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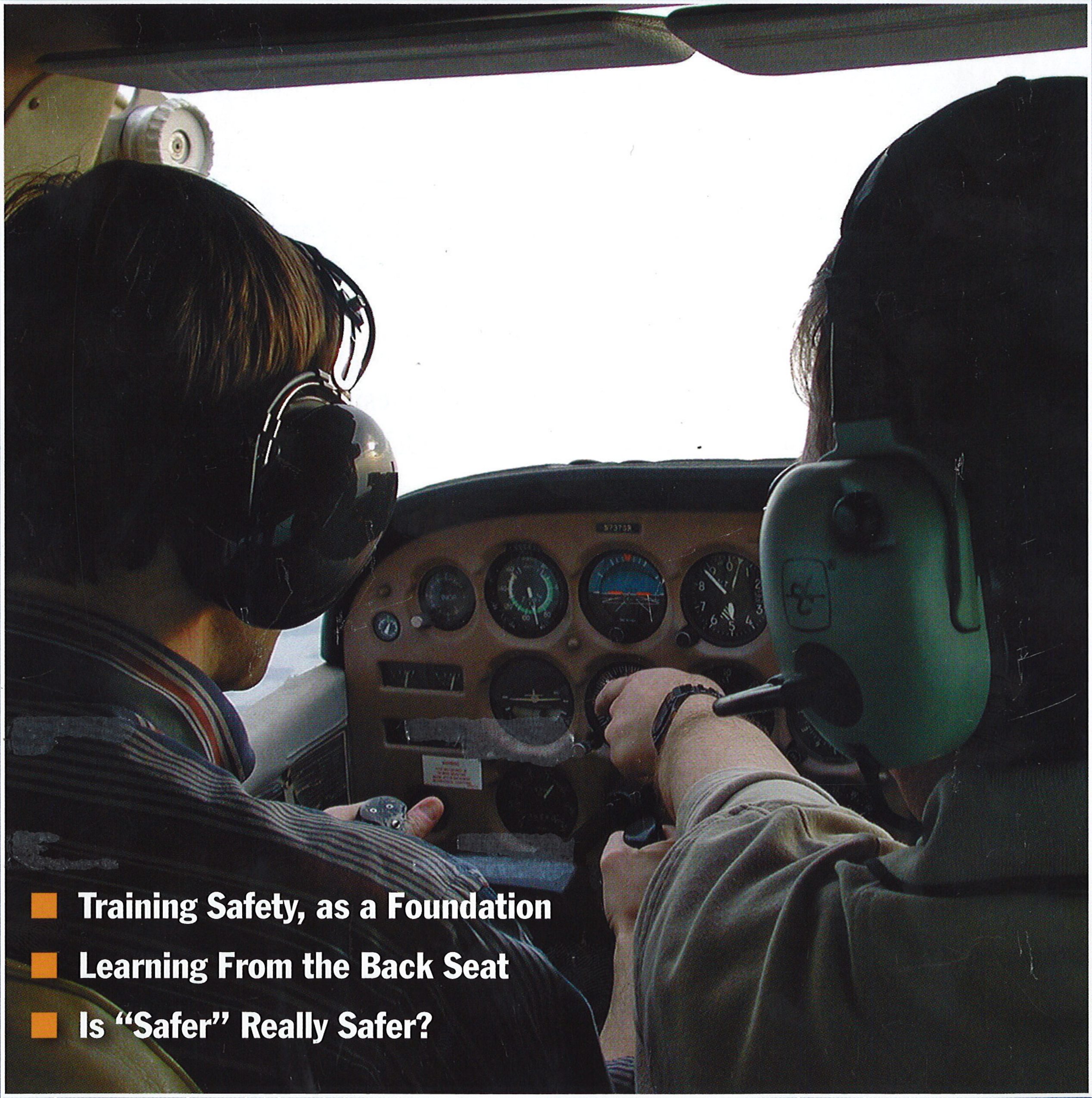

