
flying SAFETY
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SPECIAL
C-130
Broad Area
Review
ENTER
WINTER

UNITED STATES AIR FORCE

Flying Safety

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Front cover photo by MSgt Rich Moran

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It's Cold Weather Time!

336th Training Group
Fairchild AFB, Washington

■ Cold weather is approaching—and already here for some northern tier bases. So the people at the Air Force Survival School at Fairchild AFB, Washington, share this info in the hope you'll use it to prevent cold weather injuries to you, your coworkers, and family.

• Hypothermia has been called the killer of the unprepared. It occurs when the body's core temperature drops below 95 degrees Fahrenheit. Symptoms include uncontrollable shivering, sluggish movements, reduced coordination, and impaired judgment. If body core temperature drops below 77 degrees Fahrenheit, death is almost certain. Remember: Wet conditions and wind speeds increase heat loss from your body, making a need for shelter vitally important, even in seemingly mild conditions.

- The best defense against hypothermia is prevention: Maintain the body's energy supply by eating high calorie foods. Sugary foods (hard candies) are the best for quick energy while complex carbohydrates (granola) are longer lasting. If you are wet, dry off and change clothes immediately. Get out of the cold as soon as possible—seek shelter. Be well rested, and if moving to keep warm, avoid exercising to a fatiguing point. Wear clothing that insulates even when wet—wool can insulate up to 70 percent, even when wet.

• Protect the extremities during cold weather and you'll greatly improve your odds for survival.

- A tremendous amount of heat is lost through the head, hands, and feet if unprotected. It is recommended you carry a woolen cap and intermediate gloves or heavy mittens in your flight clothing pocket or survival vest during winter and arctic-like conditions.

• Remember the COLDER principle: Keep your clothing Clean, avoid Overheating, wear everything loose and in Layers, keep Dry, Examine your clothing for damage, and if any is found, Repair it.

• Wet clothing conducts heat away from the body up to 25 times faster than dry clothing. To avoid sweating, take off some of your layers prior to doing physical labor, and replace them before the body cools back down.

• Dress for the worst possible environment you will fly over, not necessarily the environment you departed from or the one to which you are flying.

• Dehydration increases the possibility of cold-related injuries and compounds their effects. Stay hydrated by drinking plenty of water. ✈

Ever try installing a washer and nut at 20 below zero? Easier said than done...

ENTER WINTER

USAF Photos by MSgt Rich Moran

MR. JAMES B. BOLIN
AF Engineering and Technical Services
Elmendorf AFB, Alaska

The brief Alaskan summer has come to a close, fall is well upon us, and conditions are favorable for "termination dust" ("snow" to those of you in the lower 48) to make its appearance anytime now. Hunting season is coming to a close, except for a few areas, and sport fishing has nearly come to an end. The salmon have all come back to complete yet another cycle of life, and the remaining Cohoes will trickle in during winter until the rivers freeze up. All of these signs herald the beginning of the time of year when our workload is heaviest and most difficult.

Ever try installing a washer and nut at 20 below zero? Easier said than done, and just one of the reasons winter presents a whole new set of challenges for maintainers in the 632d Air Mobility Support Squadron (AMSS) and anyone else who works in far northern climes. Our mission is to provide en route logistics support to Air Mobility Command aircraft transiting Alaska and keep them moving. We also recover, refuel, deice (if necessary), and launch commercial aircraft under military contract. Since we have no permanently assigned aircraft, the situation can go, in short order, from none on the ground to many on the ground, and that's why we take winter preparedness very seriously.

Working in a Winter Wonderland

First snowfall usually occurs in October, but measurable snowfall can occur anytime after August. Winter weather conditions here include rain (even in the dead of winter), snow, ice fog, and everything in between. Ice fog is especially nasty since it can take visibility down to near zero and linger for days. Everything ice fog contacts—trees, vehicles, chain-link fences, aircraft—turns white and may become nearly invisible against a background of snow.

