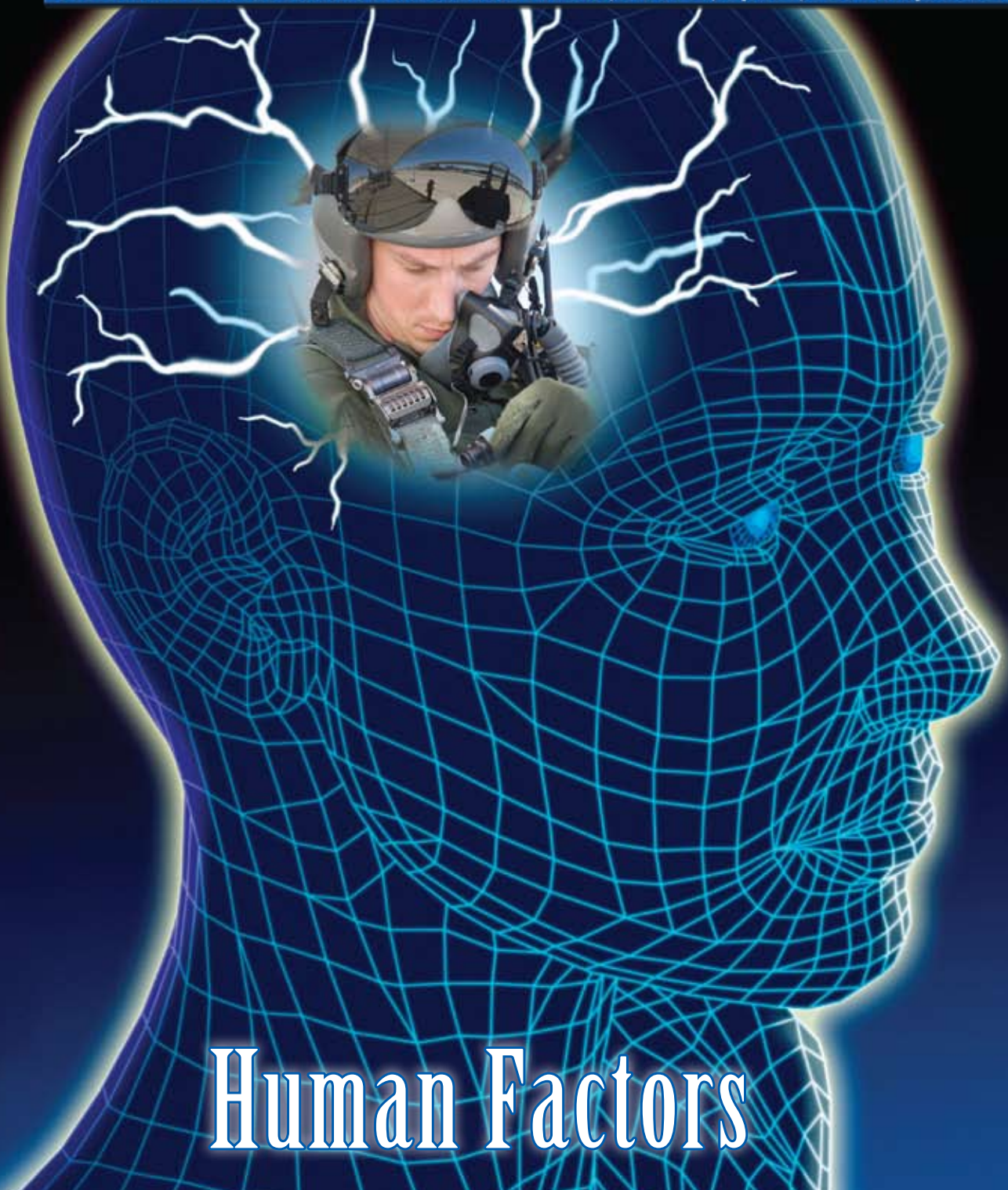
Volume 3, Number 1 Winter 2010

WINGMAN

Airmen Taking Care Of Airmen

The United States Air Force Journal of Aviation, Ground, Space, and Weapons Safety



Human Factors

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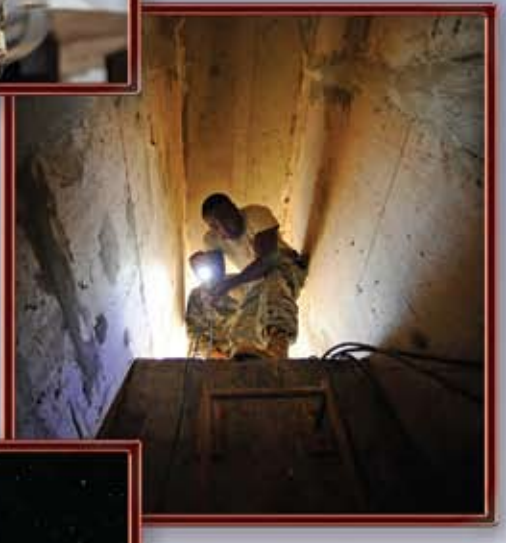
WEAPONS

AVIATION

GROUND



SPACE

Year of the Air Force Family

Air Force Recurring Publication 91-2

Features

Weapons

Aviation

Ground

Space

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Digital photo collage by Dennis Spotts

Winter: A Time of Vigilance

MAJ. GEN. FRED ROGGERO
Air Force Chief of Safety and
Commander, Air Force Safety Center
Kirtland AFB, N.M.

Winter is officially here! The days are shorter and temperatures colder — Airmen at all levels need to ensure these factors are weighed into their risk management decisions. Speaking of risk management, you probably noticed the cast. This experienced, used-to-be-younger pilot learned a lesson in risk while participating in a game of Ultimate Frisbee with my Air Force Safety Center Airmen. Afterward, my supervisor asked me to have a stern talk with the individual responsible, so I wore the mirror out. In the end, we're all individually responsible to evaluate the risks of our activities, both on and off duty, and to make the right call.

Winter, by its nature, is fraught with hazards you don't experience the other three seasons of the year. Driving on ice-covered roads, downhill skiing on a black-diamond trail, low-level night-flights in icing conditions — these are all unique to winter, and we need to be vigilant in our risk management decisions.

In this edition of ***Wingman***, the Human Factors Division (SEH) leads off as the "Division in the Spotlight" with a feature on how they support the Air Force mission. Well over half of all mishaps involve human error in some way, and SEH is there to help determine the human "why." They also discuss the Air Force Culture Assessment Safety Tool available to squadron commanders that I ask them to research and take advantage of.

The Weapons Safety Division provides a few interesting articles on futuristic weapons, site planning for weapons storage, training on risk management and preparing for inspections.

The Aviation Safety Division articles focus on night flying and human factors. In the winter, flying squadrons concentrate on accomplishing the majority of their night currency requirements. This affects both the aircrews' and maintainers' circadian rhythms resulting in fatigue that needs to be monitored and addressed before it becomes an issue. Our Flight Safety Officer Course graduates have provided some interesting "There I Was" tales on these topics.

The Ground Safety Division articles highlight the hazards Airmen have experienced with winter driving and recreation. One of our ground safety experts provides some useful safety tips for winter, and another tells an unfortunately repeating tale of the results when mixing alcohol and driving.

The Space Safety Division contributes features on tracking and cataloging space debris and satellites, the Air Force's 8-step problem-solving model and space applications, and an interesting tale of a failed space launch.

Finally, we've introduced a new section by one of our youngest AFSC members to look at and address safety from a different generational perspective. Hope you enjoy this edition and remember — Air Force Safety is no accident! By the way, the doc said I should have the cast off by the time you read this article! See you on the ski slopes — safely, of course! ★★

U.S. Air Force photo by Gary Brisbane

18th Annual Safety Professional Development Conference

The 18th Annual Safety Joint Service Professional Development Conference will be held March 8-12, 2010, at the Holiday Inn Executive Center in Virginia Beach, Va. The PDC brings together Army, Navy, Air Force and Marine safety professionals from installations around the world to achieve several key objectives; the primary objective being to serve as an excellent training source for safety professionals. Benefits include: meeting wing and mission training needs at a fraction of the cost, leveraging limited resources across all services, concentrating training in a cost-controlled environment and networking with other services.

A team of professional educators and subject matter experts from across the services as well as external sources will assemble to provide the highest quality training and educational experiences possible. Sessions during the conference will be offered in four- to 12-hour blocks throughout the week. Just a sampling of the topics for this year include: Job Safety Analysis, Mishap Investigation Techniques, OSHA 10-hour General Industry, Lean Six Sigma, Psychology of Safety, Fall Protection, Fire Prevention, Risk Management, AFSAS Power Users and an ASP Review course.

Online registration for this event begins in January. Mark your calendars! E-mail *afsc.sem@kirtland.af.mil* for additional information.

SAFETY: IT'S 24/7

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March 8-12, 2010

Spotlight on The Human Factors Division

Human Factors Division Chief
Lt. Col. Karen Heupel - Flight Surgeon

Superintendent, First Sgt
Master Sgt. Bryan Valdez - Aircraft Maintenance

Investigations Branch (SEHI)
Lt. Col. Paul Gardetto - Deputy Div Chief
Maj. Eric Dopslaf - Aircrew Flight Equipment
Capt. Richard Farley - Aerospace Physiologist
Capt. Shawnee Williams - Safety Fellowship
Ms. Lynn Madison - GS Career Broadener
Ms. Kelly Lee - UAS HF Contractor

Assessment Branch (SEHA)
Maj. Thomas Hughes - Ops Psychologist
Mr. Al Jones - AFCAST Manager
Maj. Joseph Gilpin - Weapons Officer
Tech. Sgt. Michael Kelley - Ground Safety
Ms. Ashley Palacious - GS Student Hire

CAPT. SHAWNEE WILLIAMS
Human Factors Division
Air Force Safety Center
Kirtland AFB, N.M.

It appears to some that aircrew members are less safe than the aircraft they fly (Wiegmann & Shappell, 2003). Over the past 10 years, Air Force Safety Center data shows that 66 percent of all Aviation Class A mishaps and 86 percent of Predator Class A mishaps were attributed, at least in part, to human error. However, to err is not simply tied to the aviation community. Seventy-six percent of ground motor vehicle mishaps were also attributed to human factors. Recent studies suggest that it's safer to fly than to drive a car. Even the well-trained individuals are still at risk to have a mishap while driving or working in an industrial setting. So with these growing issues, the question arises as to how data can be captured to narrow down the sometimes life-threatening human factors concerns.

The AFSC's Human Factors Division is designed to support aviation, ground, space and weapons safety programs. The staff applies human factors skill sets to identify, analyze and control human sources of unacceptable risk in Air Force operations. Through this process, we're able to provide professional expertise to all safety disciplines to recognize and mitigate the human-related hazards and vulnerabilities predisposing operational failure. If there's an operational or human system failure, our HF staff use the DoD HF Analysis Classification System to support safety investigation boards in identifying if human factors, such as fatigue, culture or climate, contributed to the mishap. We then provide trend analyses and estimate where future mishaps may exist. We play a vital role in the mishap prevention and analysis process, along with your local and MAJCOM HF professionals.

Currently, we're assisting the Aviation Safety Division with the revision of AFMAN 91-223, *Aviation Safety Investigations and Reports*. Our division also manages the Air Force Culture Assessment Safety Tool. The information gathered from the AFCAST survey is then provided to commanders and safety personnel to educate them on their culture and climate issues. When further evaluation is needed, we offer a team to go to wings to conduct organizational safety assessments to evaluate the "whys" behind the culture and climate and offer solutions. Above all, the number one goal of our division is to reduce the risk posed by humans.

U.S. Air Force photo

Reference: *A Human Error Approach to Aviation Accident Analysis: The Human Factors Analysis and Classification System.*

Preparing for the Inspection

CAPT. RICHARD MUTTER
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Air Force Safety Center
Kirtland AFB, N.M.

Continuity books?

We've all been there, moving to a new duty station just in time for an upcoming inspection. Whether it's a SAV, ORI, UCI or NSI, the feeling is always the same. How could my timing be any better? Although you may question your timing, there is no doubt the "fresh eyes" can be invaluable to your organization. Shortly after arriving at my new duty station, I had the opportunity to prepare my unit for a UCI through those "fresh eyes" and learned a lot of useful techniques along the way. I'm not suggesting that you need to be the new guy to prepare for an inspection; rather, I learned a lot of new techniques I may not have used if I had been an old timer.

