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Flying Safety

SURVIVE!

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Front cover photo: Official USAF Photo

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Courtesy *Callback*, Oct 98
NASA's Aviation Safety Reporting System

PAs on PEDs

Public Address (PA) announcements made to the passengers during taxi-out may be forgotten later in the flight. Sometimes a repeat announcement is needed to have the desired effect, particularly when Personal Electronic Devices are considered a likely source of erroneous navigation indications. The repeat PA worked for this flightcrew:

At cruise, we got several navigation deviation indications from the Course Displacement Indicator. After having the Flight Attendants check for unauthorized electronic gear, I made a PA announcement about turning off any cell phones that might be "on" but not transmitting. Shortly after that PA, the navigation deviations stopped. The same thing occurred on a flight the previous night, with the same PA and the same results. I suggest that the PAs be more direct regarding cell phones that might be "on" but not in use.

Apparently, the second time's a charm.

There We Were

Courtesy AFFSA *Airfield Operations Digest*, Nov 98, and Mr. Ken Saylor/PACAF/DOYA

■ On a rainy evening many years ago at Nha Trang Air Base, Vietnam, Scat Back Alpha, a T-39 carrying General Westmoreland was on final awaiting a landing clearance when a C-7, previously cleared for takeoff, stalled on the runway. To avoid an incident, the local controller immediately issued go-around instructions to Scat Back Alpha.

The pilot of Scat Back Alpha, realizing that this meant a delay in landing, replied, "But Nha Trang, I've got a Code Three (Distinguished Visitor) on board."

Without missing a beat, the local controller responded, "Roger, Scat Back Alpha, take him with you."

■ On a busy day at Phan Rang Air Base, Vietnam, numerous F-100s were landing and departing in support of the many daily air-to-ground missions. F-100s used drag chutes to slow down on landing roll because of their high touchdown speed. The wing Director of Operations (DO), who was visiting the control tower and watching the operation, suddenly pointed to an aircraft on the runway and yelled to the local controller, "No chute! No chute!" The local controller calmly turned to the DO and replied, "No s---, Colonel, it's a departure."

■ The flight lead of a two-ship formation of battle-damaged F-100s on radar vectors to Phan Rang called the GCA, stating that his wingman had just ejected because the aircraft was no longer airworthy. The GCA controller replied, "Roger, understand. Canceling in-flight refueling."

Official USAF Photo by Dan Yacko

TSGT BRYAN L. KASMENN
336th Training Support Squadron
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We in the Survival, Evasion, Resistance, and Escape (SERE) profession often focus more on individual physical techniques—personal protection, evasion skills, travel techniques—or survival equipment capabilities, than we do on the psychological aspects necessary for persevering in a survival situation.

Plainly put, a crash survivor could have a fully stocked all-terrain vehicle pop out of his seat kit, but without the will to survive, it would be useless. Being ill-prepared mentally makes one susceptible to "paralysis," making poor (or outright wrong) decisions, or perhaps even "giving up the fight" entirely. Conversely, survival under the grimmest of circumstances with little or no emergency equipment can most often be attributed to preparedness and *the right attitude.* Possessing the proper survival mentality is crucial, whether you're alone or part of a group. And it may mean the difference between life and death. Here are some ways for you to tip the balance in your favor.

Someday *You* May Be "The Other Guy"

Believing that a crisis can never happen to you may make it impossible to react appropriately when one does. You must accept that it *can* happen to you, so that if it does, you won't waste precious time in bewildered disbelief. Once you accept that it *could* happen, then you can train for it.

Remember the five "Ps" to survival: **P**roper **P**reparation **P**revents **P**oor **P**erformance. Once the emergency occurs, accepting the situation quickly allows you to get the maximum benefit from your abilities. Reacting quickly provides an advantage in a life-and-death situation, and denial of the predicament can take some or all of that advantage away from you. *Seconds* are precious and *minutes* are gems, enabling opportunities. Before something "bad" happens, *you must accept that it can!* Once something bad does happen, *you must accept that it did!*

Thoroughly knowing emergency procedures and survival skills, and rehearsing use of those procedures and skills regularly, will boost your confidence and prepare you for an emergency. This preparation can enable you to react correctly, even when semiconscious or in a state of shock.

A friend of mine was recently involved in a parachuting mishap. Even after striking the airplane and suffering a crippling injury, he was still able to steer his parachute and land safely. He felt his ability to survive the parachute landing was due to both attitude and the repetitive nature of the training he had received.

Dougal Robertson, who (along with his family) was adrift for 37 days at sea, wrote about his experiences in the book, *Survive the Savage Sea.* He said: "Information is a major factor in successful survival, and although survivors can learn from their own mistakes, death may in-

tervene before the learning can be applied to a second chance."

Survival Mentality in a Group

Ever hear the phrase "a team plays as well as it practices"? This is never so true as an emergency. The greater the group's cohesiveness and discipline, the easier the group will deal with the situation. An emergency doesn't bring a group together; but, the crew or group that has trained as a team will shine in an emergency.

Believing that a crisis can never happen to you will make it impossible to react appropriately when one does.

Official USAF Photo by Dan Yacko

Group morale exists when all members feel they are a contributing part of the crew, rather than just "individuals." There are accounts of injured survivors sacrificing themselves, or just giving up, so they can stop being a "burden" on the rest of the crew, and that's why all SERE schools stress the importance of assigning an appropriate job or task to everyone, even injured personnel. This not only makes them feel like less of a burden on the group's resources; more importantly, they know they are *contributing.*

The bottom line is this: Members of a group with a "team mentality" have several distinct advantages over individualists that make up a loosely organized group. Here are a few:

◆ **You can divide the team into groups.** Assigning tasks and problems to each group allows multiple problems to be worked at the same time.

◆ **You can assign a job to the most experienced or qualified person**—for instance, assigning Capt Smith to catch fish because he's the most experienced fisherman in the group.

◆ **There's strength in numbers.** You feel more secure when you know the burden isn't yours alone to carry. Your fellow survivors can be your safety net.

◆ **The right decision is easier to make** when you have the benefit of more "hands" and their experience, knowledge, suggestions, and criticism.

◆ **The members of a group can help each other over the rough spots.** No matter how bad things may seem, teams and groups always have someone with a "positive" attitude—rarely are all survivors depressed or despondent at the same time. Even if you want to "murderize" this "cheerful" person at the time, you will appreciate him/her later. Besides, sooner or later, you'll likely find *yourself* in the "cheerful person" role.

◆ **When shared, pain and discomfort seem to lessen.**

Also, remember that effective communication is critical to the survival of a group. Without it, 50 poor "talkers" can't accomplish what a group of 5 effective "talkers" can.

Individual Survival Mentality

The *Canadian Survival Manual* states, "Survival may depend more upon personality than upon the danger, weather, terrain, or nature of the emergency." It also says: "Whether fear will lead to panic or act as a spur to greater sharpness; whether fatigue will overcome the person or leave him able to take the necessary action to survive; whether or not he will have frostbitten feet or be able to travel to rescue; all are, to a large extent, dependent more on the person than on the situation."

This is illustrated in the account of a crew of airmen which was downed in the Pacific during World War II. They all suffered from the same degree of exposure and dehydration, but some, even with injuries, survived long enough to be rescued, while others just gave up and died. More recently, a couple became lost at sea in the North Atlantic. After 10 days, the man committed suicide—just climbed into the water and drifted away. But the woman, suffering from severe dehydration and saltwater sores, hung on and was rescued 4 days later.

Survivors do have an "attitude," and they share some common attributes. Here are a few things you can do to improve your odds of surviving until rescued or reaching help yourself.

◆ **Be decisive.** Make up your mind and act on your decision.

◆ **Consciously decide you *will* endure.**

◆ **Be patient.**

◆ **Learn to tolerate being alone, if you are. If you're with others, listen to "understand" their points of view and work together.**

◆ **Adapt to the situation and improvise.** Make something good out of something bad and turn ordinary things into things that meet needs.

◆ **Don't succumb to panic.** Recognize the stress you're under and deal with it.

◆ **Don't waste time** agonizing over things you can't control.

◆ **Examine problems from different angles** and decide on the best course of action.

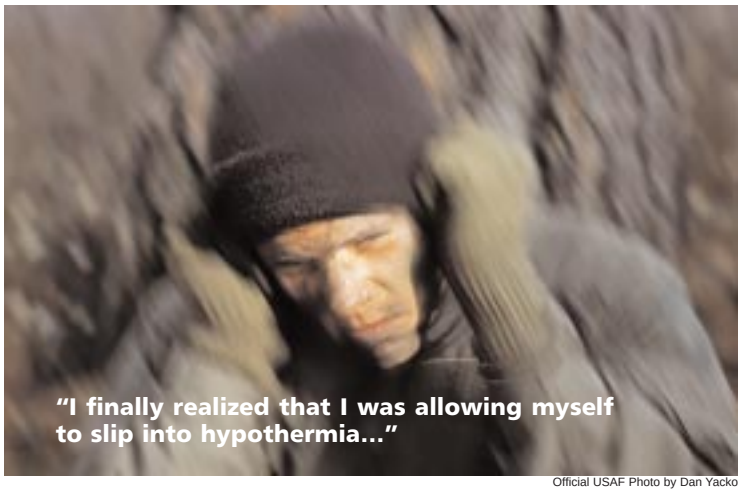
How Fear Influences Survival

Fear is a feeling we've all experienced to one degree or another. But Primo Levi, a survivor of Auschwitz, defined it best in one of his several books when he said,

continued on next page

"We say 'hunger,' we say 'tired,' 'fear,' 'pain,' we say 'winter' and they are different things. They are free words, created and used by free men who lived in comfort and suffering in their homes." Know this: Due to the extreme challenge posed by a life-or-death survival situation, fear takes on a whole new dimension and may easily become one of your worst enemies.

Feeling trapped or that there is nothing you can do is an exercise in futility—there is ***always*** something you can do to help yourself. *Play the hand you're dealt.* Denying the existence of danger won't keep fear at bay either. One of the best ways to deal with it—and greatly increase your chances for survival—is to understand and accept that fear is a natural reaction to a threatening situation. This acceptance will enable you to behave with purpose, rather than allowing fear to cause you to act without reason or intent.



"I finally realized that I was allowing myself to slip into hypothermia..."

Official USAF Photo by Dan Yacko

Helplessness, hopelessness, and dependency are all factors that can intensify fear, and how someone reacts to it depends more on the person than the situation. The person who is physically strong or seems happy-go-lucky under ordinary circumstances may handle fear poorly, while the seemingly timid or anxious person may respond to stress with calm effectiveness.

Fear happens. It must be recognized, dealt with, and, if possible, turned to the advantage of the survivor. Here are some things you can do to cope with it and improve your chances for survival:

◆ **Take your training seriously.** Train hard, trust your training, and be confident in your abilities.

◆ **Be knowledgeable about your equipment and have confidence in it.**

◆ **Focus on the task at hand.**

◆ **Sustain hope** and don't give in to feelings of helplessness.

Other Factors That Influence Survival: Pain, Cold, Thirst, Hunger, Fatigue, Boredom, Loneliness

As with fear, the more you know about these enemies to your survival, the better you can respond. For each one of these conditions, there are steps you can take to deal with them effectively. For instance, learning basic first aid, or learning which plants can be eaten (or are to be avoided) will stack the deck in your favor. Here are some things you can do to cope with these potential killers:

◆ **The same principals for managing "Fear" above.**

◆ ***Don't give in!*** The Army SERE School talks about not making "concessions to comfort." *"And in resting the soldier died."* Don't sit idly by while you freeze, burn, starve, or die of thirst! Do something about it! Here's a personal example. At one point when I was going through training, I was so cold, wet, and tired I didn't want to collect wood for a fire, a fire that would warm and dry me. I didn't even want to touch the dead wood's wet branches because I felt it would make me even colder and wetter! I finally realized I was *allowing* myself to slip into hypothermia, and I motivated myself then and there to build a fire and get warm.

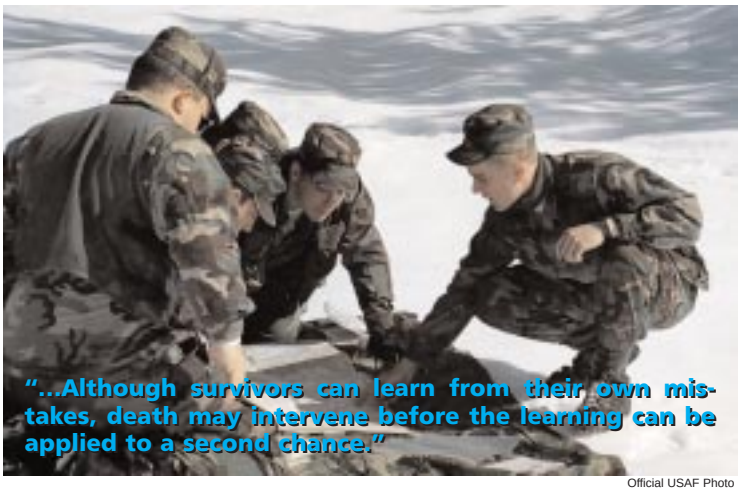
◆ **Actively pursue more SERE knowledge and information.** Use the skills you were previously taught as a scout, at the Academy, SERE schools, and/or life support continuation training programs. If you know how to build a shelter, treat injuries, determine which plants are edible, get maximum use out of your life support equipment, and get drinking water in any environment, you're a lot less likely to suffer from pain, cold, thirst, hunger, fatigue, boredom, and loneliness. Reinforce this knowledge with practical hands-on experience, and practice your skills whenever possible. The next time you go camping, bring along the matches to start a campfire, but try starting one with a single match and wood shavings. Or bring your tent, but construct a natural shelter to sleep in.

◆ **Focus on something to fight for—or against.** More on this below.

