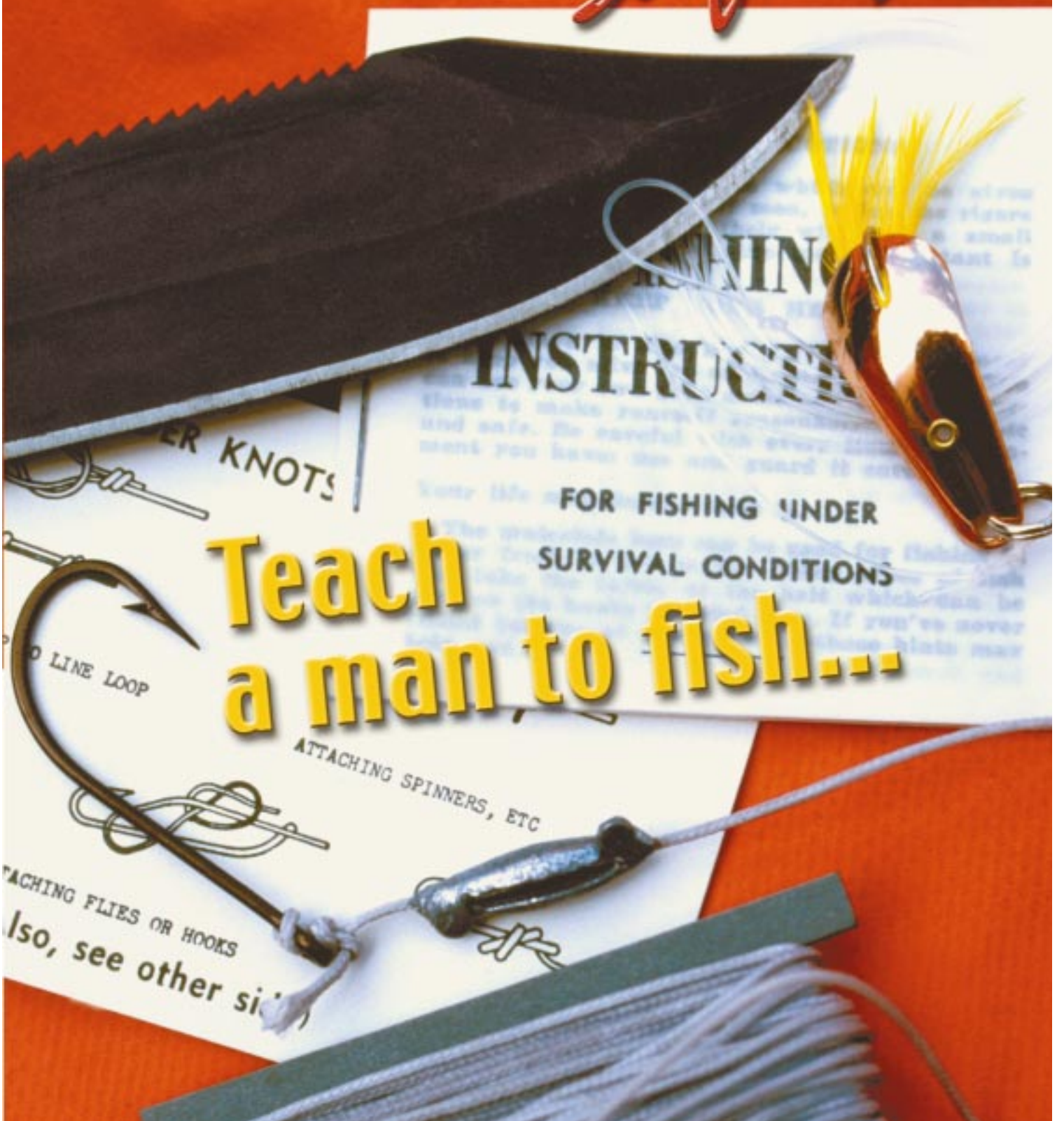
UNITED STATES AIR FORCE

FLYING Safety

MAGAZINE

May 2001



Teach a man to fish...

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This Issue:

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20

Cover: USAF Photo by TSgt Michael Featherston

UNITED STATES AIR FORCE

FLYING Safety

MAGAZINE

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FSM notams

"A GAPING HOLE IN SECURITY PROCEDURES"

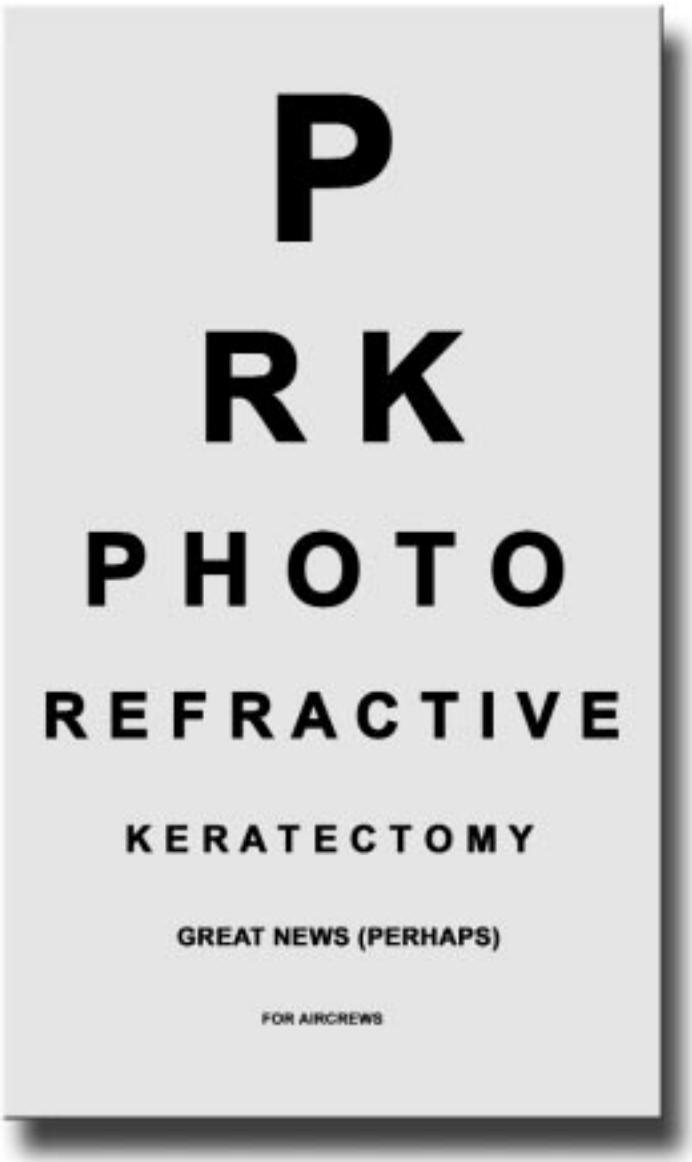
Courtesy ASRS *Callback* #251, May 00
NASA's Aviation Safety Reporting System

In March 1998, *Callback* reported an incident involving a legally armed passenger—another white-knuckle flyer—who left his gun and holster in the aircraft lavatory during flight, where they were later discovered by a flight attendant. In a similar incident reported to ASRS, the forgetful passenger was not nervous—just inexcusably careless:

We got the paperwork at the gate for an armed individual traveling alone. His agency was listed as a government agency. He explained he was a special agent with the government agency and was transporting evidence. After leaving the aircraft at [destination], I was approached by several flight attendants who explained they had found a gun in a seatback pocket. It was the government agency guy's piece [gun]—still in its little black waist pouch. The [gate] agent was busy paging this guy to come back to the gate. I do not know if he ever came back for it.

We have a gaping hole in our security procedures. We have lots of controls in place to [prevent] getting a weapon onto the airplane, but nothing to ensure that it gets off the airplane! Thank goodness it was found by a crewmember.

Perhaps we should have a procedure in place to have the individual show the piece [gun] or confirm to the crew on their way out that they have it. It is not very hard to imagine a passenger with that gun on the next flight of the airplane. Also, an authorized weapons carrier could intentionally leave it hidden on a plane for a co-conspirator to use on a later flight, and we would never know, since we have no way of checking that the [gun] made it off the airplane with the person. ➔



Is this laser eye surgery just another medical fad like copper bracelets and magnetic arch supports? No, it is not.

FREDERICK V. MALMSTROM, PH.D., CPE
CAPT SCOTT M. McKIM, O.D.
USAF Academy, CO

(Editor's note: Although the authors address only the factors for pilots and pilot candidates, all aviation and special duty personnel [those who require signed AF Forms 1042 for duty] fall under the 2 August 2000 PRK policy memo. Anyone interested in PRK should check the Web site at http://www.afms.mil/moasgoc/index.htm for more information.)

Ever since spectacles were invented 800 years ago, mankind has attempted to improve his vision without those inevitable nuisances. The lens-free, "new, improved vision" methods have ranged from the respectable to the laughable—eye exercises, enemas, purgatives, mental imagery, hypnotism, biofeedback, drugs (like pirenzepine), contact lens therapy, and even downright dishonesty, like memorizing eye charts.

For the past two decades, eye surgeons have been experimenting with laser surgery to correct their patients' astigmatism and both near- and far-sightedness. Laser-vision clinics offering PRK and LASIK (Laser-Assisted-In-Situ-Keratomileusis) surgery have sprouted up everywhere, advertising special, introductory offers. Is this laser eye surgery, which also touts "new, improved vision," just another medical fad like copper bracelets and magnetic arch supports?

No, it is not. In a reversal of longstanding medical policy, on 2 August 2000 Lt Gen Paul K. Carlton, Jr., the Air Force Surgeon General, signed a policy memo allowing limited numbers of Air Force pilots and pilot candidates to undergo voluntary Photorefractive Keratectomy (PRK) laser eye surgery *and* still retain their medical eligibility for flying.

What's This PRK Stuff?

Most of us have been told that the eyeball acts like a miniature single-lens camera, but what many of us don't know is that the eye also acts like a two-lens telescope. Although the squashy, adjustable lens, which is buried far beneath the surface of the eye, helps to focus light on the retina, it's the cornea—the tough, outer transparent surface of the eye—which accounts for over 90% of the focus-resolving power.

The only problem is, the cornea is a *fixed* lens. The cornea is also quite thin, amounting to about 500 micrometers (μm), about half the thickness of a dime. Fortunately, the cornea is really tough. Thanks to recent advances in laser microsurgery, surgeons can now permanently reshape that thin, tough outer lens with previously unheard-of precision, shaving off as little as 0.25 μm of cornea at each zap. (See Figure.) Surgeons now have precision commercial lasers that could etch your name and serial number neatly on the surface of an eyelash. Under extreme PRK conditions, the eye surgeon may be required to shave off as much as 20% (100 μm) of the depth of the cornea, but procedures which sculpt less than 10% off the cornea depth are more usual.

PRK and Eligibility

As of 2 August 2000, PRK is allowed under strictly defined and controlled clinical criteria and follow-up evaluations (surveillance). PRK is an elective procedure; it is not mandatory. Up to 200 already-trained pilots—both active and extended active duty reserve—will be offered *paid*, Air Force-sponsored PRK surgery at Lackland AFB's Wilford Hall military hospital. Reservists and guardsmen should check with Personnel as to their eligibility for paid treatment at Military Treatment Facilities.

Pilot candidates come, of course, from four general sources: the Air Force Academy, AFROTC, OTS and active duty nonrated officers. One hundred pilot candidates (about 10% of those entering pilot training), will be allowed into pilot training with medical PRK waivers. Alas, the first glitch for pilot candidates is that they'll have to pay for it out of their own pockets—a good deal for the Air Force, to put it bluntly, because PRK surgery can cost anywhere from $1100 to $6000 for both eyes. The second big speed bump is that getting PRK is no absolute guarantee your vision will improve. About one percent of patients actually experience *degraded* vision after surgery.

Don't Confuse PRK With LASIK Surgery!

