the spark plugs, the fuel filters are not contaminated, and the spark plug deposits are light gray—indicating an appropriate air-fuel mixture. Below: NTSB investigator Paul Cox (left) and FAA safety inspector Rob Lowery search the wreckage for the engine's propeller governor, which regulates propeller speed. (They later find it underneath the nose of the plane.)**




"I NEVER SLEEP THE NIGHT BEFORE," COX SAYS. "DO YOU, JILL?" SHE SHAKES HER HEAD. COX SHRUGS. "WE'RE ALWAYS WIRED." THE NTSB AGENTS COULD HAVE STEPPED OUT OF A HOLLYWOOD BUDDY FLICK.





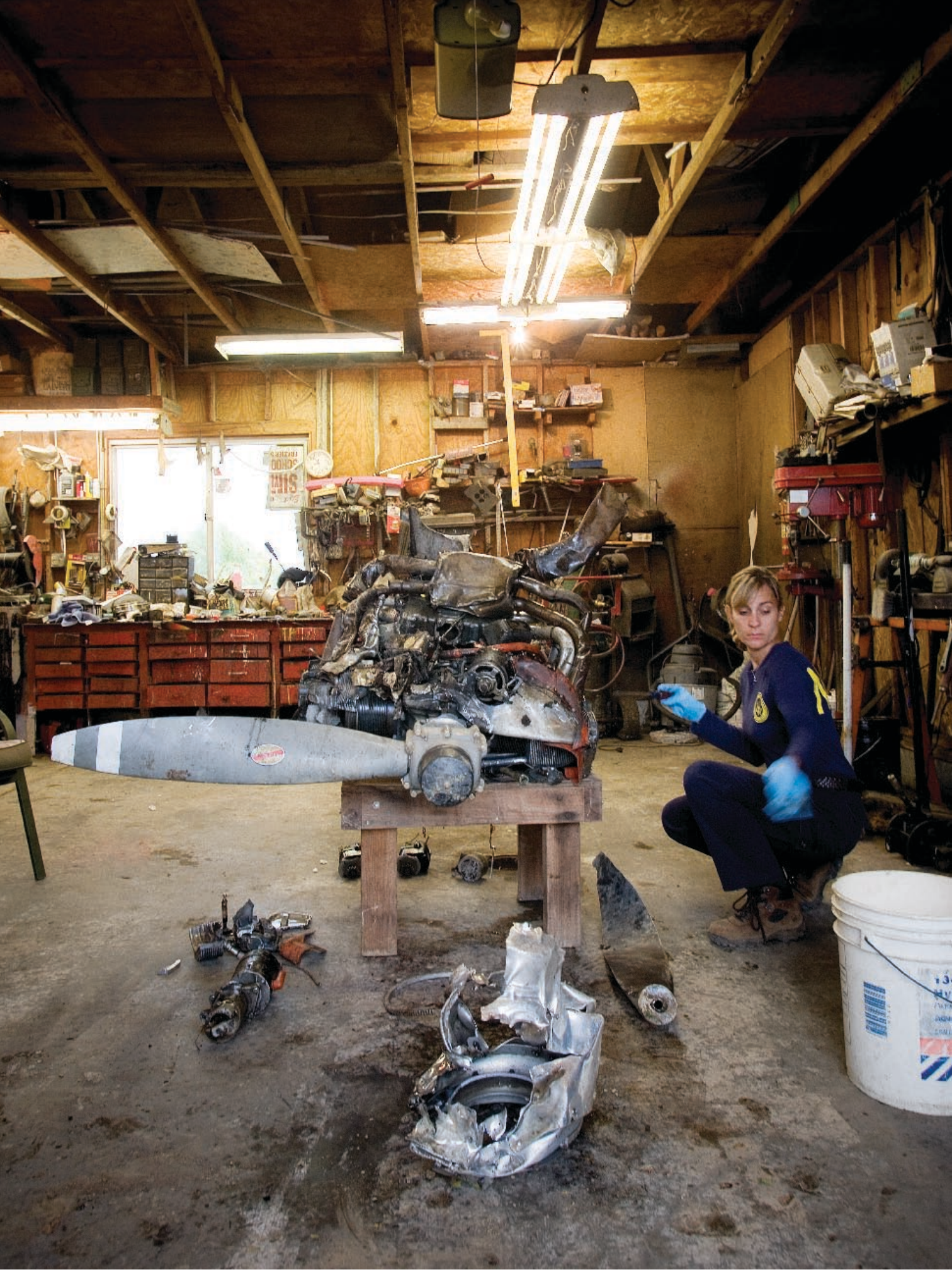

they plan to piece together with pilot logs, details gleaned from the engine examination, autopsy reports and more. However, this CSI-like work can take far longer. "One time I was on an in-flight breakup, and one of the wings was missing for months," Cox says. "A guy finally found it when he was out bear hunting."

*INVESTIGATORS* work a crash from the outside in. "We walk all four corners, taking digital photographs, to get an overview," Cox says. He points to a fallen tree. "Look at how the bark is scraped from top to bottom. You can see how the plane came down." Sunlight pierces a compact hole left by broken branches—as if the plane dropped nearly vertically.

The next step is the "inside" examination. The Mooney's seats spill forward from what's left of the cabin. Andrews reaches inside. The scene is grim: Blood and flesh adhere to the control panel; flies swarm over it. She records the positions of the controls—throttle in full aft, propeller in full forward, and so on—and checks to see whether the push/pull rods still connect the controls to the ailerons, elevators and rudder.