Enhance Your Will to Survive

The will to survive can be defined in many ways. I would change the saying, "There is nothing so dangerous as a desperate individual," to "There is nothing so dangerous as a *determined* individual." *The will to survive is determination personified!* It is a refusal to surrender! To not give up or allow defeat! As mentioned earlier, Dougal Robertson and his wife didn't give up, nor did they allow their three sons to give in during their 37-day ordeal at sea. They focused on *survival* instead of *rescue.* They told inspiring stories and poetry, like Dylan Thomas' *"Do Not Go Gently Into That Good Night."* They discussed and made plans for the future of the family. When one of them got depressed, the others would boost his spirits. *Group survival mentality is real, and it works.*

Strengthen your will to survive now—don't wait until you're "on the ground" and in a survival situation to prepare yourself. Here are some positive steps you can take:



"...Although survivors can learn from their own mistakes, death may intervene before the learning can be applied to a second chance."

Official USAF Photo

◆ **Get all the training you can.**

◆ **Be physically fit.** It's good for you and it bolsters self-confidence.

◆ **Take care of personal matters before you climb into that aircraft.** Once you find yourself cut off from the civilized world, your focus needs to be on what's happening in the here and now, not "Did I pay the bills?" Or "Did I feed the cat?" Or "Is my will up to date?" These nagging little details will sap your energy and work against you in a survival situation.

Focusing on Reasons to Survive

Reasons that enable a person to survive an ordeal are usually very personal and very specific to that person. One's determination to continue living is usually focused on one central, specific reason, and additional focuses and feelings throughout the experience will serve to support this main point of resolve. And there are countless examples of reasons to survive—even if those reasons lasted only long enough to get one through a rough stretch. Here are some documented survivors' reasons:

◆ **Resisting the enemy.** Even though he was a prisoner, Aussier Steinlauf, an Auschwitz survivor, continued resisting, refusing to surrender mentally to the enemy. He said this: "Because the camp was a great machine to reduce us to beasts, we must not become beasts; that even in this place one *can* survive and therefore *must* survive, to tell the story, to bear witness. We are slaves, deprived of every right, exposed to every insult, condemned to certain death, but we possess one power, and we must defend it with all our strength for it is the last—the power to refuse our consent."

◆ **Developing a vision of your future.** A loss of hope and courage can have a deadly effect. Brig Gen James N. Rowe, a founding father and first commander of the U.S. Army SERE School, was a Vietnam War POW for more than 5 years. He said that one must envision a future, or a goal to be accomplished, and work toward that future or goal by living. He felt that to lose faith in the future—*your personal future*—was doom.

◆ **Love of family and friends.** Morris Sage, a professional hunter and trapper in Alaska, endured freezing water and an ambient air temperature of minus 20 for more than 4 hours and *survived,* because he didn't want his daughter to be orphaned and alone. Mr. Sage couldn't bear the thought of his daughter going home to an empty house (his wife had passed away a few years prior to his incident).

◆ **Faith in God and country.** Commander James B. Stockdale, a POW in North Vietnam for more than 7 years, and Colonel Edward L. Hubbard, a POW for more than 6 years, each felt that faith in God, the USA, and their fellow Americans sustained them and enabled them to return with honor.

◆ **Anger at an individual or the situation.** Not letting them, or "it," win, or "get away with it." Every survival story I have ever read has mentioned anger at some point, even if the survivor felt it for only a few moments.

◆ **Finding inspiration.** "You are never handed a problem without a gift in it." Viktor Frankl, an Auschwitz and Dachau survivor, found beauty in the sunset or flowers he could see beyond the concentration camp fence. No matter how desperate or how bad the situation, you can find beauty or something inspirational. Being able to laugh and finding humor even in the darkest of moments can bring light to the darkness.

No doubt, these people found many more reasons to hang on to their lives than those listed above. Instead of choosing to "go gently into that good night," they instead chose to "rage, rage against the dying of the light."

Some Final Thoughts

First, accept that you may one day find yourself in a survival situation. Accept the reality of the circumstances and act accordingly. The psychological and physical factors you're confronted with aren't new, but because you're out of your normal element, they'll take on a new intensity. To cope, you're going to need to deal with many of these potential stresses now, *before* you find yourself in a life-and-death struggle for survival. Advance preparation provides the inner strength and confidence you'll need to draw on in a crisis, enabling you to concentrate immediately on the business of enduring and surviving. Build on your personal strengths, reinforce your will to survive, and train, train, train at improving your skills for resisting psychological and physiological stresses. Finally, and perhaps most importantly, focus on something to live for, something that will help you "Fight the good fight *and win."* ✈

A note about the author:

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Meant to Fly?

Official USAF Photo by Dan Yacko

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Sometimes, no matter how well an aircraft is maintained and babied, it can let you down at the most inopportune time. An emergency situation can make you wish you'd never gotten out of bed that day or maybe even question your *sanity* for choosing a flying career in the first place. You might even ponder whether or not you were truly meant to fly.

Until my recent reassignment to the U.S. Air Force Survival School, I spent over 10 years teaching aircraft egress techniques for 16 different airframes. Those included fighter/attack types (ejection seats), as well as airlift/air refueling types (no ejection seats). During that time, I taught—and *learned* again and again—that there are certain principles that can mean the difference between surviving an aircraft mishap or perishing in one. These principles apply *universally* to both ejection seat and non-ejection seat-equipped aircraft and I'd like to share them with you.

Plan Your Egress, Know Your Equipment

Fact: Whether or not you become a casualty in an aircraft mishap is directly related to how well you've thought out and practiced egress procedures. Not surprisingly, World War II history reveals that aircrew members who mentally and physically rehearsed egress procedures were more likely to get out of their aircraft safely in an emergency. Even those who only practiced ditching and bailout procedures a *few* times noted a marked increase in their confidence and abilities. More importantly, *there was a marked decrease in injuries and fatalities among those who practiced their egress skills.*

Fact: Whether or not you become a casualty in an aircraft mishap is directly related to how familiar you are (or aren't) with your life support gear. Knowing your gear builds confidence and improves your chances for survival when the unexpected occurs. Since there were no "Life Support Technicians" during World War II, the aircrew member was compelled to take an active role in the care, maintenance, and use of his life support equipment. It's one thing to know the name of each piece of life support equipment, but it's quite another to be thoroughly acquainted with your gear's capabilities and limitations.

The value of having an egress plan and making full use of available life support gear was highlighted when Capt Scott O'Grady's F-16 was downed by a SAM in the Balkans while participating in Operation Deny Flight. Once rescued, he related during his debriefing how much he had fretted about the condition of his equip-

ment, and therein, his "salvation." Because he wasn't thoroughly knowledgeable about where survival equipment was stored in the ACES II seat kit, he left behind the "hit-and-run bag" which contained duplicates of all his signaling items. Reflecting on the haste with which he had left behind his hit-and-run bag, he worried constantly about whether his emergency radio would continue working. He agonized over how much aggravation he could have saved himself if only he had remembered to take the extra battery and radio with him. As we all know, friendly forces did rescue Capt O'Grady—who was in good condition, all things considered—although he was somewhat leaner. The ending to his saga could have been a grim one had circumstances been only slightly different.

In my experience as a Survival, Evasion, Resistance, and Escape (SERE) Instructor, I've learned lots of things about operators. Here are a couple. Requiring aircrew to fly more to hone their skills is the one thing you can always *force* fliers to do! However, requiring fliers to rehearse emergency egress scenarios and become familiar with their survival gear can be like pulling teeth. Remember: Emergency procedures are repeated over and over *and over* so that they become instinctual. No one wants to believe that he or she will ever need to punch out/bail out of their aircraft in a hostile environment. However, when the time to leave arrives, decisions often must be made in the blink of an eye.

If you have to think through your ejection procedures to carry them out, it's already too late. Your preparations must be well thought out, and your reactions must be nearly automatic. Whereas a multi-engine-/multi-passenger aircraft may—emphasis on *may*—allow a little more reaction time, there's probably going to be a whole lot more to *deal with* and *react to,* as well. Knowing and practicing how to get out *before* it's crunch time, and understanding the full capabilities of your survival equipment *before* you climb into the cockpit, will give you a much better chance of seeing family and friends again!

Official USAF Photo by Dan Yacko

He agonized over how much aggravation he could have saved himself if only he had remembered to take the extra battery and radio with him.

Know the Capabilities and Limits of Your Aircraft

Each airframe has its own special characteristics, and to a certain extent, so do individual aircraft. The more you know about your aircraft, the more confident you will be and the more likely you will respond appropriately to an emergency situation using the aircraft resources at hand.

In ejection seat aircraft, crews typically discuss ejection seat procedures before each mission. In addition, crews undergo (mandatory) ejection seat and ground egress training annually. With this in mind, it's troubling to know that nearly half of all ejections during the last 14 years occurred *below* the minimum safe ejection altitude for the particular weapon system. In fact, many happened below 2,000 feet, dramatically increasing the probability of injury. The seat can't save you if you delay the ejection decision.

You may know *your* window/crew entry hatch workings and escape routes like the back of your hand, but when it comes to egress briefings for passengers, the aircrew—that's right, the *aircrew*—should be especially attentive. If your passenger pre-takeoff briefs typically include a statement like, "In case of an emergency, stay out of our way," or, "In case of an emergency, don't try to help," or, "In case of an emergency, just follow me," then you've guaranteed pandemonium should an emergency happen. While it's a legitimate concern that passengers may improperly operate escape doors or hatches, equipment, misunderstand egress instructions, or in a worst case, *panic*, remember that you can't be everywhere at once to lead everyone to safety. Should you be incapacitated and unable to play the part of the "follow-me" leader, you could be dooming your passengers. Time and again in real-life situations, a passenger armed with egress knowledge has meant the difference between life and death for his or her fellow passengers. When trying to save lives—yours or theirs—it's prudent to have as many "allies" as possible. Everyone on board that airframe should have a working knowledge and, if possible, hands-on experience with egress procedures and emergency equipment.

Knowing what your ejection seat is capable of, or the difficulties in using a specific hatch on your aircraft, may mean the difference between life and death. If you're using a piece of equipment, *know* what it is and isn't capable of. That goes for *everyone* involved in the mission. If others had followed that simple rule, a friend of mine would be walking on two legs today instead of just one.

Know *Your* Capabilities, Limits, and Weaknesses

Because of who we are, we push ourselves. We can hack it! But sometimes our confidence is greater than our abilities, our fatigue is worse than we can comprehend (or will admit), or we've "been there and done that" so many times that we've gotten complacent. And that's

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when we get ourselves into a real jam.

I know what you're thinking: "Not me! Those things only happen to the other guy!" But honestly, haven't we all, at one time or another, used what we *thought* was good judgment about our abilities or endurance and been wrong? Most of the time, these errors in judgment probably had little effect on our lives. However, as has been said before, the sky is unforgiving. Break the laws of man and maybe you'll get away with it. But break the laws of aerodynamics, and you *will* pay.

Know that overconfidence, fatigue, boredom, and complacency are among the things that can seduce us into taking shortcuts and "bending" the rules. Because the first time you bend the rules is the hardest, repeating that undesirable behavior just makes it easier and easier. Avoid "bending the rules, just this once," because it will always come back to haunt you! Or worse, if it doesn't immediately "come back," you may bend the rules to the point where "bending" becomes the normal response. That's when it comes back to haunt you *twice* as hard. Recognizing *why* you're about to do something the average sane person wouldn't is a great way to counteract the impulse to do it. It also prevents you from setting a bad example for others to follow. Staying alert and knowing yourself is the best way to ensure you live to fly another day.

Official USAF Photo by Dan Yacko

Even those who only practiced ditching and bailout procedures a few times noted a marked increase in their confidence and abilities.

Here's a personal testimony on how I once let overconfidence ruin my day. It wasn't deadly, but it was humiliating (for me) and humorous (to others). I had been a test subject ("guinea pig") for the Armstrong Aerospace Laboratory doing drop-tower and sled tests for 4 years. After losing a half-inch in height and deciding a change in duties was appropriate, I went to the centrifuge and sustained stress testing for a year. I was tested up to 9 Gs on several types of "G-suits," worked with an F-16 simulator program among other things, and did very well. Then a PCS resulted in a change in duties again.

Four years had passed when my life support officer sent me to the centrifuge at Holloman AFB for "Combat Edge" training. I figured, "I've done this before!—no big deal!" To quote a movie line from a few years ago, "I let my ego write checks that my body couldn't cash." ***I didn't practice my breathing or straining techniques until just before the training.*** Need I say that the term "G-locked rag doll" now has special meaning to me! My overconfidence and its predictable result were a source of great amusement to my classmates. If, however, I had been a real pilot in a real flight, it would have cost me my aircraft and life.

Be Aware!

Know what you're doing, and know why you're doing it. I have a favorite saying: "Let go of the banana." It means several things, but mostly it means don't get so focused or emotional about one thing that you forget to look at or deal with the others. Don't get so involved in diagnosing a malfunction that you disregard written procedures—such as forgetting to re-hook your seat kit buckles to your harness—because a Class A mishap could be the end result. It's like that line, "We were consulting the Dash One when the ground came up and hit us." There are dozens of documented mishaps where an aircrew became distracted and forgot the cardinal rule of aviation. FLY THE AIRPLANE!

Unless you're vigilant, "situational awareness" could become "situational blindness." Crews have focused on a "customary" means of egress while *bypassing* usable exits—a "This is the way I got in, so this is the way I get out" kind of philosophy. Or they wasted time attempting to open a door the "normal" way, instead of taking advantage of emergency detach points or jettisoning it. Spending precious moments fighting to get a hatch open prior to bailing out is not a very wise choice. These are some of the things I mean when I say, "Let go of that banana!" Be focused on your mission, but be aware of what's going on around you and follow your training.

In Closing…

As I stated in a related article, "Fight the Good Fight," also appearing in this issue, there's just no substitute for preparedness. You've got to accept that the unexpected could happen to you and be prepared for it, because until you do, you're not meant to fly. ✈

Factors Affecting the Decision to Eject

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(This article was adapted from a paper of the same title that Mr. Goodman presented at the 36th Annual SAFE Symposium in Phoenix, Arizona, in September 1998—Ed.)