Here at Elmendorf, we've outfitted our personnel with the clothing required to work outside safely in the Alaskan winter. Quality gloves, quality boots that remain effective and pliable in extreme temperatures, and quality undergarments that retain body heat are all absolutely essential. Here, our work continues until conditions reach *minus* 50 degrees. Even at "warmer" temperatures, good clothing, properly fitted and worn, is a must for preventing frostbite, hypothermia, and other cold weather injuries. Remember that layering your clothing is the way to stay warm and comfortable.

We've also rigged our snowplows, ops checked our deicer vehicles, and ensured all other necessary winter equipment is stored in a warm building and ready to go. History has taught us that a little preparedness goes a long way in keeping aircraft and cargo moving where they're needed.

Even though bird activity, bird strikes, and subsequent window changes are common during the summer months, we actually change *more* aircraft windows during the winter. Why? Usually because of the well-intentioned soul who arrives at the aircraft, sees windows frozen over, and figures powering up the window heat system will work as well as defrosters in an automobile. **Reminder:** Rapidly heating glass that's surrounded by cold-soaked metal will result in a shattered window! Generally speaking, window changes here are done out-of-doors, in whatever weather happens to be present, since we have no hangar space. Therefore, we do our best to educate all personnel on how using window heat for the wrong reasons can ground an otherwise mission-ready aircraft.

Despite those who may be nonbelievers, applying heat—as from an AGE heater—*really does* fix a large number of discrepancies. It often takes our technicians more time to explain to an aircrew how warming up parts fixed a problem than it did to actually perform the fix. During the conversion from JP-4 to JP-8, applying heat to the engines to get them started was SOP. Cockpit instruments can also be affected by the cold. We've found applying a little heat to the flight deck can do wonders for a stuck indicator or gyro that won't right itself. Experience has taught us the value of a little heat, judiciously applied, and we pass this on to all new personnel.

Adventures in Deicing

In the "bad old days," we had a cantankerous 1970-something Calavar Condor that had a mind of its own, and deicing with it was often an experience for only the adventurous at heart. If it wasn't working properly (a frequent occurrence) and a C-5 needed deicing, our folks would have to crawl up inside the T-tail and hoist the deicing hose up to deice tail surfaces. At that height, the pressure would be all of 5 psi, and it would take as long to deice the tail as the rest of the whole aircraft.

On one occasion, the boom extended okay for the deicing operation, but it wouldn't retract, stranding our crew chief at the top. After about 2 hours of trying to lower it without success, we called the fire department to help get him down. Fortunately, vehicle maintenance was able to get the boom operating before any rappelling became necessary. We've learned our lessons, and now we have two well-maintained special-purpose vehicles for deicing—a Calavar Condor 125 and a Reach All. And they are ready for the coming winter.

Deicing is one task with which all 632 AMSS personnel become intimately involved. During a heavy snowfall, even the 2 1/2 hours allotted for snow removal and deicing aren't enough. There are times when one section of a previously deiced aircraft will have to be deiced again

continued on next page

before the aircraft can taxi, and sometimes we have to deice at the end-of-runway area just before aircraft departure. Multiply this by four, divide by three C-5s, and you have the makings for one busy day. The only ways to keep up with this demand are to ensure enough people are properly trained and that your deicing equipment is well maintained and ready for use.

Finish Winter Preparation *Now*

Here are some final thoughts on how you can assure your winter operations are successful and safe.