Medical waivers apply only to PRK, *not* LASIK surgery. The surgeries are similar, but there's one critical, practical difference. *PRK is Air Force-approved. LASIK is not.* As of this writing, LASIK will earn you nothing but a permanent pilot disqualification. PRK is an older, more proven surgical procedure whereby the epithelium (the very outer layer of cells) is removed and the underlying whisper-thin layer, the stroma, is gently ablated (i.e., destroyed) and the underneath cornea is then laser-reshaped. The stroma doesn't grow back, but the outer epithelium does regrow, albeit quite painfully, in about three to five days. In all, recovery time from PRK can take anywhere from six weeks to 12 months before the inflammatory healing response settles down in the stroma and vision is stabilized.

LASIK surgery, otherwise dubbed "the Flap 'n' Zap") is a more recently developed procedure whereby the stroma flap is gently lifted and then replaced after corneal reshaping. LASIK recovery time is usually faster, a matter of days, but LASIK also has more unknown risks for complications. LASIK may well prove to be the superior procedure, but for now the Surgeon General is understandably playing the conservative PRK hand. After all, it's been only ten years since the Surgeon General approved soft contact lenses for inflight use by pilots and navigators.

PRK Isn't Risk-Free Either

PRK is like marriage: There are unknowns. Our search of medical literature found a deluge of recent research on both PRK and LASIK. The good news is there are about a whopping 40 professional journal studies published per month. Many articles suggest that PRK-induced corneal weakening isn't a real problem at sea level, but increased glare sensitivity, haloing and reduced contrast sensitivity continue to bother a minority of PRK patients. The bad news is that the published research on flying *and* PRK just isn't there. Spooky? Well, the MEDLINE search found only three (that's right, just *three*) PRK/aviation medical articles published over the past 15 years, and they weren't helpful. Some very basic aviation-related questions still need to be answered like: (1) Does PRK weaken the structure of the eyeball significantly? In other words, at high, unpressurized altitude will your eyeballs bulge, leak or even explode?

continued on next page

Getting PRK is no absolute guarantee your vision will improve. About one percent of patients actually experience degraded vision after surgery.

(2) Does routine PRK corneal dryness become a chronic or severe problem at the rarified, dry atmosphere of high altitude? Unlikely outcomes, of course, but in this flying business we need to be absolutely sure. Operational experience with PRK in military aviation personnel will supply the answers to these and other questions in the ongoing PRK surveillance program.

So if this PRK surveillance program proves successful, in the future we expect significantly larger numbers of volunteer pilots and pilot candidates to be routinely given PRK.

PRK-induced corneal weakening isn't a real problem at sea level...

Who Might Consider PRK?

Alright, you guys—now pay attention. If you have any otherwise medically-disqualifying but waiverable conditions, like asthma, heart murmur, etc., forget it. Here are the four pilot-vision categories that concern us:

1. Pilot candidates with nearsightedness (myopia) correction of -0.25 to -1.50 diopter are already qualified and don't need PRK waivers, period. Neither should pilots or pilot candidates with farsightedness (hyperopia) consider PRK.

2. Pilot candidates with -1.75 to -3.00 diopter correction *in worst meridian* can get to pilot training with a medical waiver but without getting PRK. Pilot candidates in this group can get PRK if they want to, but they'd be wiser to wait for PRK until *after* completing pilot training.

3. Pilot candidates with -3.25 to -5.50 diopter correction cannot get into pilot training without PRK. *This* is the group which ought to seriously consider PRK.

4. Pilot candidates with vision greater than -5.50 diopter correction are not eligible for a PRK waiver, ever.

FAA Regulations are Vastly Different

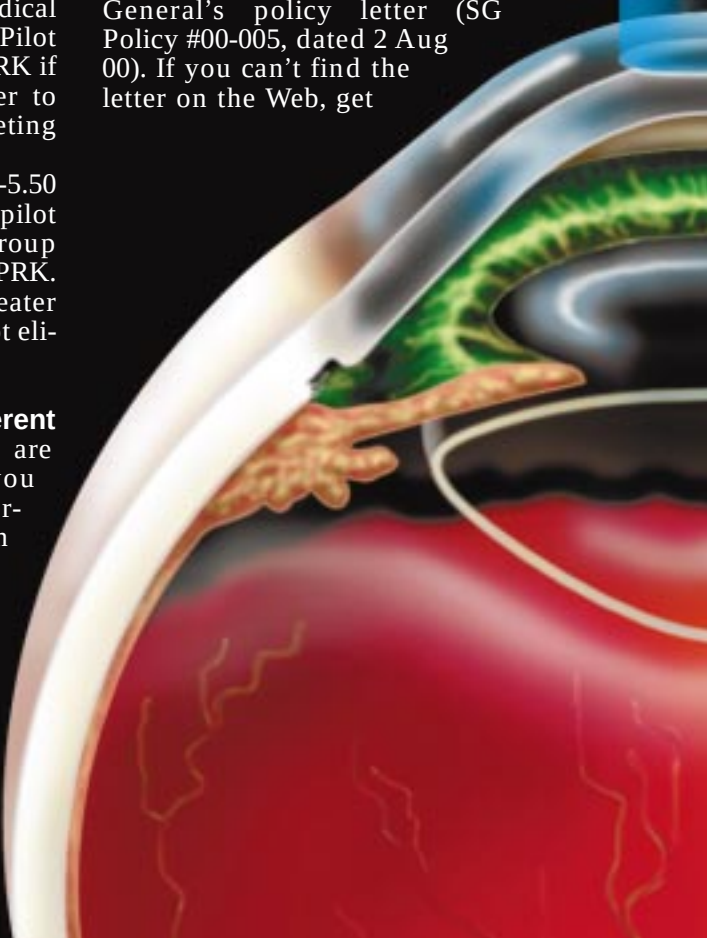
Many reserve and guard pilots are also commercial pilots. For you reserve/commercial pilots considering refractive eye surgery, keep in mind that you'll have to jump three administrative hoops; the Air Force medical regulations (which are whole lot stricter), your employing airline policy and the FAA. Before you say to your eye surgeon, "Let's do it," we strongly recommend you check out your employing airline policy first. Some airlines permit photorefractive surgery and some don't! If you get PRK surgery, your airline will also require you to get a completed FAA Form 8500-7, "Report of Eye Evaluation."

So When Can I Get Back to Flying?

Trained Air Force pilots who receive Air Force-sponsored PRK will most likely be grounded (DNIF) until cleared by their flight surgeon, and that will take about six weeks. Pilot *candidates*, on the other hand, must wait one full year between completing PRK and beginning the flying phase of their pilot training. In other words, the pilot candidate could be approved, accepted and awaiting a pilot training slot in as little as three months post-PRK. However, he or she won't be allowed into the air until that year has elapsed. Post-surgery pilots can expect to have many follow-up exams far, far into the distant future. After all, this PRK stuff *is* a surveillance program.

How Do I Begin Getting a PRK Waiver?

First, get conversant with the regulations. Visit the Web sites listed below and/or read through the Surgeon General's policy letter (SG Policy #00-005, dated 2 Aug 00). If you can't find the letter on the Web, get



one from your flight surgeon's office. These fine folks will have a copy. Second, talk to your commanding officer. All pilots *must* get their commander's written approval before committing to Air Force-approved PRK. Wilford Hall TDY is *unit*-funded, so your CO will have a very practical need-to-know. Third, *then* visit the flight surgeon's office and begin applying for the various waivers, counseling and preliminary exams. The whole PRK process is not quite as simple as scheduling your auto for an oil change.

How Do I Find a PRK Ophthalmologist?

If you're already a qualified Air Force pilot, the system will ship both your eyes and you to a Wilford Hall eye surgeon. That's all there is to it. But if you're a pilot candidate with your passions inexorably set on becoming a flyer with PRK, we offer professional advice. Federal policies understandably prohibit any official Air Force recommendation of specific ophthalmologists qualified to perform PRK. However, since there are over 17,000 licensed ophthalmologists in the United States, pilot candidates will have many choices.

Don't fret—you can narrow your choices to a local, highly-qualified (but not always inexpensive) surgeon by visiting the listed Web sites (below). You may want to select an eye surgeon who is recognized by the following three organizations. First, see if the surgeon is a member of the American Academy of Ophthalmology (and the great majority of ophthalmologists are members). Also, go to the Web sites listed below and check out eye surgeons who are *both* certified by the American Board of Ophthalmology and the Council for Refractive Surgery Quality Assurance (CRSQA). As in marriage and the medical business, there is no such thing as a sure bet, but these certified eye surgeons are more likely to have higher levels of knowledge, experience and patient satisfaction.

PRK is normally quite safe and will give most patients delightful outcomes, especially the satisfaction of pitching those spectacles into the desk drawer. But do remember PRK is elective surgery. They're *your* eyeballs, so first read the fine print—and then choose wisely.

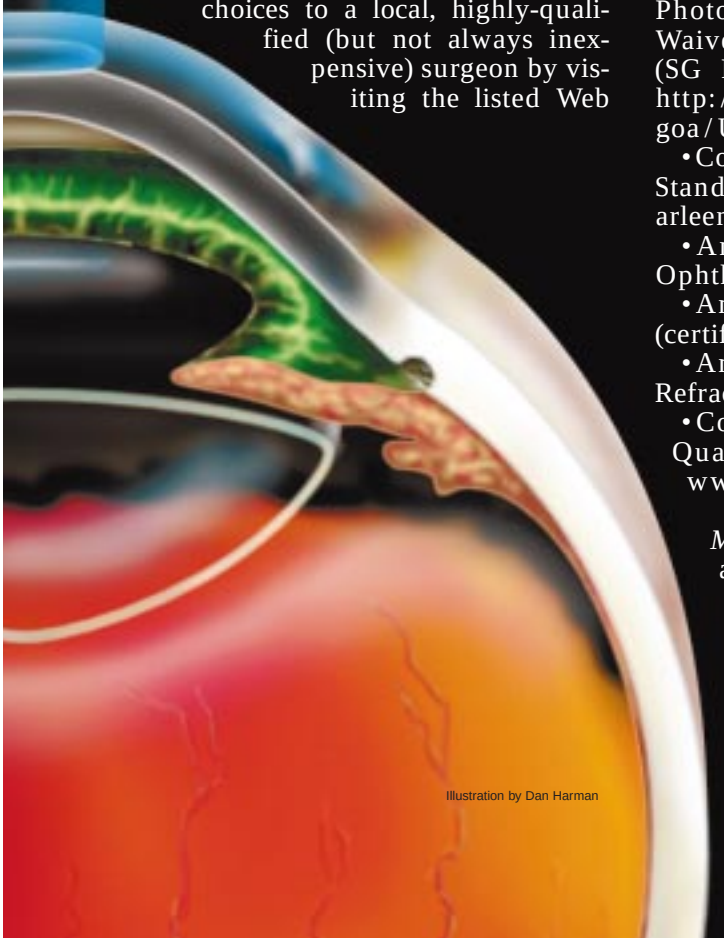


Illustration by Dan Harman

For more information on PRK and the PRK Surveillance Program, we recommend the following sources:

- Surgeon General's Policy Letter, "The USAF Aviation and Special Duty Photorefractive Keratectomy (PRK) Waiver and Surveillance Program," (SG Policy #00-005) dtd 2 Aug 00 http://sg-www.satx.disa.mil/moas-goa/USAF_PRK.cfm
- Col Arleen Saenger, Chief, Physical Standards, at arleen.saenger@usafsg.bolling.af.mil
- American Academy of Ophthalmology, www.eyenet.org
- American Board of Ophthalmology (certification), www.abop.org
- American Society of Cataract and Refractive Surgery, www.ascrs.org
- Council for Refractive Surgery Quality Assurance (certification), www.usaeyes.org
- *The Federal Air Surgeon's Medical Bulletin* "Publications" link at: www.cami.jccbi.gov
- Types of eye surgery, www.allaboutvision.com
- Zap Your Myopic Eyes? *Consumer Reports,* (June 1999)

All pilots must get their commander's written approval before committing to Air Force-approved PRK.

Inherently Dangerous: Inside and Outside the Box

Photo Illustration by Dan Harman

Not one of those pages would have helped in any of those mishaps.

J.S.T. RAGMAN

The semi-annual sim-check was two weeks away. Making good use of the ten-hour flight leg. Review the limitations. Review the abnormal procedures. Review the emergency procedures. Review the checklists. I had been doing so for years. And then came the Concorde. And Alaska Airlines. And Swissair. And ValuJet. And TWA.