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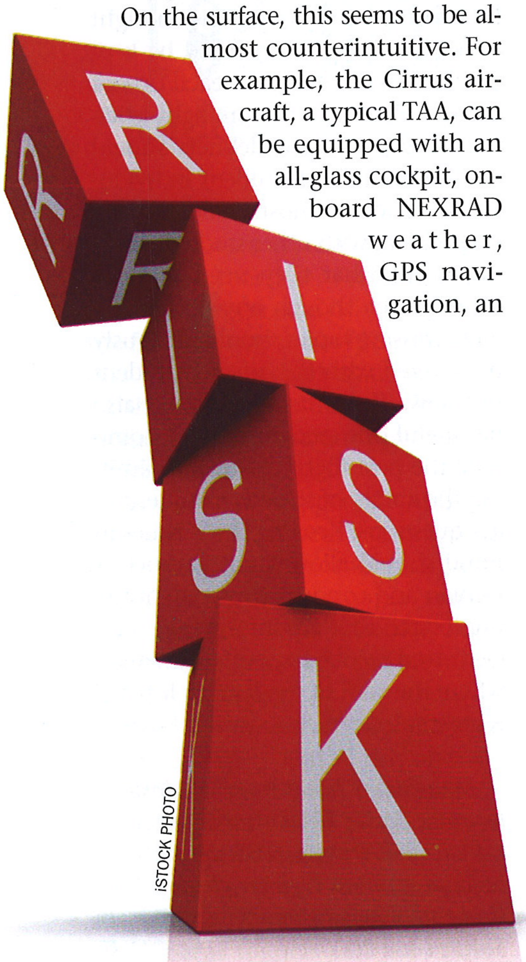
Is "Safer" Really Safer?

Pilot error and technically advanced aircraft

BY DR. DAVID CURRY, DONALD KNUTSON, AND STEVEN MEYERS

Aviation trade journals and other media sources have made anecdotal suggestions that technically advanced aircraft (TAA) are being operated by a new breed of aviators, and that the accident rate for TAA is abnormally higher than for conventional aircraft. These claims are, in part, corroborated by statistics recently released in a special report by the Aircraft Owners and Pilots Association (AOPA). Its report indicates that TAA pilots with less than 500 hours have a 15 percent higher accident rate, and while flying in adverse weather conditions, they have a 26 percent higher fatality rate (AOPA, 2007).

On the surface, this seems to be almost counterintuitive. For example, the Cirrus aircraft, a typical TAA, can be equipped with an all-glass cockpit, onboard NEXRAD weather, GPS navigation, an integrated autopilot, traffic and terrain avoidance alerts, ice protection, and a ballistic parachute.



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Since advanced technology alone seems to be inadequate to prevent accidents, then it seems logical that attention should focus on the "human factors" that might influence accident rates in this type of aircraft.

Flight Profiles

Let's take a look at an actual National Transportation Safety Board report (LAX05FA088), which typifies many of the accidents involving these TAA pilots: A low-time private pilot (473 hours' total time and 11 hours in actual instrument flight rules, or IFR) was flying a Cirrus SR22 on an IFR flight plan from Lake Tahoe to Oakland, California. The pilot received a preflight weather briefing, which advised him that there were no pilot reports for his intended route of flight, and that the freezing level was at 6,000 feet over Reno, Nevada. The pilot decided that he could safely make the flight. While en route, he unsurprisingly experienced structural icing at the forecasted levels, which then resulted in a departure from controlled flight. This in turn led to a decision to deploy the ballistic parachute, and a catastrophic airframe failure subsequently occurred.

Several key factors were noted during the subsequent accident investigation. First, the pilot underestimated and trivialized the severity of flying into icing conditions. One plausible explanation for such a nonchalant attitude is that the multifunction displays have the capability to depict a variety of weather phenomena. The pilot may have naively assumed that all weather conditions would be displayed and that he could then navigate around them. Unfortunately, icing levels and conditions favorable to icing are not displayed on such displays.

Second, the pilot may have believed that since the plane was equipped with an ice protection system, that this would protect him from the effects of structural icing. In fact, his aircraft was not certificated for flights into known icing. The pilot's operating handbook (POH) clearly indicated: *"Flight into known icing conditions is prohibited."*

Finally, the investigators determined that the pilot had elected to deploy the parachute outside of its operating envelope (stated in the POH as 133 knots maximum indicated airspeed); the subsequent parachute deployment forces were the cause of the in-flight breakup.

