

How Sm



The data are in: Automatic activation devices (AADs) save skydivers' lives. How does the complex interaction among hazard, safety and economics in parachuting compare with the similar debate over automobile air bags?



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art Is Your Parachute?

BY GERRY SMEDINGHOFF



The Risks and Rewards of High-Tech Life Insurance

AFTER 73-YEAR-OLD FORMER PRESIDENT GEORGE BUSH went on a skydive two years ago, Americans stampeded to drop zones (DZs) all over the United States—particularly septuagenarians wanting to make their first jump. According to Glenn Bangs, director of safety training for the United States Parachute Association (USPA), the public response of “if he can do it, I can do it” was so great that many DZs couldn’t keep up with the demand.

Fifty-three years earlier, during the Second World War, George Bush had been forced to jump out of a burning plane into the sea below to save his life. He made an awkward exit from the cockpit, hitting his head on the stabilizer bar, and his parachute briefly got entangled on the tail, ripping several of the panels. He was elated to have survived, but had skydiving been an Olympic sport, he didn’t feel the judges would have awarded him very many style points. A half a century later he wrote that he jumped out of a perfectly good airplane at 12,500 feet because he “wanted to do right those things I did wrong 53 years ago. For me this is personal. It’s closing the loop, revisiting my past. It’s doing it right this time. That’s all.”

What risk did George Bush—along with those who followed his example—take in revisiting his past and accepting his own personal challenge? Although the available data are sketchy, had George



Bush decided to make this skydive three decades earlier (when Johnny Carson made a jump that was subsequently broadcast on *The Tonight Show*) his chances of dying would have been four times greater.

Before the 1990s, the leading cause of skydiving fatalities was the “no pull/low pull” (NP/LP) category—failure to pull the rip cord in time, or at all. Why would a skydiver fail to perform the most basic and most important function of any skydive: pulling the rip cord? When falling to the earth at 120 miles per hour, many things can go awry. Skydivers can:

- Be accidentally knocked unconscious when exiting the aircraft;
- Suffer from hypoxia (oxygen deprivation) and black out at high altitude;
- Collide with another skydiver in free fall (where they can achieve horizontal speeds of up to 40 mph) and be knocked unconscious;
- Lose altitude awareness and not realize how close he is to the ground;
- Have a malfunction with the main parachute resulting in a violent spin that makes it extremely difficult to release the main parachute and pull the reserve;
- Fail to maintain the proper free fall position and go into an uncontrollable spin;

Birch

- Freeze up in free fall and fail to do anything.

In less than a decade, NP/LP has dropped from first to last of the top five categories of skydiving fatalities. Paul Sitter, who compiles the annual fatality report for the USPA, credits the dramatic reduction in NP/LP fatalities to an invention known as an automatic activation device (AAD), particularly the Cypres (which stands for CYbernetic Parachute RElease System) model, which was granted a U.S. patent in 1989 and is manufactured in Germany by Airtec GmbH since the early 1990s.

Like an automobile air bag unit that measures force applied to a car's front bumper, an AAD is a complex technological device that continually measures and records air pressure around the falling skydiver. It's designed to answer one basic yes/no question: “Is the skydiver in control under a fully inflated parachute as he approaches a critical above-ground-level altitude where the reserve parachute must be deployed to save his life?” If the answer to the question is no, then fire the reserve parachute; if the answer is yes, do nothing.

Also like air bags, AADs did not win immediate acceptance and have generated a good deal of controversy within the skydiving community. Ironically, the more effective AADs have become over time, the more intense the debate has grown among skydivers. With respect to such lifesaving devices, one would assume that public acceptance could be taken for granted and that public opinion would be united. After all, how many people object to smoke detectors?

Yet the resistance and controversy that accompany such lifesaving technological innovations are rational and predictable, and a decade or more from introduction to ultimate acceptance is par for the course. Designing technological innovations that improve people's lives is relatively easy; changing the way they think and act is not.

NP/LP incidents are especially common among student skydivers. A typical sample from the reports of documented Cypres AAD firings that saved the life of a student skydiver is, “Student could not find rip cord, became confused and did nothing.” Another student “tried to stop the spin by adopting the neutral position, forgot to look at the altimeter and made no attempt to pull. Later said that he felt he couldn't do anything—nothing worked.”