As I flipped through the checklists and procedures, and gazed upon the Northern Lights over Greenland, my mind wandered. A blown tire, ruptured wing fuel tanks, two engine failures on takeoff, unable to retract the landing gear. A stripped nut, loss of the horizontal stablizer, no hydraulic control, no electric control, no manual control. An electrical fire in or near the cockpit, toxic smoke and fumes, no electrical isolation procedure. Improperly labeled cannisters, improperly stored cannisters, a super-hot cargo fire, and no time. An empty fuel tank, possible vapors, a stray electron, a short, an arc, an explosion.

One hundred and sixty-six pages of "abnormal" and "Emergency" procedures. Not one of the procedures would have helped in any of the above scenarios. Dozens of pages on landing weight limitations, suitable diversion airports, and phone-patch or satcom procedures for inflight technical assistance. Not one of those pages would have helped in any of those mishaps.

My mind took a path on its own, thinking over the scenarios, the checklists, the procedures. Something just was not sitting quite right in my mind. I was uncomfortable. Something was bothering me. What lessons could I glean? My thoughts came to rest upon the words of that Army Air Corps aviation poster published in the early 1900s. To paraphrase the words: "Aviation is an inherently dangerous business."

Over the course of twenty-plus years of military and airline flying, I suspect I have had a ballpark sixty sim-checks or aircraft check-rides. For every abnormal or emergency situation, there has always been an applicable checklist or procedure. Fly the airplane, find the checklist or procedure, run the checklist or procedure, dump fuel, select a suitable diversion airport, call "home" for technical assistance, land, and walk away with a smile. We are professionals. Done deal. No problem. Case closed. Top Guns. Next.

Technology, standard operating procedures, checklist discipline, human fac-

tors design, the air traffic control infrastructure, and the many other elements of the flight safety system, have greatly lessened the "dangerous" nature of aviation. With millions upon millions of departures and arrivals, crews run checklists, adhere to standard procedures, cover all the bases, land and walk away with a smile.

We are creatures of habit. We are creatures of faith. Time and again, we find the right map, we follow the map, and we find the pot of gold. Time and again, the map, the checklists, the procedures, save lives. And that is inherently, indisputably, a good thing.

Until the Concorde, the Alaska Airlines, Swissair, ValuJet, TWA. Have we allowed ourselves to become lulled? Have our habits and our faith become stumbling blocks instead of stepping stones?

Find the checklist, find the procedure. Can't find one? Look again. Still can't find one? Look for a checklist or procedure that sounds or looks right. Run the checklist or procedure. It didn't solve the problem? Run the checklist (or procedure) a second time. Run it a third time. It still didn't solve the problem? Call "home" and ask the experts. Let them find the correct checklist or procedure. Listen to the elevator music while they conduct their own checklist / procedure search.

Have we been lulled into "the box"? Have we forgotten the "step out of the box" option? Are we trained to "think outside of the box"? Or is it that an inadvertent lesson of the dozens upon dozens of scripted sim-checks is to "stay in the box"? Put another way, have we been taught that "the box will set you free"? Find the checklist, find the procedure, cover all the bases: one, two, three and four.

Undergraduate Pilot Training. Day One. "Maintain Aircraft Control. Analyze The Situation. Take Proper Action." Have we allowed our analysis step to be a mere question of "Which checklist or procedure should we run now?" Have we allowed our proper action step to be a mere matter of "Run the checklist, execute the procedure"?

When was the last time anyone announced in the middle of a sim-check or inflight checkride: "Put it on the ground now, any ground, at any gross weight. Just put it on the ground now!"? If anyone has heard such an exclamation, what was the instructor / evaluator response? When was the last time anyone has been tossed a scenario for which there was no applicable checklist or procedure; deliberately so? When was the last time any of us was trained to "step out of the box"?

The men and women who develop our checklists and procedures have done us all a tremendous service. Their efforts, and our consistently strict adherence to checklists and procedures, have no doubt saved many lives, to include our own. But has their success in anticipating scenarios and developing remedies lulled us into a mindset in which we have forgotten that "aviation is an inherently dangerous business"? Have we allowed ourselves to become mired in "the box"?

We are indeed creatures of habit and creatures of faith. And that is a good thing. Let us turn habit and faith to our advantage. While routinely *operating inside* of the box, develop the habit of "*thinking outside* of the box." Develop an "analysis" habit beyond a mere menu-selection exercise. Develop an "action" habit beyond a mere sequenced execution of "if / then" statements. Develop a strong faith in your ability to think and operate *out* of the box.

Feet dry over Scotland. Done with the North Atlantic plotting chart. Sim-checks had taken on a whole new meaning for me. The sim-check is an exercise and evalaution of my "in-the-box" analyses and actions. It was up to me, however, to recognize the danger of living, thinking and acting solely within the box. It was up to me to ensure I developed an ability to think and operate *outside of the box.*

Aviation remains an inherently dangerous business. People far smarter than I have provided me the tools to operate within the box. And lives are saved. It's up to me to develop the tools to operate outside of the box. Or lives will be lost.

Fly Safe.

("J.S.T. Ragman" is the pen name of a C-130 pilot and unit commander in the Air Force Reserve. A regular Flying Safety contributor, he is also a Boeing 777 pilot for a major airline.)

When was the last time anyone has been tossed a scenario for which there was no applicable checklist or procedure; deliberately so?

Photo Illustration by Dan Harman

"I've Never Seen Flashes That Bright From TP Before!"

The bullets looked "TP blue" on my preflight inspection…hadn't they?

LT COL RICHARD D. TURNER
23 FG/SE
Pope AFB NC

Safety preface: We've all heard the seemingly timeless adage of "breaking the chain of events" to prevent a mishap. Once again, the truth behind such a simple statement comes to light—quite literally in the unexpected explosions of one hundred rounds of High Explosive Incendiary 30mm rounds…

The sortie was briefed as a night two-ship to the local conventional bombing range with a high-time wingman. We each planned to drop six bombs and shoot 100 rounds of TP (Training Practice) using NVGs on the high-illumination night. Our jets were already late and number two ground-aborted due to an engine problem. Single-ship takeoff, en route and range operations went smoothly until the 45-degree High Angle Strafe (HAS). My first HAS pass was planned as a short, 20 to 30-round "sighting burst" to establish a combat offset for the next pass. The unlit target was situated in the center of a 600-foot-diameter circle marked by four lights positioned on the edges at the 12, three, six and nine o'clock positions. The first pass bullets generated a lot of "sparkles" as they chewed into the standard "painted bus" target. The Range Control Officer (RCO) called an enthusiastic "Hit, One" as I maneuvered for the second and final pass.

I planned to shoot the remaining 70-80 rounds on this second HAS pass. This longer burst also created a lot of "sparkles," but in a larger area than the bus should have occupied. I reasoned that they must be hitting the hundreds of near-hit BDUs (inert practice bombs) scattered near the target. Again, the ranger called "Hit, One" as I safed the gun and flew to a base position for my last bombing event. As I approached base, the ranger radioed, "You sure that's TP you're shooting there, One?" to which I replied "That's all they'll load." And then that sinking feeling hit me as the RCO said, "Well, I've never seen flashes that bright from TP before!"

The bullets looked "TP blue" on my preflight inspection…hadn't they? I didn't use a flashlight, but they definitely weren't yellow…were they? Besides, maintenance isn't allowed to load High Explosive Incendiary (HEI) rounds and park the jet on the normal parking ramp, are they? And, even if that were

legal, I would have seen something about HEI in the aircraft forms, and I had reviewed those thoroughly…hadn't I? No, I told myself, these have to be TP rounds loaded in my jet! The remainder of the sortie was uneventful as I dropped my last two BDUs, made a half-dozen dry Maverick passes, and then departed the range for home. But just to ease my nagging suspicion, the first thing I did after shutting down in the chocks was to open the gun bay and re-check the bullets with a flashlight. They *weren't* blue TP: They were yellow HEI!

For most Safety Officers, the events leading up to an incident/mishap are like links in a chain, and this one was no different. Let's trace each link in the safety chain so that you, the reader, can comprehend how dozens of small mistakes and rushed decisions resulted in the temporary loss of a valuable training range and cost hundreds of man-hours in EOD clean-up efforts. We were very fortunate that no one was hurt…or worse.

It all began Thursday at 2000 hours the week prior, as the aircraft was loaded with HEI and two MK-82 general purpose bombs on the Hot Cargo Pad for an Army live-fire exercise. During the preflight engine intake and exhaust inspection, the Crew Chief noticed feathers in the exhaust. A borescope inspection was accomplished, and two fan blades were found to be damaged beyond T.O. limits. The determination was made at that point that the engine would have to be changed. Maintenance Supervision "MND'd" (maintenance non-delivery) the sortie and requested that Weapons come out and download the MK-82s so the jet could be towed back to its normal parking spot. There was no immediate requirement to download the HEI prior to repositioning the aircraft, so it was held until later (Link One).

After the aircraft had been towed back to its normal parking spot on the flightline side of the ramp, the crew chiefs began dropping the engine for replacement and worked until their shift was over, not being able to complete the job they had started. With ongoing major engine maintenance, neither electrical nor hydraulic power could be applied to the aircraft. Without aircraft power, the weapons load crew was unable to download ammunition from the jet, and the task was further delayed (Link Two).

Ironically, Friday was a Group Safety Day, and no maintenance was performed. On Saturday, the weekend duty crew came in to finish installing the engine. It was installed and operationally checked. The aircraft was pronounced Fully Mission Capable (FMC); however, it was late in the day. The weekend duty weapons crew made the decision to wait and download the HEI ammo first thing Monday morning (Link Three) because maintenance had already produced sufficient FMC aircraft for all of Monday's scheduled sorties.

On Monday morning, one of the scheduled aircraft was discovered to have a LOX problem and the spare aircraft was substituted in its place. The Production Superintendent (Pro Super), in conjunction with the squadron senior supervision (Top-3), agreed to add this aircraft to the lineup as a spare for a sortie that would not require use of the gun. The day shift Top-3 was reminded about the HEI, and the Pro Super agreed to brief all pilots.

The aircraft forms were reviewed and there were over 25 pages of 781As due to the engine change. When the crew chief carried forward all the outstanding write-ups, he overlooked the Info Note about the aircraft being loaded with HEI (Link Four). There is usually no need to carry 781A Info Notes forward on a day-to-day basis. The two Info Notes most often found in the forms are for Ammo/Chaff/Flare and Mode IV. The first of these is recorded by Weapons during the Weapons Postload, and the second is written by Comm/Nav before the Exceptional Release (ER) is signed. Both are on a computer generated sheet that is replaced daily. When the Pro Super ER'd the aircraft, he failed to notice that the HEI Info Note had not been carried forward to the new set of forms (Link Five).

Weapons safety procedures dictate that all aircraft loaded with HEI ammunition must prominently display an orange, X-shaped "2" fire symbol to easily identify the presence of explosives to emergency response personnel. The placard was properly affixed to the aircraft nose wheel by a bungee cord at the time of the ER, but was not noticed by

continued on next page

There was no immediate requirement to download the HEI prior to repositioning the aircraft, so it was held until later.

He would fly an unmodified jet and I had unknowingly acquired the HEI-loaded one.

the Pro Super nor pointed out to him by the crew chief (Link Six).

One of the first launch aircraft returned Code 3; a system on the aircraft was non-operational and it couldn't be used for the next sortie. Now designated as the spare aircraft, the HEI jet was flown in the second launch without incident. That pilot was briefed several times that the jet was loaded with HEI and the "2" placard was properly displayed when he arrived to preflight the aircraft. After recovery, between the second and third launch, the "2" placard wasn't put back on the jet (Link Seven).

Between the second and third launch, there was a complete shift change between the crew chiefs, Production Superintendents and Top-3 supervision. The new Top-3 was briefed about the HEI ammo and he, in turn, briefed the pilot scheduled to fly that aircraft. Due to the timing of the pilot-ready jets and the mission priorities, the Top-3 made a change in the planned aircraft line-up. My wingman was unknowingly scheduled to fly the HEI-loaded aircraft. When my flight arrived at the Ops desk to get a Step Brief from the Top-3, we were told that the jets were not yet ready. We were also told that Number Two's aircraft was one of the new Embedded GPS/INS (EGI) modified aircraft, an improved navigation and weapons delivery system that was procedurally very different and difficult for an inexperienced pilot to use properly. My wingman had never flown in an EGI jet and didn't want to make his initial EGI familiarization flight at night. So with Top-3 approval, we swapped jets at the duty desk. He would fly an unmodified jet and I had unknowingly acquired the HEI-loaded one (Link Eight). We waited at the Operations Desk with the Top 3 for 20 minutes before we received our Step Brief. In all that time, the Top-3 made no additional mention of any of our jets carrying HEI or any other non-standard configuration (Link Nine).