In the last 50 years, ejection seats have come a long way. While the first ones were designed to propel an aircrew member away from a doomed aircraft so he could deploy his parachute, today's fully automatic ejection seats are considerably more sophisticated. They can place a crewmember under a fully inflated parachute *less than 3 seconds* after initiating escape.

But in spite of all the advances in life-saving technology, aircrew members are still losing their lives, either because they initiate ejection too late for the system to operate properly, or they don't initiate ejection at all. What follows is a brief history of life support equipment, and some of the factors that contributed to late ejections/no ejections, in the hope that you may learn from their lessons.

Delaying the ejection decision is responsible for more unsuccessful ejections than any other cause.

Introduction

The 311th Human Systems Wing (HSW) at Brooks AFB, Texas, manages all life support gear and escape equipment used in every Air Force aircraft. Within HSW, the Life Support Systems Program Office (SPO) has system and technical management responsibility. Because it's critical, life-sustaining gear, and much of it is of the "one-time-use" variety, it *must* operate reliably when used. In this context, "one-time-use" simply means this: It's used only after the total sum of the aircrew's knowledge and skill is unable to maintain controlled flight in a disabled aircraft. HSW understands that a crewmember must be able to initiate that escape system without hesitation or second thought if he or she is going to survive, and that's why we make every effort to ensure that the equipment is of the highest possible quality.

Prior to procurement, prospective contractors undergo a rigid screening process. Once selected, the contractor is required to perform in-process inspections to ensure the equipment is being manufactured to specification. Upon completion of the manufacturing process, a government agent inspects the equipment before accepting it into the Air Force supply system. Finally, life support/egress technicians thoroughly inspect the equipment before installing it on an aircraft. All of this is done to ensure the equipment operates properly when needed.

The Evolution

During WWII, aircraft design and performance characteristics improved greatly. But better designs and higher airspeeds also resulted in an increase in "Q" forces, those pressures exerted on an aircraft from every direction. As airspeed increased, so did "Q" forces and the degree of difficulty required to escape from an aircraft.

The principal means of escape from a disabled WWII-era high performance fighter aircraft was an over-the-side bailout. The procedure required opening (or sliding back) the aircraft canopy, unbuckling the lap belt, diving over the side, and then deploying the parachute and survival kit on descent. Higher airspeeds and greater "Q" forces meant increased aircraft canopy resistance, posing escape difficulties for some pilots. Then, once the canopy was opened, the pilot had to deal with a new problem. Because of the higher airspeeds, they sometimes hit parts of their own aircraft and were injured, or, in a few cases, killed outright. This problem wasn't unique to Allied nation aircraft.

As it was recognized then, the challenge was to find a means of getting the crewmember safely away from the aircraft so he could then perform those other functions—deploying the parachute and survival kit—necessary for survival. In August of 1945, the U.S. Army Air Forces Aeromedical Laboratory recommended that an ejection seat, similar to one designed by the Germans, be used in the new jet-powered P-80 aircraft. It was adopted, and man-rating of the ejection seat was accomplished 16 August 1946 when Chief Warrant Officer Larry Lambert safely ejected in a test over Wright Field, Ohio.

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Over the last 50 years, there have been continuous improvements in ballistics, electro-pyrotechnics, restraint systems, and G-absorbing/dissipating ejection seat designs. A modern seat can safely propel the man-seat mass away from the aircraft, automatically release the restraints, separate person from seat, automatically deploy the parachute and survival kit, and, if landing in salt water, automatically disconnect the parachute and inflate the life preserver. The current state of operational escape systems is such that a crewmember can initiate ejection and be under a fully inflated parachute in as little as *2.3* seconds and survive ejections at airspeeds as high as *600* knots. Escape systems have definitely come a long way since that first success at Wright Field.

Lessons Learned

When a Class A mishap occurs in the Air Force, a team of experts is assembled. This team investigates every possible factor, event, and sequence of events that may have contributed to the accident, determines the root cause(s), and communicates lessons learned to help prevent future mishaps. A life support career field functional expert participates in every one of these mishap investigations to examine life support systems and components and determine if they functioned as they should have.

Sadly, and all too often, an Accident Investigation Board will conclude that the escape system was never used or that it was activated too late. Why? Many factors can affect the ejection decision, and a few follow that will likely influence *your* decision. Keep in mind that many of them are interrelated and not necessarily exclusive of each other. Some are worth serious consideration, while others aren't, and now is probably as good a time as any for you to decide how much influence a particular factor should have with you.

All too often, an Accident Investigation Board will conclude that the escape system was never used or that it was activated too late. Why?

❖ **Aerodynamics.** Some of the more advanced escape systems—those of the "zero-zero" variety—are designed to operate successfully under very difficult conditions. "Zero-zero" refers to the system's capability to safely separate man from machine, even with "zero" altitude and "zero" airspeed. But for a zero-zero ejection system to operate most effectively and increase the odds that it will save *your* life, you should consider adding three more "zeros": zero bank angle, zero pitch angle, and zero sink rate.

Altitude and airspeed may be thought of as primary determinants in a successful ejection. But pitch, roll, and sink rate also affect the time available to make the ejection decision and, ultimately, whether the operator lives or dies. If the aircraft develops a sink rate, or has other than a zero bank angle, more altitude—and time—are required for full operation of the escape system.

For example, if the aircraft has a sink rate of 10 feet per second (fps) and the ejection seat ascends at 45 fps, then the net rate of ascent will be *35 fps* (-10 fps + 45 fps = 35 fps). Conversely, if the aircraft is *climbing* at 10 fps and the ejection seat is ascending at 45 fps, then the net rate of ascent for the ejection seat is *55 fps* (10 fps + 45 fps = 55 fps).

If ejecting when the aircraft is in a roll, maximum height of the ejection seat trajectory will be affected. At 30 degrees, you'll lose approximately 30 percent of trajectory height, while at 60 degrees, the loss in trajectory height is nearly 50 percent. At 90 degrees or more, there is no upward trajectory.

And that's why the "zoom" maneuver—establishing a wings-level, positive climb rate, nose-high pitch attitude—is so critical. It ensures a higher ejection seat trajectory, reduces the time required for a successful ejection, and *could save your life!* If time is available, use the zoom.

In most out-of-the-envelope ejection fatalities, the cause was attributed to delay on the operator's part in initiating ejection. To survive an ejection, you must be familiar with more than just Bold Face procedures. The flight manual provides escape system parameters—altitude required for different dive angles, bank angles, sink rates, and airspeeds—and *limits* that may surprise you, so you should know them before strapping in. *But the escape decision must be made on the ground.* You save precious moments when a preconceived "last chance" set of ejection parameters are available, or your response to one or more sets of conditions is established *before* you are actually faced with a disastrous situation. Work the emergency, but know when it's time to get out, too. Indecision kills.

❖ **Response Time.** "Response time" is the amount of time which elapses from an event's onset—say, an unexpected, unrecoverable flat spin—until positive action

is taken in response to that event. Response time includes reception of information through the sensory system, processing of that information by the brain, the brain's perception as to the quality and reliability of the information, and determining decision options. *NOTE: The more options available, the more time the decision process will require.* Then, judgment takes over to examine the probable success of each option, with the selection process based on one's training, experience, personality, and other individual influences.

A crewmember can initiate ejection and be under a fully inflated parachute in as little 2.3 seconds…

The human can devote full attention to the processing of only one unique event at a time, so errors in the judgment process may result from too much (or too little) information supplied during a rapidly changing situation. After making a decision, the pilot must take positive action to implement that choice. In the case of the aforementioned spin, that "positive action" is most likely to be a firm pull on the ejection handle.

✥ **"Pressing."** Here are some "pressing" definitions for you to consider. **Press'ing:** *1. A condition whereby an aircrew member unnecessarily places his aircraft and himself in jeopardy; frequently results in a delayed ejection decision. 2. When the motivation to succeed (or excel) overcomes personal safety. 3. An inordinate desire to prevail that overrides good judgment and rational decision processes. 4. Continuance of a task or mission to the point that safe parameters are exceeded. 5. May be the* cause *of an emergency, or the* result *of an emergency.*

You're not "pressing" when working within prebriefed rules of engagement guidelines, nor should "pressing" be confused with the "warrior mentality." But when you fly lower than briefed (or allowed) in order to achieve greater weapons delivery accuracy, or make that turn tighter than necessary (and start graying out), you're "pressing."

✥ **Mission Requirements**. Low-level, high-speed tactics in a realistic training environment leave little time for the decision process and human reaction. During one such realistic training exercise, a crew descended to a low-level flight profile. As the pilot looked up, he saw a mountain straight ahead and immediately took evasive action, but the aircraft glanced off the top of the mountain. Despite very little time for reaction and decision-making—approximately 10 seconds—the crewmembers began initiating ejections. Five of seven ejected successfully. *Because they were prepared, they knew when it was time to get out.*

✥ **Situational Awareness (SA).** When you get too engrossed in accomplishing the mission and develop tunnel vision, you lose SA and become vulnerable to collision with terrain (or your wingman), getting caught in your own bomb burst, running out of fuel, and lots of other bad things. Loss of SA can be a killer. Going head-down in the cockpit to analyze reasons for a master caution light, and then forgetting higher priority tasks (like flying the airplane!), can easily lead to loss of SA and ignoring aircraft/ejection system performance limits. Fatigue, a hangover, or personal problems can also affect SA. Same for inattention or channelized attention.

During a 1v1 ACM training flight, both pilots became so intent on getting a radar lock on each other that they momentarily lost awareness of the body of water below. One aircraft broke off the attack in time. The other pilot looked up and could see only water. Recovery was unsuccessful, and he died when his aircraft impacted the water.

✥ **Crew Coordination.** Effective communication and coordination among crewmembers is essential. A well-disciplined, well-trained crew working together has a significantly better chance of accomplishing the mission and successfully handling an emergency situation, than one where each crewmember acts independently or contrary to written/briefed procedures.

Prior to flight, the "routine" training mission was briefed. The aircraft commander told his backseater that if an emergency occurred on the ground they would accomplish a "ground egress" (no ejection) unless he directed otherwise. The mission proceeded normally until landing, when, without warning, the nose gear collapsed. As the nose of the aircraft contacted the runway, communication broke down. As briefed, the aircraft commander began to disconnect his harness for an emergency ground egress. Meanwhile, the backseater observed spilled fuel and a fire on the runway and independently decided to initiate ejection. The aircraft commander was fatally injured when his seat ejected without him being secured to it.

✥ **Stigma.** "Stigma" associated with losing an aircraft may be real or imagined. No one wants to have more takeoffs than landings. However, preoccupation with getting tagged as a "pilot who panicked" and ejected "too soon" could prove just as deadly as refusing to acknowledge that an aircraft is unrecoverable and ejecting too late or not at all. When it's a choice between self-preservation and embarrassment, collision with the ground is much less forgiving and a lot more likely to kill than any stigma associated with losing an aircraft.

✥ **Ego.** Ego involves self-esteem and is considered a complex combination of one's perception of a role concept, pride, self-image, perceived peer pressure, fear of failure, fear of disgrace over losing an aircraft, and the fear of looking "bad." Ego is essential, but not necessarily if it fosters a sense of "I never flew a plane that I couldn't land" or "It'll never happen to me." An experienced pilot believing in his ability to escape from any situation may fly the aircraft into an unrecoverable condition. If he ponders the detriment that an early ejection could have on his professional image and hesitates, he may eject too late.

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❖ **"Well Dones."** Sometimes we show an uncommonly overzealous desire to reward someone who saves an aircraft, in spite of the fact that flight manual rules/procedures may have been violated. The real concern here is that someone perhaps not as skilled, or who may be in a more hazardous predicament, may imitate the behavior and become a smoking hole with his aircraft.

❖ **Overcoming the Problem.** In this context, "overcoming the problem" is closely related to "situational awareness" above. It refers to expending an inappropriate amount of time assessing a problem (or attempting to overcome one) and then forgetting to monitor aircraft position with respect to the earth. It might even involve second-guessing oneself while making the ejection decision and then deciding to "give it one more try" *before* ejecting.

Engine restarts are apt candidates for initiating the "one more try" scenario. Time is lost in anticipation the engine will start, and when it doesn't, there may be an overwhelming desire to attempt "just one more" start. But, even if the engine does start, it takes time to spool up and generate usable thrust. Meanwhile, airspeed's decaying, altitude's decreasing, and the likelihood of the manifestation of other human factors increases. Do you really have time for "just one more" attempt?

And keep this in mind: If a pilot-initiated maneuver created the condition(s) that led up to an ejection decision, then there's an even greater chance that decision will be delayed while trying to "overcome the problem."

❖ **Fear of Being "FEB'd."** This refers to the rare (but often rumored!) attempt to take Flight Evaluation Board (FEB) action against a pilot who lost an airplane. While briefing aircrews on their respective escape systems, members of the World-Wide Escape System Briefing Team asked if any of them had heard of someone who had met a FEB. Many hands were raised. But, when asked if they had ever *known* someone who had *actually* been FEB'd, no hands stayed up.

❖ **Command Emphasis.** This factor relates to the safety emphasis on reducing mishaps that commanders place on routine flight operations. Don't fall into the trap of thinking that the goal is merely to reduce aircraft losses or help the boss look good for the promotion board. The primary intent is to stress flight rules and regulations and save *your* life by preventing future aircraft accidents.

❖ **Avoiding Populated Areas.** How long to stay with the aircraft and delay ejection to avoid populated areas is an intensely personal decision. There have been several just-in-time ejections which were influenced by this factor. During the 1989 Paris Air Show, the No. 2 engine in Russian pilot Anotoli Kvotchur's MiG-29 was FOD'd out by a bird, causing loss of thrust during a low-level maneuver. The aircraft was fatally stricken, but in an interview after the mishap, Kvotchur voiced his concern about remaining with the aircraft long enough to ensure it wouldn't crash into the crowd. Even today, experts disagree whether his parachute fully inflated before he hit the ground, but his last-second ejection was successful.

