Why Not More CAPS Saves?

by Rick Beach

Albert Kolk's SR20 was lifted from the rugged mountains of British Columbia by helicopter using the parachute risers as lifting straps. The plane was repaired and flew again. Other Cirrus pilots have had high-altitude upsets that ended in fatal crashes.

Since August 2007, **NO** Cirrus pilot has pulled the CAPS handle in a real-world* accident. **None**.

Since that time, 13 fatal Cirrus accidents claimed the lives of 26 people and seriously injured three more.

Why weren't there more CAPS saves?

Would a Cirrus pilot, when faced with an aviation emergency, choose to *not pull* the handle? Would they consider the alternatives and avoid popping the parachute? Maybe, but it seems doubtful, so it must be something else.

Certainly, some accidents happen very close to the ground without much opportunity:

- Gurupi, Brazil: Plane touched down, a wing tip caught the ground and the plane cartwheeled. The pilot died and the passenger was injured.
- Paso Robles, Calif.: Plane impacted the ground during maneuvers over a friend's house.
- Waxhaw, N.C.: Plane impacted terrain during base turn to final.

But what about other fatal accidents? Were those circumstances so unavoidable that a CAPS pull was not possible?

That led me to investigate similarities between CAPS pulls and Cirrus fatal accidents. The results shocked me.

* *See the article on simulator training, page 41, where many Cirrus pilots have pulled the CAPS handle in realistic, simulated scenarios.*

Over Half of Cirrus Fatal Accidents Compare to CAPS Saves

Look at the sequence of decisions in an accident chain and you find many opportunities to choose a different path. For instance, at high altitude when you encounter icing conditions you can turn 180 degrees to exit, descend to warmer layers or climb out of the clouds. When the conditions persist and you lose control of the airplane, you can attempt to recover or pull the CAPS handle. You have choices.

By my estimation, 56%, or 23 of the 41 Cirrus fatal accidents involved decisions similar to situations in which a CAPS activation saved lives. There may have been more, but these are the ones I think had a high-to-middle level probability of a successful CAPS activation as an alternative:

- High altitude upsets (4)
- Pilot disorientation (5)
- Mechanical problems (2)
- VFR-into-IMC (7)
- Low altitude loss of control (5)

High-Altitude Upsets

The most agonizing accident reports to read are those where the accident pilots had time to act, but did not. In all cases so far, the investigators found the CAPS handle still stowed, or that the rocket had ignited upon ground impact.

We know that several high-altitude CAPS scenarios were successful. In 2004, two early CAPS pulls occurred at least 7,000 feet above the ground. At **Mount O'Leary, BC, Canada**, and **Peters, Calif.**, the pilots acted promptly upon losing control to activate CAPS. Their descent took several minutes under canopy. At **Childersberg, Ala.**, the pilot climbed through an unforecasted icing layer 8,000 feet above the ground, lost control, activated the CAPS parachute and gave ATC a PIREP for severe icing while descending.

In the fatal accident at **Meadview, Ariz.**, the pilot reported icing at 12,000 feet MSL (7,000 feet AGL), lost control, declared an emergency, and then spun into the ground with the parachute deployed on ground impact. A family of four perished. See the side bar on page 31, "They had time. They had altitude. But they crashed without using CAPS." At **Maybell, Colo.**, the pilots also encountered icing and crashed, then the parachute deployed on impacting the ground. At **Parish, N.Y.**, witnesses described the airplane in a flat spin, which involves relatively modest descent rates so they too had time, yet the CAPS safety pin was still in the handle and the parachute deployed upon ground impact.

These high-altitude upsets gave the pilots many seconds, if not minutes, of time to act. Yet they did not.

What to do? Remove the CAPS safety pin before flight. Instruct your passengers about CAPS procedures, especially the concept of loss of control, and encourage them to ask you if you are having difficulties. You may need the reminder! Remain aware of the loss of altitude, and if you get a warning from the terrain system, act immediately!