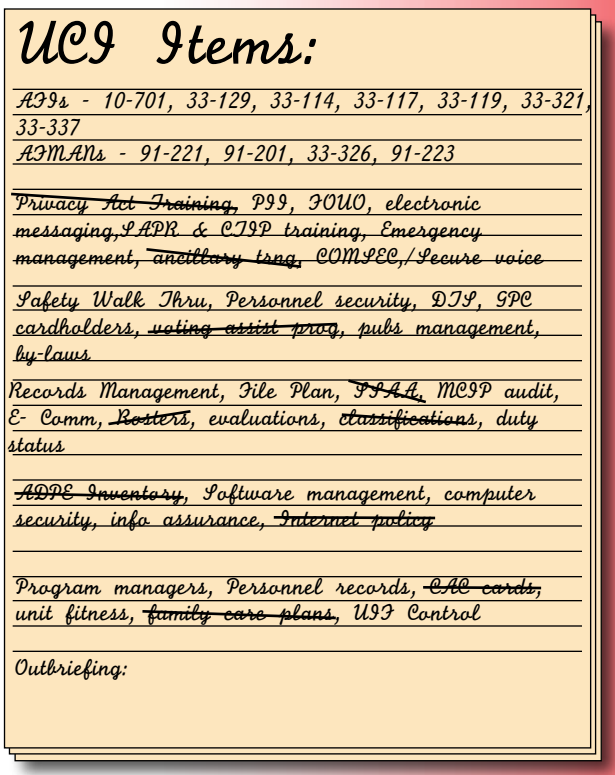
NSI!

COMPLIANCE?

First of all, as a new guy I wasn't the expert in the areas I looked at. This forced me to read, research and get outside of my comfort zone. Stepping outside of the process was invaluable to the programs I examined because my questions were directly from the AFI or other applicable guidance. It also allowed the process owners to teach — a great immersion for me and a practice run for them. The next lesson learned was to validate the checklists. We can become so accustomed to our programs that we miss an updated manual, AFI or checklist. The inspection, regardless of level, is much easier when the current checklists are filled out in detail and the questions are answered before they are asked. It'll be quite evident to the inspectors as to who put the time into their programs — validated through their level of detailed responses in checklists and continuity books.

ORI!

Once you have the technical side in order, be prepared to show off what you do and be proud of it. An inspector will feed off of your enthusiasm. Since you know what questions are on your checklist, this is like an open book test — "show" your compliance. If a question asks for an appointment letter, have it on hand or know where it's filed. Don't get caught fumbling to provide a product or answer, especially if it's a checklist item. Also, learn from the trends across your functional area; what does the cross-tell say? Call around and find the best programs. What made some a success and others less so? Learn from others' mistakes and successes.



UCI!

Finally, the most important element of all is attitude. No one likes to be told their area of responsibility needs work. The people who excel will listen to the feedback and adjust. As you prepare for that next big inspection, remember the following: (1) Look at your area as if you were the "new guy" and read up on the latest guidance; (2) fill out your checklists and continuity books as if you are trying to teach; (3) be proud of your accomplishments and show them off and (4) don't be afraid to listen and learn.

SAV!

Make your program the next "command benchmark"!

Directed Energy:
Coming to a (Combat) Theater Near You!

LT. COL. KEN PASCOE
Weapons Safety Division
Air Force Safety Center
Kirtland AFB, N.M.

Weapons

Imagine a weapon that reliably reaches out over 100 nautical miles to intercept a rapidly moving enemy target. The target is moving swiftly, accelerating and maneuvering, but cannot escape this weapon's fast approach. Imagine a weapon that strikes invisibly and with the precision of a sniper's bullet. It disables the lead truck in a convoy winding through narrow streets in an urban environment. The entire convoy is blocked and rendered harmless to U.S. forces. Imagine a weapon that forces a crowd of angry demonstrators to run away, with no lasting harm to any of them.

These three weapons are not imaginary. They are the three largest directed energy demonstration and development programs. Let's call them "Big DE." The weapons are Airborne Laser, Advanced Tactical Laser and Active Denial System. Big DE is coming to the battlefield soon. However, "Little DE" is here right now.

"Big DE" — Airborne Laser will destroy missiles in flight.

Little DE consists of directed energy devices that use laser energy to enhance the use of conventional weapons. Laser rangefinders, illuminators and designators are now common DE tools found on and over the battlefield. Little DE now includes the Air Force's first true DE weapon, which directly applies laser energy to disrupt the enemy.

"Little DE" — A laser dazzler is the first DE weapon fielded by the Air Force.

Directed energy technologies, such as laser, microwave and millimeter wave systems, can give U.S. forces amazing new advantages on the battlefield. These advantages include delivery at the speed of light, a deep magazine (many shots per platform) and effects tailored

Image courtesy of Airborne Laser Laboratory

to the task — effects that are both lethal and nonlethal. Along with the advantages come new safety concerns. To ensure safe fielding of these innovative technologies, the U.S. Air Force has put into place a new safety program. Air Force Instruction 91-401, *Directed Energy Weapons Safety*, was published in September 2008. It applies to all Air Force DEW programs.


U.S. Air Force photo

To ensure that new DE weapons are safe, a new DEW certification process has been established. The heart of this process is a DEW certification board similar to the Non-Nuclear Munitions Safety Board. Members from various Air Force organizations will review each DEW program's safety issues. The first board met in February 2009.

While laser weapons are new on the scene, nonweapon lasers have been used alongside conventional weapons for years. These operational DE devices (laser rangefinders, illuminators, designators, etc.) are reviewed by the Air Force Laser System Safety Review Board and approved for Air Force use by the chief of weapons safety. Usually these are commercial off-the-shelf systems or nondevelopmental items. Even COTS systems have safety hazards. In fact, manufacturers and vendors are usually not experts in laser safety, and sometimes not even experts in lasers. Check with your wing weapons safety office or medical group bioenvironmental flight for guidance on safe use of any lasers in your unit.

Safety is determined with respect to criteria identified in AFI 91-401 and existing standards. Additional safety standards are under development by the Air Force Safety Center. DEW programs identify hazards, assess risks and consider safety critical functions and components, such as targeting and energy containment. General safety requirements, such as personal protective equipment and administrative controls, must be considered as well.

Major commands will oversee the DEW safety program via their weapons safety offices. Wings that field DEWs will have a safety program led by a DEW safety officer who works for the wing chief of weapons safety. These safety officers will do all the things that a weapons safety officer does today: site planning, hazard analysis, mishap reporting and safety training for users and maintainers. Squadrons with a DEW operation or maintenance mission will need to become knowledgeable about DEW safety issues, including ensuring that they only use DE devices and weapons on approved ranges.

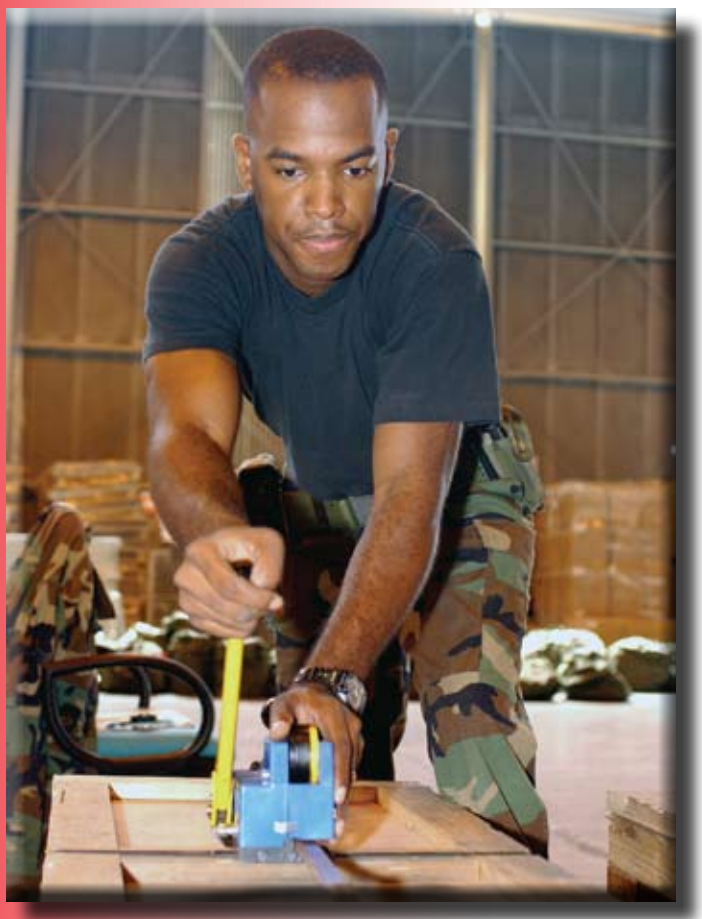
While there is no comprehensive DEW safety officer training today, there are laser and radio-frequency safety courses that serve as a good start. Your medical group's bioenvironmental engineering flight can provide further information. AFSC will be developing additional training tailored to meet the needs of DEW safety officers. This new safety program will give the Air Force the confidence to field DEW systems and the guidance necessary to field them safely.

The Way it Used to Be —

MASTER SGT. GLEN CARTER
Air Force Flight Test Center
Edwards AFB, Calif.

When was the last time you taught someone to substitute an incorrect tool in place of the right tool for a job? Have you ever shown a co-worker how to cut banding with a claw hammer or use a flat-head screwdriver in place of a pry bar to open a stubborn crate? I bet you're thinking about the countless times you've done things similar to this. Me, too — let me tell you a story about me as a young ammo troop.

My tale goes back to 1995 at Edwards AFB, Calif. I was going through munitions inspector training with a crusty ol' staff sergeant. He was going to show me "how we do things here." We were inspecting egress items that were within three months of service-life expiration. That meant these items would be inspected, their condition code changed to "C" and returned to storage. Three months later we would re-inspect these same egress items, change their condition code to "F" and then ship them to depot. After inspecting our 10th item it was time for chow. We returned from lunch to inspect stockpiled egress items that had a condition code of "C." After examining the items, I realized they were identical to the ones we had inspected that morning. I asked the staff sergeant why we didn't just put the items inspected that morning into condition code "F" with the ones we were currently inspecting and get rid of them all at the same time. He said, "I wanted you to learn how to do it by the book first." He then went over to the items we inspected that morning, opened the box and said, "Hit it on the side of the table — like this!" This caused a dent that created an unacceptable defect. Now we wouldn't have to inspect them in a month or so just to change condition codes again. I just figured that was the way things went.



To save time, we took the initiators, which are similar to shotgun shells, and other explosive items and dented the casings to create a major defect. If I had known then what could've happened if the casings were punctured, I don't think I would've accepted this procedure as standard practice.

Approximately 10 years later I worked in the weapons safety office at Edwards AFB and conducted a safety inspection at the munitions inspection shop I mentioned earlier. This brought back fond memories of processing those egress items. Inspection personnel were not processing any at the moment but some egress items had been inspected earlier that week. I asked if I could check their work. I proceeded to look over the documentation of a box containing initiators. The condition code tag contained remarks about items dented and within three months of service-life expiration. I opened the box and found all five had similar dents beyond acceptable limits. I thought, "That was just like I used to do." I asked the inspector in the bay; he said that they were returned that way from the flight line. Later that day I stopped by the egress section to confirm my suspicions about the dents. The lead in the egress shop said, "There is no way those were all about to expire and needed to be changed out." This confirmed my earlier thinking about the dented items. The next day I returned to the inspection bay and found that the items from the day before had been shipped. I decided to ask the bay chief about the ancient practice of denting items to save a little time. He said, "There is no way we would ever do that here." I asked him to be on the watch for that procedure.

U.S. Air Force photo by Senior Airman Stephen Schester

Is it Still That Way Today?

I then made my way to the inert pad to observe a repack operation. By the time I arrived to the location all the crates had been spread out with the banding cut. After carefully surveying the area I realized there weren't any banding tools in sight. I asked the crew chief how they had cut the banding. He replied, "With a claw hammer, why do you ask?"

We all know that everything is not in the book. In the old days, we would identify what needed to be done and then do it. Safety was not given a thought — only completing the job and moving on to the next task. Today, the process is changing and we have a name for it. It's called operational risk management. The most important things to remember are to ensure the troops understand the risks and hazards of the job, why their work needs to be done according to established procedures and to use the right tool for the job. Training is an everyday experience. There is more to it than just showing someone what to do; they also need to know why, where, when and how. I'm not sure if we'll ever be able to prevent those bad work habits from being passed on to future generations. We can at least teach the next generation to make informed decisions when trying to save a little time.

We react and do things the way we're trained or by imitating others. It's never too late to change bad habits, especially if they can hurt or kill someone. The next time you show someone how a job is done, be sure you think about the message you're sending. It's better to be known for being the one who gets things done right the first time using ORM, rather than someone who just gets the job done without regard for safety. As supervisors, you carry the weight of your troops. These troops unconditionally believe that you'll take care of them by not letting them do anything unsafe or stupid. Watch, learn and stick to the books; they're here for a reason!

U.S. Air Force photo by Master Sgt. Andrew Gates (top)
U.S. Air Force photo by Master Sgt. Ruby Zarzyczny (bottom)

Blue 2

COL. SID "SCROLL" MAYEUX
Chief, Aviation Safety Division
Air Force Safety Center
Kirtland AFB, N.M.