We finally stepped out the door twenty minutes later than planned. The parking locations given to us were situated on opposite ends of the ramp and had been somehow swapped, making us later still as we each walked first to the wrong jet, then all the way across the ramp to the correct one. My aircraft's forms were cluttered, and after reviewing 10-15 pages of 781As, I discovered that the intake and exhaust inspection (Red X) had not been properly annotated and carried forward to the 781H. The crew chief made the appropriate changes to the forms before I made my final review. The Exceptional Release on the 781H was not signed by the Pro Super, which is not uncommon for second or third flights. I felt comfortable with my thorough review of the forms and signed my own ER (Red Dash) rather than delaying even longer waiting for the Pro Super to come out and sign it off (Link Ten). There was no mention of HEI anywhere in the forms, the orange "2" placard was nowhere in sight, and the new crew chief never

USAF Photo by TSgt Michael Featherston

mentioned anything about the ammunition loaded.

The sun had just set about ten minutes before, but there was still plenty of ambient light to do a visual walk-around without using a flashlight. In order to check the bullet type in an A-10, you have to open a 5" x 7"-size access door under the nose of the jet and look up about two feet into the ammo feed mechanism. There is usually enough daylight reflected off the parking ramp into this area to easily distinguish bullet colors, but the sun had already set. I was late, in a hurry, and didn't use my flashlight because I thought there was still enough natural light to determine color (Link Eleven). I had been flying at this particular base for over a year and a half and had never seen anything other than TP loaded in the gun for local area sorties. We had only recently completed the approval process for live ordnance and there were specific restrictions on where these jets could be parked. I was under the impression that if HEI rounds were loaded in a jet, then that jet would have to be parked in the Live Load Area, not on the regular parking ramp (Link Twelve). I was in a rush to meet my takeoff and range time and as I looked up into the gun bay, I saw dark colored bullets in the feeder mechanism that appeared blue because that was what I was expecting to see. At that moment, I became Link Thirteen, the last link in this long "Safety Chain."

The final result of this long chain of events is 100 rounds of 30mm High Explosive Incendiary ammunition spread across the training range, a few undoubtedly unexploded, and an out-of-cycle range clean-up costing hundreds of EOD man-hours. Everyone in this chain of events had at least one chance to prevent this incident by either: following Tech Order guidance to the letter, paying close attention to detail, applying sound common sense and/or Operational Risk Management (ORM) principles, or just having the presence of mind to ensure that important details are communicated properly and timely.

Safety Post-flight: In this situation, the pilot outlines the 13 specific steps that led to this incident. While investigations and incidents may seem to focus on the operators who were "hands on" at the time of occurrence, this example highlights how all too often they really represent just another step, albeit the culminating and final one, to an otherwise preventable mishap. The breaking of any one of the thirteen links of this mishap chain would have prevented this mishap. While our actions at any given time may seem insignificant to the grand scheme, the cumulative effects of such actions with those of everyone around us can easily lead us to a mishap—or to its prevention. The links in the chain to a mishap must be proactively identified at every level. In this case they only became obvious when it was too late to turn back, and the bullets were already on the target.

As I said earlier, we were very fortunate that no one was hurt. Really fortunate. +

At that moment, I became Link Thirteen, the last link in this long "Safety Chain."

Do What I Say, Not What I Do

I had been singularly impressed with his failure to communicate his intentions with other members of the crew.

LTJG PAUL KESLER, USN
VAQ-131

After over 2-1/2 years of flight school I was finally sitting in a jet on an aircraft carrier. My EA-6B FRS class was taking its turn as backseat riders for a carrier qualification detachment aboard the USS Abraham Lincoln. As NFOs (Naval Flight Officers), we were excited about the opportunity to experience the essence of carrier aviation for the first time. A couple of days before we left Whidbey Island, the FRS CQ instructor sat the five of us down to brief us on the various types of launches and recoveries, and what we could expect to see up on the flight deck. The thing he emphasized the most was flight deck safety. Where to go, where not to go, always keep close to the instructor, and know your emergency procedures. There was also a point that he adamantly made several times. Before any airplane moved from its parking spot, all crewmembers would be completely strapped in, masks on, and visors down. No exceptions, period.

The first two days of the CQ period went well, as I was bagging a lot of traps. Better yet, all of our new pilots were well on their way to qualifying. On the last afternoon the LSOs were set to fly and CQ, so they would make the fly-off that night. I ended up flying with two instructors from a land-based squadron that were sent out for refresher training since they hadn't seen the boat in over a year. I knew walking up to the jet that it was going to be a long afternoon for me in the back seat because three pilots were going to be cycled through our jet.

We taxied out of the landing area after the second trap and parked the jet in front of the island for a hot pump and crew switch. The plan was to switch the pilots first, then take our gas. After the jet was safely chocked and chained I safed my ejection seat and unstrapped IAW squadron SOP for hot refueling. The first pilot chuckled something about dinner and that he would see us for midrats, then climbed out.

As our next pilot climbed up, I realized it was our instructor from the boat safety lesson the week before. In my only other flight with this pilot I had been singularly impressed with his failure to communicate his intentions with other members of the crew. I thought to myself, "This ought to be interesting." He jumped in the jet with only about another hour of sunlight left and still one more LSO waiting in the wings to use our aircraft. He was noticeably in a hurry climbing into the jet.

The perceived pressure to get done quickly is the only rationale I can think of for the sequence of events that followed. Apparently, the pilot decided there was enough fuel for a quick run through the pattern without going

Illustration by Dan Harman

below "hold-down" fuel. So, he made the decision to launch with the gas we had. However, he failed to convey any of these intentions to the rest of the crew and out came the chocks and chains. The crew received no verbal warning from the pilot as we began to taxi toward CAT 1. As soon as I came to the realization that we were rolling I set the land speed record for attaching all six points of the ejection seat and strapped my O2 mask up to my face. What concerned me next was the vision of my pilot's shoulder harness straps hanging unattached at the top of his seat. The taxi to CAT 1 progressed as the takeoff checks were completed and, thankfully, everyone finished strapping into their seats. After the on-deck flail exercise, the flight actually went smooth and without incident.

At the end of the long flight I climbed out of the jet and enjoyed the sunset, quite happy that it hadn't been my last. As I made it back to the ready room I was dumfounded to learn during an all-NFO debrief that ECMO 1 had not been strapped in when the aircraft started to move either. I thought to myself, "How could the FRS CQ instructor have broken faith with his students so blatantly?" I had listened intently to everything he had to say about CV operations and safety. I was dismayed to see him so cavalierly disregard the lessons he claimed to hold so dear. The worst thing that happened, though, was that I never asked him about what happened that afternoon. Anger initially kept me from approaching him on the subject and eventually one thing led to another and I never spoke with him about it.

Yes, it's bad enough that he put us in that situation, but I should have taken the initiative of telling him about it. Although my "rookie" analysis may have fallen on deaf ears, he would have heard it and I would not feel as if I had failed to bring an important issue to light.

We debrief our flights so the aircrew can all sit down at one "G" and zero airspeed and talk about what happened (or didn't happen!) during the flight. We never conducted a formal debrief that night, but I should have taken it upon myself to say something to him when we got home. The major lesson learned that day was to always speak up about safety of flight issues, whether you're the salty dog or new guy. Even if you don't have time right that moment, make a point of it to discuss the issue at a later date. If we fail to speak up when we see safety violations they'll simply continue unabated. Eventually, we'll all pay the price.

It's bad enough that he put us in that situation, but I should have taken the initiative of telling him about it.

Luckily, They Didn't Use Risk Management

Lest we forget the lessons

It is certain that the highest German leadership made several critical mistakes at a time when mistakes were unacceptable.

Courtesy US Army *FLIGHTFAX*, October 1999

LT COL MARK ROBINSON
CHIEF ATTACK BRANCH
US ARMY SAFETY CENTER

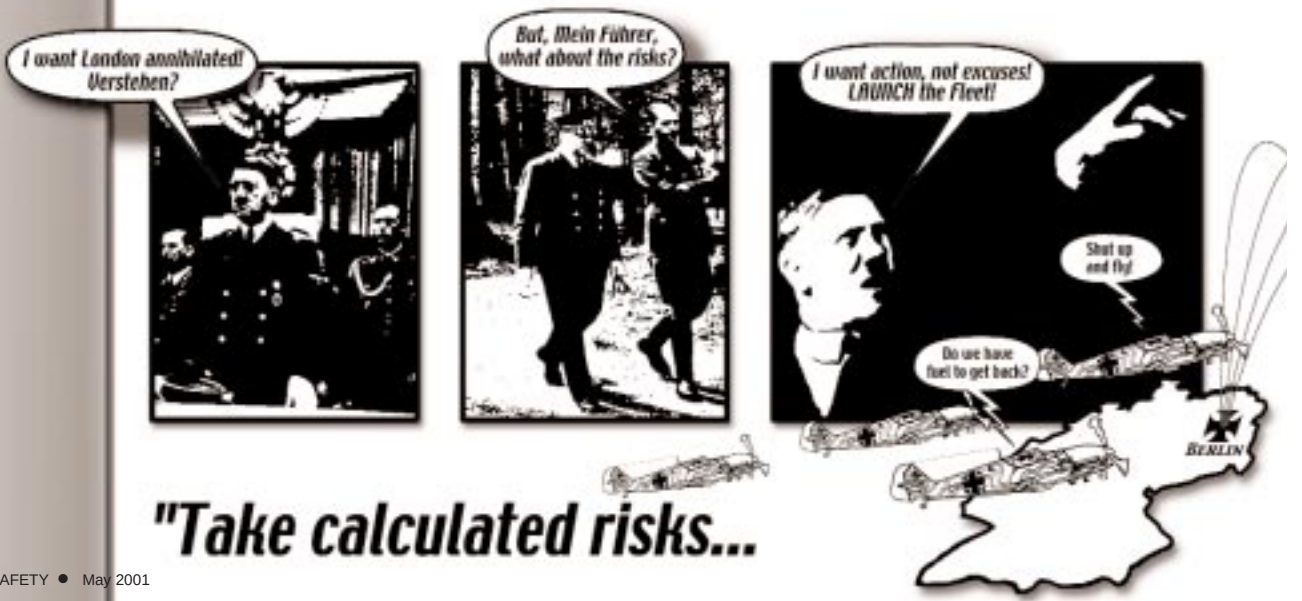
A dramatic and violent battle raged in the skies over Great Britain during the summer of 1940. Field Marshall Göring promised Hitler that the Luftwaffe could and would make quick work of the Royal Air Force, as the forerunner to Operation Sea Lion, the German invasion of the British Isles. Why couldn't they? Success belonged to the Luftwaffe and their tactics known as Blitzkrieg, the first fully modern, combined arms warfare. In a matter of months, they had conquered all of Western Europe, handing defeat after crippling defeat to the Allies.

The Luftwaffe was at its peak in proficiency. They were combat-experienced, confident and battle-hardened. They had flight time, training and field leadership. They outnumbered the British by more than two-to-one.

Historians and scholars argue about the reasons why the Luftwaffe eventually failed at gaining and maintaining air superiority during those crucial months, but it is certain that the highest German leadership made several critical mistakes at a time when mistakes were unacceptable. They failed to recognize the newly developed technology that radar offered the RAF as a force multiplier. The British, using radar, were able to mass their very limited fighter resources in the right times and places, intercepting, attacking and disrupting the huge German bomber formations.

Although the Germans initially went after the RAF fighter bases, attacking their aircraft and support facilities on the ground, Hitler ordered a shift in policy. After a German bomber formation accidentally bombed London, RAF bombers retaliated against Berlin, something Hermann Göring promised would never happen. Absolutely furious, Hitler ordered London bombed off the face of the earth, giving invaluable recovery time to the RAF fighter squadrons.