The most celebrated case of AAD firings occurred on September 13, 1997. Four experienced skydivers, preoccupied with performing their rehearsed routines in free fall, all lost altitude awareness in the middle of their last maneuver. None of them heard their audio altimeter warning device go off, but all their AADs fired simultaneously, saving the lives of all four jumpers.

A more tragic case occurred three months later when a four-way team jumping at the South Pole, Antarctica, lost altitude awareness. One skydiver was saved by his AAD. The other three non-AAD-equipped skydivers died on impact.

Because technical devices can be expensive, because most people don't have complete faith in new technologies, because

new technologies don't always function as designed and can sometimes injure or kill people, the issue of high-tech life insurance can become extremely complex. Once the problems of designing and building such devices have been solved, three additional interrelated economic and social barriers must be overcome before these high-tech forms of life insurance are accepted and adopted by the general public.

The Information Barrier

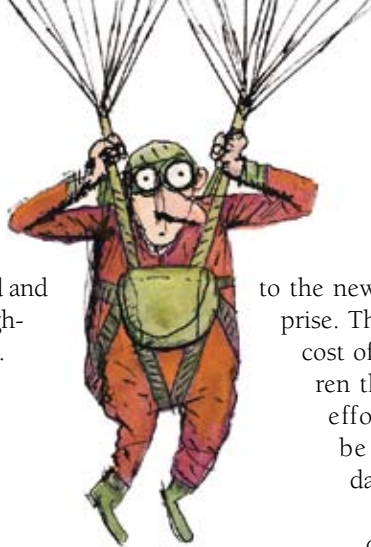
In economics, this problem is referred to as a *market failure*. A market failure is a situation where the limited flow of information within a society, and its rigid organizational structure, prevents mutually beneficial exchanges between producers and consumers. Either producers are unaware that sufficient demand exists to make investment and production profitable, or consumers aren't convinced that this new product is worth more to them than the cost. Market failures are sometimes identified and addressed by governments, and eventually resolved by advancing technology and changing attitudes.

On the supply side, a good example is classical music. In previous generations, members of the aristocracy enjoyed classical music, but the market failed to provide the opportunity for them to hear it. Consequently, governments stepped in and addressed this market failure by building concert halls and funding symphony orchestras. Today, technology has solved this dilemma beyond anyone's wildest dreams. Now, virtually everyone—from millionaires to hourly laborers—can afford to buy a CD player and a disk and listen to a symphony countless times anytime and anywhere, without any market intervention.

On the demand side, a good example is seat belts. Just because manufacturers can provide a valuable good at a price most people can afford doesn't mean the public wants it. At the same time safety advocates were arguing for legislation mandating air bags in automobiles during the 1970s, a segment of the car-buying public was staging a revolt against the (then) aggressive measures to coerce people to use seat belts. Some considered it a fundamental patriotic duty to engage in a non-violent protest by disconnecting the annoying seat belt warning buzzer that began to appear in new cars in the 1970s.

The Risk Barrier

Also known as the utility barrier, this represents what you have to give up (in addition to the monetary cost) to get the benefit. The fact that there wasn't much consumer resistance



If skydivers valued AADs on the same scale as the general public appears to value air bags, Airtec could price Cypres at close to \$17,000 each. The logical extension of this value scale would be that an AAD would cost almost five times as much as the rig itself.

to the new-technology smoke detectors is no surprise. The risk of a smoke detector "misfire" (the cost of a false alarm) was only an annoying siren that could be switched off with minimal effort—a consequence that can easily be reversed without any permanent damage.

Air bags aren't a problem for most adult drivers but are a serious consideration for smaller adults and children, who face an increased risk of death from the impact of the air bag, especially when it misfires. Not only do these people have to pay the same price for the air bags in the new cars they buy, but they have to confront a new risk they want no part of.

More than 100 people have been killed by air bags since the late 1980s. Originally, children and small adults were not informed of the dangers they faced from air bags. Adding insult to injury, not only were they guinea pigs in a life-and-death study of the effectiveness of air bags; they were denied the opportunity to take reasonable and sensible actions to reduce the risks once they were informed of them.