Mechanical Problems

Many know of the military studies of early ejection seat fatalities. Apparently, if the plane had a problem, pilots safely ejected, but if the pilot had a problem, he/she often failed to eject. Rigorous training to eject whenever there was a problem changed things. We need something similar for CAPS.

The first CAPS pull at **Lewisville, Texas**, involved an aileron that came unhinged after maintenance. The pilot maneuvered and pulled CAPS, making history. At **Fort Lauderdale, Fla.**, when departing in IMC and encountering erratic instruments (shown later to be due to water in the static system), the pilot pulled CAPS at about 700 feet AGL and was photographed in the descent.

In another **Fort Lauderdale, Fla.** accident, this time fatal, the pilot reported instrument problems while persisting in IMC, executed instructions given for another aircraft, became disoriented and ultimately crashed into a house. Offshore from **Stuart, Fla.**, the pilots reported instrument problems but crashed into the ocean without activating CAPS. During a ferry flight near **Greenland**, the pilot reported engine failure due to oil loss and chose to ditch in the ocean, but was found drowned with a broken leg. When a new turbo SR22 was misfueled with Jet-A in **Rio de Janeiro, Brazil,** the experienced pilot attempted to return to the airport but crashed short of the runway.

What to do? Did these pilots remain aware of their CAPS option? Were they focused on recovery or diagnosing confusing instruments? When you encounter problems, remain aware of your chain of decisions. Remain alert to intervene and activate CAPS before running out of options.

Jeff Ippoliti's SR22 was photographed descending under canopy after CAPS was activated about 700 feet in clouds. A nearby roof worker heard the rocket firing, turned and photographed the event before the plane landed in trees nearby. Other Cirrus pilots have had low-altitude upsets at similar altitudes that ended in fatal crashes.

Low-Altitude Loss of Control

Not all accidents provide obvious clues with extraordinary long times to react. Sometimes, the situation requires a prompt decision to activate CAPS.

The CAPS deployment in **Fort Lauderdale, Fla.**, mentioned earlier, was at about 700 feet in a departure climb. At **Wagner, S.D.**, the instrument-rated pilot admits to being distracted, becoming disoriented and entering a stall/spin when he immediately activated CAPS. At **Luna, N.M.**, the pilot forgot to turn on his pitot heat, lost airspeed indication, maneuvered into a high-speed descent, received a terrain warning while still in IMC and activated CAPS. At **Indianapolis, Ind.**, the passenger activated CAPS in a spin just 528 feet AGL, four seconds prior to impact, and three people survived.

Other fatal accident pilots faced difficult situations, yet appeared to press on regardless. At **Huntersville, N.C.**, the instrument-rated pilot failed to maintain course while maneuvering for approach, made several unexplained turns, descended causing an ATC low-altitude alert, and crashed. At **Statesville, N.C.**, the pilot failed to follow the missed approach procedure and maneuvered low and close to the ground in IMC, then crashed with two fatalities and two seriously injured. At **Jagel, Germany**, a VFR pilot miscalculated the onset of nighttime and low clouds, attempted an emergency landing at a military airfield, impacted power lines and crashed. And in **Manhattan, N.Y.**, Cory Lidle, and his instructor, maneuvered to avoid controlled airspace and lost control, then impacted a building.

What to do? Observe the similarities in the decision-chains but notice the different outcomes. The CAPS pilots report determination to use the parachute when things went bad. The fatal accident pilots appeared to persist in maneuvering or attempting to salvage their flights. As a Cirrus pilot, you have the option to pull the CAPS handle, but only if you recognize when to abandon the flight, to stop maneuvering, and to avoid catastrophe.

VFR-into-IMC Accidents

Perhaps the most challenging fatal accident scenario in which to consider CAPS is a VFR flight into IMC conditions. While one commonly refers to these accidents as controlled flight into terrain, closer examination of the accident reports often reveal last-second maneuvering indicating awareness of their predicament.