Having limited range, the German fighters were unable to escort their bomber formations to the targets. Had they utilized drop tanks, the bombers would have taken far fewer losses. In essence, the Luftwaffe faced the same



problems as the Army Air Corps faced in the latter stages of the war.

However, in wartime, mistakes do happen, and the German High Command leadership made their share. Still, the Germans came incredibly close to winning the Battle of Britain. With their superiority in sheer aircraft numbers, the Germans could have easily defeated the British, despite mistake-ridden, High Command decisions. The slight difference could have been made with the concept of risk management.

Wartime accident losses are usually preventable and reduce your ability to complete the mission. It is even more true today than then. Although no statistics are available on exact losses due to accidents, it is fair to assume that at least 50 percent of the 1655 German aircraft lost were due to accidents. This rate has remained somewhat steady over history for the United States, ranging from 56 percent in WWII, to 44 percent in Korea, to 54 percent in Vietnam. In Desert Storm, accident losses went to 75 percent of the total US casualties (USASC files).

Given the extreme conditions of the extended ranges, poor weather conditions, field maintenance, flight discipline, and rushed training, it is conceivable that a 50 percent loss rate due to accidents is quite realistic for the German forces. Imagine if the basic German leadership had used the principles of risk management. Imagine if they had identified and controlled, to the best of their ability, hazards to protect their force. A reduction of perhaps five to ten percent might have made the difference in the numbers, allowing the Luftwaffe to deplete the severely limited RAF fighter pilot reserves and gain air superiority.

The risk-management process is not rocket science. The simple steps, when incorporated into every activity, reduce the risks to an acceptable minimum. The steps are (1) Identify hazards, (2) Assess hazards, (3) Develop control measures and make risk decisions, (4) Implement controls and (5) Supervise and evaluate. (NOTE: The Air Force uses a six-step process: (1) Identify the hazards, (2) Assess the risks, (3) Analyze risk control measures, (4) Make control decisions, (5) Implement risk controls, and (6) Supervise and review.) Using this process, the Germans could have effectively reduced maintenance errors, weather-related errors, weather-related accidents, crew-mix-related accidents, crew coordination problems and training-related accidents. Indeed, the very switch in tactics from Blitzkrieg to massing aircraft to obtain air superiority likely caused battlefield confusion and probably was not taken into account as a potential hazard.

Remember, the fine line between victory and defeat is sometimes measured in small numbers. Even a slight reduction in the German accident rate could have made the difference then. It is important that we do not forget the lessons of the past and incorporate our safety doctrine and risk management techniques into all operations, peacetime and wartime.

Imagine if German leadership had identified and controlled, to the best of their ability, hazards to protect their force.

...That is quite different from being rash."

—General George S. Patton, Jr.

JOLT?

Photo by TSgt Michael Featherston
Photo Illustration by Dan Harman

He got the $#!% knocked out of him by a jolt powerful enough to drop him to his knees.

MSGT EDWARD L. WARWICK
93 ACW/SE
Robins AFB GA

As Flight Safety NCO for the 93rd Air Control Wing, with 20 years experience on large aircraft, I thought I'd seen everything during my career. For the last four years as a safety professional, I've investigated incidents and mishaps that were pretty easy—in-flight engine shutdowns, dropped objects, bird strikes, etc. But last August, I had one of those investigations where as soon as you kick one rock out of the way, you find three more underneath it.

One afternoon the Command Post reported that a crewmember on our E-8C had been shocked and the plane was returning to base. As the aircraft came to a stop, I met the flight crew and discovered the navigator had been shocked by a coffee jug. As the Nav was being transported to the hospital, I quickly found out that he didn't just get zapped; he got the $#!% knocked out of him by a jolt powerful enough to drop him to his knees. The aircraft commander also told me that shortly after receiving the shock, the Nav complained of lightheadedness and shortness of breath.

Immediately after the incident, Maintenance inspected the aircraft and the coffee jug. An ohms check revealed resistance between the 115-volt pin and the metal case. At first we thought there was a short in the coffee jug when it was hot, but a continuity check after it

cooled down showed no defects. The next day, one of our squadron commanders reported receiving a mild shock from a coffee jug a week earlier. After this incident, the flight kitchen was informed of the mild shocks and was asked to condemn the jug. With no knowledge of maintenance and inspection requirements, they placed the jug back on the shelf for use at a later date. This same jug is believed to have shocked the Nav.

When we talked to the flight kitchen personnel, we discovered that about three and a half years earlier, the wing had coordinated with the kitchen to maintain the jugs. Eventually, the kitchen maintained approximately 50 coffee jugs for three different units on base. We could have just condemned this one jug and pressed on with life, but a team was assembled and began checking the rest of the jugs in the kitchen. As we talked with other individuals within the wing, we soon discovered at least two other incidents involving 93 ACW aircrew members receiving mild shocks from coffee jugs. An inspection of other coffee jugs in the kitchen revealed that five of 50 jugs showed suspect continuity between the pins and the metal case.

At this point, it wasn't known if a technical manual existed for the jugs or how to properly inspect them. We later discovered that T.O. 13A15-4-3 covers this type of coffee jug. It states that the jugs should be inspected every 180 days, and that the reading between all the pins in the plug and metal case must show infinite resistance (zero ohms). In addition, it cautions not to submerge the coffee jugs, due to the severe potential for heating element corrosion and short circuit. Until this incident, qualified personnel were not inspecting these containers according to the technical manual, and the jugs were routinely being submerged in water. After finding the testing procedures in the manual, our electrical backshop personnel began reinspecting 23 of the original 50 jugs. Eighteen of the 23 jugs had enough significant defects to pull them from the shelf.

The inspection of the coffee jug that shocked the Nav revealed the insulation on the wire supplying 115 VAC to the container's heating element had deteriorated and allowed the conductor of the wire to contact the metal case of the container. When the coffee jug was moved around, the wire would reposition and may or may not show a defect when ohms-checked. The heater supply wire contacting the case was one of two malfunctions required to allow the outside of the container to become electrically charged; the other was an insufficient electrical ground. If the container was well-grounded, the current would pass from the wire into the case of the container and out the ground, and there would be no voltage potential between the container and the aircraft structure. If the coffee jug was properly grounded, the circuit breaker would have heated up and popped. An inspection of the circuit breakers revealed no defects. Before the Nav touched the jug, it had no ground available, so the circuit was not closed and no current flowed through the circuit breaker. The Nav briefly provided a current path when he touched the jug. The relatively high resistance of his body and the small time he was touching the jug limited the current through the circuit breaker to levels below that required for it to actuate.

At first, we weren't sure if this would turn into a mishap, because we didn't know the condition of the Nav for the first couple of days. After he was checked out by the Flight Surgeon and released for duty, we decided to send out a HAP (High Accident Potential) message. To our amazement, we've received numerous calls from other bases noting similar problems with the jugs; they too had not been inspecting their coffee jugs.

For the Nav, I know everyone in the wing has ribbed you about this incident, and I'd like to publicly thank you for your sense of humor. I'm grateful you weren't seriously injured.

Here's the bottom line: Technical orders are written for a purpose. They provide information to disassemble, clean, inspect, replace, repair and assemble items used in the Air Force. As a suggestion to all units, be reminded of the hazards associated with non-compliance with all technical orders, manuals, AFIs, etc., including T.O. 13A15-4-3.

We lose far too many people every year for reasons beyond our control. Crying over spilt milk is one thing, but is it worth dying over a cup of coffee?

Until this incident, the jugs were routinely being submerged in water.

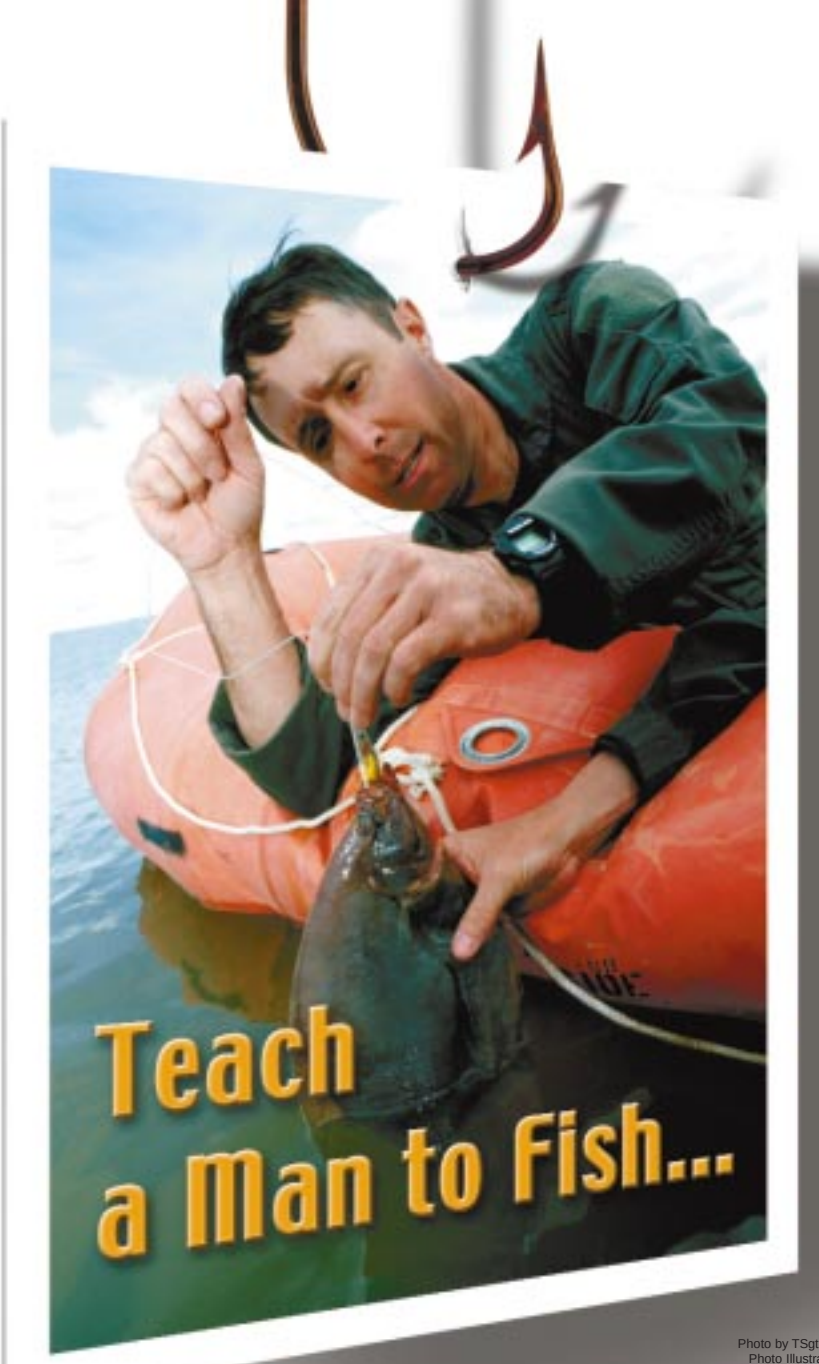


Photo by TSgt Michael Featherston
Photo Illustration by Dan Harman

Getting food helps survivors maintain their emotional, as well as physical, well-being.

MSGT BRYAN KASMENN
27 OSS/OSTL
Cannon AFB NM

"Give a man a fish and he'll eat for a day, but teach a man to fish and he'll eat for a lifetime."

This old adage sums up much of the guidance/philosophy of survival training. To put it another way, we survival instructors don't extract or rescue our students from a situation, we teach them how to deal with it. After spending 11 years teaching aircrews who flew almost all their missions over water, I became interested in the literal application of this adage—to teach a hungry survivor, adrift in a life raft, how to procure food.

Getting food helps survivors maintain their emotional, as well as physical, well-being. It gives them control over something, so they feel they are taking steps towards survival, even if they don't catch anything. Most importantly it can be a great morale booster. The sense of accomplishment in "Look Ma, I caught a fish" can greatly improve the

will to survive. As a side benefit, the act of procuring fish, or even just the attempt, may help prevent seasickness, by keeping the mind and body active (this worked for me).