It wasn't until January 1998 that it became legal for auto dealers to install deactivation switches in cars equipped with air bags. Over the next four months, the federal government issued 30,000 letters of approval to the public for installation of these switches, but only 1,000 (or 3 percent) had actually been installed. The vast majority of those with a government-approved request for air bag deactivation were either turned away or discouraged by dealers who feared that installing the switches would make them liable in future lawsuits.

Public/Private Choice

Just because someone believes air bags or AADs are affordable, is convinced they work and isn't concerned about any additional risk they might pose, should everyone be forced to use them?

Private choices are situations in which individuals can exercise different preferences at the same time to everyone's benefit. Common examples are clothes and food. We all wear different clothes and eat different foods at the same time with no negative effects. Public choices are situations where a rule is necessary to standardize behavior to maximize the benefits of the greatest number of participants. Examples are stoplights and speed limits. Public roads would be far too dangerous if drivers ignored traffic signals and drove as fast as they pleased.

Air bag insurance in passenger automobiles, for the most part, emerged from inception to general public acceptance in the realm of public choice. Twenty years ago, there were no cars on the market that had air bags. Today, federal legislation ensures that there are no new cars on the market that do not have air bags. Not only are those who don't want air bags forced to buy them; they are also forced to accept the additional risk they pose.

AAD insurance for skydivers has emerged from inception to date entirely in the realm of private choice. Each skydiver has been able to weigh the risks, costs and benefits with respect to his personal situation and act accordingly. The USPA mandates AADs for tandem (where an experienced skydiver jumps with a passenger attached) and student rigs. But since the USPA is a purely voluntary organization with no enforcement power, experienced skydivers have never been forced to use them.

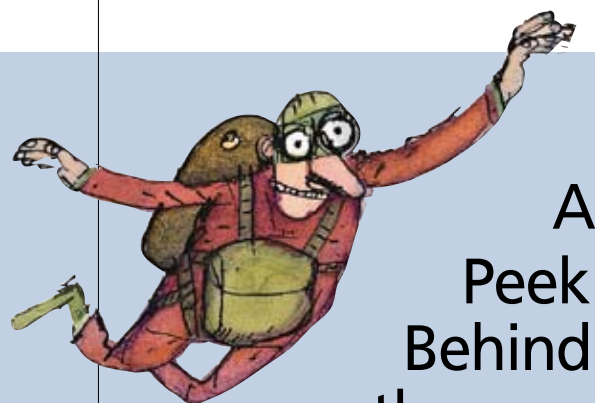
With the advancement in AAD technology and its proven success, this may change. A few DZs, such as Skydive Las Vegas, now require that all jumpers be equipped with AADs. Recently, the USPA considered an AAD mandate for accelerated free fall (AFF) jumpmasters (JMs) who jump with students. And some skydivers now fear that FAA regulation looms on the horizon.

A Great Leap of Faith

AAD discussions among skydivers often grow very intense very quickly. When they reach a stalemate and agree to disagree, the debate usually ends with the statement, "If you want one, get one; if you have one, turn it on; if you need one, get out of the sport."

According to Mark Turoff, co-author of *Parachuting: The Skydiver's Handbook*, the introduction of the Airtec Cypres AAD in the early 1990s has shifted the debate among skydivers from "Will this device reduce my risk?" to "Why don't you have one?" He says the deaths of several noted skydivers over the past decade, either because they weren't equipped with an AAD or because they failed to turn it on, have caused a growing number of skydivers to re-evaluate their notions of the role of AADs in the sport.

The microprocessor design of the Cypres represents a significant leap in AAD technology and is recognized as the best on the market among skydivers. The *Cypres Design and Test Report* describes the unit's operation as follows: "The data processor evaluates the jumper's altitude and descent rate along with five other parameters. When *all seven* parameters indicate that an activation is necessary, then the Cypres activates." The result has been that accidental misfires and deaths from AADs failing



A Peek Behind the Numbers

Cypres Calculation

Helmut Cloth's estimate that the actual number of Cypres saves is more than twice the reported number—or a 100 percent variance—is based on the combination of several interacting factors. Skydivers have a tendency to view altitude the way Las Vegas gamblers view luck: They allow their wishes to get ahead of their intellect and believe that more is available to them than is actually the case.