In the CAPS save at **Nantucket, Mass.**, the pilot encountered extensive low-stratus clouds, attempted an ILS approach even though he had not yet completed his IFR rating, failed to turn towards the airport, became disoriented and pulled the CAPS handle. The parachute snagged a communication tower and fell to the ground, breaking the tail and sending the pilot and his wife to the hospital with serious injuries.

In the fatal accident at **Sylva, N.C.**, an instrument-rated pilot departed VFR to pick up an IFR clearance in the air, encountered low stratus clouds, and impacted terrain in a canyon. At **Hood River, Ore.**, an instructor-rated pilot flew a low-level approach into an airport without an instrument approach and impacted the last ridge before the airport. At **Big Bear, Calif.**, an instrument-rated pilot flew VFR to his home airport in the mountains, attempting to keep under the freezing level, but impacted terrain. At **Spirit River, Alberta, Canada**, a VFR pilot flying at night encountered IMC and maneuvered away but impacted terrain.

Tom Jackson's SR22 came down under canopy after he became disoriented while flying VFR into IMC conditions. The parachute, seen near the nose, snagged on a communications tower and caused the plane to fall hard enough to break off the tail. Too many other Cirrus pilots have died persisting in VFR into IMC conditions.

What to do? In each of these and many other similar cases, the fatal accident pilot persisted in flying VFR-into-IMC without abandoning the flight and pulling the CAPS handle. At some point, a Cirrus pilot must realize when continued flight is more risky than activating CAPS.

Reasons Why Not CAPS

These comparisons shed some light on the similarities that can be found within the accident decision chains. At some point, one finds an opportunity that was taken by a Cirrus pilot who activated CAPS, yet not taken by a fatal accident pilot.

Why?

All Talk, No Action

One reason shows up in the simulator. Many Cirrus pilots talk about using CAPS, and Cory Lidle did so during a sports interview. Yet instructors report that when faced with unusual circumstances, not necessarily a full-blown emergency, they become so task-focused, so overloaded, so adrenalized, and so incapable of even remembering that they have the option – they do not or cannot pull the CAPS handle.

Wrong Habits

Another reason may be habit. To pass your FAA certifications, you must demonstrate recovery – you don't need to demonstrate use of CAPS. When something stressful happens, if you revert to habit, you attempt recovery. Unless you create a habit of activating CAPS, you will press on regardless.

Waiting Too Long

Don't wait too long. Coincidentally, there have been two CAPS activations with fatalities, and both involved activations late in the accident chain. At **Norden, Calif.**, the pilot encountered icing and entered a high-speed descent, probably over twice the demonstrated deployment speed and the parachute ripped off. Pull early. At **Indianapolis, Ind.**, the NTSB report discovered that the plane was mushing for 30 seconds above 3,000 feet in a stall before spinning and the parachute was activated at only 528 feet AGL, just four seconds prior to impact. In both cases, the pilots died. Don't wait!