A note about water: Without water, the survivor should not be eating. The reason is that it takes approximately two pints of water to supply the body's demands for gastric juices and the disposal of the waste products of protein matter. However, sea survivors have procured and eaten much of what the sea will provide with a great deal less than two pints a day.

Advice from the Experts

Edible sea life comes in many forms. In this attempt to "teach a man to fish," I will discuss how survivors/sea adventurers have procured plankton, fish, sea birds, turtles and even barnacles. I will not discuss the signs and symptoms of poisonous marine life, which you can get in any survival manual, beyond warning to avoid those fish that look like members of a punk band. But here's a quote from Dougal Robertson's Sea Survival: A Manual (he and his family spent 37 days adrift, half in a condemned inflatable raft and the other half in a fiberglass dinghy): "The adjustment to primitive eating practices should be made before desperation robs the castaway of basic good judgment of the difference between what is harmful and what is simply disagreeable. It is better to live dangerously than to die cautiously."

Besides Robertson, I will also be using information from Maurice and Maralyn Bailey (who spent 117 days adrift in two inflatable rafts), Poon Lim (133 days adrift in a wooden life boat), Steven Callahan (adrift 76 days in an inflatable raft; he used Dougal Robertson's book Sea Survival: A Manual to help meet his needs), Thor Heyerdahl (leader of six men who traveled 4300 nautical miles in 101 days on board a balsa wood raft called the Kon-Tiki), Dr. Alain Bombard (a self-inflicted castaway who sailed a life raft 65 days to prove an individual could survive off the bounty of the sea) and William and Simone Butler (66 days adrift in an inflatable raft).

Plankton

Plankton is a general name for thousands of species of visible and invisible small organisms which drift at or near the surface of the sea. Some are plants (phytoplankton), while others are loose fish ova and tiny living creatures (zooplankton). In waters where plankton is plentiful, there are thousands of them per cup of seawater.

Thor Heyerdahl used a silk "net" sewn in the shape of a funnel with a circular mouth (formed from an iron ring) about 18 inches across, towed behind the raft Kon-Tiki. The best catch was during night and in the cooler waters off the west coast of South America. Most of what he got were tiny shrimp-like crustaceans and fish ova, but he also got marine larvae, miniature crabs, jellyfish and an endless variety of small creatures. Heyerdahl says, "The inedible vegetable plankton were either so small that they washed away with the water through the meshes of the net, or they were so large that we could pick them out with our fingers. 'Snags' in the dish were single jellylike coelenterates like glass balloons and jellyfish about an inch long. Otherwise everything could be eaten, either as it was or cooked in freshwater as gruel or soup….And, bad as it smelled, it tasted correspondingly good if one just plucked up the courage and put a spoonful of it into one's mouth. If this consisted of many dwarf shrimps, it tasted like shrimp paste, lobster or crab. If it was mostly deep sea fish ova, it tasted like caviar and, now and then, like oysters."

Dr. Alain Bombard packed a plankton "net." His plan was to maintain his vitamin C intake by eating plankton, not really considering the protein content of this food source.

To trap plankton in large quantities, the survivor may have to improvise some type of net. I thought of occasionally bringing in the sea anchor (when its end has been pulled closed or tied off) on the nights when the plankton are running thick. Or you might carry (or have someone donate) a pair of pantyhose. Using either line from the survival kit (at least one 30-foot, 100-pound test line per 20-man life raft), fishing line or the line from the activation lanyard, tie off the ends of the improvised net. Lacking nylons, a t-shirt or even socks may work. The Robertsons talked about using sailcloth, but never tried it.

continued on next page

Bad as it smelled, it tasted correspondingly good if one just plucked up the courage and put a spoonful of it into one's mouth.

USAF Photo by TSgt Michael Featherston

Gulls, boobies and the like will perch on your raft—and sometimes even you.

Barnacles

If plankton isn't your cup of tea, how about barnacles? Steven Callahan ate the barnacles that formed on his man-overboard pole: "I easily peeled three or four ounces of barnacles from the line. Mixed with rainwater, they made a slightly crunchy soup, which I drank from my Tupperware™ box." Callahan wasn't alone in doing this. Poon Lim and the crew of the Kon-Tiki ate the barnacles that grew off the sides of their vessels. Our survivors could eat any barnacles that grew off their life raft CO_2 bottle.

Callahan also pulled in large clumps of seaweed and ate the small mottled-skinned Sargasso fish, small shrimp, and especially the small crabs attached. He avoided the wormlike creatures and jelly-like slugs.

Turtles

Turtles were the main part of the Robertsons' diet and provided a change in diet for the Baileys. In most accounts, a sea turtle would bump up against the bottom of the raft and then pop up on the other end. This gave the survivors warning time, so they could grab the turtle by the hind flippers and haul it in, keeping its beak and front flippers (claws) from doing damage to the raft and its crew. They flipped the turtle on its back and cut the neck, severing the arteries and veins. (This sounds a great deal easier then it actually is.) The blood was used as a "sauce" for sun-dried fish meat, and even the eggs found in female turtles were eaten.

Sea Birds

Poon Lim, the Baileys and Steve Callahan had meals "flown in" or "air-dropped" to them, in the form of sea birds. Initially, the Baileys and the Robertsons didn't think about harvesting these "meals-on-wings," but on their second opportunity the Baileys snatched and wrung the neck of a bird, while the Robertsons never got a second chance. The wide-ranging birds, such as albatross, petrels or frigate birds, seldom approach close enough to be caught by hand, but gulls, boobies and the like will perch on your raft—and sometimes even you. Poon Lim and Dougal Robertson had birds actually land on them. A baited hook can also be used to attract low-flying birds. Just make sure to have the line tied to something that you can easily hold

onto like a mechanical pencil, because second degree burns and cuts can occur from fishing line and parachute cord. The swift use of a flight boot, an improvised club (blunt objects are best) or just a snatch/neck-wringing will invite your aerial visitor to stay for dinner. It's better to skin the bird than to pluck it, especially if eating it raw.

Fish

Fish have been known to land in the survivor's pot—specifically, flying fish have landed in rafts and on survivors, usually smacking their face or chest. These fish have been found on top of raft canopies and in the bellies of larger fish. Our sources used them as a great breakfast snack to start the day, and also took parts (heads, mostly) to bait hooks for other fish.

Survivors have used an assortment of methods to procure other fish. The Baileys used their emergency fishing kit at an early point during their cruise and failed to return it to their life raft's emergency equipment (one of those classic examples of why you don't rob your survival kit), so right from the start they were reduced to improvising different techniques. In the end, their haul of fish was an impressive one, an average of 40 fish a day, with over 100 fish on some days. When procuring fish, the Baileys used safety pins for the most part, cut off short and bent back. Safety pins are found in the first aid kits in all multi-passenger life rafts.

With their converted safety pins, the Baileys caught most of their Dorado (also known as mahi-mahi or dolphinfish) directly beneath the raft or in its immediate vicinity. They fished with a vertical line. A quote by Maralyn Bailey: "Maurice always let the fish swallow the hook before he caught them and would use six or eight pieces of bait to catch one fish. This was too slow for me and my expertise had improved so much that, as soon as the fish got close to the bait, I gave the line a jerk. Rather than discourage the fish, this had the opposite effect. Once I had jerked it away from them they swam fast towards it and held on tightly to the bait. I would haul them quickly over the side and fling them in the dinghy. My fishing had little style about it but it was fun."

Methods

Fishing by hand with bait relies on the greed of some species of fish and on the fact that, once they bite, they don't readily let go. This was how Maralyn Bailey, after catching and dismembering a booby, came to put the wing, dripping with blood, into the water. Some fish bit straightaway, and with a flick of the wrist she shot them into the raft. She had a fine day's catch and didn't risk her precious "fisherman's" safety pins. The same method was later used with a turtle's shoulder blade, some strips of flesh or the bloody skin of sharks, and so on.

An equally effective form of bait is a piece of cloth, which has just been used to wipe up blood and scraps after dismembering a fish or a turtle. Almost all carnivorous fish—not just sharks—are extremely responsive to the smell of blood.

Poon Lim also started out with no fishing equipment. He rationed himself very strictly from the beginning, for the provisions were very skimpy. Once they were gone, he started to work out how to fish. Removing one of the loops of rope attached to the side of the raft, he separated its strands and tied them end-to-end. As a hook he used a galvanized nail from the raft, which he bent with his teeth. For bait he had put aside a piece of his last biscuit, making it into a paste with saliva and letting it dry in the sun. This lash-up fishing tackle was good enough for him to catch his first fish. Restraining his hunger, he used it as bait for larger ones. This paid off, and from that point on he lived on raw fish. Mr. Lim also took apart a saltwater-activated light, once it stopped functioning, and used the interior wire spring for a hook.

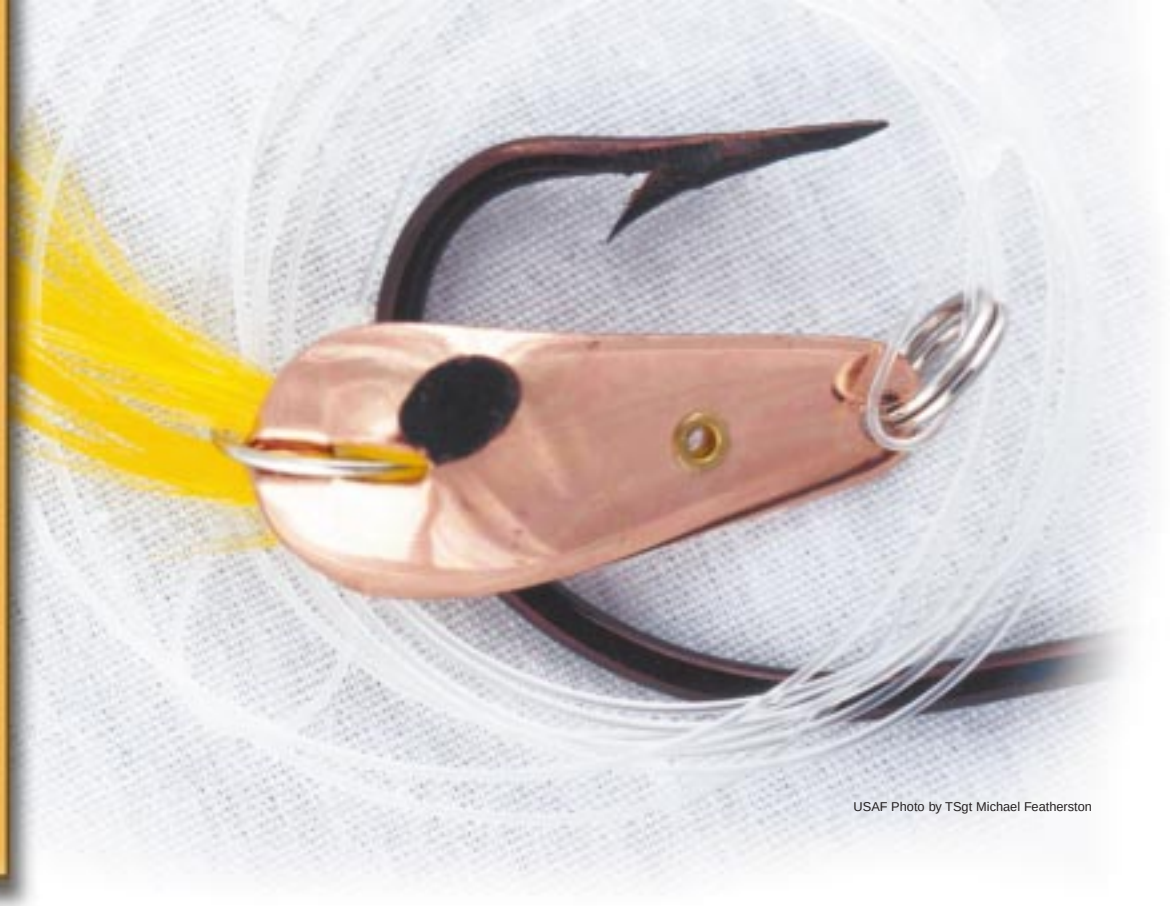
Even though he had plenty of hooks, Dr. Bombard improvised hooks from the body of a Dorado. Behind the fish's gill cover is a perfect natural bone hook. In this way the Dorado provided both hook and bait, which he used to catch many a fish.