Airtec once conducted a test to measure skydivers' altitude perception. A Cypres unit was attached to a

dummy skydiver, dropped from an airplane and fired. The 35 expert skydivers who observed the test estimated the altitude of firing an average of 46 percent higher than where it actually occurred. In many incidents where a Cypres fires, the skydiver claims either (a) he was above an altitude where it should have fired, or (b) he was in the process of pulling the rip cord and the activation of the Cypres did not save his life. When a Cypres does fire, however, Airtec is able to dump the memory from the unit's microprocessor to more accurately determine the activation altitude. Although there's a margin for error in the measurement, the traditional skydivers' bias is evident.

Airtec GmbH's legal liability is—for all practical purposes—infinite, and skydiving is literally a matter of life and death (as opposed to advertising claims about a new-and-improved laundry detergent). This certainly accounts for Airtec's conservative bias in reporting

Cypres saves.

"Airtec considers a 'save' to be *only* those incidents where all indications are that there would have been a fatality otherwise," says Cliff Schmucker of SSK Industries. "If the skydiver says he was in the process of pulling. . . [generally] it's not included on the list."

So it's possible that some lives on the 'saves' list may not be true saves, while there are probably other saves from around the world that are not reported back to Airtec. He concedes that Airtec has a "shaky statistical base [that doesn't] have a great world reporting/record keeping system (yet)," and iterates his caveat to "once again, please consider the possible statistical insignificance and pitfalls in overanalyzing the data."

Air Bag Calculation

Unlike Airtec, the National Highway Traffic Safety Administration doesn't have the luxury of a seriatim count of

to fire at the proper time have been dramatically reduced.

Just as a generation ago many people considered buckling their seat belt an acknowledgment that they lacked confidence in their ability to drive, today many experienced skydivers view equipping their rig with an AAD as an explicit admission of incompetence or cowardice. Mark Smith, a tandem and AFF JM at Skydive Virginia, describes the skydiver generation gap. "All students use one," he says, "and when they get off of student status, they buy one. The old-timers who don't want one don't buy one."

To overcome this consumer resistance, manufacturers must convince skydivers that an AAD is worth the price (market information barrier). Skydivers must be convinced that the benefits of reduced risk exceed the potential threat—real or imagined—posed by an alternate increased risk (risk/utility barrier). And they must not feel they're forced into using AADs against their better judgment (public choice barrier).

Market Forces

Several years ago, Mark Smith was inadvertently yanked from a free-fall formation by an AAD misfire. He concluded that the purely mechanical devices available at the time lacked sufficient precision and vowed not to use one. The introduction of

the Airtec Cypres not only changed his mind, but now he has joined the swelling ranks of skydivers who would buy one at twice the \$1,200 purchase price.

Since most new skydivers are young with limited discretionary income, the cost of an AAD can appear to be prohibitive. Unfortunately, inexperienced skydivers are precisely the group that needs AADs the most. And many of them aren't able to rationalize the \$1,200 purchase price by amortizing the cost over its useful life.

Many experienced skydivers aren't able to rationalize and amortize the cost of an AAD either. Tonney Boan, co-owner of the Skydive Virginia DZ, acknowledges that "one of the factors that has kept some skydivers from buying one is the high cost. I know this from a personal perspective, having convinced several experienced skydivers to buy one, only after doing an exhaustive explanation of overcoming their high-cost argument."

Marc Garber, formerly a tandem JM at Skydive Chicago and now an AFF JM Skydive Virginia, is more direct: "If you can afford to skydive, then you can afford an AAD."

Hal's Choice

The dividing line of the risk/reward barrier for automobile air

lives saved. Instead it must resort to statistical comparisons of fatalities in cars equipped with air bags to similar models without them. NHTSA acknowledges that this statistical methodology is subject to a 35 percent variance in either direction of the estimate of lives saved. The \$1,700,000 benchmark is calculated based on the midpoint of the NHTSA estimate of lives saved less the actual number of people killed by air bags—approximately one for every 30 lives saved. Also of note:

■ A dual-air-bag unit cost of \$346 for a 1991 model car is assumed for all cars in all years. This ignores both inflation and the benefits of cost reductions from the technology learning curve. The cost per life saved can be scaled up or down in direct proportion to the average unit cost divided by \$346.