❖ **Complacency.** Complacency usually results from too *little* stress and can definitely contribute to a late (or no) ejection attempt. As used here, complacency often occurs when a pending mission element is perceived as relatively undemanding or "routine." Inattention, dropping your guard, and unnatural trust in someone else's abilities also fall into the "complacency" category. Complacency could also be related to advancements in technology that have made flying easier and safer. Too great a trust may lead one to believe that instrument crosschecks to confirm aircraft position or altitude don't need to be done as often (or that they're unnecessary).

❖ **Behavioral Inaction.** This is a phenomenon that has been used to explain why airline passengers sometimes don't take immediate action to exit an aircraft after they've survived a crash. Under conditions of extreme stress, or if there are too many choices to consider, some people will "freeze" and be incapable of taking action until commanded to do so. "Freezing" is an inability of an individual to act during times of high stress and may be an explanation for some of the so-called "suicide" flights.

❖ **Spatial Disorientation (SD).** SD occurs when a pilot incorrectly perceives aircraft motion, altitude, or attitude relative to the earth's surface. If the senses indicate the aircraft is doing one thing and the aircraft is actually doing something different, then SD has occurred.

There are three types of SD: Type I (Unrecognized); Type II (Recognized); and Type III (Incapacitating/Uncontrollable). Type I is the most dangerous because the pilot doesn't know (or even suspect) that he has it. During the years 1988-1997, 88 percent of all USAF Class A mishaps involving SD were of the Type I variety. With Type II, there is recognized conflict between actual aircraft performance and what the pilot perceives that performance to be. In the years 1988-1997, 8 percent of USAF Class A mishaps involving SD were Type II. Type III is a condition where the pilot is disoriented, recognizes it, but is unable to take corrective action. Under certain conditions, nystagmus (rapid involuntary oscillation of the eyeballs) may occur and interfere with the reading of flight instruments.

Spatial disorientation may be overcome with knowledge and vigilance— knowledge that SD can and will occur and vigilance through periodic instrument crosschecks. Vestibular sensations must be overcome in order to bring the aircraft back to a wings-level attitude. Often the assistance of another crewmember or a wingman will help overcome the effects of SD.

Physical and mental fatigue, alcohol, and self-medication increase susceptibility to SD.

❖ **Temporal Distortion.** Temporal distortion is another one of those phenomena that occurs in high-stress situations where the brain slows down perception of events in an effort to provide time to deal with the crisis. It has the effect of reducing anxiety and quite often results in a loss of a sense of urgency. *It gives the false perception* that additional time is available since events ap-

pear to be taking place very slowly.

During a fighter aircraft functional check flight, a crew of two took off from a commercial airport in the midwestern United States. As the aircraft lifted off, the air traffic controller radioed the crew that they were on fire. The pilot immediately climbed to altitude and began assessing the problem. After a few moments, his crewmate asked what his intentions were. The pilot advised there was "plenty of time," so he was assessing the situation. The crewmate noticed a number of fire warning lights illuminating, several utility systems starting to fail, a decay in airspeed, and the altimeter unwinding through 2,500 feet. He asked the pilot if he had considered ejection, and the pilot said, "Not yet." He then suggested to the pilot it might be wise to point the aircraft toward an unpopulated area while assessing the situation.

While attempting to turn, the pilot found the flight controls to be stiff, aircraft response to be sluggish, and he had difficulty maintaining control. It was at this moment he realized the seriousness of the situation and how little flying time they had left. He was able to point the aircraft toward an isolated area, but he initiated ejection with only enough time to get "one swing" in the parachute before landing. Afterward, the pilot described a condition in which everything slowed down, and he felt he had plenty of time to make a decision. This condition was later dubbed "temporal distortion."

If he ponders the detriment that an early ejection could have on his professional image and hesitates, he may eject too late.

In some cases, a crewmember may only remember pulling the ejection handle and then suddenly being under a full parachute. In other cases, there are those crewmembers who remember every single event that occurred from the time they initiated ejection until they completed their parachute landing fall.

The crew of a two-seat aircraft was on final approach, and they had configured the ejection system so that regardless which crewmember pulled the ejection handle, both of them would be ejected. In this particular escape system, there's a three-tenths-second delay for the aircraft canopy to depart and a half-second delay between the two seats ejecting. When their engine flamed out, with little airspeed and no altitude, there was no opportunity to recover and little time to react. The aircraft commander initiated ejection.

Both ejections were successful, but in the aftermath of the mishap, the aircraft commander complained of a system malfunction. He reported that everything in the escape system had operated slowly, *way* too slowly. He related how the aircraft canopy had slowly departed the aircraft, how the backseater had slowly and gently floated into the air, and how he had been compelled to pull the ejection handle several times before his own seat started slowly moving up the rails. He remembered the wind blast to the face, the snapping and popping of straps as they entered the slip stream, and the gradual billowing of his parachute as it lazily inflated. A thorough examination of the escape system components and scatter pattern of escape system debris revealed the system operated exactly as it was designed to. Temporal distortion, plain and simple.

Conclusion

Delaying the ejection decision is responsible for more unsuccessful ejections than any other cause. Improvements in escape systems have made them more versatile and provided crews with faster system operating times than ever before. The Human Systems Wing will continue efforts to improve functionality and survivability. However, ultimately it's up to *you,* the crewmember, to reduce the time for making that decision to eject. It could be the single most important factor affecting *your* life. ✈

About the Author: *Mr. Charles (Skip) Goodman was an Air Force crewmember from 1966-1972. He earned a Bachelor of Business Administration Degree in 1972 and a Master of Science Degree in 1980. He joined the Life Support Systems office at Kelly AFB, Texas, in 1974 and has been actively involved in the egress, survival equipment, and life support equipment areas. He has conducted on-site aircraft mishap investigations and performed equipment analyses on others. He has served as Chief of Life Support Program Management and Chief of On-Site Mishap Investigation. He has been an adjunct professor for Embry-Riddle Aeronautical University since 1989 and teaches at the Aircrew Life Support Officers Course and the USAF School of Aerospace Medicine. He is currently located at the 311th Human Systems Wing, Brooks AFB, Texas, and is assigned to the Life Sciences Artifact Section of the Life Sciences Equipment Laboratory (LSEL). The LSEL is the DoD organization which establishes accountability for U.S. and Allied MIA personnel in Southeast Asia and Korea through analyses of equipment/ clothing recovered from military action sites/air crashes.*

Are You Ready For This?

MAJ MARK CARTER
Courtesy *Torch*, Sep 97

"Am I ready for what? An ejection? Come on, no one really plans on a nylon letdown, but let's get real. Here in AETC, we fly hundreds of sorties a day, over 100,000 sorties a year, and what?…maybe once or twice a year someone has to leave a jet in the air. What are the chances I'll have to eject? Besides, I've been through survival school and egress training.

"And even if I have to eject, chances are I'll get down, get out of my chute, walk over to Farmer Brown's house, call the base, and settle in with an iced tea until someone picks me up. Okay, even at worst, I'll be on my own for a couple of hours until rescue finds me. No sweat—I can handle it."

You may think there are some pretty good arguments for not worrying too much about the possibility of ejecting during a sortie or having to survive for an extended period of time afterward, at least here in AETC. Most of our sorties are local area and usually end with a safe

landing, so the probability of having to survive on your own for an extended period is pretty slim. We also use some excellent aircraft kept in shape by an outstanding bunch of dedicated maintainers. Combine this with a quality pilot corps, and there's little wonder we have such a fantastic ejection-to-sortie ratio.

Sure, all fliers know a serious problem is always a possibility—Murphy can rear his ugly head despite everyone's best efforts—but the odds are still pretty good against having to eject…except, of course, if you're that one pilot in that one aircraft that just doesn't make it.

Are your egress and survival skills good enough to keep you safe in that situation?

But you probably think your luck will hold up—again, what are the odds? I'm sure Capt Brian Udell hadn't devoted an overabundance of time to pondering ejection possibilities before he actually ejected, at over 750 mph, from his F-15 off the Carolina coast. The following excerpt from "Back in the Saddle," an *Airman* article by TSgt Tim Barela, tells what Capt Udell went through from ejection to rescue.

"I made the decision to bail out at 10,000 feet, got into good position, and pulled the handles at 6,000 feet, left the aircraft at 3,000 feet, and got my parachute at just under 1,000 feet. All that happened in a matter of a few seconds," he said, taking a deep breath. "So if you crunch the numbers, I had about a half second to spare. If I'd waited for more than a half second, I would have impacted the water still in the seat," he added, clapping his hands together in a sobering smack that echoed through the room.

As Udell floated to earth at the end of a parachute, he couldn't remember pounding into those granite-hard shock waves as his unarmored body pierced the sonic wall. Those 3 seconds that sent all 190 pounds of him hurtling at a supersonic velocity appear mercifully lost forever.

"I don't know if it was because of the trauma my body went through or the terror—'Holy s---! This is happening,'" he said, his eyes widening. "But I'm glad I don't remember punching out."

Slowly descending, Udell felt as though he'd been hit by a train. Had anyone seen him at that moment, they might have agreed. His helmet and oxygen mask had been ripped from his head and his earplugs snatched from his ears. His gloves and watch also were torn off. All his pens and flight suit patches were gone. His wallet and a water bottle had blasted through the bottom of his G-suit pockets, with the zippers still closed. Underneath his flight suit, his T-shirt looked as though someone had taken a razor blade and shredded it. And the laces on his boots were imbedded into the leather.

Udell felt some pain, but had no clue to the extent of his injuries. He began going through his post-ejection checklist.

"First you check the parachute canopy to make sure it's deployed properly," said Udell, who credits much of his survival to Air Force life support, egress, buddy care, and survival training. But since it was too dark to see and I wasn't dropping like a rock, I figured it must be okay. Next you make sure your visor and oxygen mask are off. That was no problem, since my entire helmet had been blown off in the ejection."

Then he attempted to inflate his life preserver, but found it shredded. He figured he'd better reel in the life raft that automatically deploys during ejection to ensure he had some kind of flotation device when entering the water. That's when he discovered his left arm was injured. He hauled in the raft with his right arm and his teeth.

"Just about the time I got my hand on the raft, I hit the water," Udell said.

His struggle to get into the raft began.

He'd been trained in different techniques to board the one-man boat, but that had been under the assumption he'd have four good limbs. He was down to one—and even that one had been dislocated and somehow popped back into place. He made several unsuccessful attempts before he simply stopped and started praying.

"This was no put-your-hands-together-and-bow-your-head praying," Udell said candidly. "This was face-to-face, 'Hey, God, I need Your help' kind of praying."

He gave it one more try, and somehow managed to inch his way onto the raft. Sitting in the rubber boat, he had his right leg straight out in front of him. But from the knee down, it involuntarily dangled at a 90-degree angle over the right side of the vessel. With his right arm he grabbed his lower leg and jerked it into the raft. It

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USAF Photo by SSgt Andrew N. Dunaway, II

flopped 180 degrees over his left leg with his upper right leg still pointed forward. He adjusted it until the entire limb aligned in the same direction. Then he did the same for his left ankle, which had been bent totally backwards.

"There was just nothing holding them together," he said, shaking his head. Even the skin had stretched out."

Once he had immobilized his legs and his left arm, Udell searched his 6-foot-1 frame for other injuries. Finding nothing that appeared life-threatening, he went into prevent-shock mode. He drank some water out of an emergency pack that automatically releases during ejection, then tried to get warm.

"When the raft deploys, only the main donut ring inflates," he explained. "You have to manually inflate the bottom and the side spray shields. Without the bottom inflated, I'm still sitting in the water, and without the sides, the wind and waves crash over me. At that point, I'm chilled to the bone, and the cold bothered me more than my injuries."

Udell began to inflate the bottom of the raft.

"But when I first put the tube in my mouth and tried to blow, I couldn't create a seal around the tube," he said. "I reached up and touched my face for the first time. It felt like a dish of Playdough. My lips were especially deformed. The blood vessels in my face had burst under the pressure of the slipstream, and my whole face was swollen. It had no definition."

Despite his desperate situation, he had to laugh. He envisioned himself looking like Mush Mouth from the cartoon Fat Albert.

"I stuck the tube back in my mouth," he said, still chuckling. "The only way I could get a seal around it was to hold the tube with my teeth and clamp my hand down around my lips. My lips fit into the first three fingers of my hand, so they were out there pretty far."

Despite getting a head-rush like he'd blown up a couple hundred party balloons, Udell inflated the bottom of the raft, then the spray shields, until he had formed a floating pup tent—his own little cocoon. And after bailing out water with plastic bags from his survival kit, he finally began to warm.

"I was exhausted and wanted to sleep, but was afraid I'd never wake up again," he said….

Udell spent 4 hours in the water before a Coast Guard helicopter found him. Using an emergency radio, he directed them to his location.

"But I asked them not to get too close, because I didn't want the rotor wash to knock me out of the raft," he said.

Aviation Survivalman 2d Class Jim Peterson fished Udell out of the raft and into a litter.

"He was in a lot of pain, but he just bit his lip and dealt with it," Peterson said. "I even bumped his legs with my flippers a few times while dragging him to the litter, but he never complained. For being all busted up, he was a very strong man."

Actually, Udell admitted he weakened so much he had trouble pushing the radio button. And now cold struck again.

"When he [Peterson] secured me in the litter, the helicopter flew overhead and lowered the winch. I felt like I was in a typhoon," Udell said. "The rotors kicked up the wind and waves, and it felt like needles were hitting me. But worse yet, the rotors acted as a giant air conditioner, giving me another big chill. As they're hauling me up, the basket starts spinning, until finally they pull me aboard. I owe those guys a lot."

Once Udell was in the helicopter, the Coast Guard rescue crew rushed the downed pilot to the nearest hospital in Wilmington, North Carolina.

Granted, Capt Udell's experience was extreme and not the kind of situation most AETC pilots (Will you always be in AETC?) would find themselves in, but the point is still the same—as far as most of us are concerned, an ejection/survival scenario is an inherently unsafe situation. An ejection is a rocket ride from a very stressful cockpit situation into a very stressful parachute situation followed by a very stressful survival situation. It's not a movie; it's not an academic situation. What's involved is a real crisis where your knowledge or lack of knowledge can decide whether you live or die. So what do you say? How about a little refresher?