Part of Callahan's original survival equipment was a fishing harpoon gun. When he lost the launching mechanism, he lashed the harpoon to the gun and using it like a spear. He would kneel for hours waiting for a passing fish to be at the perfect spot and then jab it with the makeshift spear.

continued on next page

Almost all carnivorous fish—not just sharks—are extremely responsive to the smell of blood.

By improvising and problem-solving, they were improving their will to survive—not just accepting their fate, but struggling against it.



USAF Photo by TSgt Michael Featherston

Having limited luck with fishhooks and line, Dougal Robertson improvised a spear. He later converted it to a gaff, then redesigned it to allow for a swiveling hook and additional safety lines to secure it. Using this tool, he pulled in fish ranging from 15 to 25 pounds.

William Butler used his pocketknife in much the same manner as a spear or gaff. He held it under water and jabbed upwards, spearing fish. He then followed through and brought the fish up into his inflatable raft.

The Baileys used something they called their "fish trap," in which they caught large quantities of small fish. It was a blue one-gallon plastic container (for kerosene), measuring 8" by 8" by 7" wide, with a handle on top and a spout. A square hole was cut on the side opposite the spout, and a line was threaded through the spout and then baited inside the container. Using the handle, it was lowered over the side of their raft until the hole was below the surface of the sea. With patience, they could get about 20 fish for breakfast. Unfortunately this method of fishing only attracted the triggerfish, and it could only be used in reasonably calm weather.

As a young staff sergeant, I used a variation on this technique off the coast of North Carolina. While cleaning out the 20-man life raft bailing bucket I had used for motion sickness, I noted that small fish which had been swimming under the raft came up to feed. Several of these fish (4–6 inches each) ended up inside the container. I repeated this process several times, and the fish ended up as bait and "sardines." Whatever works, right?

In almost every case I've mentioned here, the individuals were doing more than just catching fish. The fish were for their survival, but procuring them was a way of adapting to their environment. By improvising and problem-solving, they were improving their will to survive—not just accepting their fate, but struggling against it.

Dougal Robertson sums it up best: "...our chances of surviving among them (sea creatures) lay in our ability to adapt our past experiences to present circumstances. Our ability to fashion tools, to help each other physically and psychologically, and to use knowledge as a weapon of offense as well as defense, these were the attributes that would allow us to live from the sea."

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Pay Attention!

Real-life drama of an accident that *almost* happened

LT COL RUSSELL SMITH
Iowa Wing Civil Air Patrol

"Airplane Crashes into Wooded Lot: 2 Injured, Aircraft Destroyed"

Here's the story of how this headline *didn't* get printed:

The flight was scheduled as a mission check ride for the pilot in the left seat, with a mission check pilot riding in the right seat. The aircraft was a 1979 Cessna 182 with a little more than 650 hours on the engine. The check ride was scheduled to last about one hour, southwest of Cedar Rapids (KCID) airport.

Preflight and pre-takeoff checks went according to plan, and the engine showed no abnormalities. The Cessna departed KCID for the practice area to evaluate the left-seat pilot's ability to conduct various CAP search mission patterns. About 45 minutes into the flight, the right-seat pilot noticed the oil pressure had dropped from where it usually indicated on this aircraft. He brought this to the attention of the check pilot, and they decided to cancel the remaining maneuvers and return to base.

The crew expedited a return direct to KCID, and after rollout they turned onto the taxiway to the maintenance facility. At this time the oil pressure gauge dropped to zero. The engine seemed to be running "a little rough" but showed no other abnormal signs.

When the maintenance crew examined the oil filter, they found metal "chunks" in the filter media. An engine teardown showed that a rocker arm had failed and the disintegrating parts jammed into the oil pump, rendering it inoperative. The maintenance chief later advised CAP personnel that the engine was literally moments from catastrophic failure.

What did this crew do right to prevent the above headline from occurring? They included a scan of the engine instruments as part of their cockpit routine in a search grid. This gave them four-dimensional situational awareness (above, below, around and *inside*). They reacted quickly to an engine gauge indication that both had not seen before and decided to "play it safe," as opposed to trying to "finish up" the check ride. They quickly returned to the base to avoid an off-airport landing.

This is a prime example of an accident that *didn't* happen. Put yourself in the same position. Do you routinely scan the gauges, or do you rely on warning lamps to let you know you have lost temperature or pressure? Would you have taken an extra five minutes to complete your check ride ("filling squares") instead of returning to base?

Lt Col Chuck Enfield was the left-seat pilot. Chuck completed pilot training in 1942 and flew C-47s (DC-3s) in the China/India theater of operations in WWII. He has accumulated over 4600 flying hours, still maintains instrument currency and is a Mission Pilot for Iowa Wing CAP. For those of you who have heard the saying "There are *old* pilots and there are *bold* pilots, but there are no *old, bold* pilots," he is proof of that adage.

Major Michael Krenz was the right-seat pilot. He is an Advanced Products Manager at Rockwell-Collins, where among other duties he helps develop futuristic aircraft cockpit systems. He is the Iowa Wing CAP IG, Mission Check Pilot and Mission Coordinator.

Due to the diligence displayed by these two pilots, they avoided an off-airport landing which could have resulted in the loss of an aircraft and possible injury to two people.

What about you? Do *you* pay attention?

They decided to "play it safe," as opposed to trying to "finish up" the check ride.

Editor's Note: The following accounts are from actual mishaps. They have been screened to prevent the release of privileged information.

"Hey! Where'd You Get Your Driver's License?"

A KC-135 Stratotanker received a request to emergency refuel an E-3 Sentry. Conditions were day VFR. The two aircraft joined, the Sentry received necessary fuel and both aircraft separated, with the KC—in contact with a regional center—going to the top of the refueling block (FL 250), and the E-3—in contact with a military radar site—moving to the bottom (FL 230).

The Sentry then closed with and flew under the tanker, and began a climbing—that's right, a climbing—right-hand turn. Luckily for all concerned, the KC's TCAS began giving advisories and commanded the crew to climb. The Stratotanker and Sentry passed each other with one-half mile separation, co-altitude. If not for TCAS and some good fortune, you'd undoubtedly be reading about breakdowns in communication, crew coordination and "see-and-avoid" after the fact, in a Class A Mishap report.

The lessons here are simple:

- Receivers: See your tanker and don't hit it.
- Tanker crews: Coordinate an "End A/R clearance" for your receiver(s).
- Boom Operators: Keep your eyes on your receiver(s) until you know there won't be a conflict.

"Hey! Where'd You Learn How To Park?"

A military vehicle was positioned behind and very close to the left wing of a C-17 to on-load chains and other necessary mission support gear. Due to the cargo doors being closed and lots of taxiing aircraft, the military vehicle was parked unusually close. While one pilot assisted with on-load of mission support gear, the other pilot performed required preflight checks. Things were fine until, per the preflight checklist, he initiated the spoiler control/electronic flap computer (SC/EFC) test, which causes the flaps to extend… And extend they did, striking the parked military vehicle. Nobody was injured, but aircraft and vehicle were both damaged.

The mishap message reiterated: "…Bad things can happen to good people trying to accomplish the mission. Vigilance and attention to detail are required from the time crewmembers step to the aircraft until the crew has completed postflight. Most of the restrictions in our AFIs are the result of prior lessons learned." 'Nuff said?

You Sure You're Cleared to Cross That Active?

The mishap pilot (MP) had completed a local training sortie and was headed for the home drome. Several minutes before reaching home, he tuned in his home field's ATIS (Automated Terminal Information Service) and heard that Runway XX was closed. The MP landed, dearmed through EOR and proceeded via Taxiway ZZ—which intersects Runway XX—to the parking ramp.

While taxiing—and getting closer and closer to the intersection with Runway XX—the MP heard Ground Control say something. He didn't quite catch it, but assumed Runway XX was still closed and safe to cross. Once Ground Control pointedly singled out the aircraft on Taxiway ZZ crossing Runway XX to state call sign, and asked if said aircraft had clearance to cross Runway XX, the MP realized that the several minutes-old ATIS information was just that—old. Runway XX had become active in the intervening time but, happily, for all concerned, nothing was landing or taking off when the MP committed the runway intrusion.

You know the allegory about what happens when you assume, yes? Remember: You're responsible for understanding and reading back all Tower and Ground instructions. If unsure whether or not you're cleared to proceed, get clarification.

USAF Photo by SrA Stan Parker

Singin' Those Class-9-Hazardous-Cargo Blues

Assorted cargo was loaded onto the C-130 Hercules and it was closed and sealed for the night. Several hours later, a Flight Engineer (FE), two Loadmasters and a Flying Crew Chief (FCC) arrived to carry out pre-mission duties. They unsealed the aircraft, entered and immediately knew something wasn't right. There was a strange smell; one of the Loads experienced a loss of breath; and the FCC had tightness in his chest. The partial crew evacuated the Herk straight away and requested medical, Fire Department and ATOC assistance.

After it had been thoroughly ventilated, Fire Department personnel entered the Herk and isolated the source of the problem as some Class 9 Hazardous Cargo that had been uploaded before the aircraft was locked up the previous night. The hazardous cargo was…dry ice! During the eight hours or so the aircraft had been sealed, the dry ice had given off carbon dioxide, displacing all of the oxygen in the cargo compartment. Hence, no "air" to breathe.

The FE, Loads and FCC suffered no lingering after-effects from their brief exposure, and were subsequently cleared for duty by medical. Excess dry ice was downloaded from the Herk, and the crew pressed on with the mission, knowing that both they and ATOC personnel were wiser after learning, per AFJMAN 24-204, *Preparing Hazardous Materials For Military Air Shipments*, that 600 lbs. is the limit for dry ice loaded on aircraft with "…minimum air changes."

See, and Avoid

The airlifter crew showed up right on time for their o'dark thirty mission. The mishap crew (MC) had been deployed to an overseas location for two weeks and was now homeward bound. The airfield's parking ramp was unmanned except for the MC and they would be responsible for marshalling their own aircraft out of parking.

After normal preflight operations, each of the crewmembers assumed normal duty positions for engine start. Engines 3 and 4 were started and external equipment was moved away from the aircraft. While the engine start evolution continued, the Flying Crew Chief assisted the second of the two Loadmasters with upload of some additional gear. He finished, and was about to exit the aircraft for a final walk-around, when the primary Load gave him a "Thumbs Up" that everything was good.

Soon after, the flight crew finished the Starting Engines Checklist and the Before Taxi Checklist, and proceeded with taxi. That is, until they felt a "bump." The taxi was halted and a crewmember deplaned to investigate. Cause of said "bump"? A fire bottle had lodged itself under the left side of the nose radome and punched a hole in it.

The flight crew then *precisely* executed the Engine Shutdown Checklist and called home to let everyone know they'd be running a little late… How good's your checklist discipline? ✈

Editor's Note: The following accounts are from actual mishaps. They have been screened to prevent the release of privileged information.

Frozen Flight Controls

The mishap pilot (MP) was flying a cross-country in day, VFR and had been cruising at FL310 for nearly three hours when the flight controls in his A-10 stiffened, and then jammed, in pitch and roll. Cockpit indications were normal, with no hydraulic system or aileron/elevator jam indicator lights present. Rudders worked okay, and aileron and elevator trim provided some pitch and roll authority; otherwise, the control stick wouldn't budge.

The MP's wingman moved closer to give the crippled aircraft a visual once-over and saw no visible signs of flight control surface anomalies or hydraulic fluid leaks. After considerable Dash-1 review, a few rounds of "wrasslin'" with the control stick, a little luck and some careful planning, the MP was able to safely land his recalcitrant Warthog using pitch trim and power.

Maintainers impounded the aircraft. It was discovered that the drain holes weren't draining and a shallow lake of water had developed on the cockpit floor area that couldn't be seen without raising the ejection seat. After removing the seat, Maintainers also found water present in the area of two control rods that receive control stick inputs for aileron and elevator control. Turns out heavy rains prior to the cross-country flight provided ample opportunity for water to enter the Warthog's cockpit, where it remained liquid until encountering the minus-45 degree temps found at FL310. One-time inspection of assigned aircraft revealed nearly two-thirds of them had drain holes that didn't drain.