U.S. Air Force photo by Dennis Spotts

Winter ops! Days are shorter and colder; engines don't want to start; but, when they do, the thrusties and lifties increase with the cold air … as do the whole host of winter flying hazards. These days our Chief of Staff and Chief of Safety (Gen. Norton A. Schwartz and Maj. Gen. Frederick F. Roggero) have placed renewed emphasis on "Back to Basics" and given examples of back-to-basics areas: compliance, checklist usage and book knowledge, among others. With that in mind, I figured I'd roll down a few items on my personal winter ops checklist.

Preflight Planning — Check. Review weather alternate and divert requirements. What are all the "standard" numbers? Review the current approaches into my standard divert bases; have the approach plates changed? Have I flown them recently in the Sim or for real? Do I have enough fuel to fly this mission effectively, legally and safely?

Dress for Egress — Check. We cover a lot of distance in our airplanes which allows us to fly over a variety of climates, most of them cold. Will you freeze to death if you eject or crash-land? Dress and fly with a good survival kit (if able). If you're sitting on your survival kit, get Life Support to walk you through the winter gear.

De-icing and Anti-icing Fluid — Check and Check. You'd be surprised to know how many Airmen don't realize the two fluids aren't the same. Know the differences between them, hold-over times, how they make the ramp slippery and how to ensure the aircraft is free of ice contaminants. Air Florida Flight 90 is a good example of a mishap related to this area: http://www.aviationpast.com/AF90.html.

Ground Operations — Check. Review and practice tech order cold weather procedures for preflight, engine start, warm up, taxi and use of engine and airfoil anti-ice. Are there engine starter time limitations, EGT limits or oil pressure restrictions?

Garbage In, Garbage Out — Check, Check. How old is that ATIS? A 30- to 60-minute-old ATIS or RCR can provide a historically invalid picture of what's really going on. Ask for updates. For example, one Air Force heavy landed with a reported RCR of 10 when it actually should have been reported as a seven. The crew kept it on the runway, but they stopped with only 300 feet remaining. In another event, a tanker landed at a fighter base with a reported RCR of 15 at the approach end; plenty good for this big jet. Remember that fighters usually only need the first half of the runway, but heavies use it all from brick to brick. The departure end RCR was somewhere around zero or one. This mishap drove some major changes to the way we incorporate RCR spot-checks across the runway's length to compute an overall worst-case RCR.

Area- and MDS-specific "Gotchas" — Check and Check. Every region has its own specific winter weather hazards. A few that come to mind include lake-effect storms and snow near the Great Lakes, mountain waves, white-out, airfield visual illusions after snow fall … the Spangdahlem, Germany fog monster is a classic. Each MDS has specific gotchas, like the F-16 Class A due to AoA sensors icing up and the pilot not cross-checking other available instruments; all which led to loss of aircraft control. This is classic aircrew meeting and bar talk fodder, so I urge our experienced aviators and safety officers to share their wealth with the "green beans."

Runways, Taxiways and Snow — Check x 3. Sometimes snow plows only clear snow and ice from 50 feet on either side of the runway or taxiway centerline. That makes landing and taxiing on centerline extremely important. Also, snow-covered taxi/runway marker signs and ground surfaces can reduce our SA. We may get lost and be sitting on the runway or taxiway when the crew isn't expecting it, even on a crisp clear day. Maybe it's a good time to request progressive taxi from ground control.

Enjoy the winter flying. It's my favorite flying season. It's also the season in which we have suffered the lowest percentage of Class A, B and C aviation mishaps over the last 10 years. But be careful — we can get ourselves in trouble quickly with little warning and few options for recovery. Fly hard and fly safe!

Blue 2's engaged!

Maintenance Spoken Here!

CHIEF MASTER SGT. SANDY STACY
Aviation Safety Division
Aircraft Maintenance Safety Manager
Air Force Safety Center
Kirtland AFB, N.M.

Gut Check

Gut check. We've all heard the term. Merriam-Webster defines it as "a test or assessment of courage, character or determination." As Air Force maintainers you'd like to think we never have to do a "gut check" because we have all kinds of rules that dictate our actions. However, there are still times when we have to decide if we're going to do the right thing.

For instance, what if you're a young, energetic 7-level responding to a Red Ball for a flight control failure and you identify the problem as a bad flight control computer? You remember there's a jet in the hangar waiting for test equipment, so you tell the pro super you're going to take the computer from that jet and fix the Red Ball. You've done all the right things. You've used the correct tech data, wrote up the removal in the aircraft forms and successfully gotten the jet in the air. The expediter gives you a pat on the back and says, "Good job." You're glad you remembered that the jet in the hangar had a good computer. Or did it? Now that the excitement's over you remember the jet in the hangar was grounded and waiting for test equipment for the flight control system. You've just put a suspected bad part in a jet and sent it into the air. What do you do?

What if you're the chief of the squadron and one of your pro supers calls you over to the spot where they've just launched a jet? This is the call most of us dread because rarely are they calling you over just to talk. You show up to find one of your best engine troops and pro super have the engine troubleshooting TO open on the hood of the super's truck. You walk over to see what's going on. Both the engine troop and the super look nervous and you ask, "What's up?" It turns out the magnetic chip detector inspection from the jet's previous sortie revealed significant "chips." The TO (still open on the hood of the truck) clearly states to replace the engine. Of course, that's the jet they just launched 10 minutes ago. Oh, and the MAJCOM commander is flying it. What do you do?

What if you're a weapons troop and you've just installed explosive carts on the "other" AMU's F-16s and you discover you're missing a socket? You realize you've been so focused on getting the jets ready to deploy for a TDY that you failed to do a tool check after working on each jet. Now there are 12 jets that should be grounded? What do you do?

In the case of the suspected bad flight control computer the answer is simple. You tell the pro super what has happened and they tell ops to bring the jet back. No problem. How about the MAJCOM commander flying a jet with a bad engine? You guessed it; the chief calls ops and tells them to bring the jet back. In both cases the decision should be easy because the consequences of not calling them back could be catastrophic.

However, what about the weapons troop? He's pretty sure the socket isn't in a jet because he knows he only used it outside the jet. Nothing bad could happen, could it? What if he doesn't turn the toolbox in to support? No one will know anything's missing until after the jets are launched for the TDY. So what does he do? He tells his supervisor, a technical sergeant. The supervisor goes through the same thought process his Airman did. In the meantime they've looked everywhere they can think of to find the missing socket. They searched all the aircraft shelters, ripped the toolbox apart, checked the trash cans and asked each other a dozen times where the socket could be. Now, the expediter notices all the frantic commotion and asks them, "What's going on?" The expediter immediately calls the pro super over and tells him what's going on. Now the decision is in the right person's hands.

The pro super is responsible for everything on the flight line. He re-reads AFI 21-101, *Aircraft and Equipment Maintenance Management*, about what to do with lost tools. It definitely states all jets affected should be grounded. Of course, it's 5 a.m. and he's the only supervisor at work and is reluctant to make the big decision to ground another AMU's aircraft. He starts thinking about the repercussions of grounding the jets. What will the chief say? Will he get in trouble for stepping "outside the bounds" of his job? What will the squadron/group commanders say? Will he lose his job? Where is that darn socket?

What do you think? What would you have done? We're trained to make decisions that affect our people and the mission. What's the worst thing that could happen if you make a decision to ground a jet? If you're wrong you might be a bit embarrassed. Your friends might harass you for a little while. You might temporarily lose some self-confidence.

What happens if you don't make that call? The jet is damaged or crashes. Innocent people, maybe your fellow maintainers or the pilot, are injured or killed. How would you feel then? The risk of a little bit of embarrassment far outweighs the risk of not making that tough call.

The stories above are not fictional. I won't tell you if it was me or someone I know, but they are true. What about the socket you ask? Well, the jets were grounded. The group commander was happy and mad at the same time. Happy the call to ground them was made and mad that it had to be done. And the socket? The darn thing was found underneath the floor mat in the truck!

U.S. Air Force photo

The Aviation Well Done Award is presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

The Aviation Well Done Award is presented to Maj. David Shevchik and Capt. Derrick Erickson of the 134th Fighter Squadron, South Burlington, Vt., in recognition of exceptional performance during an emergency that occurred on Dec. 2, 2008. Maj. Shevchik and Capt. Erickson, pilots of SNIPER 1 and SNIPER 2, were flying a training sortie with live-loaded Air Defense aircraft. While performing a high-speed, low-altitude tactical turn, Capt. Erickson's F-16 had a power takeoff shaft failure. He lost both hydraulic systems and main and standby generators, and his emergency power unit activated. Capt. Erickson immediately called "knock it off," climbed and informed his flight lead that he was diverting to Bangor, Maine. SNIPERs 1 and 2 declared an emergency with Boston Center and began seamlessly working together to analyze and handle this serious emergency. They achieved a one-to-one glide ratio and ran the appropriate checklists for power takeoff shaft failure, alternate gear extension and activated emergency power unit/hydrazine. SNIPER 2 notified Bangor Tower that he had live weapons on board and activated the emergency power unit that would necessitate bioenvironmental services. SNIPER 1 maneuvered to a chase position to assist and back up SNIPER 2's checklist procedures. SNIPER 2 made a flawless on-speed landing within the first 1,000 feet of the runway. SNIPER 2 ran checklist procedures for after-landing with an activated emergency power unit, egressed the aircraft, secured all classified material and ensured weapons and expenditures were safe. The outstanding leadership and safety awareness displayed by Maj. Shevchik and Capt. Erickson reflect great credit upon themselves, the Air National Guard and the United States Air Force.

The Aviation Well Done Award is presented to the crews of Air Force Rescue 109 and Air Force Rescue 205 of the 56th Rescue Squadron, RAF Lakenheath, United Kingdom in recognition of exceptional performance during an emergency that occurred on Dec. 10, 2008. The 56 RS received a call from the United Kingdom Aeronautical Rescue Coordination Centre requesting rescue support for a critically injured sailor from a container ship located 250 nautical miles west of the Irish coast. The crews prepared and launched less than four hours after initial notification and encountered continually worsening weather en route with visibility as low as one quarter mile and ceilings down to 100 feet above water level. Nevertheless, the crews requested and received clearance to proceed onward to avoid possible life-threatening delays. Upon arrival, the helicopter crews found the ship pitching and rolling violently. Using excellent crew resource management, the crews established a nonstandard hover to compensate for the ship's superstructure. In addition, the crews had to deal with in-flight emergencies, a demanding visual approach, questionable hoist cable and language barriers. Based on the crew's sound and skillful decisions, the mission resulted in a safe transfer and recovery of the injured sailor to a land-based medical facility. For their heroic efforts, the crews of Air Force Rescue 109 and 205 were credited with one life saved and proved how far rescue forces will go "that others may live!" The outstanding leadership and safety awareness displayed by the crews of Air Force Rescue 109 and Air Force Rescue 205 reflect great credit upon themselves, United States Air Forces in Europe and the United States Air Force.

U.S. Air Force photos

Into the Intake

Anonymous

There I was. It was a nice Wednesday morning at 9:45 a.m. in Sardinia, Italy. I was standing by waiting for the weather brief for our deployment back to Germany. Behind us were three uneventful weeks of flying over the sea. Twelve deployed F-4Fs flew 458 sorties with no major air or ground incidents. We had a great time with weekends of surfing and scuba diving. I was called back to reality as the weather brief began. The Italian weather observer briefed us like every other day: "Weather is good for jet flying. Any questions?" That meant 36 degrees Celsius at 10 a.m. and increasing. Winds were from the northwest at about 15 mph. Everything was the same as usual.

Our commander gave us some final words and the plan for deploying back home before handing the briefing over to the DO. The DO briefed, "Gentlemen, the plan is to deploy home in three four-ships; first takeoff time is noon, and then 20 minutes thereafter. Today we're lucky; we got our diplomatic clearances to fly over Austria just in time, with a little back draft. Mandatory approach times. First four-ship 1 p.m. to 1:05 p.m.; the second four-ship 1:20 p.m. to 1:25 p.m.; the last one 1:40 p.m. to 1:45 p.m." In that moment I saw a big smile on my instructor pilot's face. I knew he was glad to not be flying around Switzerland, stopping over in France to get gas and flying home. Going straight over the Alps would save us more than three hours. I knew his wife called him this morning and told him she packed her bag because she thought she was going into labor that day. The DO handed out a new deployment folder for the latest routing, alternates and fuel requirements. This folder was huge.

I'd never seen a deployment folder like this. Ten letter-size pages in page protectors held together with a metal clip through the punch holes. There was no safety tape or anything. While sitting in the four-ship briefing, a duty desk clerk came in and told me, "Sir, you'll have the two squadron travel pods on your airplane so you need to stow your luggage with somebody else." Not a problem; I had enough time. Two minutes later, the door swung open and the DO ran in shouting, "We had a mistake in the mandatory approach time when they were converted from Zulu time. They're all one hour earlier. We have to launch the first four-ship now." First four-ship? That's us! What time is it? It was now 10:25 a.m. The only thing my lead said was, "Let's go, gentlemen." We headed out of the room and to our airplanes.