In essence, a combination of the aircraft being equipped with multiple safety features and the pilot lacking adequate training may have presented the operator with a false sense of security, leading him to venture into conditions that he might otherwise have avoided. Research has repeatedly shown that individuals oftentimes do not value increases in safety *per se*, but rather use an increased safety margin as a license to undertake greater risk-taking behavior.

Risk Balance

Some psychologists developed the theory of *risk homeostasis* to account for such behavior (Wilde, 2001). According to the theory, each individual determines an "acceptable" level of risk for any particular activity in exchange for the benefits he or she expects to receive for undertaking it. This behavior is based on the relationship between the risk and the perceived benefit.

If people assess the level of risk associated with a particular activity to be greater than the acceptable level, they tend to exercise greater levels of caution (likely by not performing the activity). The opposite is also true: If they assess the level of risk to be *lower* than their acceptable level, they tend to engage in actions that increase their level of risk-taking.

An individual subjectively regulates his behavior to maintain a *homeostasis* (balance) between risk exposure and risk avoidance to maintain an acceptable level of risk. If the level of risk for a particular activity is somehow reduced, he may react by increased risk-taking to return himself to an "acceptable level," as long as he perceives a benefit in doing so. The danger here is that he evaluates the risk-exposure level subjectively, rather than objectively.

A familiar example of this phenomenon is winter driving. The majority of drivers slow down when road conditions become icy. However, it is not unusual to see the drivers of four-wheel drive vehicles simply engage the traction control and maintain or increase their speed based upon a perception that that they are adequately protected from the effects of reduced traction. Even though their vehicle's performance is improved while driving on straight and level surfaces, their ability to *stop* or *turn* on ice remains at its original level. If these drivers had simply slowed down like their two-wheel drive counterparts, they would experience a net *increase* in overall safety, but their behavioral change (i.e., not reducing speed as other drivers do) negates the advantages of the four-wheel drive system.

Support for the theory is provided by a number of research studies. One performed by DiLillo and Tremblay (2001) is typical. In it, mothers were asked to indicate the level of risk they would permit their child to assume during several types of activity (e.g., jumping a bicycle off a ramp, riding in-line skates down steep hills, or climbing trees to various heights). Participants were assigned to conditions in which safety equipment either was or was not present during the assessments. Results showed that mothers who evaluated the activities with safety equipment reported significantly higher levels of risk tolerance for risky behavior on the part of their children than did mothers who viewed identical activities without the safety equipment.

Other studies have shown that injuries aren't reduced when participants of high-risk activities use personal protective equipment due to increased risk-taking, increased accident frequency with anti-lock brakes due to closer car-following distances and delayed braking, and a relationship between mandatory seat belt use and increased vehicle speeds.

In the aviation arena, it's likely that such risk-adjustment behavior would manifest itself as an increase in the likelihood of an individual being willing to expose himself or herself to greater levels of risk if the aircraft were perceived as being safer due to technological changes. Consider the case of a pilot being pressured by his boss to meet an important schedule. Questionable weather or maintenance issues are weighed against the benefits of making it to a potentially lucrative meeting or fundraising event, as well as against the potential for being penalized for not meeting the schedule. Add advanced (i.e., safer) technology to the picture (which is potentially perceived as a "get out of jail free" card if the aircraft malfunctions), and the unwary pilot may have sufficient additional justification to accept the risk of punching through bad weather or other marginal conditions.

It is important, therefore, not to focus strictly on the technological safety features or aircraft capabilities, but to recognize the performance of the human element. Individuals have acceptable levels of risk that they assign to any particular task; those that train to become pilots need to understand their personal limitations and the limitations of their equipment. This will increasingly be brought to the forefront as more advances to aircraft systems become available to less-experienced pilots in general aviation.

In many ways, these new aircraft can be every bit as complicated as a modern airliner; it is imperative that training and testing requirements that address this fact be mandated. When properly operated, such new aircraft and systems can offer quantum leaps in safety over previous-generation aircraft—but not if their capabilities are used to venture into environments or situations that would previously have been considered unacceptable.

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For more information about the authors, visit www.GeneralAviationExperts.com.

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