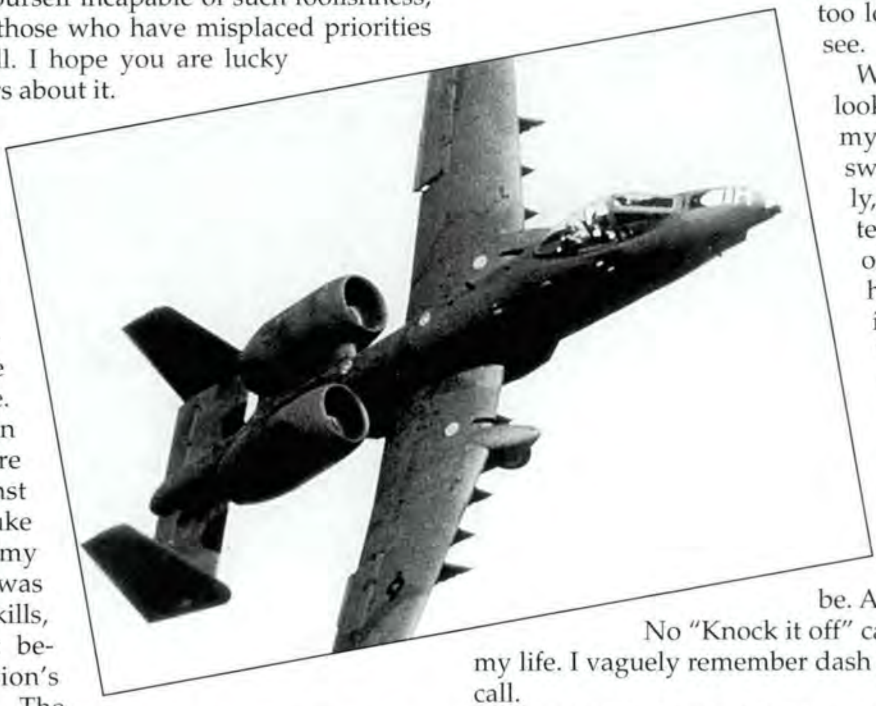
- Provide everyone with the proper cold-weather gear. Ensure they understand how to wear it properly for maximum protection and *that they use it*. Use of the buddy system during extreme cold conditions will also help prevent cold weather-related injuries.
- Winter conditions—cold temperatures, ice, snow, and reduced visibility—and winter clothing will all conspire to make jobs take longer than usual, so plan for additional time to perform routine tasks.
- Make sure the equipment you'll depend on for sustaining operations—heaters, deicers, snowplows, and the like—is serviceable and ready to go *before* you need it. And suitable training, whether initial or refresher, is critical for the people who'll use that equipment.
- Driving, towing, and even walking present opportunities for equipment damage and personal injury that just didn't exist in spring and summer, so be attentive to the task at hand.
- Personnel wearing lots of cold-weather gear—parkas, bulky field jackets, mukluks—move more slowly and represent a larger mass. Because of this, there is an increased danger of being ingested into a running aircraft engine. Maintaining greater distance from intakes and awareness of proximity to running engines are the best defenses.
- Use lessons learned from this winter season to improve operations during the next one. ✈

Remember—It's a whole lot easier to go with common sense and logic to avoid a winter hazard than to spend time thinking about what you SHOULD have done while you're laid up in a hospital bed...or worse.

Priorities

MAJ KEN EDWARDS, USAF
NAS Whidbey Island, Washington

Since I started flying, my instructors and squadron mates senior to me have drilled into my head three priorities: AVIATE, NAVIGATE, COMMUNICATE! It quickly became obvious to me that if it could kill you, it was a priority! In other words, when one is more concerned with sounding good on the radio than scanning altitude and airspeed, something bad is probably going to happen. The aviator who suffers this fate is clearly suffering from a dose of misplaced priorities. If you think yourself incapable of such foolishness, beware! There are those who have misplaced priorities and those who will. I hope you are lucky enough to tell others about it. I know I was.



The weather was severely clear in southern Arizona that day. I was leading a division of A-10 Warthogs on a low-altitude defensive maneuvering sortie. My flight and an AWACS were matched up against two F-16s from Luke AFB. One of my briefed objectives was zero unobserved kills, so visual lookout became the division's prime concern. The "Hogs" were eastbound at 500 feet AGL in a battle box formation. I was the north man with dash 3 positioned 8,000 to 9,000 feet behind me. Dash 2 and dash 4 filled in the southern portion of the box formation.