On the way to the flight line I remembered that my back seater and I had to store our gear on somebody else's airplane. We got to the airplane and saw that maintenance wasn't finished gassing up the underwing tanks. My crew chief told me we'd been assigned the spare aircraft; it hadn't been moved in three days and now had to be reserviced. By the time we stowed our luggage, all other crews were strapped in their jets and ready to start engines. Now we had to hurry. We only had 12 minutes to strap in, start engines, taxi and take off in order to make the time over Austria. My instructor in the back seat sped things up, jumped in the rear cockpit and got his stuff done. I ran around the aircraft, did my preflight and rushed up the ladder into the cockpit.

While strapping into the aircraft I knew I needed to get some order in the cockpit. Pubs, checklists, approach plates and the huge deployment folder were scattered about. Against all rules, I stuck the deployment folder under the windscreen. Much better I thought. "Steel One check, Two, … , Four." Damn, we weren't ready! The other crews started their engines. Finally, with all checklists complete, I was ready and started the engines. My lead called for taxi. I was still busy with my before-taxi checklist when I saw No. 1 and No. 2 taxiing by me. Still behind, I sped up. I told my IP, "Sir, ready to taxi!" His answer: "Sure son, two minutes ago." I gave my crew chief the run-up signal and pushed

U.S. Air Force photo

up the power. I powered to 74, then 76, then 78 percent rpm with no movement of the jet. I said to my IP, "Sir, the aircraft won't move and I can't go higher on the power than the 78 percent ground blast limit." He answered, "Son, the brakes are sticky because the airplane hasn't moved for three days; push it up!" I passed 80 percent rpm and the aircraft began moving. At that moment, the air conditioning kicked in, blowing all its air into the defog system of the windshield. I couldn't believe it; the deployment folder was airborne, flying out into the wide open, off of my canopy. I tried to grab the folder but only managed to grab one of the pages. The rest of the pages were gone out the left side of my canopy. I immediately looked at my crew chief and he signaled me to go. Excellent; nothing went into the intake, or so I thought.

While taxiing out of the chocks, I told my IP what happened and that I could only hold on to one page. He asked me if the crew chief had signaled me to go and I acknowledged. I had the impression he wanted to go home. Holding in the "last chance," I couldn't stand it anymore. I called tower to check with the SOF and see how many pages they had found on the ramp. In the meantime my lead called tower for takeoff. The tower immediately cleared the four-ship for takeoff. The lead took the runway and lined up with No. 2 aircraft 500 feet down. I was holding the brakes still waiting for tower's answer. Finally my IP impatiently said, "Son, push up the power and line up!"

Without coordination, I called for an abort and told No. 4 to line up with the first two-ship. Hell was rising in my rear cockpit; my IP wanted to go home to his family — now. The three-ship was taking off as we were waiting for a response from the tower. About five minutes later, with our time window closed over Austria, the tower called us back: "Steel 3, they didn't find any paper on the ramp." After we received the bad news, we taxied back into the chocks and shut down the aircraft. When I stepped down the ladder, I looked into the intake. I could already see paper sticking on the first compressor stage. My crew chief crawled into the engine and removed the FOD. Nine full pages with page protectors. But where was the metal clip that was through the punched holes? It was gone — most likely through the engine. The engine had to be pulled and changed. Our engine guru said that the FOD in front of the compressor stages most likely would've caused an engine failure during takeoff. My IP came back to me and said, "I probably won't see my baby and wife today, but thanks to your guts, I will see them."

U.S. Air Force photo by Senior Airman Christina D. Kinsey

Keep

Anonymous

My crew had been alerted to fly a de-positioning mission from Europe to the States. We had been off of our sleep cycle for a few days but were feeling good after raiding the commissary deli during our alert sequence. We arrived at ops and looked at the flight package. Everything looked vanilla; standard airways, no new NOTAMs and low ORM. The weather forecast showed nothing of significance along our route of flight other than the expected head winds going west. Our crew was in a relaxed go-home state of mind and had no idea of the surprise we would have in about eight hours.

The front-end crew consisted of an experienced aircraft commander (myself), a high-time first pilot and an inexperienced co-pilot. The preflight went normal. Everything looked good on the 781s and all systems operated as they should. We started engines and taxied out of chocks to the runway for departure. During the taxi, we ran our predeparture checklists. This included an operational check of the weather radar which the co-pilot accomplished and I confirmed. After the checklists were complete, we called for departure clearance. We then made one last check of our displays to include nav-aids, weather radar and configuration. All systems, lights and displays were normal; all checklists were complete. We were cleared for takeoff.

The departure, climb and cruise into the Atlantic crossing route went smoothly without incident. We were clearing people off interphone to hit the bunk, start cooking cinnamon rolls, etc. I was in the co-pilot seat and the low-time co-pilot was in the left seat. The flight across

Photo courtesy of NASA
Digital illustrations by Dennis Spotts

the Scan Going

the pond seemed to take forever. We did our best to stay awake by reviewing upgrade books for my co-pilot which, by the way, was not a good choice of stimulating reading material. As our eyeballs dried up, we noticed on our nav display that we were approaching the eastern seaboard. Suddenly we encountered what felt like moderate turbulence. Being a pitch-black night and unable to see the horizon, we instantly became concerned. We turned up our radio volume to see if anyone was reporting turbulence or weather near our location and reviewed the weather forecast to see if we missed anything. Again, we noted nothing out of the ordinary. A call to ATC confirmed our route was clear of weather and that a front of thunderstorms had been reported north of our position. My eyeballs, reverting to my prior flight engineer training, began scanning all displays and control panels. After completing a thorough scan of the displays, I noticed that the weather radar was not on. Somehow the weather radar had been placed into "standby" sometime between the time we did the ops check before takeoff and our current location.

I promptly turned the system back to "operate" and was surprised to see a wall of red thunderstorms directly in our flight route about 30 miles out. Immediately, I thought about the scene in the movie "Cast Away" when the FedEx pilots were trying to fly through the "red wall" and didn't make it. I coordinated for a clearance south to find a good enough hole to pass through, and we continued the rest of the mission without incident.

This was a situation that could have led to an incident or worse yet, an accident. Without the warning sign (turbulence) giving us a clue that something was wrong, we might never have noticed that the weather radar was off. We very easily could have unknowingly flown into the "eye of the beast," as I call it. In that situation, it would have been too late and the best we could have hoped for would be to come out in one piece on the other side. This is a lesson in flying safety I'll always remember. Keep the scan going at all times. The littlest thing could make a huge difference. Many times we're tired, especially on long ocean crossings, or we become complacent in our duties. We need to force ourselves to be as alert and as connected as possible with the equipment we're operating. A switch in the wrong position can easily be overlooked, especially when the incorrect position doesn't give any indication that it's in the wrong position. Most of us have these little experiences during our flying careers when the hairs on our neck stand up or we feel like something just isn't right. We need to honor those feelings. Being alert, maintaining good situational awareness, and adopting a thorough in-flight scanning technique may stop the chain of events that could potentially lead to a mishap.

There We Were ... 10 Days Later!

CAPT. ROBERT T. FOSTER
98th Flying Training Squadron
U.S. Air Force Academy, Colo.

In April 2008 I was deployed as a newly certified aircraft commander flying the KC-10. Like most pilots in my squadron, I deployed almost immediately after I was declared mission-ready. The crew consisted of an experienced instructor flight engineer, a new co-pilot and boom operator. We turned out to be an outstanding crew which was challenged very early on.

Our trip to the desert was a cargo mission with stops in Spain and Italy before proceeding to the AOR. We had two full crews on our aircraft and were going to swap out with two crews who were waiting to return home. The additional crew on this mission was more experienced than our own, with instructors at each crew position except co-pilot. We were also traveling with two flying crew chiefs. Our second crew was flying the jet to Naval Air Station Sigonella in Sicily, Italy when they noticed that the oxygen gauge had failed during descent. According to the minimum equipment list, we were required to have a functioning oxygen gauge and couldn't take off without it. The crew chiefs coordinated to have a new gauge flown to Sigonella.

Aviate ...

We felt bad for the two crews who were stuck in the desert; their deployment prolonged while we waited in Sicily for our jet to get fixed. It was definitely a good deal for us. When our part arrived and the aircraft was FMC again, we showed up and agreed that my crew would fly the leg out of Sigonella. The runway at Sigonella is 7,000 feet by 147 feet, which is as short and narrow as the KC-10 can legally use. With all of the cargo on board and enough fuel for the long flight, our critical field length was just under the runway length.

I decided to do the takeoff from the left seat. The preflight and before-takeoff items were normal on a beautiful VMC day. When we were cleared for takeoff, I taxied onto the runway, set flight idle, and called for takeoff power. I knew everything would happen quickly because of the short runway. As we were going down the runway, the co-pilot called "80 knots," and the engineer announced that the power was set. I glanced at my own airspeed indicator to verify the airspeed; it checked.

Navigate ...

A few seconds later, the co-pilot called "V1," which is the go/no-go speed. I didn't say anything because we were going so fast down the runway with little time in between required calls. But my first thought was, "Silly co-pilot, we're not at V1 yet." Next, the co-pilot announced, "Rotate," and I thought, "NOW, we're at V1." The co-pilot continued to yell, "Rotate, Rotate, ROTATE!" I glanced to the right and noticed that one of the airspeed indicators was wrong. I didn't have time to figure out which one, but I knew I would rather rotate using my own airspeed indicator and risk going too fast than risk rotating when we were too slow. Also, we were already past our decision speed, and I knew this was a small enough problem for which I wouldn't abort the takeoff.

I looked out the window and decided that I had enough runway remaining to keep the aircraft on the ground until my airspeed indicator showed rotation speed. I said that we were not at rotate yet, and the flight engineer announced that one of the airspeed indicators was broken. I rotated when the airspeed on my side checked, and the co-pilot raised the landing gear. While I was flying, the co-pilot and the flight engineer compared the two primary airspeed indicators with the standby airspeed indicator and determined that my indicator was malfunctioning. We transferred aircraft control and raised the flaps and slats using the retraction speeds from the co-pilot's indicator.

U.S. Air Force photo by Staff Sgt. Ken Bergmann

While the co-pilot continued to fly the standard instrument departure, the flight engineer and I ran the flight instrument malfunction/failure checklist. The checklist allowed us to duplicate the co-pilot's airspeed information to my side, giving me correct indications on all instruments. Next, we called the instructor pilot from the back of the aircraft and briefed him on the actions we had taken and discussed our options for the rest of the flight. We also talked to the crew chiefs on the aircraft to see if there was a way to fix the problem. While the cargo was important and the crews waiting in the desert were growing impatient, we decided to return to Sigonella to have the equipment repaired. If we had continued, we would have had to fly many hours with only one reliable airspeed indicator. Since the co-pilot's instrument information (including altitude) was being duplicated to my side, we no longer had the two primary altitude indicators required for Reduced Vertical Separation Minimum airspace.

Communicate ...

We accomplished all normal checklists before our uneventful return to Sigonella. After making the time-critical decision to continue the heavyweight takeoff on a short runway, the crew displayed outstanding crew resource management by epitomizing the "aviate, navigate, communicate" principal. Additionally, it was helpful to use the other crew members who were onboard the aircraft to make an informed decision. Also, we immediately accomplished time-critical items to get the aircraft away from the ground and into a safe configuration. Afterward, we took our time, ensuring that we covered all our bases and completed all checklist items. This allowed for a smooth and safe landing.

Upon completion of our very short sortie, we had the unfortunate job of notifying the crews waiting for us in the desert that we would not be arriving. They had to wait patiently, eating chow hall food and sleeping in dorms. We enjoyed several more beautiful spring days in Sicily. When we finally arrived for our deployment, we got a lot of grief from the other crews. We had to explain numerous times why it took 10 days to resolve all maintenance problems before we could safely fly the final leg of our mission. During the rest of our deployment, my crew performed in the same outstanding manner, and we used our lesson in communication and CRM to continue making safe decisions.

U.S. Air Force photo by Staff Sgt. Ken Bergmann (top)
U.S. Air Force photo by Airman 1st Class Matt Cook (bottom)

Searching for Comfort — In the Wrong Place!

CAPT. RYAN E. LUCERO
80th Fighter Squadron
Kunsan Air Base, Republic of Korea

Fixing simple glitches in the Viper is usually a basic task. The good ol' "off-on" does the trick most of the time. That's where my attention sat on a memorable "pit-and-go" day. I was troubleshooting a multi-function display problem in the jet while getting ready to take on fuel in the flow-thru. I was reading off maintenance fault lists to the tech, and he eventually had me cycle the power to fix the problem. This drew my focus to the right side of the cockpit. At the instant I was toggling the switch my peripheral vision caught a flash of movement.