■ The number of lives saved by air bags is two-thirds less than initial NHTSA estimates dating back to the early 1980s, largely due to a fivefold increase in seat

belt usage—from 14 percent in 1983 to 70 percent today.

■ Air bags have been shown to decrease the incidence and severity of head and chest injuries, but they also are the cause of a corresponding increase in arm and lower-body injuries. Consequently, the NHTSA considers the offsetting effects of these injuries to cancel each other out and assumes that air bags do not significantly reduce bodily injuries.

■ Now that dual air bags are mandatory for all cars and light trucks, the number of lives saved may increase slightly, as most of the early cars had driver air bags only. But the number of occupants killed may increase at a more rapid rate because the vast majority of people killed by air bags are front-seat passengers.

■ Surprisingly, at \$150,000 per life saved, the mandatory mechanical seat belts in the average car are more expensive than high-tech AADs. As seat belt

usage continues to climb, however, cost remains constant while the number of lives saved will increase, so the cost-per-life-saved will drop.

Calculation Comparison

Finally, although the \$125,000 AAD and \$1,700,000 air bag cost-per-life-saved numbers were calculated using the same methodology, it should be stressed that the AAD figure lies toward the extreme conservative end of the range, while the air bag figure is in the midpoint of the range. If Airtec chose to get aggressive with its marketing, based on its data and expertise (both Helmut Cloth and Cliff Schmucker have made more than 1,000 skydives each), it could double the number of Cypres saves and halve the cost-per-life-saved figure down to the \$60,000 range, or almost 1/30th the cost-per-life-saved by an automobile air bag.

—Gerry Smedinghoff

bags is occupant size. With AADs it's the experience level of the participants. Tonney Boan, a pilot and skydiver for more than two decades, recaps the history of AADs from the pre-Cypres era—when the risk/reward experience curve worked against veteran skydivers—to the present.

“Older-type AADs can misfire more easily,” says Boan, “and it was thought that this could create more of a potential hazard in the type of skydiving activities in which most experienced skydivers participated. In essence, at that time, the cons outweighed the pros. AADs have been saving those instudent skydiving progress years, and with the advance in technology they're now saving those considered highly experienced.”

The primary concern among expert skydivers is an AAD misfire in a free-fall situation where one skydiver is directly above another. If the lower skydiver's AAD accidentally fires, his parachute will slow his descent causing a collision with the skydiver above him, resulting in certain injuries and possible fatalities. This is comparable to the unwelcome added risk an automobile air bag poses to children and smaller adults, which is essentially a loaded gun aimed directly at the occupant's chest. A misfire at the wrong time can be fatal.

Many people who feel at the mercy of advancing technology cite the classic science fiction scenario of machine against man from the movie *2001: A Space Odyssey*.

In the film, the HAL 9000 computer decides not only to kill all the humans aboard the *Discovery* spaceship, but does so only after weighing all the facts and acting on reason. Those who want to ride the technology wave cite Moore's Law (computing power doubles and prices halve every 18 months) and IBM's *Deep Blue* supercomputer that was able to defeat the greatest human chess player, Garry Kasparov.

Arguing the case of man over machine is Kevin O'Connell, a veteran skydiver with 15 years' experience, who refuses to use an AAD. “The current designs,” he says, “in combination with the emergency procedures I've learned over the years, are as dangerous or potentially more dangerous to me than jumping without one.” Even with his experience and well-informed, well-reasoned objections, he maintains an open mind. He would consider using an AAD “if there were some modifications to the system logic that would allow me to override its firing decisions during the jump, such as a user override dur-

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ing free fall and a warning of impending fire.”

Surfing on the crest of the advancing technology tidal wave is Gretchen Duran, an AFF JM at Skydive Dallas with more than 1,600 jumps. “I have two sets of gear and they're both equipped with Cypres AADs,” she says. “I insist on having the best (Cypres) because it's only my life! I use them because you never know what can happen. They're expensive, but if I never use either one, I certainly won't feel like I wasted my money.”