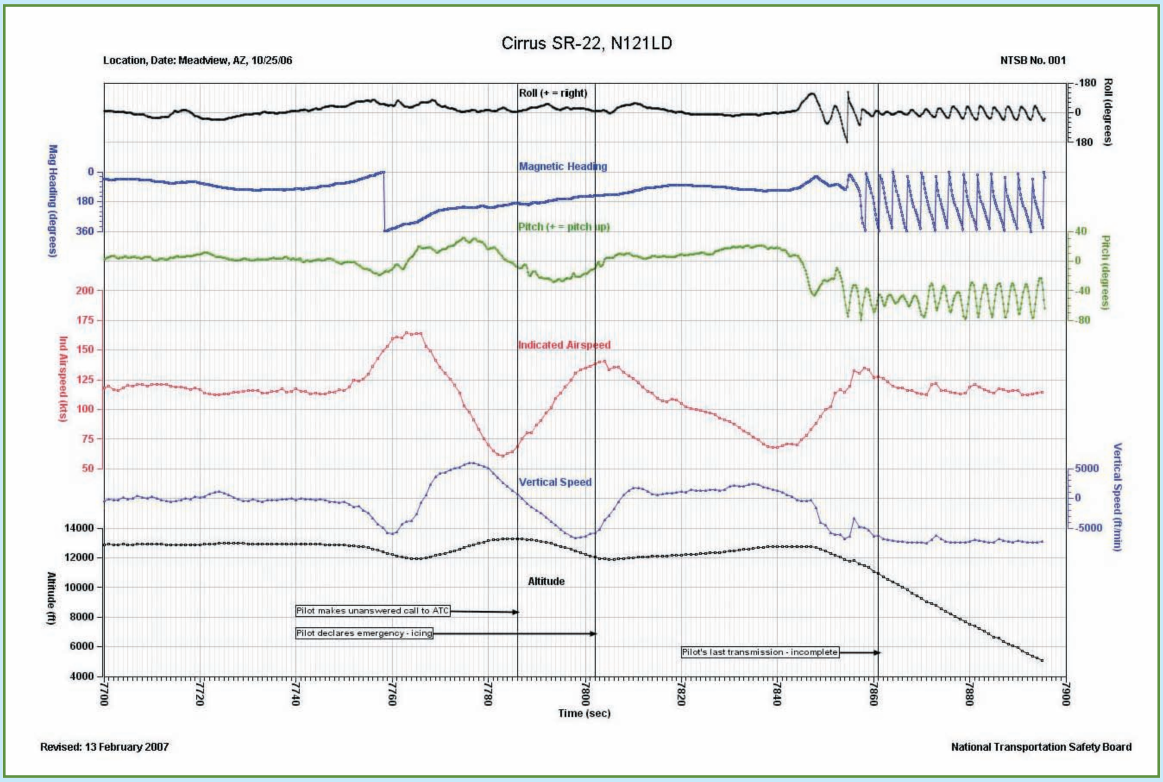
Situational Awareness

Finally, pay attention to your situation. Remain aware. Keep thinking of your options, including CAPS. Please, don't become another accident statistic. COPA

They had time. They had altitude.

But they crashed without using CAPS.

The last 3:20 of the Meadview, Ariz. accident flight.



Could there be a more graphic depiction of a loss of control fatal accident?

This NTSB chart depicts flight parameters over the last three minutes and 20 seconds (3:20) of the accident flight that crashed at Meadview, Ariz.

On October 25, 2006, a family of four departed from Lake Tahoe Airport for Grand Canyon National Park Airport. En route they encountered icing conditions and the pilot declared an emergency. Despite attempts to regain normal flight, the pilot lost control and crashed. All perished.

The NTSB reconstructed the flight profile using data extracted from the Avidyne EXP5000 MFD and PFD units. The chart above shows several parameters over time. Reading from top to bottom: roll, magnetic heading, pitch, indicated airspeed, vertical speed, and altitude. The time stamps are labeled every 20 seconds.

At time stamp 7750, the airplane begins a dramatic change in vertical speed, diving in a descent exceeding 5,000 fpm within 10 seconds. The plane rolls left and turns counterclockwise then begins a climb.

At 7786 and 7802, 36 seconds later, as the airplane pitches down and descends rapidly exceeding 5,000 fpm again, the pilot makes two radio calls to declare an emergency. The plane flies level at 12,000 feet, but with indicated airspeed decreasing to below 75 knots.

At 7842, 40 seconds later, the plane abruptly rolls left and pitches down 40 degrees.

At 7854, 32 seconds later, the airplane rolls over completely and reaches a vertical descent of over 7,000 fpm. After the second revolution, the pilot makes a final radio transmission. The plane executes 15 revolutions.

At 7895, 41 seconds later, the recordings stop.

The NTSB factual report states:

"The activation handle used to fire the CAPS was present and located unstowed from the activation handle holder located at the roof of the airplane."