The pit boss was running toward my jet. The expression on his face displayed absolute terror. All of his radio equipment cords were flailing about as he ran. This made my heart race. I was comfortably fixing a problem in one instant and dizzy with anxiety in the next. I reached for the throttle in case I would have to cut it off. The pit boss was faster than I could imagine. No, he wasn't making a running dive for the intake; rather, he was racing to grab a fuel technician who was leaning on the side of the jet — the side of the jet opposite of all the switches I was "too busy with" to notice. If I wouldn't have been so focused on the switches, I might have noticed how close he was to the intake.

The fuel technician was a new apprentice to the job. No doubt the ink on his papers was still wet. He was plucked away from the side of the jet by the once terrified, now angry, pit boss. The technician proceeded to lose several

U.S. Air Force photo by Senior Airman Larry E. Reid Jr.

layers of pride and even more in qualification. The pit boss made it a lesson to remember. What is it that aligns the stars in such a way to cause an incident? It's often due to a set of unmitigated risk factors. How then can I explain what happened next?

Everyone in the flow-thru regained their calm and restarted hot pit refueling. In less than 10 minutes, another jet pulled in to the adjacent flow-thru. That's all the time it took for the same thing to happen again! The pit boss again raced into the HAS flow to pull away another fuel tech that strayed too close to the intake for comfort. You might ask, "How close was either of these incidents?" The answer is similar in all incidents. As operators and maintainers, we are often one misguided step away from an accident. It might take one extra stroke of bad luck, or one last action versus another, to complete the accident chain.

I passed these incidents on to the squadron at our next meeting. The important part was conveying a few simple reminders. The first, what we do is dangerous. Second, executing the mission in accordance with standards, TOs, and CRM/ORM mitigates the level of risk that we all take. So what about all those chance variables? True, there are many factors that can line up to cause an incident. They may be out of our control. As many safety lessons remind us, it's the factors within our control that we absolutely have to mitigate. Safety culture is what 99 percent of us embody without even thinking about it. The next moment you find yourself too comfortable with the jet might be the time the stars line up against you — and they will correct your false sense of security.

U.S. Air Force photo by Airman 1st Class Jonathan Steffen

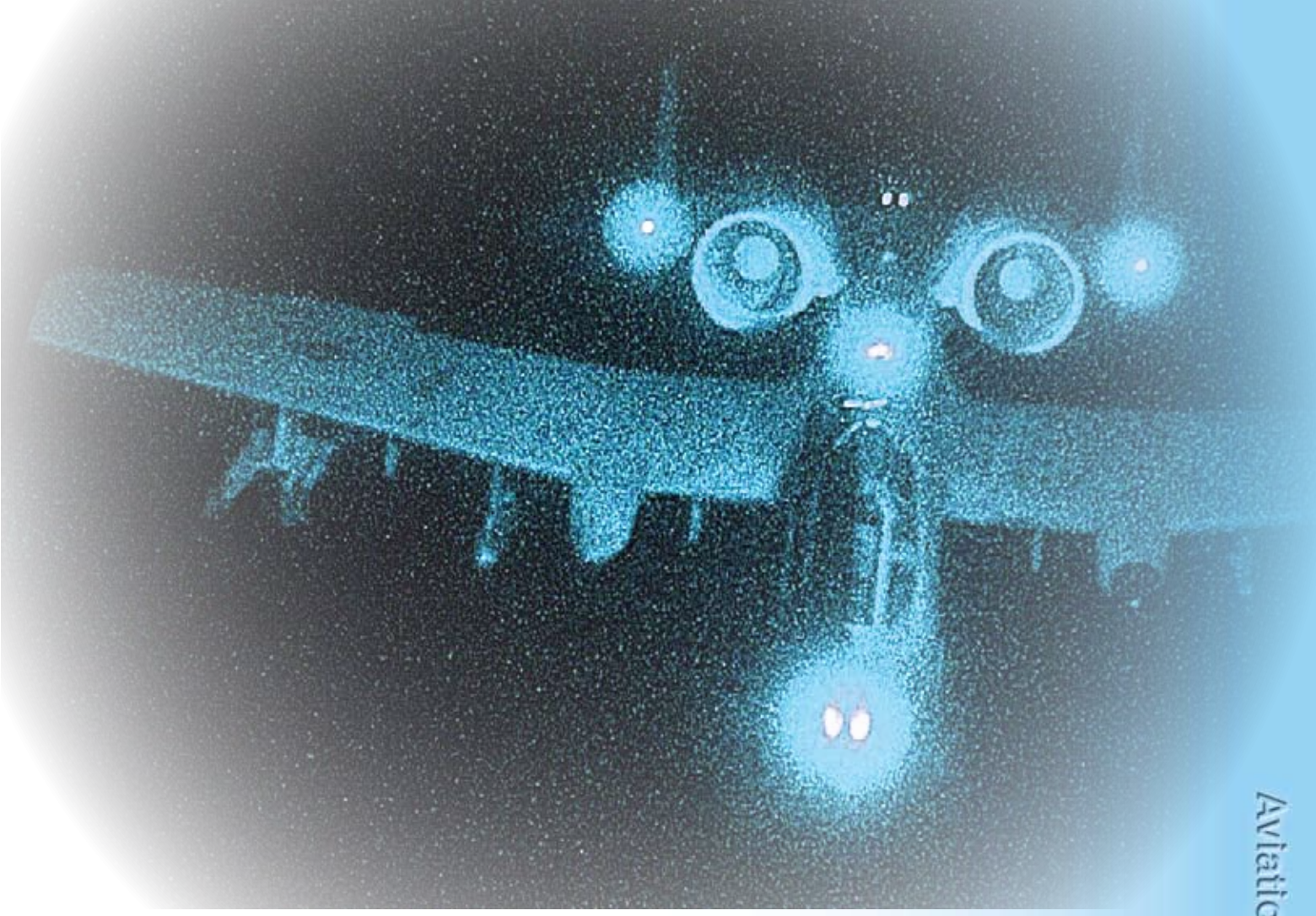
Ice Skating at Night in Korea

LT. COL. MICHAEL SCHULTZ
47th Fighter Squadron
Barksdale AFB, La.

A night FLUG ride in Korea; what could be better? I was returning to the A-10 after a three-year tour in Air Education and Training Command and was in the middle of my flight lead upgrade program. The weather was 1,500 feet with good visibility at takeoff with no hazardous weather forecast for the evening. I knew it was going to be a challenging night since I had flown virtually no night rides in the last three-and-a-half years. I had no idea it would end up as bad as it did.

I was a little apprehensive before takeoff as the first snow flurry fell, but we had a mission to complete. I wasn't going to be the guy to speak up and show weakness of any kind. We got the jets armed up and took off into what appeared to be a fairly accurate forecast. The weather started at 1,400 feet and was solid all the way up to 11,000 feet. We climbed up on the standard instrument departure out of Osan Air Base, Republic of Korea, and were on our way up to the training area for a nighttime surface attack tactics mission. We broke out of the weather above the clouds to an unusually pretty night. I was grateful to be out of the weather and rejoined with my wingman as we started our coordination for entry into the restricted area.

We had just about reached training area two when we heard, "51st Fighter Wing WX recall" on guard. I immediately turned the flight around and with a few choice thoughts started heading back toward Osan AB. I directed my wingman, who was also my IP, to get



the ATIS and report back. He relayed to me that Osan AB weather was broken at 400 with snow showers and visibility intermittently down to 1.5 miles. I thought to myself, "That's good enough — let's go." We made sure our navigational aids agreed with each other before the penetration and flight split-up. I split the flight with approach and prepared to commence the penetration. I entered the weather around 10,000 feet and found myself in a fairly heavy snowstorm that I wasn't really expecting. I had everything set up for the approach and was doing my dead-level best to keep the cross-check going so I wouldn't get spatially disoriented. You know the feeling, balancing 500 pounds on a pinhead; the pressure is so intense and the concentration is so focused you have to remind yourself to breathe. The snow got to be so heavy that the strobes were becoming very distracting as they lit up the world around my A-10.

I heard the controller break off the approach for the A-10 in front of me because the weather had gone below minimums. This was going to be worse than I had expected. At around 10 miles, I slowed the aircraft and configured for landing. I had to turn the landing light off as soon as the gear started to come down because it was horribly disorienting with the heavy snow coming down. I planned to turn it back on as soon as I broke out of the weather. I started to see the warm glow of lights over Songtan at 1,000 feet and got a slight comforting feeling that I was almost home. As I approached decision height, I saw the first light in the "rabbit," then the second one, the third one and then the end of runway lights — thank God! I shifted my velocity vector up because I had been aiming a bit short. I turned the landing light on and saw a totally snow-covered runway. I couldn't see any of the paved surface so I made sure I was between the side marker lights and put the jet down. I couldn't really tell how far down the runway I had landed because the snow had covered everything. I had no idea what was about to happen.

I pulled the throttles to idle and deployed the speed brakes. I cautiously pushed on the pedals to feel the brakes, and the jet immediately started to slide sideways, even with the anti-locks cycling. I let off the brakes, straightened the jet with the rudders and tried it again. Same result with same actions taken. The third time it happened, I looked up to see how much runway was remaining and saw the red end of runway lights coming up fast. I was still sliding sideways. I wasn't going to be able to stop the jet so I made the decision to straighten it up as best I could and "drive it off." I departed the prepared surface which was emphasized when I went over the huge chain

U.S. Air Force photo by Staff Sgt. Samuel Morse (left)
U.S. Air Force photo by Staff Sgt. Ken Bergmann (top)

that anchored the departure end cable. That cable allows other aircraft to drop their hooks and stop — I wished I had one of those. I pulled both throttles to "off" and braced for the rough ride while waiting for my A-10 to come to a stop. Once it did, I started to emergency ground egress. That's when it finally occurred to me what had just happened. I was instantly furious that I hadn't been able to keep my aircraft on the runway. All of a sudden there was someone on the boarding ladder looking at me and telling me he had to get me out of the aircraft. A very sharp de-arm crew had been watching the accident take place and were already running toward me before I left the runway. They snapped me back to reality as they got me out of the jet and into their vehicle for a very slow ride back to ops.

After the normal procedure of writing everything down that happened, I was gathered up by the flight doc and driven to the hospital. It's kind of funny now, but ironically the flight doc is the one who almost killed me that night as we slid through an intersection and almost hit a building — missing it only by a couple of feet. As you can imagine, I looked at the flight doc and told him I had already done a good enough job of almost killing myself and that I had met my quota for that sort of thing for the evening. Gratefully, my day came to an end around 3 a.m. with all my parts and pieces in place and attached as they should be. I was thankful that my accident resulted only in a "hard landing" inspection by the maintenance crews and six other A-10 crews diverting to an alternate location. They actually thought I had piled it in.

After some reflection on the accident, a few things come to mind. I used to think of myself as a fairly conservative pilot who didn't push the boundaries. Landing in 300/1 conditions during a snowstorm is not conservative. Even though some of us do things like this on a somewhat regular basis, just because we can, doesn't always mean we should. I now listen to that inner voice that has been forged through experience and the ability to learn from other pilots' misfortunes. I'm not concerned anymore of how I'm perceived when making judgment calls, although I'm still thought of as a fairly cautious pilot. I can live with that and so can others. Finally, no matter how hard you try, you can't stop a 37,000-pound jet in 6,000 to 7,000 feet when the runway condition reading is below 6. If things aren't as you expect them to be, ask basic questions like, "Has anyone checked the runway lately?" We all pride ourselves with having excellent situational awareness — it was tough to find out mine wasn't good enough as I sat in my A-10 off the end of a runway with snow falling softly around me.

U.S. Air Force photo by Senior Airman Joshua Strang

Confined Space — A Death Trap!

SENIOR MASTER SGT. TERRY TODD
Ground Safety Division
Air Force Safety Center
Kirtland AFB, N.M.

A confined space is a confined space is a confined space — until you introduce a hazard, turning it into a potential death trap. That was the case on a cold November morning when we were notified of a fatality involving an entry into a confined space. A worker had been assigned the task of drilling a hole underneath a runway. Several things went wrong before and during the entry. Looking back, it's pretty obvious that training, or a lack thereof, played a major role in this fatality.

The worker, knowing he would be working in a permit-required confined space, took the initiative to supply himself with what he thought was an appropriate level of protection. Before entering the space, the worker put together an ad hoc version of forced air ventilation by taping a hose to a leaf blower: bad choice No. 1.

Bad choice No. 2 occurred when he decided to enter the permit-required confined space without an attendant or a retrieval line to assist him if anything went wrong.

Using a nonapproved forced air ventilator proved to be a fatal mistake. The gas-powered blower introduced carbon monoxide into the space, resulting in an oxygen-deficient atmosphere, ultimately killing the worker. This type of mishap was preventable.

In accordance with AFOSH Standard 91-25, *Confined Spaces*, a confined space:

- Is large enough and so configured that a worker can bodily enter and perform assigned work.
- Has limited or restricted means for entry or exit
- Is not designed for continuous worker occupancy.