Before I go any further, I need to make clear this article is no substitute for some serious life support/survival training. It's like *Cliff's Notes*—it can supply some info, perhaps jog your memory, but it's not nearly as rich or useful as the real thing. Also, the info you get here will be fairly generic, and due to time and space considerations, this article will center on T-37/T-38 ejection situations. Be sure to take a good look at your local operating procedures and aircraft specific equipment and operat-

ing procedures.

According to CMSgt Joe Lynch, AETC Command, Survival, Evasion, Resistance, and Escape (SERE) Manager, "Survival decisions are not made in the cockpit—they're made on the ground before the flight." So let's start there, with what you can do *before* you take off to improve your ability to survive an ejection/rescue situation.

First, take a look at the very basic package—yourself. What kind of physical condition are you in? Do you just get in shape for your ergo test, or is fitness a regular part of your lifestyle? You're not one of those people we see standing outside the squadron puffing their lives away, are you? Your general physical condition can be a major player in your safe recovery from a survival situation. The greatest physical enemies of survival are injury, pain, illness, cold/heat, hunger/thirst, and fatigue/sleep deprivation. If you're in good physical condition before you have to "hit the nylon," you potentially lessen the impact of many of these items. If you don't already, start taking your health and physical condition seriously. It's good for you anyway.

Do you keep yourself well hydrated? I'm talking water here, not pop or beer. The flight docs recommend you drink 64 ounces of water per day, and that's under "normal" conditions. If you're not well hydrated under "normal" circumstances, how well do you think you're going to hold up under the stress of an ejection/survival situation? Or do you think the 12 ounces of water in your Parachute Spacer Kit (PSK) will do you until rescue arrives? If you do, you haven't spent much time in the Arizona desert or the Colorado Rockies. Water is essential to all your body functions, including your thought processes, and you need to be thinking straight in the cockpit, in the straps, and on the ground. DRINK WATER! You should also consider carrying a small, supplementary container of *water* on you when you fly.

USAF Photo by SSgt Andrew N. Dunaway, II

In good shape and all watered up? Great—now let's talk about your wardrobe. The advice from life support and SERE is to dress for the environment, and they're not talking about the environment where you would land if the sortie goes as planned. They're talking about dressing for your egress/crash environment. It may have been 85 degrees when you took off from Laughlin, but there may still be snow in the mountains you'll be crossing in New Mexico. Some "long handles" and leather gloves with inserts might come in handy should you have to unexpectedly spend some time in those mountains, or even in the desert at night.

Beyond the physical, your mental attitude is another big factor in your egress/survival situation. You may not want to really think about the possibilities, but all fliers need to be mentally prepared just in case things go to hell in a proverbial handbasket. Three of the top six factors in ejection fatalities (inadequate knowledge, overconcentration, and denial) are part of the mental side of the ejection/survival picture.

Have you set your ejection standards? For instance, figure 1 shows the by-the-book T-37 ejection envelope and recommended ejection altitudes.

Envelope at wings level/no descent—
- Minimum
  - — Zero delay connected
    100 feet and 120 KIAS
  - — Zero delay disconnected
    200 feet and 120 KIAS
- Maximum
  - 425 KIAS

Ejection Altitudes—
- Uncontrolled
  - 10,000 feet AGL
- Controlled
  - 2,000 feet AGL

Figure 1

These are the book standards, but what are yours? At what point are you going to go or give the ejection command? By far, the leading cause of our T-37/T-38 ejection fatalities has been ejecting out of the envelope, so your standard should be firmly planted in your mind before you go fly. You *must not* let some John Wayne notion of pulling the crippled jet out 10 feet above the trees cloud your judgment. Ill-advised machismo is a poor legacy to leave your family and friends. Set your standard, stick with it, and help keep yourself safe.

One of the best things you can do for yourself before or after you get into an egress/survival situation is develop a *balanced* mental attitude. You must maintain the will to survive, controlling the fear, at least in part, with the knowledge that you will be rescued. At the same time, you must not mentally set a rescue deadline.

"It's like any stressful situation," says TSgt Bill Renfro,

continued on next page

USAF Photo by SrA Jeffrey Allen

NCOIC of SERE Programs. "If you expect something to happen in 15 minutes and 20 minutes passes, your anxiety level goes up. The national average for rescue is 2 hours over land and 4 hours over water, but plan on at least being out overnight, if not longer."

The biggest mental enemies of survival are fear, anxiety, boredom, loneliness, and isolation. A positive attitude and staying busy establishing and maintaining your survival environment can go a long way towards keeping these gremlins at bay.

By the way, how's our egress and survival knowledge? Let's see…some of us went through survival school when…1949? Seems like it's been that long for me. And of course I remember everything I was taught like it was only yesterday—right! Then there's continuation training. That's 3 to 5 hours of instruction once a year whether you think you need it or not, instruction you certainly give your utmost attention—you know—considering it might save your life. Here's some food for thought:

Improperly performing parachute landing falls (PLF) accounts for 50 percent of ejection injuries. This high rate, says CMSgt Lynch, stems simply from the fact PLFs aren't practiced enough. Are you willing to trust your safety to the once-a-year practice you get in continuation training? Is it enough to keep you from complicating your survival situation with a compound fracture?

Try this:

1. Take the initial impact on the balls of your feet.

2. Roll to take next impact on the side of one leg.

3. Take next impacts on thigh, hip, and back of shoulder.

4. Activate your canopy releases. Sound familiar?

Do you really give your parachute preflight the attention it deserves? I mean it *is* the difference between a safe letdown and you ending up as a slick spot on the grass. As you're zipping to earth is not the best time to realize the acid stain on your parachute cover you blew off during your preflight inspection may have been an indication of a possible problem with your chute.

Feeling your ribs crack, while an attention-getter, is not the best way to jog your memory that your LPU bladder shouldn't have been positioned between you and your harness straps.

Have you got your survival priorities straight? You do remember your survival priorities:

1. Take care of yourself first, to include checking for and treating injuries.

2. Drink water—shock and stress reduction.

3. Go to wreckage—rescuers will probably find it before they find you.

4. Find the other crewmember(s) (if applicable)—there's physical and emotional safety in numbers.

5. Inventory and keep all equipment—you need to know what's available for the "long haul."

6. Find food and water and find or build shelter—again, think about the "long haul."

Consider these priorities a survival self-help checklist that might help keep you safe in an unsafe situation.

I can hear it now—"Oh, man…Someone sure screwed up when they packed my SRU-16/P survival kit. They said I was supposed to have a water bag in the kit, but they put a rubber condom in instead. Surely they don't expect me to drink water from a condom!" Yes, they do, and you might want to bring along some water purification tablets to make sure the water is safe to drink.

What good is your PRC 90-2 radio (a PSK survival item) going to do you if you don't know how to switch frequencies (push button in and rotate up for voice on 282.8) and can't transmit on 243.0 because you don't know how to find the URT-33 C/M beacon (it's in your parachute pack) which is also blasting away on 243.0?

How are your first aid skills? Do you think you and your jet mate are going to eject without either of you sustaining some physical injury? Have I got an investment deal for you. Your first aid and buddy care skills, as well as your ability to work with the limited resources available to you, may determine whether or not you or your copilot bleeds to death before rescue arrives.

Don't get me wrong. Survival and continuation training offer us some excellent information and practical experience. Without them, most of us, and my hand is up now, would probably be in dire straits if thrown into a survival experience. But we must be honest. We all need to take a personal inventory of our own egress/survival knowledge and capabilities. If you're not comfortable with what you find, if you don't feel safe, don't you think some survival review, some "independent study" if you will, a little more often than once a year might be in order? Talk to your local life support/survival/parachute people; they'll be glad to help you get additional information or training.

A few more words and I'll get out of your face. Capt Alan Jagolinzer and Capt Richard Malagrifa, Life Support Officers for the 559 FTS and 560 FTS, respectively, at Randolph, share in either the blame or praise, depending on the reader's perspective, for this article. Without their help, it wouldn't have come about. Thanks guys. ✈

INTO THE RIVER, AND BOY! IS THIS WATER COLD!

or *WHO NEEDS DRY SUITS OVER LAND?*

LCDR ED HOBBS
Courtesy *Approach*, May 98

Our A-6 qualifications for Search Radar Terrain Clearance (SRTC) had expired. Requalification consisted of a day, low-level bomb mission in the mountains followed by the same low-level at night. Temperatures were in the low thirties with gusty winds, but visibility was 7 miles. It seemed the perfect day for a low-level. Our route was completely over land except for a river that ran through the target area. Dry suits were not required and definitely not desired.

We taxied to the radar warm-up area to test our SRTC display only to find that it was down. Now that it was impossible to achieve our SRTC qual, we decided to change our flight plan and fly straight to the target for bombing practice.

We checked in with the target controller and started our runs. Descending to 500 feet at 450 knots, I acquired the target on radar, and we made our first drop.

"Thirty feet at 5 o'clock," the controller said as we pulled off target and headed downwind. I felt it was a fair hit, and I was sure I could do better on the next run. About a minute later, as we were turning in from 6 miles on a straight-path attack, we added power and began accelerating to 450 knots.

Photo courtesy US Navy

With no warning, we felt an explosion, and the aircraft began rocking. Seconds later, we lost all electrical power. My pilot fought with the controls, but the aircraft would not respond. My mind raced through the millions of places I'd rather be at that particular moment.

We deployed the ram-air turbine to restore electrical power, but before we could breathe a sigh of relief, three fire lights on our instrument panel told us we had a serious problem. I looked outside for secondaries. I turned as best I could and gazed at the aft portion of our aircraft. A large fire had engulfed the horizontal stabilizer. That was enough of a secondary indication for me.

Decisions were coming easy now. I looked at my pilot and yelled "Eject! Eject! Eject!"

I pulled the lower seat handle. The seat fired, and I was on my way, tumbling in the airstream. A second later, the seat turned upright, and the parachute deployed. Thankful I had survived the ejection, I glanced down to see where I was. Having been to remedial swim twice, I was in the worst possible place—right over the river that ran through the target area. That dry suit would have come in handy. I inflated my LPU, then tried to deploy the raft. "Where's the handle?" I wondered. For some reason, I couldn't find it. The water was getting close, so I went through the rest of my post-ejection procedures. I removed my mask and executed my four-line release, then I found my koch fittings.

I still couldn't find the handle, and it was time to get wet. I decided to take care of my raft after I got situated in the water. I hit the water and released my left koch fitting. Man, the water was cold. But considering how hot the Intruder was getting, I felt it was a fair trade. For some reason, my right hand wasn't working too well, so I released the right koch fitting with my left hand. I went back to locating my raft.

"If I release one of the lower koch fittings, maybe I can find the handle," I thought. At that point, a few stray brain waves kicked in, and I accidentally released both lower koch fittings. My seat pan and raft sank gracefully to the bottom of the river. The river banks were too far for me to swim to, and the current was too strong, but I was certain I would be rescued shortly.

Thirty-five minutes later, I was still in the water. My hands were numb.

I could see orange smoke in the distance. It was a huge relief to know my partner had survived. I assumed he was signalling a rescue unit, although I couldn't see it myself. My first instinct upon seeing the smoke was to break out my flares, but the river had transformed me into a popsicle. I couldn't even feel the zippers on my gear, much less use them.

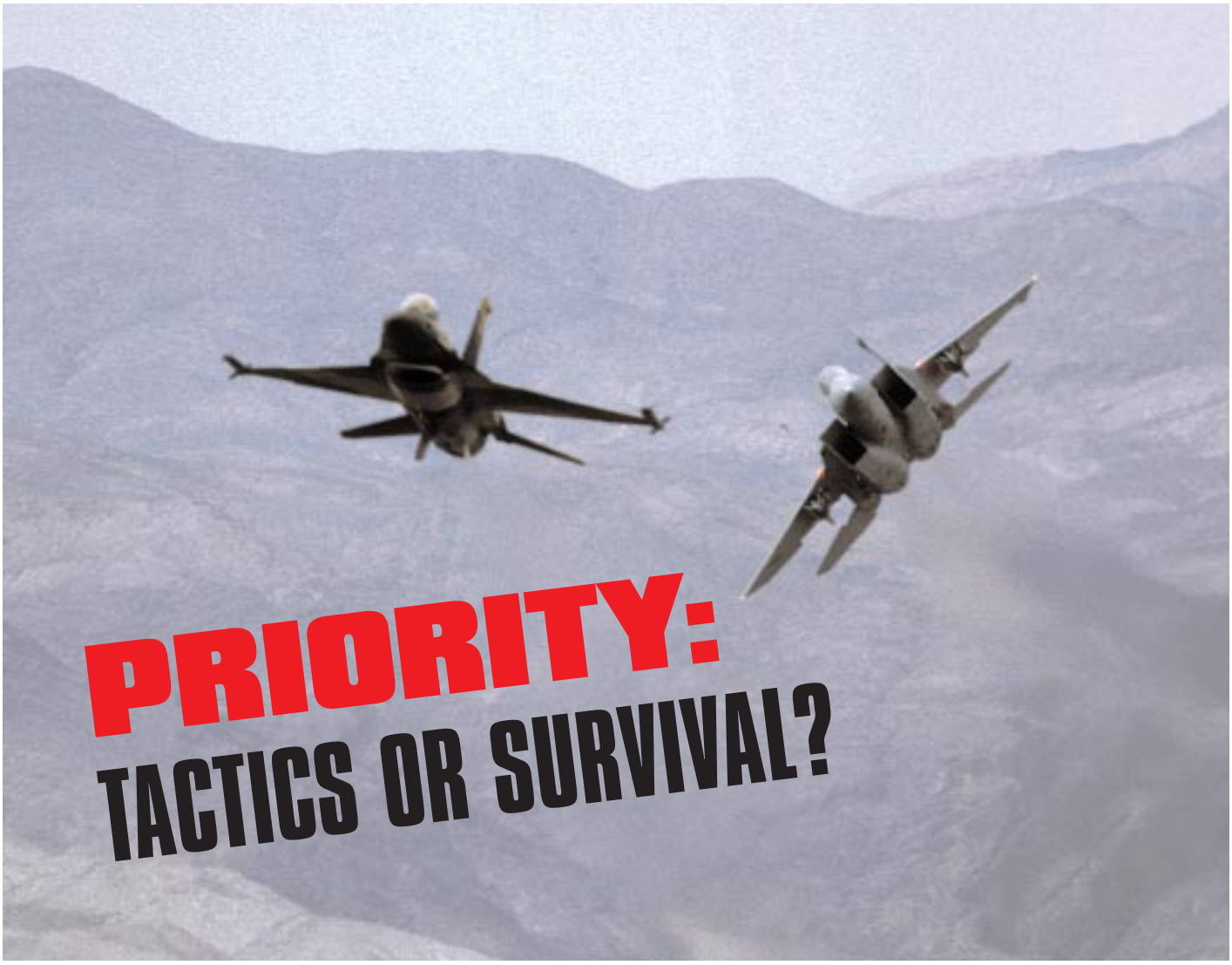
A Coast Guard helicopter finally arrived and hauled me out of the river. In the helo, I discovered I had severed two tendons on the back of my right wrist, and I had hypothermia.