While on the opposing side of the AAD debate, she is similarly well-informed, logical, open-minded and cautious. “There are AADs out there that I would not have on my gear, ever,” she says. “I'd rather have no AAD than one I don't trust. The Cypres is all I will have, at least until something better comes along.”

To date, Airtec is not aware of any skydiving deaths directly attributable to a Cypres, but has confirmed two deaths of skydivers equipped with an activated Cypres: One was incorrectly installed, while the other had an outdated battery that was almost four years old. If a Cypres AAD fails to fire, the reason is usually that the skydiver failed to turn it on, and not because it failed to perform as intended. Just like seat belts, some people forget to use them, others refuse to use them.

Not Everyone the Same

What's good for one individual is not necessarily good for everyone. Penicillin may cure what ails one person, but might cause an allergic reaction in someone else. Kevin O'Connell objects to the design of the Cypres (to answer one yes/no question, like an air bag) because—as an air bag does with front-seat automobile occupants—it lumps all skydivers into one category.

“It's a device that's fairly ignorant of most of the parameters of a situation,” he says, “and tends to try to judge a fairly complex situation based upon one or two variables. The critical factors being ignored are immense.” Ironically, he feels that it lacks the information bandwidth and reasoning ability of the HAL 9000 computer.

“There's similarity because both devices fire based upon an outside stimulus,” notes Marc Garber. “But airbags have a different effect with children and small adults than they do with the general population. The Cypres does not have a different effect. It treats everyone the same.”

However, he concedes, treating everyone the same “is not necessarily a good thing. For example, the Cypres treats someone who launched his main chute one or two seconds ago (in time to save his life) the same way it treats someone who is unconscious and not going to deploy. The failure of the Cypres to recognize the difference between these scenarios is a shortcoming.”

“Carrying a reserve parachute along on every jump also increases our survivability factor, even though most of the time it’s a bulky and costly addition to the equipment that we really ‘need,’” says Cliff Schmucker of SSK Industries, the U.S. distributor of the Airtec Cypres. “AADs are similar to a seat belt or air bag in an automobile or a helmet on a motorcycle. They’re a hassle to use, they get in the way, they add expense, they infringe on our personal freedoms and in bizarre circumstances they sometimes hurt more than help. But statistically they save lives. Hopefully skydivers will voluntarily use AADs before they’re mandated by the government.”

An actuary who makes a living collecting and aggregating data into averages, along with most of the general public, may wonder why AADs are even an open issue and why the debate is so intense among skydivers. Even skydivers generally don’t disagree on the available data. And they agree more strongly on the fact that all of them view their lives and their participation in the sport as an experiment with a sample size of one, *without replacement*. No one is average. There are no guarantees. And no one gets a second chance.

Skydivers examine every aspect of their equipment more carefully than jewelers evaluate diamonds, because they recognize that their life is on the line on every jump. But when most people buy cars, they don’t investigate the critical life-and-death variables of cars the way skydivers do with their rigs. Car buyers make their decisions based on cosmetic extras such as a sunroof or a stereo system. But drivers put their lives on the line every time they get behind the wheel just as skydivers do every time they jump. From this perspective, skydivers are rational and cautious consumers when compared to car buyers, who are irrational and reckless.

The primary disagreement among skydivers is on the public/private choice question. Each skydiver views his situation as unique and wants to maintain control of as many variables as possible. But skydivers also attend more funerals than the average person in their age group. And they realize the primary aspect that separates skydiving from most other sports is that one error in a split-second decision can annihilate two decades of experience—from which there may be no chance to recover. In a rare unexpected crisis of terror, skydivers need all the help they can get.

Wendy Faulkner, a skydiver with more than 1,600 jumps and a master’s degree in mathematics, has a vested interest on both sides of the high-tech insurance debate. She measures less than 5 feet tall, jumps with a Cypres but drives a car without an air bag.