We must remember and apply the following fundamental basic safety rules when working in confined spaces:

- Confined spaces (e.g., tanks, vessels, missile silos, storage bins, hoppers, vaults and pits) are permit-required spaces that have limited access and egress and are not intended for continuous human occupancy.
- If you are a supervisor responsible for a worksite, ensure you're aware of all the hazards that are present. Identify and mitigate hazards and threats to life, safety and health before allowing your workers to enter the space. Don't put your workers in harm's way. Inform, properly train and document your workers' duties.
- Workers who lack the skills and expertise should refuse to work under unsafe and risky conditions. Get the permits and proper training before working.

Confined spaces are deadly — they rarely offer workers a second chance when hazards are present or workers take a shortcut. Mishaps on worksites are preventable as long as everyone takes the initiative to look out for safety first.

U.S. Air Force photo by Airman 1st Class Jason Epley

Winter S

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Ground

We'd like to share some safety tips for driving during the winter season. While many of the strategies may already be known, continued emphasis for safe driving during the winter months could save lives. This information may possibly prevent losses when driving in inclement weather or wintry conditions. We know that even one mishap can negatively affect the mission, morale and performance of the organization.

At the Air Force Safety Center, we care — for you!

Travel Preparation

Allow extra time for your journey when traveling to work or other locations during wintry conditions. Arriving alive is top priority! Being late for work, getting caught in unexpected delays and running into unexpected snow flurries or winter storms are inevitable. Don't risk your life or the lives of others. Even Colonel "Never-Late-On-My-Watch" or Chief "Hard-As-Nails" will understand that things happen during this time of year. Put safety before punctuality during bad weather!

Before traveling, consider these safety tips:

- ✓ Clear all windows of snow or ice using a scraper and deicer. Ensure you have good all-round vision.
- ✓ Use water-repellant sprays on door locks and then oil them.
- ✓ Use a cigarette lighter to warm a key for a frozen lock.
- ✓ Don't breathe on the lock — it will just freeze.
- ✓ Ensure you have the following items available in your vehicles during winter months:
  - ✓ First-aid kit
  - ✓ Tow rope
  - ✓ Blankets
  - ✓ Boots, warm coat, gloves, hat
  - ✓ Snacks and water
  - ✓ Jumper cables/leads
  - ✓ Warning triangle
  - ✓ Water-repellent spray
  - ✓ Cell phone with a car plug and emergency phone numbers
  - ✓ Flashlight
  - ✓ Snow shovel

afety Tips

Car Preparation

We've all heard about the horror movie where the car breaks down and the real fun begins. The horror of your vehicle breaking down in the winter months can be just as bad as any scary movie. Check your battery, tires and windshield wipers; the time and effort you spend ensuring your car is prepared for the winter can ease your tension and stress level.

- Battery/Electrical systems — Modern batteries are maintenance-free, but there's no harm in ensuring the top of the battery is clean and connections are tight. Make certain the alternator and fan belt are in good condition. When starting the car, ensure nonessentials, such as lights, heater and wipers, are turned off. Use the starter in five-second bursts if the engine doesn't start quickly, leaving 30 seconds between attempts to allow the battery to recover.
- Tires — Check all tires for proper pressure, condition and tread depth. At least 3 mm of tread is recommended for winter driving. Don't reduce tire pressures to get more traction (an ineffective myth). You should have a jack and spare tire and know how to change a tire. In cold weather areas where snow is prevalent, it's recommended you have a regular-size spare tire instead of the donut-size spare. Snow chains are also recommended. Buy chains from a reputable specialist and ensure they're the right size for your vehicle. Practice fitting and removing snow chains before using.
- Visibility — Darkness is synonymous with winter as sunlight is with summer. Natural light is reduced by 60 percent during the winter months. This means motorists use their headlights more during this time. Check headlights, taillights and brake lights for operability once per week. Check and/or replace windshield wipers and washer fluid. Windshield washer fluid should be topped off. Additionally, don't use antifreeze for washer fluid. Clean snow off the car roof that may fall onto windshields and windows. Ensure windows are clear.

Driving in Inclement Conditions

Driving in snowy and icy conditions requires gentler maneuvering. The key to safe driving during any season or month is paying attention to the road and following safe driving practices. Stopping distances are typically 10 times longer in snow and ice. Wear comfortable, dry shoes or boots that won't accumulate and maintain snow on the soles, causing slippage from the gas and brake pedals. Maintain a constant safe speed for the given driving conditions. When driving downhill, drive slowly to prevent skidding and gently apply brakes. In areas with low temperatures during winter months (below 32 F) and wet roads from snowfall, melting snow or rain, slow down and beware of black ice.

In areas where rainfall is more prevalent during winter months, watch out for flooded areas. Only drive through water if you know how deep it is. Speeding through standing water is dangerous. If you can't avoid the water, maintain a steady and reasonable speed. Hydroplaning is when tires lose contact with the road and you lose control of the steering wheel. If you hydroplane, hold the steering wheel lightly and lift your foot off the gas and brake pedals until your tires regain traction. Lastly, don't drive through fast-moving water — your car could be swept away.

These are just a few pointers that could make your winter driving experience safer and prevent your vehicle from breaking down, maybe even saving your life. We hope you have a safe winter season and look forward to seeing you on the other side — spring!

Christmas and ORM

An early Christmas present saves a trip to the hospital

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It was a sunny day and the three inches of snow on the ground had just melted off during a brief warm spell, upsetting the early onset of winter. This was just the type of day I was hoping for. I had a row of Christmas lights on the roof that wasn't working and, with no snow on the roof, today was the day to fix them. As the sun warmed up the roof, I put my 8-foot ladder on the ground, leveled the ladder and climbed up to test the asphalt shingles. The shingles seemed mostly dry and provided good traction to my gloved hand, so I thought they'd be fine for my boots as well.

I climbed off the ladder and onto the gently sloped portion of the roof above the garage. As I tested the traction, my boot didn't slip at all. So far, so good. I grabbed a handful of replacement light bulbs and started uphill. As I left the garage and started walking up to the peak of the roof, I stepped out of the sunlight and onto a patch of roof that was shaded from the sun. For the first few steps uphill, my boots retained their grip on the shingles. However, the frost that hadn't yet burned off this portion of the roof soon changed the physics of the climb, and my progress started to reverse. I was sliding off the roof! From this point, I had about 30 feet of sliding before I was off the roof and in the middle of an 8-foot drop to the driveway below. Luckily, as I slid back onto the sunlit portion of the roof, I regained traction and stopped sliding.

Christmas had come early, and that dry patch of roof was all I could have asked for. I decided one row of unlit light bulbs wasn't worth an 8-foot fall, so I gave up on the lights and went back in for a cup (or maybe a pot) of coffee.

I misapplied the basic concepts of operational risk management that day, and it almost cost me a fall off the roof. What should I have done differently that day? The Department of Defense summarizes the ORM process into a five-step model: identify hazards, assess hazards, make risk decisions, implement controls and supervise (plus watch for changes). As I analyzed my decisions that day, I realized I didn't fail to apply ORM; I instead failed to *fully* apply ORM.

I understood the hazards of a slippery roof. I also assessed those hazards when I tested the roof for traction. I made risk

decisions, deciding the risk was low enough that I could fix the lights while realizing a risk still existed. I even implemented controls, wearing winter boots with the best traction I had available. I may not have applied these steps perfectly, but the breakdown in my application of ORM that day was the final step.

The big mistake I made in the ORM process was the last step. I failed to watch for changes. As I transitioned from the sunny side of the roof to the shaded side, I didn't reassess my ORM. The conditions had changed, but my assessment had not. This last step in the ORM process can often be the most important.

ORM is successfully applied throughout the Air Force, both on- and off-duty. Many of the failures of this process are not inherent to the process itself, but instead to the application of the process. The ORM process is not a "fire-and-forget" weapon; it must be continually updated to incorporate changes in the environment, the activity and even the operators. Without this continuous update process, the ORM system will only be accurate for one point in time, and as we all know, nothing in the Air Force is stagnant. Continuously updating ORM decisions is the only way the process works — both at work and at home.

Driven to Distraction

A Disturbing Side Effect of Technology

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There I was, driving along in my car, when I saw a sweet, sleek, aqua-blue '66 convertible Mustang in mint condition. I was taking in the moment when out of my peripheral vision I saw a fast approaching object. I hit my brakes hard. Only a few inches separated my front bumper from the back bumper of the vehicle I almost rear-ended. I looked ahead at the owner as she shook her head with disgust. I could almost read her thoughts … "such an idiot."

That was my near-miss experience. The owner was right; I was an idiot, a distracted idiot. I had experienced one of the four types of driving distracters — visual.

How often do you send text messages or use your cell phone while driving? Do you use a global positioning system in your vehicle? How many flashy billboards have you noticed while driving down the road? Technology has definitely made our lives easier and more enjoyable; however, it's also taking a toll on our safety when that technology influences our driving abilities.

Distracted driving is fast becoming a major concern as a causal factor in many traffic-related mishaps. Statistically, up to 25 percent of all motor vehicle mishaps can be attributed to some type of distraction. How often do you take your eyes off the road when looking for a street address or watching people walking? From using the latest technology to being in deep thought, any distraction can lead to disaster.

Distracted driving is defined as the voluntary or involuntary diversion of attention from the primary

driving task. Distractions come from three primary sources: self-induced (you), internal and external factors. These elements influence and impact the time you, the driver, have to react to ever-changing traffic situations around you. The diversion reduces your situational awareness, decision making and performance. This could result in a collision or near-miss. Let's take a closer look at these sources of distraction.

You, the driver. What are you thinking about? Do you want to send someone a quick text message or check out your Facebook or Twitter page? Where does your attention go when you're texting and driving? Most likely not on the road.

Internal distractions in the car. Your radio, CDs or DVD player can be a major distraction. Passengers can draw your attention away from the road. An intense conversation may increase the driver's adrenalin, causing an additional distraction.

External distractions include averting your attention to sources outside of the vehicle. Seeing someone or something on the side of the road can divert your attention or you may focus on other vehicles, flashing billboards/advertisements, etc.

Working in concert with the sources of distractions are the following four types of distracters:

Visual — anything you see that causes you to take your eyes off the road

Auditory — anything that diverts your hearing, including listening to the radio or CD player

Cognitive — anything that takes your mind off the road, i.e., thinking about work, family or vacation plans

Manual — anything that takes your hands off the steering wheel, such as eating, reaching for a cell phone or trying to wipe a child's face

When you learn to drive, the importance of paying attention and keeping your eyes on the road is stressed. Over time, we forget those invaluable, timeless tenets that focus on the skills needed to "stay alive." When driving a vehicle, you still have a huge responsibility to yourself, your passengers, those around you and those who love you. You control a vehicle that can end a life in the few seconds that it takes to look at a text message or grab that CD off the floor. A recent Harvard study estimated distractions due to cell phone usage cause 2,600 traffic deaths per year and 330,000 accidents that result in moderate to severe injuries. A study by Virginia Tech Transportation Institute suggested that a driver texting on or dialing a cell phone is 2.8 times more at risk of a crash or near-crash than a nondistracted driver.

In some cases, problems can be identified and mitigated before they become a distracter. Focus on the traffic around you instead of the accident scene. Eat before or after you drive, ask passengers to help you focus on driving, turn off the cell phone until you reach your destination or pull off on the side of the road if you absolutely have to send a text message. Many issues can come up while you're driving; stop and give them your undivided attention.

Knowing what causes you to become distracted while driving is the first step in eliminating the problem. Once you start recognizing driving distracters, you can start controlling them. Currently, 18 states have enacted laws to ban cell phone usage and texting while driving, with other states soon to follow. Operating a cell phone and texting while driving are also strictly banned on all military installations.

Make the right choice now and choose to focus on driving; don't become another statistic. Two words to help you remember — **just drive!**

U.S. Air Force photos by Dennis Spotts

Safety Shorts

Stranded

What if you were traveling cross-county and suddenly drove into a blizzard? Would you continue driving? Would you pull over to the side of the road and start walking to find shelter? What if you became stranded? Would you know what to do?

If a winter storm strands you in your vehicle, stay there. Don't leave the vehicle to search for assistance unless help is visible within 100 yards. You may become disoriented and lost in blowing and drifting snow. Snow blindness can occur in seconds, not minutes. Display a trouble sign by hanging a brightly colored cloth on the radio antenna and raising the hood. Turn on the vehicle's engine for about 10 minutes each hour and run the heat to keep warm. Also, turn on the vehicle's dome light when the vehicle is running as an additional signal. Beware of carbon monoxide poisoning. Keep the exhaust pipe clear of snow and slightly open a downwind window for ventilation. Watch for signs of frostbite and hypothermia. Do minor exercises to keep up circulation. Clap hands and move arms and legs occasionally. Try not to stay in one position for too long. If more than one person is in the vehicle, take turns sleeping. For warmth, huddle together. Use newspapers, maps and even the removable car mats for added insulation. Avoid overexertion since cold weather puts an added strain on the heart. Unaccustomed exercise, such as shoveling snow or pushing a vehicle, can bring on a heart attack or make other medical medications worse. Be aware of symptoms of dehydration.