I had made many mistakes. My wrist injury could have been less severe if I had been wearing gloves.

Although my injured hand contributed to my problem, it was no excuse for not deploying my raft. And, for obvious reasons, don't lose your seat pan in the water.

Finally, our survival gear is tied to our vests. In cold weather, I recommend immediately pulling the survival gear out so it's ready for use. My pilot did this and said that since he could see his flares and radio, he could use them even though his hands were also numb from the cold.

If this mishap had happened at night or in IMC, or had my rescue been delayed longer than the 45 minutes I was in the water, the ending could have been tragic. ✈



PRIORITY: TACTICS OR SURVIVAL?

Official USAF Photo

MAJ LINN L. VAN DER VEEN
Flying Safety, Oct 87

If the USAF was trying to get you ready for only one big mission, you'd have been issued a white scarf with a big red sun on it—you know, one you wrap around your head when they seal you into the cockpit. In other words, when and if the balloon goes up, we have to get to the target, whether it's tanks, airfields, or airborne MiGs, and back, over and over again. So where does this fit in with the way you fly each day, the way you train yourself and others? Are you training to be tactical, or training to survive?

It's no big secret, I hope, but the way we train had better be *both* tactical and safe because if the priorities are right, there is *no* difference! Sure, flying into the merge outnumbered three to one, or popping to blast an armored regiment defended by multiple SAMs and ZSUs are inherently unsafe missions. But the approach to these missions and, of course, training for these missions, must coordinate the right mixture of tactical aggression and basic skills, or else we might as well issue that white scarf with the sun on it.

Every year we lose good pilots and their aircraft when the desire to be "tactical" results in a disastrous misprioritization. Good tactics *start* with survivability. The same factors which result in the loss of aircrew and aircraft in peacetime will still be present during combat. So the first tactical priority must be a basic—such as ground avoidance, midair collision avoidance, or good basic instrument flying. The biggest difference is there will be more distractions, more reasons to concentrate on something other than the highest priority—**SURVIVAL.**

Poor Tactics

Here are some examples of tactics which sounded good but turned out bad:

• The wingman's reluctance to climb, caused by his desire to avoid detection at Red Flag, contributed to a midair between two A-10s attempting a low-altitude cross-turn.

• A pilot, flying a low-altitude awareness training (LOWAT) mission, flew into the ground after 130 degrees of a reaction turn as he watched the attacker pass overhead.

• A pilot making coordinated attacks with another two-ship flew into the ground watching the other aircraft as he pulled off target.

• A pilot, also flying LOWAT, flew into the ground during a check turn made to place his wingman in a perch position.

Did these pilots have their priorities right? Did their desire to successfully complete the tactical scenario temporarily become more important than clearing their flightpath for the ground and other jets? If we could ask them, they would all probably agree they never consciously placed mission over survival. However, the way they learned to be tactical allowed all of them to die, or nearly die, being tactical. For some reason, the desire to stay low *and* check six overrode the No. 1 priority at low level—ground avoidance.

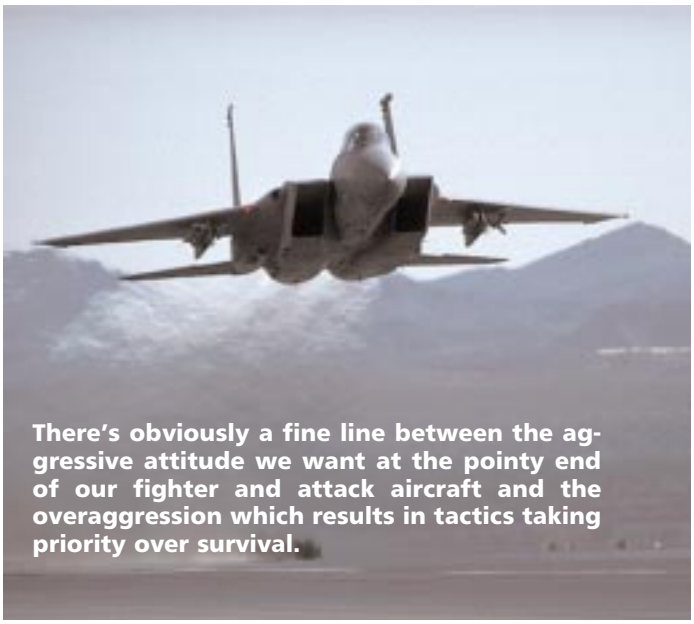
Combat Experience

If you think these mishaps will be avoided in combat, prevented by an increased awareness or some other miracle cure, the British/Argentine combat experience during the Falklands War proved otherwise. Six of the first seven British aircraft lost during the conflict were noncombat losses. This total included three helicopters lost attempting to land in bad weather and a midair collision as two Harriers maneuvered separately for an intercept at low altitude. The Argentines lost four aircraft which flew into the ground attempting to land or fly at low level in bad weather. For both sides, 16 percent (17 of 104 aircraft) were noncombat losses. The opposing forces learned early that even the best tactical plan would be unsuccessful unless basics like instrument flying and good lookout were successful first.

Setting Priorities

I'll leave you with three conclusions about priorities in tactical situations. To start with the obvious—there's no peacetime mission more important than you and your jet. On the ground, everyone knows that, though—it's almost too basic to mention! The problem comes in the air when tactics, mission objectives, pressure from flight members or a check ride, an emergency, etc., result in a pilot forgetting this basic rule. Our guys are not consciously placing tactics before survival, but they are still losing track of the No. 1 priority. Some portion of the mission insidiously demands so much attention the pilot or crew *allows* the mission element to become more important than life itself.

This leads to the second conclusion. If your tactics are so complicated you or your wingman can't concentrate on things like ground avoidance or the position of other members of the flight, then you need to simplify. Use a building block approach to break your cosmic attacks or maneuvers down so they can be mastered in stages without sacrificing any basic aircraft control.



There's obviously a fine line between the aggressive attitude we want at the pointy end of our fighter and attack aircraft and the overaggression which results in tactics taking priority over survival.

Official USAF Photo

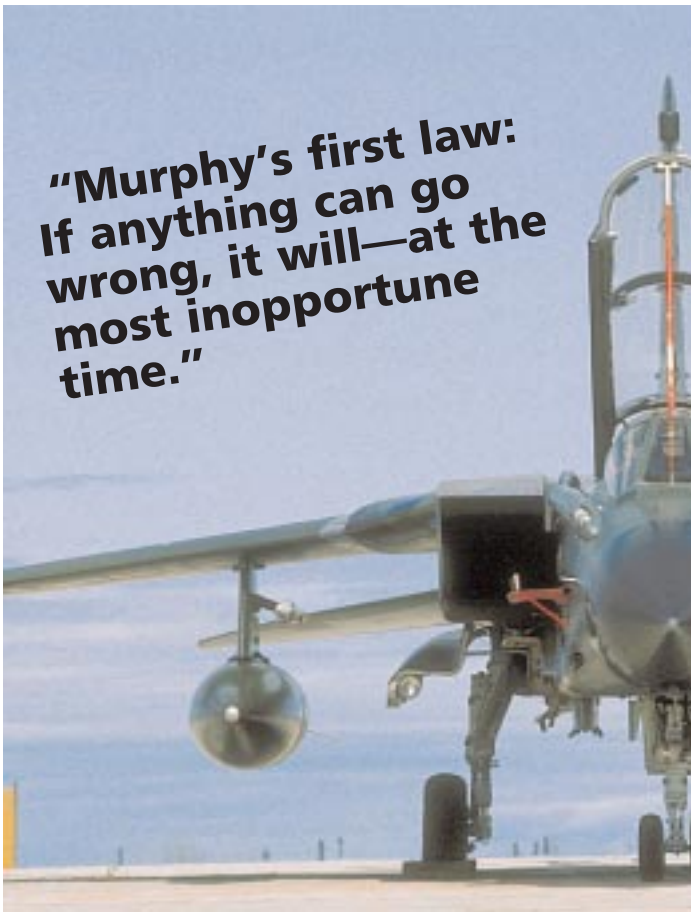
Thirdly, there's a problem people wearing flight suits allow to exist and can cure themselves. The same pilot performed the first two examples of disastrous tactics listed earlier. On the same mission as the fatal ground impact, he was fouled for strafing below 75 AGL during the long-range strafe portion of a "tactical" attack.

Survival First

Is there anyone in your unit hiding a lack of respect for the hazards of flight under the disguise of being "tactical"? Think about it—is there anyone in your flight or squadron who's usually the lowest in the low block, who regularly presses on bomb release, will do almost anything, including getting too low or passing uncomfortably close to a wingman, to *make* the tactics work? Maybe a young guy with great hands and an excellent future, the guy who will take any sortie, as long as he can go low and fast, hit the range, or have an opportunity to get at your "six." He might pick up a few more fouls than the rest of the squadron, may press the bubble a few times just to get the kill on film, and always pushes for one more setup, one more pass. Do you find yourself making allowances because he's "tactical"?

There's obviously a fine line between the aggressive attitude we want at the pointy end of our fighter and attack aircraft and the *overaggression* which results in tactics taking priority over survival. Training programs, briefings, and debriefings must consciously stress survival as the first priority in every tactical plan. Supervisors and peers, especially flight leads and other flight members, must enforce this. If we forget the basics in peacetime, in an attempt to better prepare for war, not only will we reach combat with fewer resources, but those remaining resources will be depleted faster due to noncombat losses. ✈

LT COL HANS SWOBODA (GAF)
HQ AFSC/SEFF



"Murphy's La

This story portrays a chain of events that almost led to a Class A flight mishap—events that took almost 4 days to blossom.

The Scenario

A German Air Force unit was transferring its aircraft from the east coast to the west coast of the United States. The highly experienced aircrews performed the necessary preflight and route preparations for the trip to their destination, as well as their selected alternate airfields. The stopover airfields were able to support TACAN and ILS approaches even though the transferring aircraft could only fly TACAN approaches.

The Players

Due to technical problems, one of the deploying aircraft had to abort the planned takeoff and was rescheduled to depart 4 days later. Again the crew went into action and preflighted for the planned mission, filed a flight plan, and requested a weather forecast the day prior. The day of the mission, the crew received another weather briefing and read the NOTAMs. The crew felt the weather for the trip was reasonable—gradual weather improvements with clear skies after takeoff and visibility of more than 8 kilometers at the destination and alternate airfields.

"As the Knuckles Whiten…"

Halfway into a planned 3-hour flight, the crew couldn't ignore the simple facts that they still had not been able to see the ground, and the headwinds at altitude were 40 to 50 knots stronger than what was briefed by the weather shop. They decided they'd better get a weather update for the destination airfield which was now about 200 NM away.

It took almost 10 minutes (70 NM) to acquire the weather update due to the high volume of air traffic. The weather report they got was absolutely unbelievable: *WIND CALM, VISIBILITY 1/4 MILE, CEILING 100 FEET OBSCURED.* The weather was below minimums for their TACAN approach! While the pilot and WSO were upset by this info, they *really* became concerned when the weather report for their alternate airfields indicated *…VISIBILITY 1/2 MILE…* Their alternates were below minimums too.

A look at fuel remaining and some quick calculations showed they had enough fuel for only 20 minutes of flight, plus the 20 minutes of reserve fuel required for the alternate airfield. Not good. The crew simply could not believe the situation they found themselves in. How could this happen? Why didn't they see the situation growing out of control?

The closest two civilian airfields didn't have published TACAN approaches, and both had the same poor weather conditions. After air traffic control delays and another destination weather report, which verified conditions at 1/2 mile visibility, the crew declared an emergency for fuel and requested direct course to destination.

While established on the TACAN approach, the aircraft entered a solid cloud deck at 3,000 feet MSL, and the crew continued the approach down to minimum descent altitude (MDA) of 400 feet for the TACAN approach. The fuel situation wasn't good. The ground wasn't visible at the MDA. And while continuing the descent below the MDA *against* procedural guidance, the crew vaguely caught sight of the ground at 250 feet AGL.

The crew terminated the approach and initiated missed approach procedures when the TACAN needle showed they had passed the airfield. They were keenly aware of their desperate situation and had only 15 minutes of fuel left, if that much. The control tower was well aware of the critical fuel situation and immediately in-

aw Revisited"

formed the crew, "THERE IS OPEN TERRAIN NORTHEAST OF THE FIELD." They had just enough fuel for one more approach—maybe—and it had to be successful.

At this point, the LOW FUEL light illuminated, further impressing the crew they needed to seriously start preparing for possible ejection in the next few minutes. They just couldn't believe the situation they were in… Over and over the WSO looked at the written weather forecast he had received from the weather shop that morning for some logical answers or clues as to what had gone wrong. Nothing.

The crew quickly got the aircraft set up for another approach. At 12 NM from the runway, they again entered the clouds. The TACAN broke lock. The INS was now inaccurate since it had been drifting gradually for 3 hours. That left only the aircraft radar for the WSO to use to perform the approach.