“The AAD/air bag comparison is a valid one,” she says. “A seat belt is a passive device; I always wear mine. But I’m very glad my car doesn’t have an air bag. The government-required air bags weren’t designed to save a person my size. And there have been numerous accidents to prove it. Most people are much safer in a car with air bags. Just not me. I believe the vast majority of people are safer jumping with a Cypres. But that doesn’t mean 100 percent of people are. The government thought it was worth it to kill a hundred small people to save some larger number of unbelted males. As one of the small people, I have a big problem with this.”

AAD Economics

To Wendy Faulkner, standing in the open door of an airplane at 13,000 feet, about to jump with a parachute on her back, an AAD makes a lot of sense. But how well does the case for AADs hold up for an actuary sitting at a desk punching a calculator? A new skydiving rig, complete with main and reserve parachutes, can cost between \$3,000 and \$4,000. Adding a new Cypres AAD increases the base cost by one-third. A \$75 battery must be replaced every two years. And a complete maintenance check must be performed every four years at a cost of \$160. As of the fall of 1998, there were 45,000 Cypres units in use worldwide. In addition to the fixed cost of skydiving equip-

Mid America Search

ment, the ongoing cost of jump tickets for a plane ride to 13,000 feet (of 100 or more annually) is roughly \$17.00 each.

After the initial purchase price, two other economic benchmarks need be established to determine whether AADs are worthwhile: the average cost over the life of the unit and the overall cost to society. A reasonable estimate for the average cost of an AAD to a skydiver is about \$0.50 to \$1.50 per jump, or roughly the equivalent of a 6 percent tax on a \$17.00 jump ticket—depending on the number of jumps annually. For skydivers who jump significantly more than average, the cost per jump is less. Those who lose interest in the sport can sell their AADs and recover most of their investment.

A conservative estimate for the cost to society, based on the total number of Cypres units in use worldwide and the documented number of lives saved is about \$125,000 per life. Helmut Cloth, the inventor of the Cypres and founder of Airtec, estimates that the actual number of lives saved by Cypres AADs is more than twice the number of documented saves. Consequently, the actual cost-per-life-saved is probably lower. A recent proposal for the Washington, D.C. Metro subway system to invest \$8 million in escalator safety sensors would have prevented the deaths of five people over the past 13 years—a cost of \$1.6 million per life, nearly 13 times greater. By comparison, AADs represent one of the best life insurance bargains on the market.

Applying the same actuarial methodology for AADs to calculate a cost-per-life-saved by air bags yields a figure close to \$1.7 million. This makes air bags even more expensive than the Metro subway safety proposal and produces a price ratio to AADs approaching 14 to 1, definitely “low-hanging fruit” in the arena of high-tech safety devices. (See sidebar.)

If skydivers valued AADs on the same scale as the general public appears to value air bags, Airtec could price Cypres at close to \$17,000 each. The logical extension of this value scale would be that an AAD would cost almost five times as much as the rig itself. Instead of charging by the jump, consider giving AADs away for free to all skydivers and charging them only when one fires and a life is saved. Since most skydivers don't have \$125,000 in spare cash lying around in case their AAD fires and saves their life, the problem of the significant cost of an AAD (\$1,200) has been replaced with the problem of raising the prohibitive sum of \$125,000 in cash on short notice.

With respect to drivers, many states have addressed the risk

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posed in this situation by imposing the public choice requirement that all licensed drivers carry a minimum level of auto liability insurance. If this were replicated with skydivers, the economic result would be similar. The cost of insurance would be highest for the younger, less experienced skydivers who need it the most and can afford it the least. And, just as many young drivers choose to go without insurance, younger skydivers will choose to jump without an AAD.

We now have three price points for the same AAD:

- A monumental expense (or financial loss that requires insurance) of \$125,000 for the lucky few who get a second chance to live

- A significant investment of \$1,200 in a high-tech device

- A trivial \$1.00 per jump, or 6 percent tax. Since an AAD manufacturer would get the same revenue by charging \$125,000 per life saved, \$1,200 per unit, or \$1.00 per jump, it would be indifferent to the financing arrangement.

So how should skydivers view AADs? As a risk that needs to be insured, as an investment or as a tax? If this sounds like “*déjà vu* all over again,” it is. In the span of two decades, air bags went from a high-priced insurance test market in a few experimental models in the 1970s to a moderately priced optional investment in the late 1980s, and ended up as a mandatory tax on all new cars built today.