Would you have pulled the CAPS handle?

Could you?

Will you?

COPA

NTSB Analysis of Cirrus Accidents

In mid-August, the NTSB surprised many Cirrus pilots with the extensive analysis presented in the factual report of the fatal parachute activation near Indianapolis, Ind., on August 28, 2006.

This was the fatal accident in which the pilot's son pulled the CAPS handle close to the ground and the airplane impacted a pond in a residential neighborhood. The pilot suffered fatal injuries while the three passengers survived with severe injuries requiring hospitalization.

What caught our attention was the extraordinary detail in the reconstruction of the flight from recorded data, even though this airplane was not equipped with a flight data logger, now installed in newer aircraft by Cirrus Design.

Curious about this new level of sophistication, I talked with the NTSB investigator and requested the docket of materials. Should you be interested, we have posted these materials in the NTSB Dockets archive under the Resources tab of the COPA website.

Just like other accidents with black boxes, the NTSB extracted data from all of the avionics they could. They even shipped the MFD and PFD in coolers of fresh water after extracting them from the airplane (see Figure 1).

FIGURE 1:
Avidyne EXP5000 MFD (left) and PFD (right) after removal from accident airplane N91MB, which had crashed into a retention pond, then transported to the NTSB submerged in fresh water, for preservation, in a cooler. (NTSB photo)

We knew that some recorded data was accessible, such as the engine data stored in the MFD, but the NTSB extracted additional data from internal memory chips (see Figure 2).