Water is good when you're thirsty. But when water gets in areas where it's not supposed to—engine intakes, and flight control and landing gear areas—and freezes, the consequences can be dire.

Contaminated Oil Servicing Cart

Mishap Crew Chief number one (MCC1) was thru-flighting his F-15 (mishap aircraft one—MA1) for a night sortie. The No. 1 engine and right AMAD (airframe-mounted accessory drive) needed servicing so he rounded up an oil cart and serviced them. Mishap Crew Chief number two (MCC2) was doing a BPO on his F-15 (MA2) and found both engines needed servicing prior to a ground maintenance run to troubleshoot a fuel imbalance problem, so he snagged the same oil cart to service his jet.

MCC2 commenced his maintenance run and, during the course of troubleshooting, it became apparent that something was definitely wrong—the oil had an unusual odor. MCC2 shut down his maintenance run and alerted supervision. MCC1 had already launched his jet but, thanks to MCC2's quick action, MA1 didn't get airborne—it was turned around and sent back to parking. As it would be learned, the oil servicing cart used on both MA1 and MA2 had been contaminated with an aircraft-strength cleaner/degreaser—not necessarily a good thing for oil-wetted parts that spin at thousands of RPM.

In an attempt to purge the contaminated oil and check for safe, proper engine operation, MA2's engines were drained and flushed five times (with oil filter changes after each drain and flush), the engines were run on the test cell and, at depot direction, set up to be closely monitored via regular JOAP-sampling intervals. MA2's left AMAD and

right IDG (integrated drive generator) did require R&R. On the other hand, it was too late to do anything for MA1's contaminated No. 1 engine. It had been running long enough that the contaminated oil had turned semi-solid, necessitating the engine be removed and sent to depot for repair, along with its AMAD.

If not for MCC2's keen senses, good instincts and decisive action, MA1 could very easily have launched and suffered a catastrophic engine failure, perhaps leading to loss of a pilot and aircraft. When airworthiness is in doubt, there can be no doubt—it doesn't fly!

Why It's Important To Do A Thorough Intake Inspection: Part One

Mishap aircraft (MA) engine start, taxi, takeoff, flight and landing were uneventful for the twin-engine jet. Thruflight inspection revealed the MA had sustained a bird strike on the right side of the fuselage in front of the No. 2 engine. First stage fan blades did exhibit some damage, so the mishap engine (ME) was borescoped, and additional fan blades were found damaged. The ME was removed to the Propulsion Shop for further evaluation where it was discovered several blades in the high-pressure compressor had also suffered extensive damage.

While installing the replacement engine, a piece of a coin—an ordinary piece of US pocket change—was found behind the MA. Propulsion top-halved the ME for additional inspection, compared the coin remnant to witness marks on the blades and decided the bird—unless he had been carrying change in a pocket—was guiltless in this instance of engine damage. Which leads to the following thoughts:

- If you do an intake inspection with loose items on your person, you're going to FOD an engine—that could cost an aircraft and crewmembers' lives.
- It's impossible to over-estimate the value of a through intake inspection.
- If you ever DO come across a bird transporting coinage, be sure to notify the folks here at the AF Safety Center's BASH Team. They'd like to see that for themselves!

Why It's Important To Do A Thorough Intake Inspection: Part Two

The mishap Maintainer (MM) was detailed to work weekend duty and he was as busy as he had ever been, working to get an NMC jet fixed. Monday rolled around and he was still jumping, working the problem-NMC jet. The mishap aircraft (MA) had made its first flight of the day and, in-between turns, its Crew Chief discovered a couple of fan blade nicks that looked like possible candidates for blending. The Crew Chief notified his Expediter, who contacted the MM, who stopped work on his NMC jet. The MM checked out an engine blade blend kit and other gear necessary for evaluating the MA's engine.

The MM inspected the MA engine, determined the suspect nicks had been blended previously and were within serviceable limits. He exited the intake, documented the 781s accordingly and proceeded back to his problem-child aircraft. Can't say just how the sequence of events unfolded from there, but can pick it up from the point where the mishap pilot (MP) arrived at the MA.

The MP reviewed the aircraft forms, noted the engine write-ups and performed a thorough walk-around, paying particular attention to the engine intake area. Satisfied all was well, he climbed in, strapped in and proceeded with engine start. Engine start sequence was fine until just before reaching idle RPM, when he heard a loud "Thump!" looked outside and saw a neighboring Crew Chief running his way giving him a visual to shut down the engine. The MP shut down IAW emergency procedures and deplaned. A quick look down the intake revealed extensive damage and a look behind the aircraft was just as chilling: In addition to engine parts, there were the remains of a two-cell, metallic flashlight.

More lessons learned?

- It's impossible to over-estimate the value of a through intake inspection. (Sound familiar?)
- It's impossible to over-estimate the value of a thorough CTK inventory before, during and after completing maintenance.
- The costs to repair the damage done by this two-cell metallic flashlight totaled more than $700 thousand. Ouch!

FY01 Flight Mishaps (Oct 00 - Mar 01)

11 Class A Mishaps
1 Fatality
8 Aircraft Destroyed

FY00 Flight Mishaps (Oct 99 - Mar 00)

9 Class A Mishaps
5 Fatalities
6 Aircraft Destroyed

04 Oct ♣✶ An RQ-1 Predator UAV crashed while on a routine test mission.

12 Oct ♣ An F-16C crashed during a routine training mission.

23 Oct ♣✶ An RQ-1 Predator UAV went into an uncommanded descent.

27 Oct (Added) A KC-10A sustained Class A Mishap-reportable engine damage.

03 Nov An F-15C experienced engine problems on takeoff. The pilot successfully RTB'd. Both engines sustained damage from FOD.

13 Nov ♣♣ There was a midair collision between two F-16CJs. Only one pilot was recovered safely.

16 Nov ♣ An F-16CG on a routine training mission was involved in a midair collision.

06 Dec ♣ A T-38A impacted the ground while on a training mission.

14 Dec ♣ An F-16C crashed shortly after departure.

12 Jan ♣ An A-10A crashed short of the runway.

09 Mar During a ground maintenance run a KC-135E's No. 2 engine suffered catastrophic damage.

21 Mar An F-16B experienced a bird strike but recovered safely. A fire developed after landing. The aircraft suffered structural and engine damage.

21 Mar ♣ An F-16C experienced engine problems soon after takeoff and crashed.

23 Mar ✶ An RQ-1 Predator UAV experienced loss of control during landing and its landing gear collapsed.

- A Class A mishap is defined as one where there is loss of life, injury resulting in permanent total disability, destruction of an AF aircraft, and/or property damage/loss exceeding $1 million.
- These Class A mishap descriptions have been sanitized to protect privilege.
- Unless otherwise stated, all crewmembers successfully ejected/egressed from their aircraft.
- Reflects only military fatalities.
- "♣" denotes a destroyed aircraft.
- "✶" denotes a Class A mishap that is of the "non-rate producer" variety. Per AFI 91-204 criteria, only those mishaps categorized as "Flight Mishaps" are used in determining overall Flight Mishap Rates. Non-rate producers include the Class A "Flight-Related," "Flight-Unmanned Vehicle," and "Ground" mishaps that are shown here for information purposes.
- Flight, ground, and weapons safety statistics are updated frequently and may be viewed at the following web address: http://safety.kirtland.af.mil/AFSC/statspage.html
- **Current as of 25 Mar 01.**

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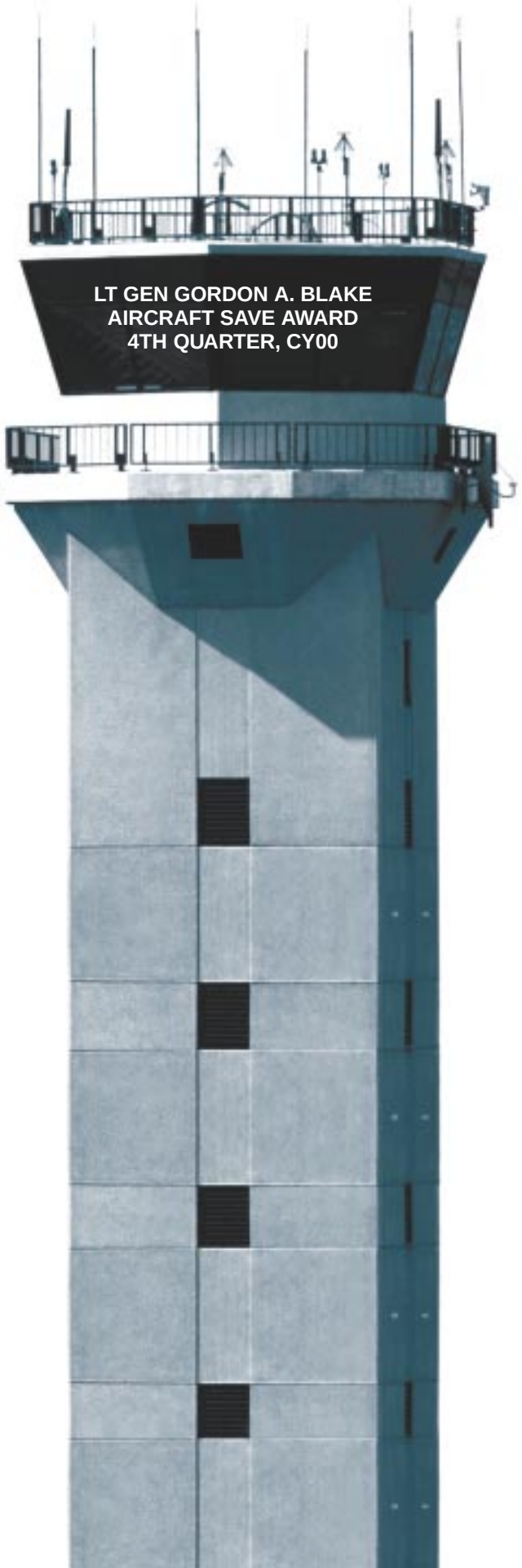

LT GEN GORDON A. BLAKE
AIRCRAFT SAVE AWARD
4TH QUARTER, CY00

MSGT JONATHAN GRAY
ATC OPERATIONS AND PROCEDURES ANALYST
AFFSA

SSgt Raymond P. Stone (Tower, Local Controller), 8th Operations Support Squadron, Kunsan AB, Korea.

While working as local controller in the Kunsan tower, SSgt Stone noticed an unauthorized vehicle entering the runway while an A-10 was approximately 1,000 feet from touchdown. He immediately sent the aircraft around and notified Base Operations and Security Forces to remove the unauthorized vehicle and operator. SSgt Stone's quick reaction and accurate assessment of his terminal environment prevented a catastrophe, and saved lives and a valuable Air Force combat asset.

POSTER CONTEST!

MAJ TINK SULLIVAN
HQ AFSC/SEFF

How often have you walked into Ops, and been attacked by glaring posters and signs with sayings like "Safety First," "Bring Them Back Alive," or the real, original one, "Fly Safe!"? Aside from being inherently obvious, they usually have some dated picture from a mishap long ago, or maybe a staged photo of some guy acting like a stupid drunk. These dry posters are as commonplace in our units as an iron major trying to bag some flight time and, if you're like me, you find them boring.

Well, no longer will we have to endure. An Ops shop in the Middle East had an innovative idea for safety posters. They had children of aircrew make posters, with drawings and pictures, stating things like: "Please Come Home Daddy," "Be Careful Today So We Can Play Catch Tonight" or "Mommy I Love You – Please Fly Safely." The 58 SOW at Kirtland has taken the idea a step further, by holding a poster contest and awarding a one-day pass, pizza and some free bowling and movie passes to the selected artist's parents. The contest idea is one way to empower your people (throwback to TQM days) to make your unit safety awareness the best in the Air Force.

Granted, nobody wants their Co or wingman thinking about the family back home in the middle of hacking the mission, but a personal plea from the ones closest to us can have impact and hopefully remind us of why we do the work we do—and help us make sound, safe decisions in the cockpit.

If you have questions, or even a better idea, just contact us in the AFSC Flight section. Either call me at DSN 246-7031 (e-mail, sullivas@kafb.saia.af.mil) or Maj Paul Gallaher at DSN 246-9509 (gallahep@kafb.saia.af.mil).