What's different is that the evolution of air bags was mandated by federal legislation in a public-choice setting, and air bags were ultimately made affordable by the dramatic cost reductions from advancing technology since the 1970s. AADs, on the other hand, have evolved in a private-choice setting (so far). They have left the market failure stage of prohibitively expensive insurance, are presently in the risk stage of a significant \$1,200 investment, and are on their way to the final public choice phase where they may wind up as a universal pseudo-tax or surcharge on the sport of skydiving.

Air bags have reached the extreme of the public choice spectrum because every new car buyer is forced to buy one and forced to “use” one. There has been a partial retreat; while everyone is still forced to buy one, people may be allowed the option of disarming them. AADs are now poised to evolve into the public choice phase of high-tech life insurance. But since each AAD is already equipped with an on/off switch, even if all skydivers are eventually forced to buy them, they most likely will be left with the option to use them.

Tonney Boan has no doubts about the future of AADs. “With

the passage of time and continued education,” he says, “the use of these life-saving devices will be the absolute norm.”

Better Safe Than Safer

Three points that transcend the market, risk and public choice aspects of the high-tech life insurance debate are almost universally ignored. First, closer examination of any safety issue reveals there’s always some point at which the vast majority of the public decides that further investment in increased safety measures isn’t worth the cost or the effort. There’s no doubt that automobile injuries could be significantly reduced if all drivers and passengers were required to wear crash helmets at all times. Not only does no one drive with a crash helmet, but most people would probably think someone who does is a prime candidate for psychiatric evaluation.

Second, if people carefully examined all their own opinions and behaviors (along with the behaviors of others they perceive as reasonable) they could easily find a host of cases where they make what they consider to be logical and rational choices that increase both their risk and cost. One well-known example is the television football announcer John Madden, who prefers to travel by bus—sometimes from coast to coast—instead of flying commercial airlines. Not only does every actuary know that his risk of injury or death is dramatically increased by his choice to drive, but this fact is common knowledge. Not to mention that driving is much more expensive in terms of time, money, and personal comfort.

John Madden probably doesn’t make “irrational” decisions to drive without a crash helmet and avoid commercial flying because he’s not informed of the risks. More likely, he doesn’t want to stand out as the only driver wearing a crash helmet. And he feels uncomfortable being confined for several hours in the cabin of an airplane at 30,000 feet. Informing him of the serious consequences of head injuries and the fact that no passengers died on domestic commercial flights during 1998 would probably not influence his behavior in the least.

Since no one is arguing that all automobile occupants should be forced to wear crash helmets and no one is arguing that automobile trips longer than 100 miles should be outlawed, the larger question of what determines which personal safety measures should be mandated by law deserves serious reconsideration.

Finally, just as there’s no such thing as a free lunch, there’s no such thing as “free safety.” Kevin O’Connell, who skydives with a crash helmet but drives without one, was once involved in a bizarre skydiving situation where his helmet could easily have killed him.

“We could all be ‘saved’ by a large variety of equipment that we don’t wear,” O’Connell explains. “Broken limbs galore could be saved by body armor. We could all wander around looking like hockey goalies and probably save thousands of injuries a year. But *any* device can become the tool for your undoing. Every button, lever, switch, knob or snap is something to

potentially get stuck in the wrong position. You have to weigh what every gadget you buy could do *for* you, against what it can do *to* you. A helmet in a car can save your head. It can also increase fatigue, interfere with glasses, make your head heavier in a rear-end collision and, depending upon what kind you get, decrease peripheral vision.”

Whatever the final outcome of the AAD story, it will provide an excellent high-tech insurance case study to compare and contrast with the checkered and controversial saga of air bags. We know where we’ve been, we know where we are and we know roughly where we’ll end up. The main unanswered question is: “How soon will we get there?”

While skydivers can be left to debate the pros and cons of AADs as they pertain to their individual situations, special risk underwriters reviewing the applications of skydivers should be united in taking the position, “If you don’t have an AAD, get one (preferably a Cypres); if you have one, be sure to turn it on; and if you need one, we won’t sell you a life insurance policy.” ●

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