The great thing about flying over flat and featureless Arizona terrain was that I was able to keep a close eye on my entire flight. As the contacts turned hot toward us, the AWACS calls became more energetic. My southern wingmen immediately began their visual sweep south in response to the bogie calls. They strained to visually acquire the approaching tracks who, at this point, were declared as bandits. "No joy" was the response.

After a few more "No joys," my wingman and I also started visually sweeping to the south. You can probably see where this story is going—all four aircraft looking south with an occasional glance forward in the direction of flight. It's amazing how much real estate one eats up during a fight like that. I glanced forward and assessed I had enough time for another 10- to 15-second sweep south before entering mountainous terrain. I was determined to deny those viper babies an unobserved kill. This was the point where my priorities shifted to visually scanning south for the bandits.

As the attack progressed, the AWACS informed us there was only one contact, and he was south of our position. I thought, "This is a classic decoy." The second viper was undoubtedly north of us getting ready to pounce. He was probably too low for the AWACS to see.

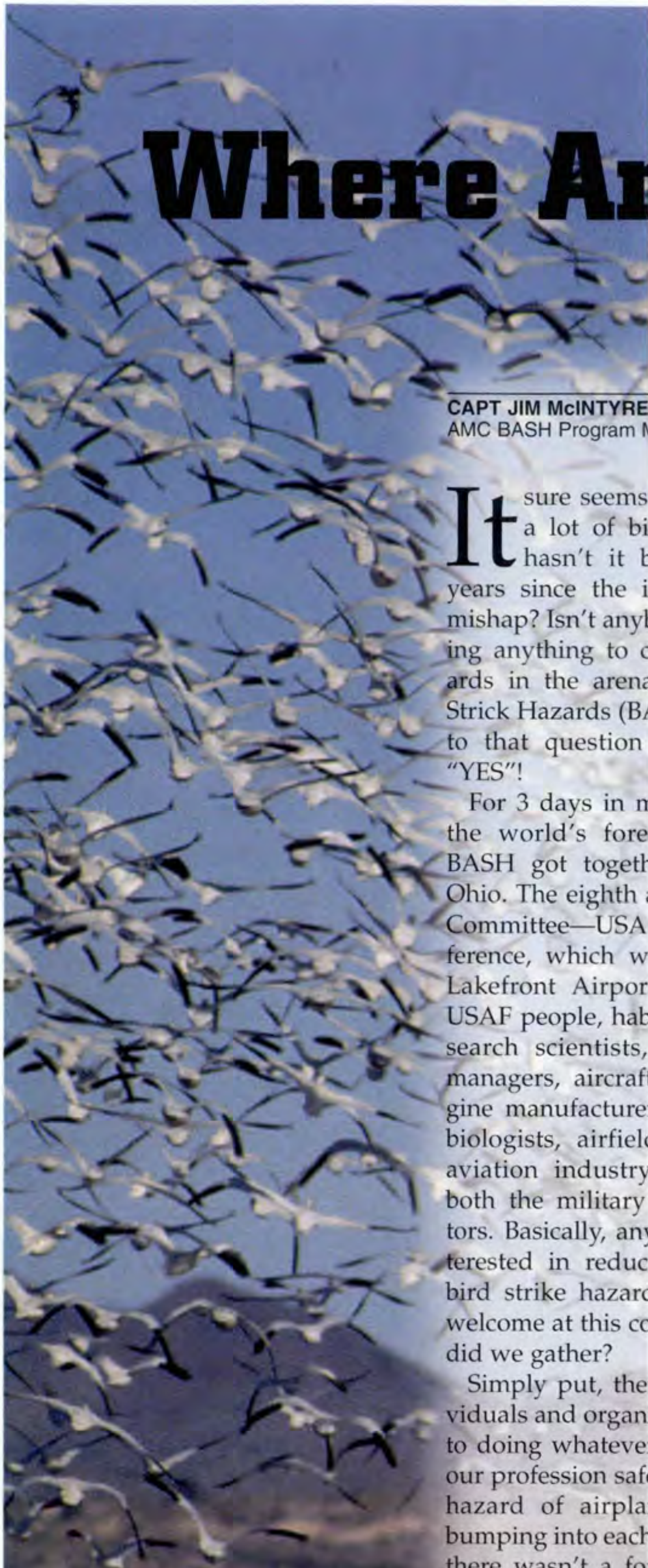
With everyone else looking south, I shifted my scan north. As I swung my eyes northerly, I saw rapidly rising terrain directly in front of my flightpath. Perhaps "rapidly rising" isn't quite accurate. What I actually saw was a sheer rock face rising some 1,200 feet above the desert floor. I and my flight were suddenly 700 feet lower than we needed to be. All I could do was pull.