Next, Andrews and Cox examine the propeller. It is scarred by a pattern of scratches that suggest to the agents it was still spinning when the plane plunged through the branches. Such deductions are at the heart of the crash investigator's job. "It's kind of a black art," Cox says. Unlike commercial aircraft, the Mooney carried no flight data recorder. However, the plane's age and construction offer some advantages: The fuselage is aluminum, and retains the bends and dents imparted to it on impact; newer composite bodies tend to shatter. Old-fashioned analog gauges often display the data they showed when they stopped working; most digital instruments simply go black.

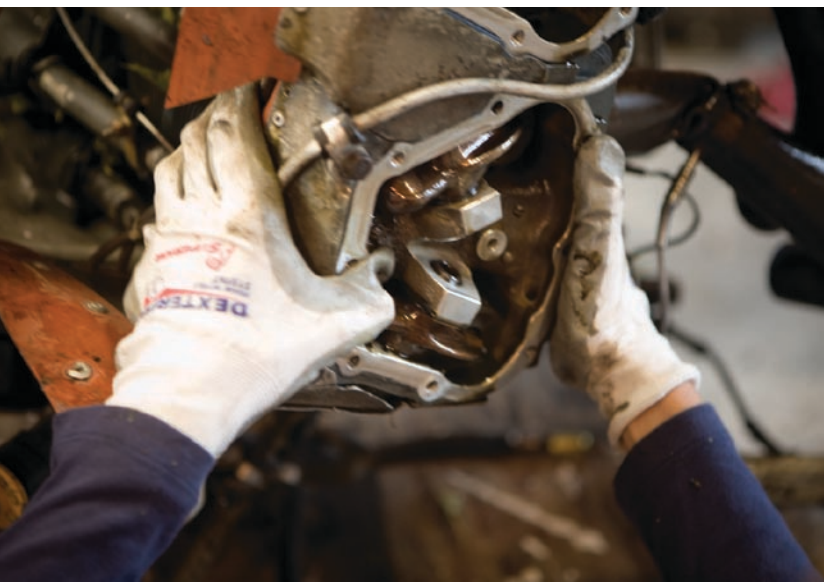
In the late afternoon two FAA investigators arrive; they are conducting a parallel investigation, focusing on whether any changes to aviation rules should be made in light of the accident. A firefighter named David Simmons appears with a track loader to help move the plane. Finally, as daylight fades, a representative from Textron Lycoming, the engine maker, arrives. It's his job to supply the NTSB team with in-depth expertise on this model. He spends 10 minutes taking hundreds of photographs, then watches as Simmons scoops up the engine in the loader's bucket and heads back up the trail. "Man," Cox says, looking back somberly. "When those pilots took off yesterday, they had no idea that we'd all be out here doing this today."



**ANDREWS CHECKS** TO MAKE SURE THE CYLINDERS HOLD PRESSURE—THEY DO. THE CRANKSHAFT AND PROPELLER TURN. THE ENGINE ROTATES—AND THE PLANE DIDN'T RUN OUT OF FUEL.

*WEDNESDAY MORNING AT 8:30 AM,* the investigators reconvene in Simmons's garage and settle in to strip the engine. While Simmons rehashes his own theory on why the plane crashed ("we all think the engine failed"), Andrews checks the spark plug deposits. Black would indicate an overly rich air-fuel mixture, but the deposits are an acceptable gray. She tests to make sure the cylinders hold pressure—they do. The crankshaft and propeller turn as they should, and the engine rotates. The fuel tanks were ruptured in the crash, but there is fuel in the engine, and the injection system shows no blockages. The plane didn't run out of gas.

Only about 10 percent of crashes are caused by mechanical problems, according to the NTSB. "Sometimes we have the engine shipped back to the factory for a complete tear-down," Andrews says. "But usually, we examine the engine systems near the site, which helps determine whether there was a catastrophic malfunction." There's no evidence of that. Whatever went wrong in the air over Brownsville apparently didn't start with the engine.



**Left: Andrews begins disassembling the engine by removing the screws from the cylinder rocker box covers. All engine components, from screws to cylinders, are preserved. Above: She checks for valve train continuity and, later, "thumb compression" on all cylinders. In this crash, such procedures help rule out catastrophic mechanical failure as a cause of the accident.**

Two weeks later, the preliminary NTSB report is ready. The pilots, it states, were on a biennial flight review, evaluating pilot skills. "To have an accident on a biennial flight review is one of the rarest things you can imagine," says Chuck Leonard, an aviation professor and former NTSB investigator. "That means there are two competent pilots on board."

Radar readings show the plane's speed dropping sharply in the 2 minutes before the crash. Cox and Andrews can't speculate why, but the pilots could have been testing "slow flight" handling or practicing stall recoveries. The final report should be out this spring, but we may never know just why the plane crashed.

The NTSB investigators have ruled out mechanical failure, but why, then, did witnesses believe the engine was cutting in and out? Back in Simmons's garage, Cox slipped a credit card under the clip of his pen to stand in for the plane, and slowly rotated it. As the plane spun, he explained, the engine would have sounded alternately louder and quieter to a stationary witness. "In general—and I'm only talking in general now—a spin happens after a stall, which is a lack of lift in the wings," he said. "But the plane also has to be at a yaw" for it to spin. He tilted the pen and credit card and let go. Together, they spiraled downward and crashed onto the concrete. It was not hard to imagine that if they'd been plunging to the forest floor, they would have punched a neat, small hole in the canopy. **PM**

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