Staying with and in the vehicle increases your opportunity for survival. Make the right choice!

Source: Occupational Safety and Health Administration

Wind Chill

The coldest day I've ever encountered was in 1985 at Minot AFB, N.D. By noon, we were at 79 below zero, with a wind chill of 94 below zero. If you don't know the importance of dressing for the weather, days like this are a jolt of reality.

In the 1940s, the wind chill index was developed to describe the relative discomfort and danger that resulted from the combination of wind and temperature. The wind speed, relative humidity and sunshine play important roles in determining how cold you feel outside. Simply knowing the temperature doesn't tell you the true conditions outside. The importance of the wind chill index is as an indicator of how to properly dress for winter weather.

An important factor in dressing for cold weather is to remember that the best protection against the cold is entrapped insulated air warmed by body heat. To achieve this protection, wear loose-fitting, lightweight, warm clothing in several layers. Outer garments should be tightly woven, water-repellant and hooded. Mittens snug at the wrist provide better protection than fingered gloves.

The chart below is a guide for determining wind chill temperatures. Find the approximate temperature at the top of the chart. Read down until you are opposite the appropriate wind speed. The number which appears at the intersection of the temperature and wind speed is the wind chill index. Sometimes it's colder than you think. Dress accordingly!

Source: WeatherImages.com

Wind Chill Chart

Wind (mph) \ Temperature (°F)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	29	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

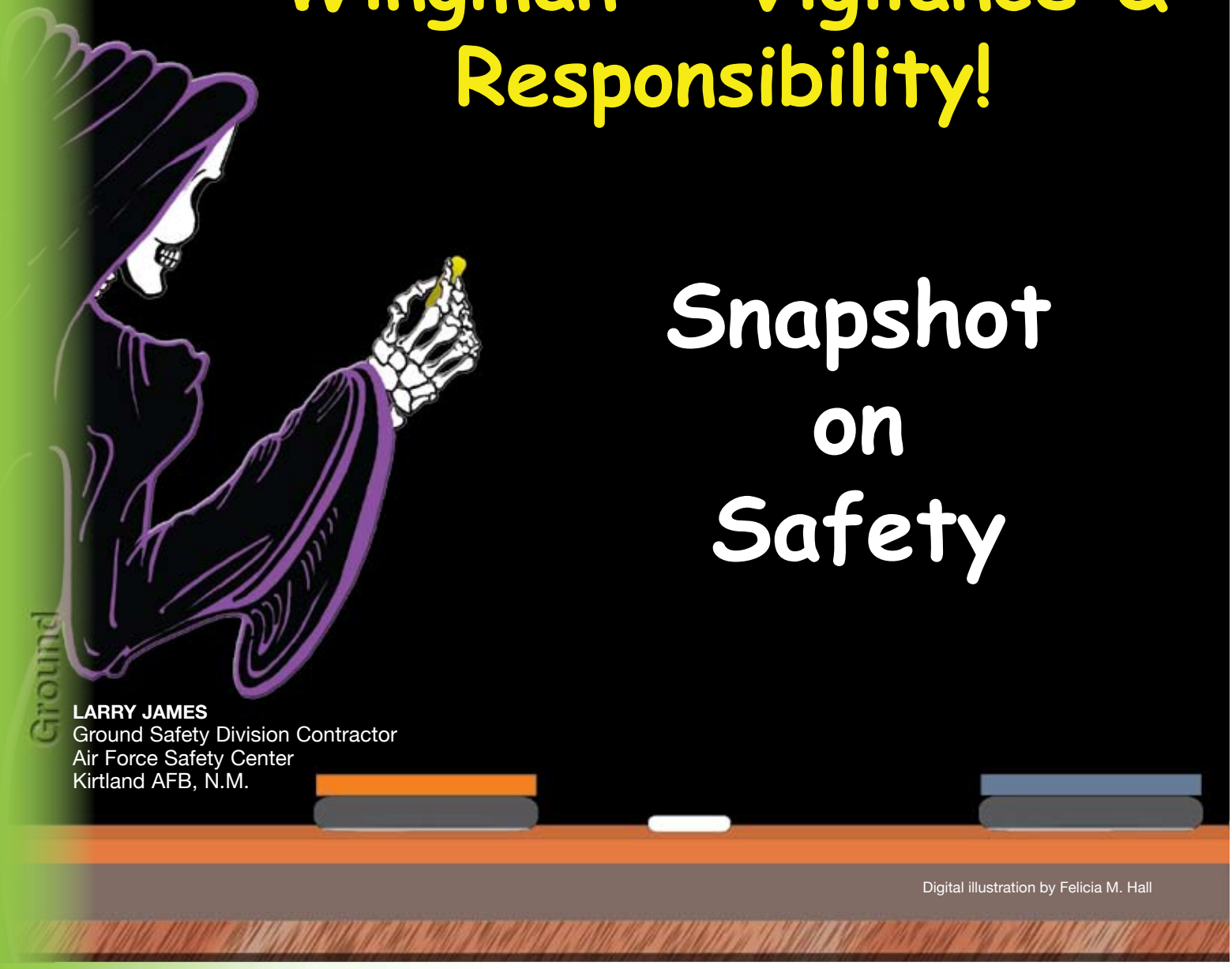
Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Wingman = Vigilance & Responsibility!



Snapshot on Safety

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Digital illustration by Felicia M. Hall

Snow-covered Trouble

During a wing's winter sports day, an Airman was operating a snowmobile in a snow-covered, dry lake bed. Knowing that the Airman was an inexperienced snowmobile operator, his crew leader provided him with a short briefing on the controls and safe operation of the snowmobile. The crew leader stressed the importance of staying off hills because of the rider's inexperience. While coming down a hill, the Airman struck a snow-covered embankment and received blunt force trauma injuries to his face and neck. He was pronounced dead approximately one hour after the mishap. Alcohol and lack of sleep were not factors in this mishap.

Lessons Learned

Inexperience and failure to follow the advice given during the safety briefing were factors in this mishap. The Airman should have received the proper training before being allowed to operate a snowmobile; however, proper application of risk management principles could have compensated for his lack of experience. When inexperienced, always adhere to good advice and apply operational risk management. Use caution when learning a new task and have a safer, more enjoyable experience in the long run.

Spinning on Ice

On a cold, February night, three Airmen went out for some fun at a pool hall and later at a local nightclub. During the night, Airmen 1 (A1), 2 (A2) and 3 (A3) spent several hours at the pool hall and the nightclub. A1 drank only nonalcoholic beer while A2 and A3 had several drinks. At around 3 a.m., A2 found A3 asleep in the vehicle and told A1 that it was time to go. A3 stretched out in the back seat and continued to sleep as they started back to base. A2 buckled the seatbelt, but didn't say anything to A1 or A3 about buckling their restraints. As A1 entered a curve, the vehicle hit black ice and went into an uncontrollable spin, striking a guardrail and tree, resulting in A1 and A3 being ejected from the vehicle. A2 was uninjured in the mishap while A1 was injured and A3 received fatal injuries. Alcohol and fatigue were factors in this mishap.

Lessons Learned

Alcohol use, weather conditions, failure to use available safety devices and failure to follow proper personal risk management practices were factors in this mishap. The fatal injuries A3 sustained were a direct result of being ejected from the vehicle. A3 had too much to drink, and that combined with fatigue, caused A3 to be in a position that didn't provide the same protection as sitting upright, wearing a seatbelt. While A1 was sober and familiar with the area, A1 wasn't accustomed to driving in freezing conditions. Black ice has often been referred to as the silent killer. A1 failed to use good risk management principles when choosing to drive too fast for the conditions and by not wearing the restraints provided. Additionally, A2 wasn't being a good wingman by not speaking up about A1 and A3 buckling up or about how fast A1 was driving, considering the conditions. A1's leadership failed all who were riding in the vehicle. A good, experienced driver would anticipate areas of possible black ice. In wintry conditions, after a rainy or snowy day and below freezing conditions, black ice is an inclement condition that sneaks up on most drivers. There had also been a briefing about the likely locations where black ice could develop in the area. Not adhering to the local guidance, driving too fast for the conditions and not using safety restraints contributed to the injuries to A1 and the death of A3. Fun that ends in tragedy is not really fun at all.

Alcohol and Firearms

On a warm, January night, an Airman and a friend decided to spotlight hunt for deer. Spotlight hunting is a process whereby shining a bright light into the eyes of a deer causes the deer to become transfixed on the light, giving the hunter time to shoot. This type of hunting is illegal in most locations. During the hunt, the Airman spotted a deer and cocked the lever-action rifle, but the deer bolted before the Airman could fire. While tracking the deer to get another shot, the Airman apparently stumbled, depressed the trigger and caused the rifle to discharge a round that struck the Airman in the head. The Airman was pronounced dead at the scene by responding law enforcement officers. Alcohol was a factor in this mishap.

Lessons Learned

The factors in this mishap included alcohol use, environmental conditions and failure to follow proper personal risk management practices. Even though in an alcohol rehabilitation program at the time of the mishap, the Airman was drinking and had a blood alcohol content greater than three times the level that indicates intoxication. Hunting at night is always dangerous, and when combined with alcohol use, far exceeds the principles of risk management. Being intoxicated prevented the Airman from making sound judgments about hunting, gun safety and muzzle awareness. Alcohol and gunpowder do not mix. Never use alcohol and firearms simultaneously; the only one safe in the hunting party when this happens is probably the deer.

Generation M

Zero Fatalities — Let's Stop Reckless Behavior

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Since Sept. 11, 2001, the Air Force has suffered 53 combat deaths and a staggering 572 private motor vehicle mishap deaths. Just in 2009, the Air Force was stricken with the loss of 46 Airmen from PMV mishaps. Since 2005, 72 percent (60 out of 83) of PMV-2 (motorcycle) fatalities and 68 percent (86 out of 127) of PMV-4 (4-wheel) fatalities have been due to reckless behavior. Statistics identified the target group with the greatest risk as male, average age of 26 for PMV-4 mishaps and average age of 27 for PMV-2 mishaps.

Due to these statistics, Air Force Safety implemented the "Zero Fatalities: Stop Reckless Behavior" PMV campaign. The goal of this campaign is to facilitate commander engagement, provide behavioral training and encourage individual and unit accountability to help decrease the number of PMV mishap fatalities to zero due to reckless behavior.

As a 20-year-old student at the University of New Mexico, I see my generation providing the most PMV mishap fatalities. For a person in their twenties, it's more about the current moment than anything else. "Generation Media," as I call it, wants everything faster. It seems we're always in a hurry and our patience is shorter than any other generation. We want to have fun, get straight A's and advance in our career, all at once.

Driving has become an inconvenience. It might have revolutionized society once, but now it's too slow. I believe that's why we see so many reckless behaviors with my age group: texting while driving, speeding, aggressive maneuvers, racing and so on. What can we do to stop so many fatalities? One possibility is to create an understanding of the risks associated with speeding and to educate my generation on outlets for adrenaline and the ineffectiveness of their hurry/multitasking mentality. There are race tracks in many states that would provide ample room to really test the performance of cars. Speeding to get you somewhere never really works. The stop lights will halt your progress, anyway.

I believe the PMV campaign will start to effectively implement self-accountability for military members. This should get them thinking and becoming aware of the impact their actions can cause on the Air Force mission. It will also provide PMV training to help individuals observe their behavior while driving and correlate its impact on their daily lives. Tools, such as the Travel Risk Planning System, or TRiPS, will be provided to help slow down individuals and get them to think of the proper set of actions. Commanders will be at the lead, implementing and encouraging individuals in order to effectively use the PMV campaign's guidance.

Note: Figures have changed since this article was written.

Taurus XL/Orbiting Carbon Observer Failure

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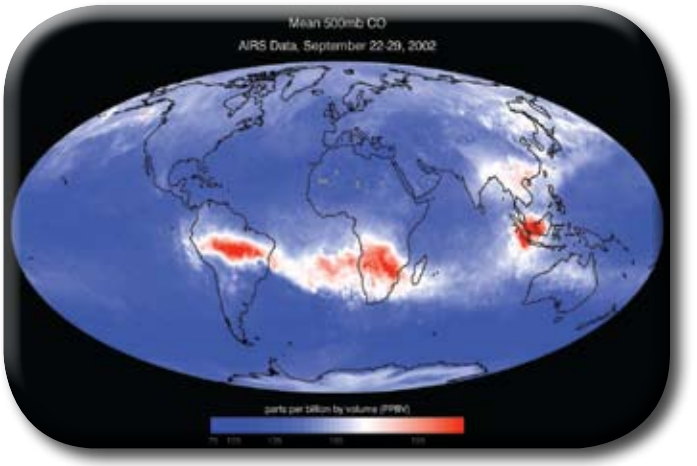
On Feb. 24, 2009, NASA launched the Orbiting Carbon Observer, an environmental satellite designed to monitor the amount of CO_2 in the Earth's atmosphere. About three minutes after launch, the payload fairing was supposed to separate from the launch vehicle's third stage, thereby exposing the payload for its later release into space. The expected jump in acceleration that produces the necessary delta-v for the satellite to make it into orbit did not occur. The fairing failed to separate and the third stage of the rocket, not meant to carry the extra weight, crashed into the ocean near Antarctica. The $273.4 million irreplaceable satellite continued sending telemetry data until impact.