No "Knock it off" call. I simply pulled for my life. I vaguely remember dash 3 transmitting a climb call.

Dash 3 took the lead and sent 2 and 4 high. He indicated he wanted to rendezvous so he could check my aircraft for damage. I knew I had not overstressed the aircraft, so I asked why he was concerned. He was certain I had impacted the ground because as I crossed the ridgeline, I kicked up a nice cloud of Arizona desert. Closer inspection revealed I had cleared the ridge—but by how much I'll never really know.

As you can see, my priorities were pretty far out to lunch. My determination to avoid an unobserved kill could easily have resulted in scoring a *real* kill for those vipers. ✈

Maj Edwards currently flies the EA-6B, "Prowler," with the Fighting Phoenix of VAQ-128.



Where Are We Headed

(Or: "Why we have a super-dupe

CAPT JIM McINTYRE
AMC BASH Program Manager

It sure seems like we're hitting a lot of birds. I mean, gee, hasn't it been a couple of years since the infamous AWACS mishap? Isn't anybody out there doing anything to combat these hazards in the arena of Bird Aircraft Strick Hazards (BASH)? The answer to that question is a resounding "YES"!

For 3 days in mid-June, many of the world's foremost experts on BASH got together in Cleveland, Ohio. The eighth annual Bird Strike Committee—USA (BSC-USA) Conference, which was held at Burke Lakefront Airport, assembled 115 USAF people, habitat managers, research scientists, BASH program managers, aircraft and aircraft engine manufacturers, pilots, wildlife biologists, airfield managers, and aviation industry personnel from both the military and civilian sectors. Basically, anyone who was interested in reducing the threat of bird strike hazards to aircraft was welcome at this conference. So, why did we gather?

Simply put, there are many individuals and organizations dedicated to doing whatever it takes to make our profession safer by reducing the hazard of airplanes and wildlife bumping into each other. In the past, there wasn't a forum designed for widespread information crosstell of effective BASH program management techniques. With the BSC-USA, each year the FAA, USAF BASH Team, USDA, and Aviation Industry Wildlife Hazards Working Group get together and present the BSC-USA Conference. This year's focus was "Practical Wildlife Control Techniques for Airports."

The conference included presentations and demonstrations on wildlife control techniques, habitat management, new technologies, land-use issues, training, and much more. The conference was exceedingly informative; however, the greatest advantage of the '98 BSC-USA came from the hands-on "training sessions."

The demonstrations included fogging to repel birds, new and improved pyrotechnics, high-tech gas cannons, falconry, herding dogs for birds and deer, bird hazing with remote control (RC) model airplanes, raptor trapping techniques, and so on. In addition to the demos, one of the more practical aspects of the conference was the military training session.

This session, chaired by the USAF BASH Team, covered the FAA's Title 14, Code of Federal Regulations, Part 139.337 (Wildlife Hazard Management), an update on pyrotechnics, the new "electronic 853," and a review of current AF BASH regulations. This session served as an excellent forum to dialogue where we are in the world of AF BASH guidance, data tracking, and program management as well as where we are headed. Prior to this session, there was also a demonstration on the new GIS-based (geographical information system) Bird Avoidance Model.