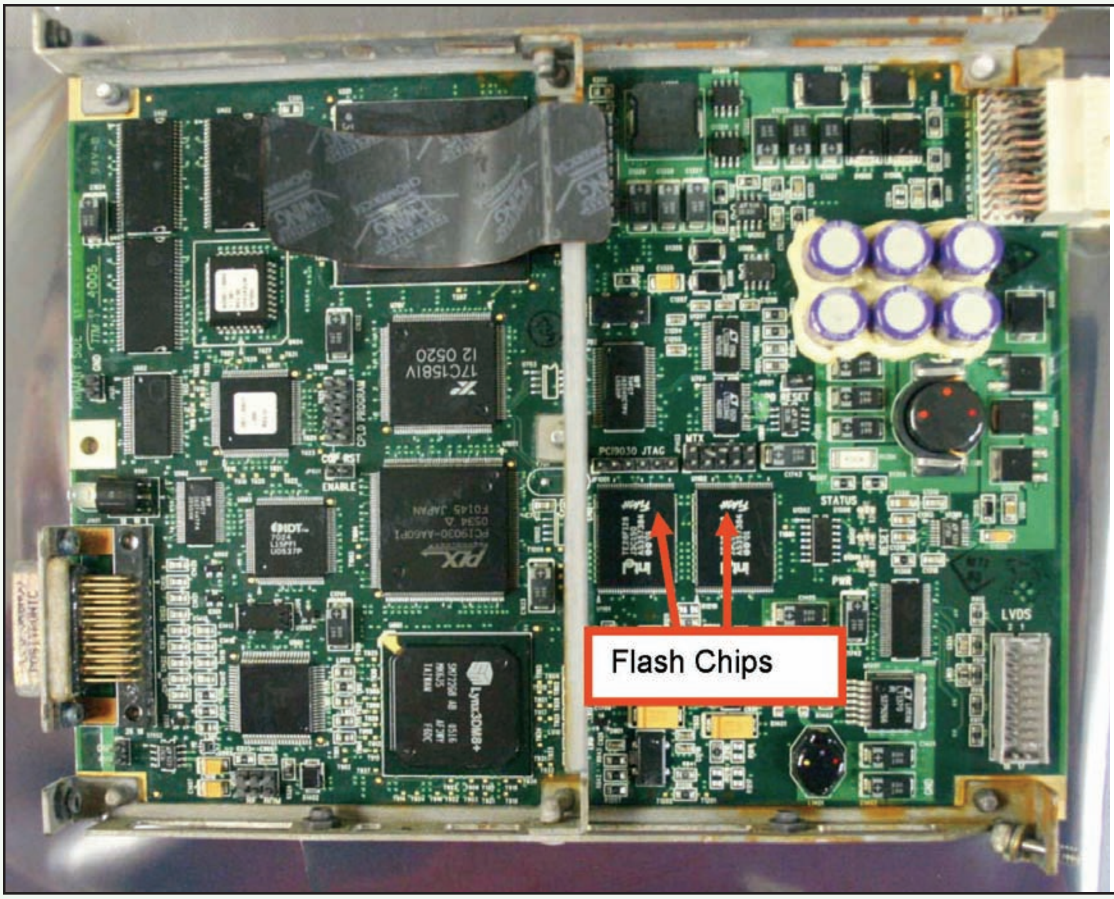


FIGURE 2:
The Avionics Computing Resources (ACR) circuit card from the PFD contains two surface mounted (non-removable) flash memory chips. After repairs to the corroded connector (upper right) and some other failed components, the circuit card functioned normally and data was extracted for analysis.
(NTSB photo)

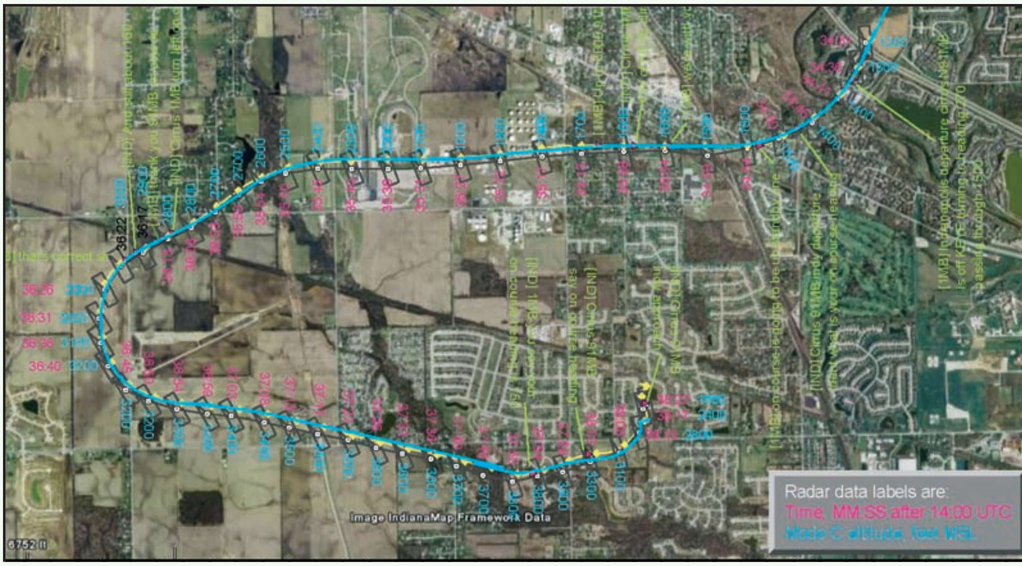


FIGURE 3:
Detail of the flight reconstruction produced by NTSB investigators, combining time stamps (magenta), radar track data with Mode C altitude readouts (circle marks with cyan numbers), superimposing ATC recordings (green), along with MFD/PFD position data (yellow marks along cyan line). Note that the MFD/PFD data continues farther and lower into the accident sequence than the radar tracks. (NTSB chart)

From the MFD, PFD, and GA-EGPWS, the NTSB had sufficient location and flight attitude data to reconstruct the flight path at much greater precision than with radar track data alone (see Figure 3). Some of the PFD data is sampled five times per second, while the radar data is typically recorded five times per minute; because of this, the NTSB had a lot more data to work with. The data continues to be sampled below radar coverage farther into the accident sequence, although ultimately some data was never recorded due to power failure.