At 7 NM out, they were at the MDA and still in the clouds. The pilot lowered the gear, reduced power, and slowly continued the descent—again, below the MDA. They knew this was dangerous, and they were breaking the rules, but it was either that or give up on landing and eject. At approximately 150 feet AGL, the horizontal visibility was still insufficient, but they could see small roads and bushes whizzing by below.

A quick review of their situation: no visibility, emergency fuel, no altitude, and no runway in sight. At 2 NM out, the pilot pulled up to avoid a power line! The aircraft entered the clouds briefly, but they continued the approach. Just then, the WSO shouted, "Runway fifteen degrees right at half a mile!"

Immediately, the pilot pushed the throttles forward and initiated a quick "S" turn to move the aircraft 600 feet to the right and line it up with the runway. After touchdown, it was very quiet in the cockpit. The waiting rescue vehicles turned their lights off, and the aircraft taxied to parking. Before engine shutdown, they checked their fuel: 7 minutes of fuel remaining—7 minutes from a Class A mishap.

Been There, Done That?

We've all found ourselves in predicaments where unplanned events led to an out-of-control situation. We also know that most of these horror stories could have been avoided. In this story, the weather forecast issued to the aircrew turned out to be a forecast from the *previous* day. The meteorologist hadn't realized the weather information he presented to the crew was more than 14 hours old. Looking at a valid time period on the weather forecast sheet, neither the meteorologist nor crewmembers suspected a problem.

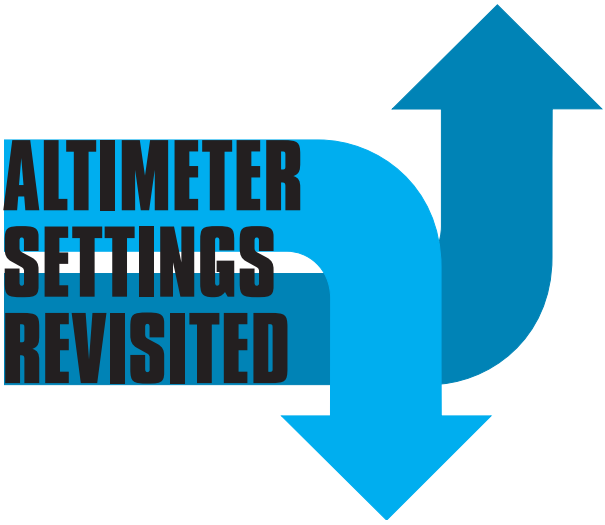
On reexamination, it was decided the squadron's deployment plan to the west coast was planned with too few en route stops. Each leg was too long and left almost no extra fuel for unplanned surprises. It was a mishap waiting to happen.

Poor selection of alternate airfields also contributed to the incident. Alternate airfields with instrument approach capability should have been chosen to enable landings during poor weather conditions.

Finally, breaking the rules—*descending below the 400-foot MDA while blind and in unfamiliar territory*—could easily have cost this crew their lives. But they got lucky. *This time*.

Flight planning needs to be realistic with answers to all the "what if" questions, and this incident proves that point very well. When a situation turns sour, good decisions are sometimes compromised. This incident held true to the old rule that there are always several factors leading to a mishap. Thankfully, we avoided the mishap this time.

Be sure you're planning carefully to prevent "Murphy's Law" from putting you into a dangerous situation.✈



Courtesy ***Callback***, No. 233, Nov 98
NASA's Aviation Safety Reporting System (ASRS)

FL180 is the altitude at or above which all aircraft altimeters should be set at 29.92, and below which they should be set to the current barometric pressure of the nearest reporting station. A frequently reported cause for altimeter mis-setting incidents that occur during a climb or descent through this altitude is distraction by other cockpit tasks. In a report to ASRS from an air carrier captain, distractions inside and outside the cockpit, including a mechanical malfunction, led to an altitude deviation.

While descending through approximately 23,000 feet and navigating an area of precipitation and thunderstorms, both air conditioning packs failed…As we worked on the pressurization problem…we were assigned 11,000 feet. As we leveled, ATC asked our altitude because he saw us at approximately 10,500 feet. Then we noticed that two of our altimeters were still set at 29.92 with the pressure at 29.42. Our workload was obviously heavy, but we should not have missed this basic procedure. Someone always must pay attention to flying.

A 1997 ASRS study on flightcrew monitoring incidents found that a large majority of such incidents occurred when the aircraft was in a "vertical" flight mode—climbing or descending. Flightcrews also were more likely to experience monitoring errors while performing two or more flight-related tasks—like the crew in this report who were avoiding weather, dealing with a pressurization problem, and talking to ATC, all while descending through FL180.

As our reporter noted, appropriate division of cockpit tasks (one pilot to fly the aircraft, the other to handle the malfunction), and adherence to procedures (the checklist) probably would have allowed the flightcrew to catch this mistake before ATC did.

12 O'Clock High

An air carrier crew's altitude problem started during preflight, when they failed to notice that their altimeter needles were aligned at the "12 o'clock" position—at an airport with a field elevation of 1,000 feet MSL. The First Officer reports:

After we leveled at 11,000 feet, Center said to descend and maintain 11,000 feet. We replied that we were level at 11,000 feet. About a minute later, Center again said to descend and maintain 11,000 feet. They said they showed us level at 12,000 feet and pointed out traffic at 13,000 feet. About that time, we discovered that the altimeters were set to 28.88 instead of the proper setting of 29.88. We quickly descended to 11,000 feet.

The night before, maintenance personnel had dialed both altimeters back to sea level…[the actual] field elevation is approximately 1,000 feet MSL. We accomplished all checklists on preflight, but failed to notice that the second digit [of the barometric setting indicator] had been set to an 8 instead of a 9. This is something that is easy to miss.

High to Low, Look Out Below

The rapidly changing weather associated with cold fronts and steep frontal slopes can create significant and sudden drops in barometric pressure, causing some pilots to mis-set their altimeters. An air carrier captain provides an example:

During descent below FL180, I put 29.82 into my altimeter. When the First Officer (FO) came back from talking to company on the No. 2 radio, he also put 29.82 into his altimeter. We were descending through 6,000 feet for 5,400 feet when the Approach Controller announced a ground proximity alert and told us to climb immediately to 6,000 feet and to recheck our altimeters at 28.82. We started to climb, checked our altimeters, and discovered our mistake…

It was an unusually low altimeter setting that day. Both the FO and I wrote the correct altimeter setting on our note pads, and both of us mis-set our altimeters.

Unusually low barometric pressures may take pilots by surprise, especially if the weather appears to be improving, leading the crew to believe that a higher altimeter setting looks plausible. The old adage, "High to low, look out below" is still sound advice.

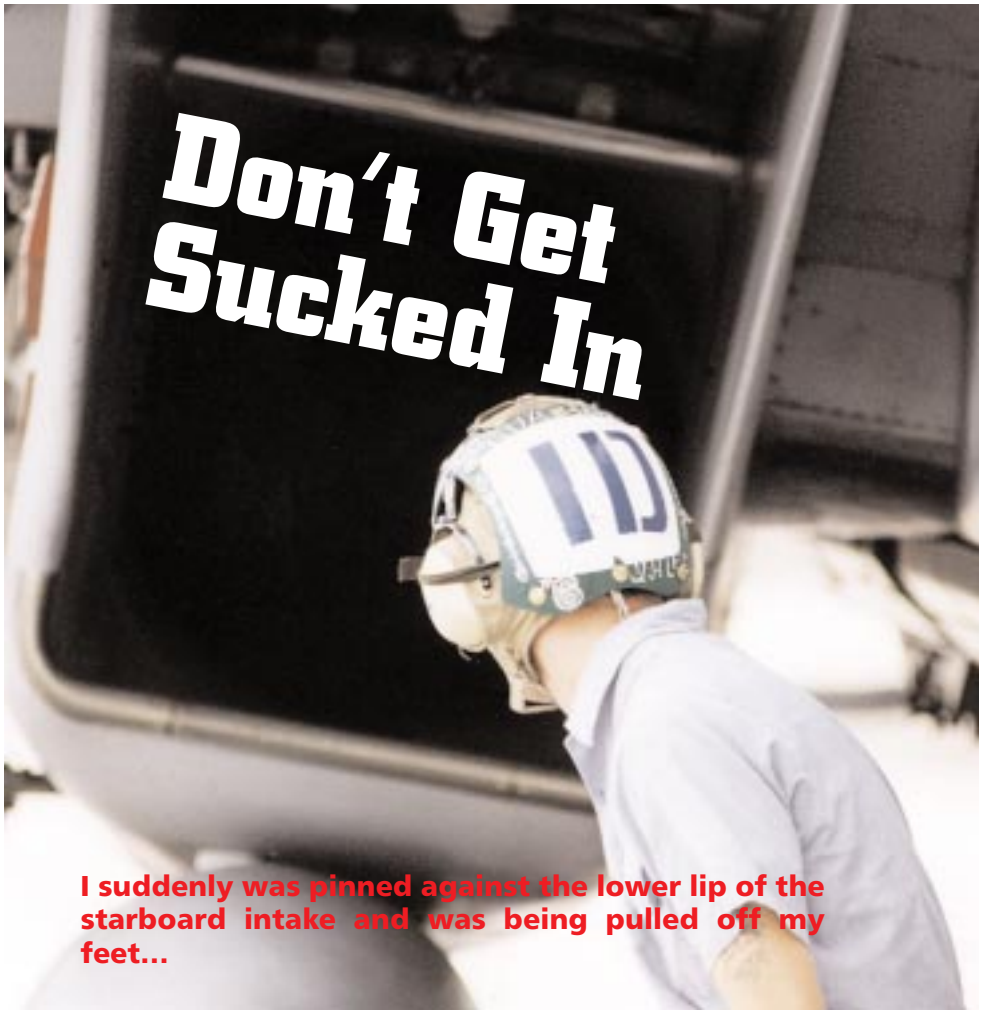
When flying during winter, a related reminder applies: Flying into cold air has the same effect as flying into a low-pressure area; that is, the aircraft is lower than the altimeter indicates. Altimeters cannot be corrected for temperature-related errors. However, pilots can adjust their minimum procedure altitudes to compensate for extremely low temperatures. Canadian pilots consult a government-provided chart to determine how much altitude to add to the procedure altitudes listed on approach charts, thus ensuring obstacle clearance during very low temperature operations. The U.S. Defense Mapping Agency publishes a similar altitude correction table for military pilots.

Readers who would like more information about low temperature correction charts should refer to ASRS *Directline*, Issue No. 9, available on the ASRS Web site at **http://olias.arc.nasa.gov/ asrs.** ✈

Editor's note: See also the related story, "It's Cold Out Here!" in the October 1998 issue of Flying Safety magazine.

Don't Get Sucked In

AT1(AW) TOD M. GREVER
Courtesy *Mech*, Oct-Dec 98



Official US Navy photo courtesy *MECH* Magazine

It all started with a simple order; my supervisor said, "Go help the guys on one-oh-six." That meant a trip to the flight deck—a seagoing obstacle course of intakes, exhaust blasts, and propellers.

"Sure thing," I replied, as I donned my flight-deck gear, grabbed a tool pouch, and headed to the roof. Being a cruise veteran with 9 months of flight-deck experience, I knew my way around up there, so off I went.

Since the deck was open to recover an S-3, I decided to go up on the starboard side just aft of elevator 3. It was a beautiful day in the Arctic Circle: dim, gray, and cold. And you could barely tell where the sky and water met. The ladder from the catwalk came up right under the belly of a sister squadron's F-14. I could hear engines running close by, so I looked around trying to figure out which Tomcats were turning. I started with the jet I was standing under, looking back at the burner cans trying to see heat from the exhaust—nothing there.

I crouched and looked around for a plane captain, thinking that if the jet was turning, there would have to be a plane captain in control, but no one was there. A couple of other birds nearby were already turning for the upcoming launch, so I figured they were probably the ones I was hearing. I made my move.

I walked towards the nose gear and hung a right. Whoosh! I suddenly was pinned against the lower lip of the starboard intake and was being pulled off my feet by the suction created by a running engine. There was a screaming in my ears—my ear cups had been sucked out of position. Off balance, I tried to duck under the intake, but the drop tank was in my way. "Think, Tod, think!" My mind raced.

I threw my weight forward with all my energy and broke loose. An instant later, I landed on my hands and knees, **hard.** I got my ear cups back in place and shot into the catwalk in nothing flat. I did a quick check around the deck; no one was running towards me. I peered up at the cockpit; both of the fliers were busy with pre-launch checks. The whole event had gone unnoticed, and there was still no sign of a plane captain. I inventoried my tools; my gear was intact—nothing missing. I decided to get below.

Back on the 03 level, knees shaking and heart beating wildly, I went over the events of the last 2 minutes and realized what I'd done wrong. I had assumed because I couldn't see "heat" from the tailpipes and no plane captain out in front of the Tomcat that it couldn't be turning. But on a dim, gray day like this one, the heat was invisible and plane captains sometimes leave their posts to get an FDC or troubleshooter.

I also thought about what I'd done right. I took the time to dress-out in full flight-deck uniform before climbing onto the flight deck. I'd also fastened my cranial strap snug; that kept it on my head and out of the engine's fan blades. My tools were strapped tightly around my waist with the Velcro™ flap securely shut, keeping them out of the engine as well. That engine would live to fly another day.

Later, I realized I had made an even bigger mistake by not sharing my story right away. I waited a while. I guess it was out of embarrassment and not wanting to tarnish my image, but that's stupid. I've since recounted that story many times during safety standdowns. As an instructor, I've trained personnel on the dangers of jet aircraft. We share experiences to prevent similar mistakes. ✈

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The Zodiac Killer

The mission was scheduled as a night, tactical, rigging alternate method Zodiac (RAMZ) airdrop sortie off the east coast of Florida. It would provide one of those great "train as you fight" opportunities, both for the flightcrew and the four Pararescuemen (PJs) who would follow their Zodiac boat into the water from an altitude of 3,500 feet.