Throughout the conference, there

With This BASH Stuff?

r big conference on bird threats")

were myriad presentations on everything from goose management in North America to the influence and impact the media is having on our efforts to reduce wildlife hazards. There were entire afternoons dedicated to grass and wetland management (Note: Pilots were warned to have lots of caffeine pumping through their veins for this one), falconry, and new technologies being pursued to minimize either the possibility or the damage of bird strikes. Everything from the design of more impact-tolerant composite aircraft structures to the use of radar technology to warn aircrew of bird threats was discussed. So, what does this mean for you, the operator?

Some very dedicated professionals are out there trying anything and everything to mitigate the risks posed by birds and other wildlife being in "our" airspace. Everyday there are scientists tucked away in small, dark labs trying desperately to develop new technologies to warn us and help us avoid birds. The FAA, ALPA, USDA, and other agencies are striving to standardize the policies, procedures, and program management of the BASH programs. Although the airlines have yet to publicly get fully on board, the civil airline industry, primarily through professional agencies and local airport managers, are working hard to make their airfields safer. Through the efforts of advocates such as the Bird Strike Committee, civil airfields are becoming safer for our transient crews. (It should be pointed out, however, that civil airfields are not standardized in their programs or reporting of bird hazards. Some airfields still won't even determine or report a Bird Hazard Condition!)

On the Air Force side, folks are trying some new and some very old techniques. The use of NEXRAD radar to identify bird roosts in the Korean AOR, SSgts flying RC models at MacDill, and ACC's push to integrate ORM into their BASH "thinking"(something all MAJCOMs should do or are actively pursuing) are just a very few of the "edge of the envelope" initiatives making our flying safer. It may seem mundane to you and me, the operational flier, but concerted efforts from our BASH brethren in civil engineering and airfield management continue to pursue new and improved methods of habitat management. Improved deterrents, different types and heights of grass, putting netting over open water areas to keep out waterfowl, and placing Plexiglas™ on hangers to keep birds from being able to build nests continue to make our airfields safer.

What does all this mean? Bird strikes and the threats they present continue to be an important subject. The efforts of committees like the BSC-USA continue to highlight this problem and pursue practical solutions. This benefits all of us through safer skies at both military and civilian fields as well as our low-level routes, special-use flying areas, and bombing ranges. ✈

Capt McIntyre, currently assigned to HQ AMC Flight Safety, is AMC's BASH Program Manager. He is an evaluator pilot with flying time in the KC-135R, EC-135, and T-37.

Official USAF Photo

CMSGT DAVE YOUNG
Logistics Environmental Program Manager
HQ Air Mobility Command

"Quality Air Force" (QAF) was responsible for ushering in an era where everyone was encouraged to challenge existing paradigms. In many cases, questioning some of these long-held principles led to changes that made life a little easier. One of those questions that should be familiar to maintainers is: *Why can't deicing and anti-icing fluids used on commercial aircraft also be used on military aircraft?* Good question! And the answer *is* making life less complicated.

Why Commercial Fluids and Commercial Guidance?

A move away from exclusive use of MIL SPEC deicing and anti-icing fluids gained momentum with a Department of Defense standardization policy requiring conversion to nongovernment specifications wherever possible. To examine suitability of replacing Deicing Specification MIL-A-8243 Products, the Air Force Research Laboratory (AFRL), headquartered at Wright-Patterson AFB, Ohio, conducted the required testing. Finding that commercial fluids performed satisfactorily, Type 1, AMS (Aerospace Material Specification) 1424 commercial deicing fluid, and Type II and Type IV, AMS 1428 anti-icing fluids, were adopted for general use in March 1995.

A move to align Air Force aircraft deicing/anti-icing program guidance with the commercial one administered by the FAA was prompted by a 1996 Class A mishap involving an engine FOD'd by ice. Following completion of the safety investigation, Brig Gen Orin Godsey, then Air Force Chief of Safety, commented the *"Air Force aircraft ground deicing program is deficient"* and recommended that it *"...adopt the Federal Aviation Administration (FAA) ground deicing program guidance as the AF standard."*

Aircraft deicing and anti-icing programs administered by the FAA and its international counterpart, the International Standards Organization (ISO), mirror each other, so a "global standard" was already in existence. After comparing these commercial aviation business practices and deicing/anti-icing products to Air Force policies and MIL SPEC products, there derived a short answer to the question asked in paragraph one, above. Within certain guidelines, the Air Force *can* use many of the same standards and products as those used by commercial aviation. As a result, TO 42C-1-2, *Anti-Icing, Deicing, and Defrosting of Parked Aircraft,* was revised in June 1997 to bring the Air Force program in line with the FAA and ISO programs.