More interestingly, the reconstruction analysis can determine the flight attitude from the PFD data (although not the pilot control inputs). The behavior of the airplane as it stalls, rolls left, enters a spiral dive and reacts to the activation of the CAPS parachute can all be determined from the data analysis (see Figure 4).

Furthermore, the NTSB conducted several aircraft performance studies to match the accident aircraft with typical aircraft. The wealth of flight attitude data enabled them to construct test flights in similar aircraft to demonstrate conditions experienced by the accident airplane.

Cirrus pilots now have extraordinary insight into an accident sequence thanks to the diligent efforts of the NTSB investigators, the avionics and safety manufacturers of Avidyne, Honeywell, Amsafe and Northstar, as well as, Cirrus Design, BRS and Teledyne Continental.

We have much to learn and use from these investigations, thanks to the hard work of the NTSB. COPA

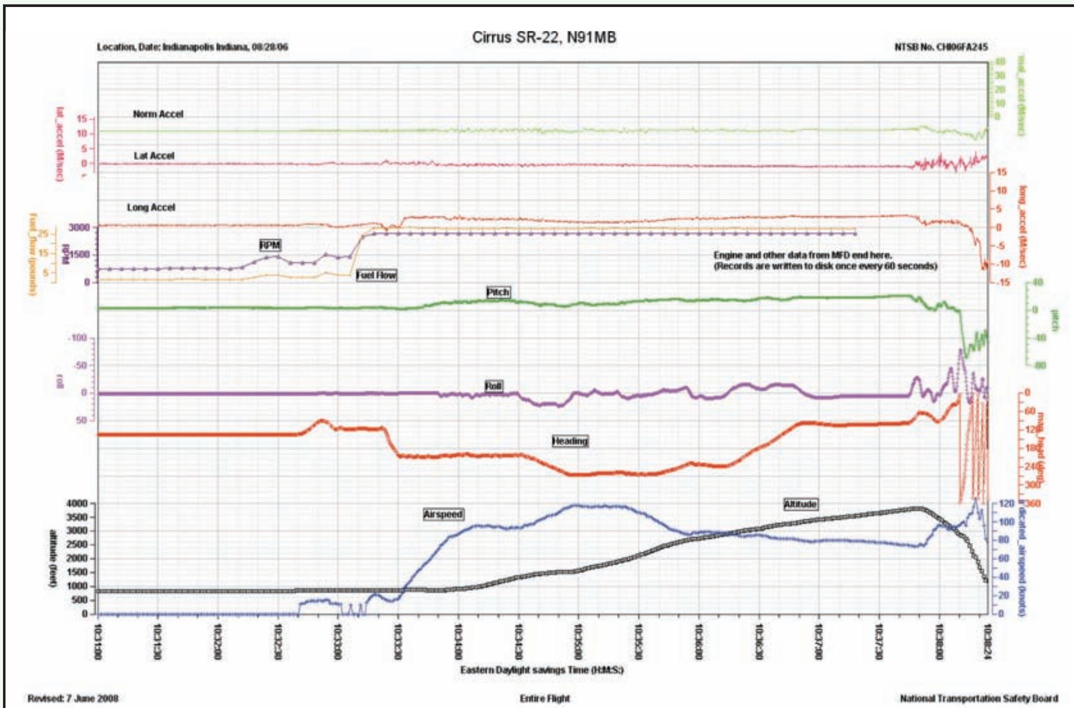


FIGURE 4:
Recorded and computed data for the accident flight of N91MB prepared by the NTSB. Data is presented from system start at 10:31:00 to end of recording 10:38:24, with labels every 30 seconds. Other items displayed in this chart include Norm Accel (vertical), Lat Accel (lateral), Long Accel (longitudinal), RPM, Fuel Flow, Pitch, Roll, Heading, Airspeed and Altitude. (NTSB chart)