Planning, briefing, departure, and the trip to Florida were pretty much uneventful. Upon arrival at the drop zone area, conditions for the cargo/personnel airdrop were a "Go," with only light, steady winds. The RAMZ package was kicked off the aircraft, and it exited routinely, followed immediately by three of the four PJs. The fourth PJ, the jumpmaster/instructor, remained on board for a few seconds to ensure the load and his charges were descending as expected. Personnel chutes opened normally, but the jumpmaster PJ watched in astonishment as the RAMZ's two parachutes deployed, then promptly *disconnected* from the load. He immediately jumped from the aircraft and followed the RAMZ to the surface where it impacted the water in a near-vertical attitude and was destroyed. All four PJs landed safely, rendezvoused, and assisted in the recovery process.

The RAMZ package had been inspected prior to airdrop, and it was rigged correctly IAW applicable tech data. The instructor PJ related to investigators that the two RAMZ package parachutes deployed normally after the Zodiac bundle left the aircraft, but promptly detached themselves, with one inflating fully and the other not inflating at all. One of the two parachutes was recovered, and careful examination of it revealed what had gone wrong: The stitching on the 120-inch riser, which attaches the parachute to the RAMZ package, had failed. But, what caused the parachute risers to fail?

Seems the unit's stock of contractor-manufactured risers had been sent to South West Asia for use in real-world operations. In order to maintain proficiency while waiting for new risers to show up through regular supply channels, the PJ Section coordinated with the unit's Fabrication Flight to local man replacement risers. Per tech data, the risers were to be sewn with 6-cord thread, 5-8 stitches per inch. The riser that failed was sewn with 3-cord thread—a thinner, less sturdy cord. Not robust enough to withstand the opening shock and weight of the deploying RAMZ package, it failed immediately. This failure to follow tech data could easily have resulted in serious injury or death if circumstances had been slightly different, but fortunately (?) total mishap cost was limited to $13,000 for a new Zodiac. Please, follow that tech data!

SPARK, CRACKLE, POP

The two-seater F-15 was prepped for a daytime flight, and until taxi, things were routine. As the pilot released brakes and pushed the throttles forward to taxi, the crew chief noticed sparks coming from the tailpipe of the left engine. Not altogether unprecedented, but sparks visible in bright, sunny daylight conditions?!?! He signaled for brakes, notified the pilot what he had seen, and asked if engine indications were normal (they were).

Just to be on the safe side, the crew chief advised an engine shutdown and requested the Expediter send a 7-level jet troop over to take a look-see. As best we can determine, the 7-level crawled both engines' intakes and detected no obvious damage. As a result, all involved concluded that the sparks were an anomaly and it would be safe to continue the mission.

The crew strapped in, started engines again—no sparking this time—and taxied to the EOR arm/dearm area. The pilot ran the left engine up to 80 percent (nothing abnormal) while in arm/ dearm and did it again after taxiing onto the active (again, nothing abnormal). After the usual coordination and a short wait for takeoff clearance, he released brakes and pushed the throttle forward.

As soon as the throttles reached military, the jet went "Bang!" three times in rapid succession. Shortly thereafter, the flightcrews' heart rates also advanced to military. Concluding (correctly) that this wasn't a good day to fly, the pilot immediately retarded the throttles to idle (all engine indications still normal), made a return trip through the arm/dearm area, and taxied back to the ramp, where the aircraft was impounded.

Borescope of "Sparky," the suspected bad No. 1 engine, revealed extensive compressor damage. It was removed and sent to SA-ALC for teardown analysis, and the mystery as to what caused the damage was solved.

The inside diameter bearings (I.D.) for the fourth and fifth stage rear compressor variable vanes (RCVV) had failed, allowing the fourth stage stator shroud to move forward and machine

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into the rotating fourth stage disk. This liberated a section of the fourth stage shroud into the gas path, resulting in the sparking that was seen just prior to the initial taxi and the damage discovered during the borescope. TCTO 2J-F100(II)-578 was already initiated to install more durable bearings, and it wasn't overdue, but it had yet to be accomplished on the mishap engine.

According to a P&W engineer, impending failure of these bearings wouldn't result in an increase in oil consumption, nor would a JOAP sample indicate that something bad was going on. There would likely be no warning that a potentially catastrophic event was about to occur.

So, what can be learned from this mishap?

First, things which may cause "sparking" can range from the harmless (turbine blades shedding carbon) to the serious (bearing failure or FOD damage).

Second, kudos to the crew chief. Paying heed to his instincts that something was wrong, when he first saw sparks coming from the tailpipe, was a good choice. When that little voice inside *your* head tells you something doesn't seem right, listen to it. Better to err on the side of caution.

Third, in circumstances like this one, a visual inspection is better than no inspection, but a visual inspection *and a borescope* would be better still.

Don't Get Glad®, Get Mad!

One of the unofficial laws of aircraft maintenance goes something like this: *"An object dropped on (or in) an aircraft will always migrate to the spot where it's most inaccessible and/or can cause the most damage."* In this Class C mishap, that principle was once again validated.

A C-5 Galaxy needed to be knelt in order to download some rolling stock. And kneeling the landing gear meant using both APUs to power the ATMs to supply hydraulics for the operation. The crew chiefs accomplished the procedure without a hitch, the aircraft was knelt, and the APUs were going through the required no-load, cool-down cycle before shutdown.

Suddenly, the fire warning horn for the right APU sounded, and an associated light in the fire handle illuminated. As per tech data and training, the crew chiefs performed emergency shutdown procedures, declared a ground emergency, evacuated everyone from the aircraft, and discharged both fire bottles for the right APU. The fire light remained illuminated, so they discharged the APU's alternate fire bottle. Still, brown smoke was seen venting from the right APU, so a ground fire bottle charged with halon was fired into the APU compartment, and that did the trick. The team effort paid off, and the fire was extinguished.

After the aircraft was deemed safe, maintenance was allowed back on to assess damage and determine what needed to be done to get the aircraft in MC condition again. As expected, the right APU was crisped and had to be replaced. While disconnecting APU inlet ductwork—and here's where that maintenance law referred to earlier reared its ugly head—they discovered a large plastic bag covering the APU inlet. It had prevented the APU from receiving necessary cooling air and caused the overheat that turned into a near-catastrophic fire. But how had the bag gotten there?

Several people had been working the aircraft at the time of the mishap, including some from AGS and some from APS Fleet Service. Coincidentally enough, Fleet Service was emptying garbage and cleaning the aircraft, and the offending bag found in the APU inlet was similar to those used during post-mission servicing. But since high winds were present at the time of the mishap and that particular type of plastic bag was also in wide use in buildings situated near the aircraft parking apron and by vehicles that frequented the flightline, it's impossible to say where it really came from.

This is one of the more unusual instances of FOD—that is, Foreign Object *Damage*—that we've run across. And that's one of the things to be learned from this mishap: FOD—that is, Foreign Object *Debris*—can come in many forms. As this plastic bag illustrates, even seemingly innocuous items can make up a link in a chain of events that culminate in disaster. If it doesn't belong on the flightline, pick it up, and dispose of it properly.

Kudos to the crew chiefs and everyone else who played a part in saving this irreplaceable air mobility asset. Total cost of this mishap exceeded $112,000 dollars, but it could have been much more expensive. Which leads us to the other thing worth remembering about this mishap: When crunch time came, this maintenance crew was ready. Their use of tech data, knowledge of emergency procedures, ensuring that serviceable fire suppression equipment was on hand—and perhaps most importantly, thorough training—really paid off. There's no substitute for professionalism. WELL DONE!✈

CDR J. N. LEWIS
Patrol Squadron One
Whidbey Island, Washington
Courtesy *The Combat Edge*, Aug 98

I recently read an article from a safety publication entitled, "How the Safety Officer Fell Off the Roof." I remember asking myself what kind of bungler would first pull a stunt like that and then compound the mistake by publishing it. Since then, I have reassessed what this brave soul did. In concert with my duty as squadron safety officer, I put away my pride and now offer up my blundering tale for your review…the working title of which is, "Don't Go Surfing in the Hurricane When the Waves Are the Size of City Blocks and Can Snap You in Two Like a Toothpick." I know the title is awkward, but it's very accurate. The surfing experience I'm about to tell you left a lasting impression upon me. In this particular case—speaking from the perspective of a unit safety officer—I exhort you to "do as I say and not as I do" (i.e., don't try "hanging ten with the safety officer").

I was on a good-deal detachment as Officer-in-Charge (OIC) from Naval Air Station (NAS) Cold-and-Dreary to NAS Warm-and-Sunny. Apart from the improvement in the weather, I had been looking forward to seeing some old friends from my first tour and maybe borrowing a surfboard and getting in a few sessions—flight schedule permitting. I was stationed in Hawaii, where in my humble opinion I mastered the long-board and sorely missed those days of daily surfing (always after normal work hours, of course).

A Harrowing Experience

One of my friends was able to hook me up with a nice 10-foot thruster. I took it out on a calm day, caught a few nice waves, and felt that old skill come back—you know, ready for anything. I stored the surfboard in my BOQ room, conveniently located near the beach. Now all I needed was some tasty waves to pop up and I could be in the water in mere minutes.

Fortunately, some waves did pop up; or more accurately, rose to astronomical heights and pounded the beach unmercifully. A hurricane was forecast to come our way—a pretty rare occurrence for that area—and the storm surge was predicted to produce some excellent surfing. After work, I grabbed my board and hurried to the beach to check out the action. From the parking lot, I could see the surf breaking and a few riders already out in the lineup. COWABUNGA! There was one obstacle; a red flag was flying from the lifeguard stand. The beach

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was closed for swimming. But all hope was not lost. This time of year, the lifeguards were not on duty on the weekdays; so I reasoned it must have been left up from the previous weekend. Besides, the signs said "Enter at Your Own Risk."

My view from the parking lot was not as impressive as the view from the beach, but the waves still did not appear to be the epic size that all the radio surf reports had called for. The swell looked to be running about 4 feet, with the wave faces about 6 feet as I tried to paddle out.

I REMEMBER ASKING MYSELF WHAT KIND OF BUNGLER WOULD FIRST PULL A STUNT LIKE THAT AND THEN COMPOUND THE MISTAKE BY PUBLISHING IT.

My first clue that there was something wrong was the effort it was taking to paddle out to the lineup—I wasn't making any progress. After getting blasted back to the beach three or four times, I decided to reevaluate my desire to surf. A couple of the local surf rats were waxing up and observing my belated progress (and, I'm sure, laughing with me; not at me). I couldn't let them think I was a quitter, so I decided to make one more valiant attempt.

Back into the surf I went, and good timing was on my side. There was a momentary break in the swell, and I finally made it out into the lineup. I paddled about 50 yards offshore and turned my board around to take a look at the break and pick my wave. Odd, I thought; the swell is lifting me up high enough to see all the way into the parking lot. It wasn't like this a couple of days ago! After watching a few gargantuan waves pulverize the surf zone, reality set in. This surf was too big for me to handle. The smart play would be to head in and try it another day, maybe in a tropical storm next time instead of an actual hurricane. You know, start small and then work my way up.

Getting back in presented a new set of problems, however. Now I had to ride into the beach on the same waves I had judged too dangerous to drop in on. Simple, I thought. All I have to do is wait for the kind of lull that allowed me to paddle out, so I bided my time and looked for a break to paddle in on.

A small glitch developed in my plan, though. As the storm got closer to the coast, even the lulls were building up to some seriously large waves. After about an hour of biding my time, I was beginning to get cold. The sun was going down, and pretty soon I had to make a decision. I paddled in as close as I could to get a better look at the break—while still not getting pulled in—when suddenly the decision-making process became real simple. I got caught inside. The swell began to break, and I had no choice but to try and ride it in.

I would have looked real cool to the guys on shore if I had stood up, made the drop, and surfed the wave in. But survival was on my mind, and I thought the best tactic would be just to hold onto my board and hope the sound of the breaking surf would cover the sound of me screaming. I went over the falls going something near the speed of sound with my surfboard pointed straight down at the earth. Of course, this was a nonstandard surfing maneuver. In Hawaii, we used to refer to it as getting "pearled."

The board was torn from my death grip, and I experienced the feeling of being trapped in a washing machine with a nasty penchant for dismembering its occupants. It was at this point that I rediscovered the flexibility I could achieve when exposed to thousands of pounds of hydraulic force. Imagine my astonishment when I found out that the back of my head could actually touch my posterior!

Finally released from the ocean's clutches, I stood up in the inside break covered with seaweed and sand. Fortunately, the leash on my board had stayed in place, which made the search for my trunks all that much easier. I gathered myself together as best I could, brushed off the larger pieces of seaweed, and bravely walked past the small crowd on the beach. Naturally, one of them had to say, "Nice ride, brah." Not willing to let that remark pass, I asked when they were going out. Their response: "Are you nuts? We just came out to barbecue. That surf is too dangerous today." I limped back to my car with the smug satisfaction that I had at least tried, even if it was one of the dumbest things I had ever done.

Safety Lesson Learned

There's a moral to my story. Not carrying the safety ethic from work to your home—or recreation—has accounted for many injuries. Every time you take an old sport up again, there is the desire to start at the same level of skill you had at the end of the last season. Unfortunately, nature doesn't support that.

I realize now that some value does come from near-death experiences. From this one, I learned (as trite as it sounds) that a person should never go surfing in a hurricane—or any large swell, for that matter—particularly if you are out of practice. I try to apply this lesson to other things I used to be good at but do not regularly practice anymore.

Since this experience, I learned not to try the double-diamond slope the first time off the lift. Guess how? I keep hoping wisdom will start coming with age and not from physically painful lessons that require the application of heating pads and aspirin.

On a more positive note, my wife saw this nerve-racking experience as an excellent opportunity to put my surfboard collection in our next garage sale. This year, I may not argue.

Hmmm, now where did I leave that mountain bike…✈

Words of Wisdom From Old Aviators

or

Lessons Learned the Hard Way

"Fly it until the last piece stops moving."

"The only time you have too much fuel is when you're on fire."

"Scan, scan, scan; there's always something you missed."

"It's best to keep the pointed end going forward."

"Takeoffs are optional; landings are mandatory."

"Learn from the mistakes of others; you won't live long enough to make them all yourself."