After a thorough investigation, the NASA mishap investigation board could not isolate a definitive cause. They identified four potential causes, each as likely or unlikely as the next. Investigators only know at this point that the payload fairing didn't separate and jettison as planned.



The fairing is a shroud that envelops and protects the payload from the effects of the rocket moving through the earth's atmosphere and is heavy enough to prevent the satellite from obtaining orbit if not deployed. Fairing separations are historically so reliable that this type of failure isn't taken as a risk at readiness reviews unless it's a previously known problem. The Taurus fairing separates with explosive ordnance that splits it in half; the pieces then fall away from the launch vehicle and burn up in the earth's atmosphere.

Photos courtesy of NASA

The OCO spacecraft and the Taurus XL booster were built by Orbital Sciences Corp. The four-stage Taurus XL rocket stands about 93 feet tall and is capable of launching satellites weighing up to 3,500 pounds into low-Earth orbit. The OCO weighed in at 972 pounds. The Taurus is a land-based version of the Orbital Sciences Pegasus booster which is launched from an airplane. This latest failure is only the second of eight total launches for the Taurus. The previous failure occurred in September 2001.

The latest malfunction is a major setback to climate research after eight years of development to ready the satellite for launch. Researchers had hoped the spacecraft would provide definitive answers to questions surrounding the Earth's natural carbon dioxide cycle. Scientists also anticipated OCO would resolve how the planet processes the 8 billion tons of greenhouse gas produced by the burning of fossil fuels and other human behavior each year. This would improve our understanding of the natural processes and human activities that regulate the abundance and distribution of carbon dioxide. This would also predict how fast carbon dioxide will build up in the future and how quickly we'll have to adapt to the climate change caused by this build-up.

The Observatory was the next in line of a series of Earth-orbiting satellites known as the Earth Observing System; these are a coordinated series of polar-orbiting low-inclination satellites designed to monitor and understand key components of Earth's climate system. Elements include land surface, biosphere, solid earth, atmosphere and oceans. As the series of satellites is designed to correlate data received from instruments on one satellite with another, the loss of one satellite can create a huge gap in the system. For example, scientists could have compared OCO data with simultaneous measurements gathered by the Atmospheric Infrared Sounder, an instrument on the already orbiting Aqua satellite. The whole "A-Train" system comprises over 20 satellites, with the first launched in the late 1990s. These, along with the recently launched Japanese climate-studying satellite "Ibuki," may be able to offset the loss of OCO. Only time will tell.

Investigators are fairly confident that if any of the four potential causes are confirmed and associated recommendations followed, it will go a long way to alleviating the chance of this particular mishap occurring again.

During a normal Taurus launch, the fairing halves separate along frangible joints. These joints contain small explosive charges to sever the connections which hold the fairing together and attach the shroud to the rocket. Small pneumatic thrusters then push the fairing parts outward in a hinge motion.

One potential cause sited by the board is an incomplete fracture of the frangible joint base ring between the fairing and the launch vehicle. Another possible cause is the current from the electrical subsystem might have been too low to blow the pyrotechnics. The explosives require 24 amps, but the telemetry system only measures up to 14 amps. Changing the telemetry measurement range is an easy recommendation. Another potential cause is the pneumatic thrusters, designed to force apart the fairing halves after the explosive joints fire, didn't have enough power to push the fairing outward as designed. Lastly, there could have been a snagged detonating cord that prevented the fairing from separating.

Orbital Sciences Corp. conducted an independent study and has already begun to implement corrective actions. They plan for these actions to be completed in time for the next Taurus launch in support of NASA's Glory satellite in 2010.

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What's in Earth Orbit?

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Author's note: A more detailed version of this article was published in July 2009 in the online journal "The Space Review" under the title "The Numbers Game."

Whenever the topic of space debris and satellites in orbit comes up, numbers tend to get thrown around by different people making it hard to keep the figures straight. Since many objects are flying around in Earth orbit, it helps to categorize them. Generally, there are two basic types of objects: natural and artificial (man-made). Natural objects consist of meteoroids and micrometeoroids — pieces of asteroids and comets. Given their very small size, usually smaller than a few millimeters in diameter, most of them are not considered to be trackable, especially using ground-based methods.

The other major category, artificial orbital debris, consists of the leftovers from humanity's activities in Earth orbit. Every time we put a satellite into space, we end up leaving something behind in Earth orbit. At the very least, we leave the satellite itself, one or more rocket stages and bits of miscellaneous stuff. The bits of stuff include explosive bolts, lens caps and solid rocket exhaust particles. Sometimes these leftover bits shed more pieces through what are called fragmentation events. These events can be minor (a few dozen pieces) to extreme (explosions creating more than a thousand pieces).

Population Sizes of Objects in Earth Orbit

Category	Definition	Estimated Population	Potential Risk to Satellites
Trackable	Greater than 10 cm in diameter	19,000 +	Complete destruction
Potentially Trackable	Greater than 1 cm in diameter	Several hundred thousand	Complete to partial destruction
Untrackable	Less than 1 cm in diameter	Many millions to billions	Degradation; loss of certain sensors or subsystems

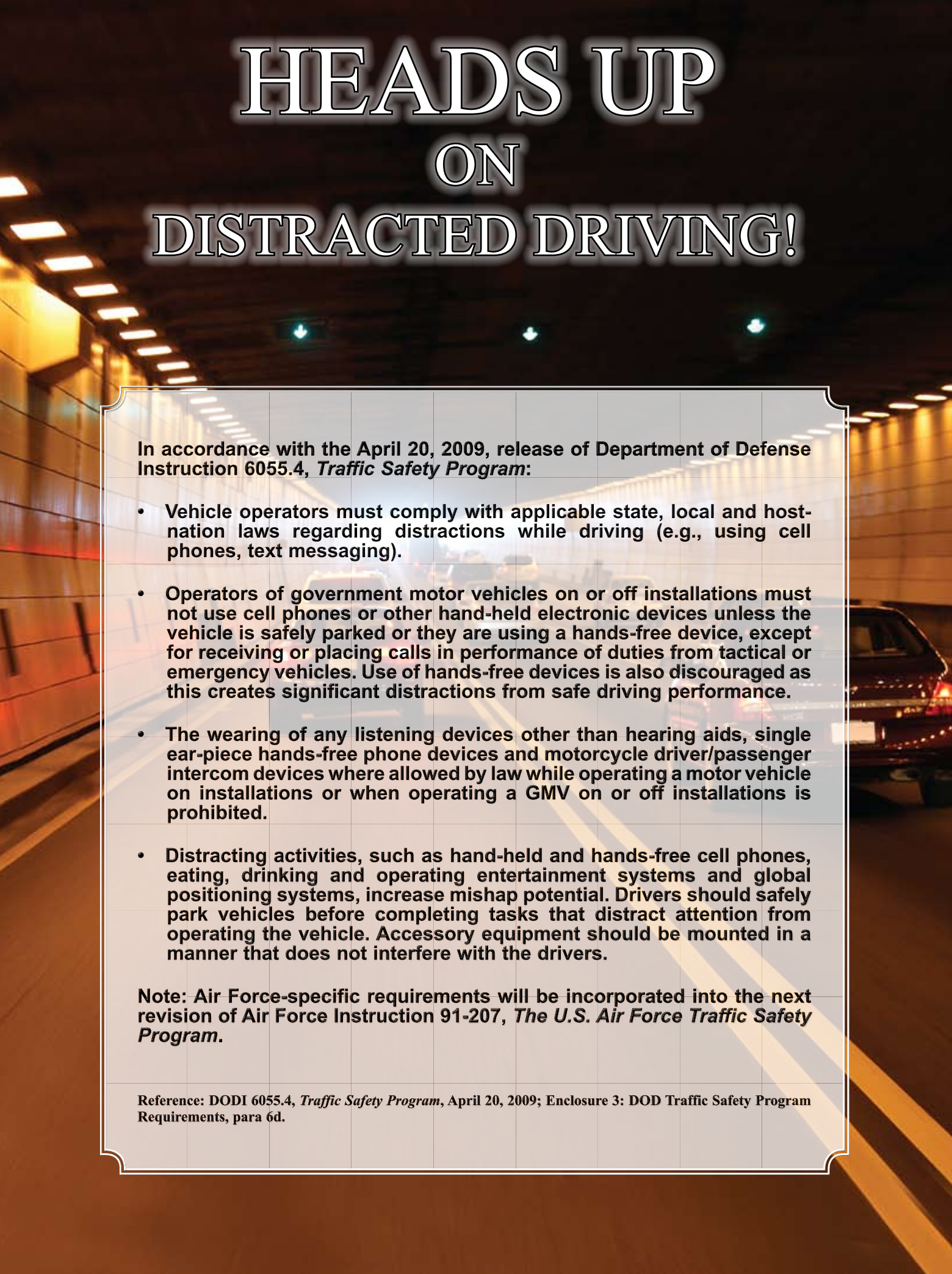
Within this category of artificial objects, we define three basic populations: the trackable, the potentially trackable and the untrackable, as summarized in the table above.

Due to the extremely high orbital velocities of these objects, and thus momentum, it's considered impractical to shield against impacts from objects bigger than one centimeter. The risk due to potential impacts from objects smaller than one centimeter can be mitigated in some fashion through shielding and satellite design. These smaller objects generally present risks for only damage to a satellite or subsystem and not total destruction.

A satellite catalog is a database which contains a list of objects in orbit. Information about the objects includes date and country of launch as well as orbital data that describes the position of the object. There are multiple satellite catalogs in use across the world. The most well-known, complete and publicly available catalog is the one maintained by the U.S. military. It's traditionally referred to as the satellite catalog or SATCAT. This catalog and others like it are a critical part of space situational awareness, providing knowledge about what's happening in space.

When a satellite passes over a sensor, such as an optical telescope or radar, that sensor can determine the satellite's position at different points during the pass. These points are called observations and when taken together, are called a track. Multiple tracks from different sensors along a satellite's orbit are combined to produce an element set or equation that describes where a satellite is in space. These element sets are stored in a satellite catalog.

A version of the SATCAT is available publicly through the Commercial and Foreign Entities program on the Space Track Web site (*http://www.space-track.org*). It provides positional data on the locations of objects in the form of two-line elements. Anyone in the world can sign up for a free account to view, sort and download this data. The main restriction of this source is that redistribution of the data requires prior approval from the Department of Defense. While the U.S. military does a yeoman's job with this mission, there are many initiatives that our government can undertake to improve the situation. The incentive is assured access to and continued use of space for the U.S. Keep in mind that continued access and use depends on the actions of the other actors in space. If the other actors are operating in space without good knowledge of the space environment, they could potentially take actions that could damage the long-term sustainability of the space environment. As is the case with many regimes and problems, knowledge is the key to safe and secure operations in space. A comprehensive and accurate satellite catalog is the essential foundation of this knowledge and enables many other services and functions.



HEADS UP ON DISTRACTED DRIVING!

In accordance with the April 20, 2009, release of Department of Defense Instruction 6055.4, *Traffic Safety Program*:

- **Vehicle operators must comply with applicable state, local and host-nation laws regarding distractions while driving (e.g., using cell phones, text messaging).**

- **Operators of government motor vehicles on or off installations must not use cell phones or other hand-held electronic devices unless the vehicle is safely parked or they are using a hands-free device, except for receiving or placing calls in performance of duties from tactical or emergency vehicles. Use of hands-free devices is also discouraged as this creates significant distractions from safe driving performance.**

- **The wearing of any listening devices other than hearing aids, single ear-piece hands-free phone devices and motorcycle driver/passenger intercom devices where allowed by law while operating a motor vehicle on installations or when operating a GMV on or off installations is prohibited.**

- **Distracting activities, such as hand-held and hands-free cell phones, eating, drinking and operating entertainment systems and global positioning systems, increase mishap potential. Drivers should safely park vehicles before completing tasks that distract attention from operating the vehicle. Accessory equipment should be mounted in a manner that does not interfere with the drivers.**

Note: Air Force-specific requirements will be incorporated into the next revision of Air Force Instruction 91-207, *The U.S. Air Force Traffic Safety Program*.

Reference: DODI 6055.4, *Traffic Safety Program*, April 20, 2009; Enclosure 3: DOD Traffic Safety Program Requirements, para 6d.