Commercial Deicing and Anti-Icing Fluids

The rewrite of TO 42C-1-2 covers use of commercial fluids and is an invaluable resource for information on the deicing/anti-icing program. *Please note this is a general series TO!* It clearly states that each weapon system

SPD must authorize use of AMS 1424 deicing fluid and AMS 1428 anti-icing fluids on their aircraft due to unique, aircraft-specific issues involved. For instance, while the KC-10 and KC-135 SPDs have approved use of these fluids without restriction, this isn't true for C-5, C-141, and C-17 aircraft. Testing these fluids for unrestricted use on them is ongoing. Before defining types of fluids, here are some definitions from TO 42C-1-2 that are worth remembering:

- Deicing is defined as "*...the process of removing accumulations of snow, frost, slush, and/or ice from the aircraft critical surfaces, crevices, additional openings, and hinge points...*"
- Anti-icing is defined as "*...the process of preventing further accumulations of snow, frost, slush, and/or ice on clean aircraft critical surfaces by the application of fluids...which...prevents the formation of ice or snow crystals.*"

As we move from MIL SPEC deicing fluids to commercial deicing and anti-icing fluids, confusion can arise because of similarities in terms used to identify them and what type of equipment is required for application of these substances. Here's a brief description of each and equipment needed.

Deicing

- MIL-A-8243 exists in Type I (propylene-based) and Type II (ethylene-based) forms. Since 1993, Air Force policy has strictly prohibited new purchases of Type II MIL SPEC fluid because of its toxicity, but existing, on-station stocks of Type II may be used—for now—until depleted. You may be surprised to find a substantial amount of Type II is on-station reserved for WRM requirements. If so, you're encouraged to rotate it from WRM, replace it with Type I, and use Type II while still permissible.
- Both MIL-A-8243 Types I and II can be applied with existing deicing vehicles or the new deicing/anti-icing vehicles. (See photo.)

Reminder: Both MIL-A-8243 Type I and Type II deicing fluids are used for deicing *only*. Neither one provides "holdover time." Holdover time is the estimated amount of time a fluid will prevent ice and snow from reforming on surfaces under freezing precipitation conditions—*only anti-icing fluids will provide this feature.*

- AMS 1424, Type I, is the industry standard commercial deicing fluid. AFRL scientists determined it to be as effective as MIL-A-8243, and with respect to performance, found it superior in that it has *limited* holdover time (compared to *zero* holdover time for the MIL-A-8243). AMS 1424 Type I can also be applied with either existing deicing vehicles or the newer deicing/anti-icing vehicles.

Anti-Icing

- AMS 1428, in Type II and Type IV variants, is a commercial anti-icing fluid which *does* provide holdover time. This is a critical factor when utilizing commercial airfields during inclement winter weather conditions, since military aircraft may have to wait in line with commercial aircraft for extended periods before takeoff. While AMS 1428 Type II provides 30 minutes of holdover time, AMS 1428 Type IV demonstrates superior performance, boosting holdover time to nearly 1 hour. This improvement in performance is so significant that it's unlikely AMS 1428 Type II fluid will continue to be manufactured in the future. If so, TO 42C-1-2 will delete all references to AMS 1428 Type II once it's no longer available.
- Since AMS 1428 Type II and Type IV anti-icing fluids are viscous substances, the dispensing vehicle must be equipped with a specialized, nonshearing pump in order to apply them. Older model deicing vehicles don't have the necessary specialized pumps. Newer model deicing vehicles, available now, are equipped with separate tanks for deicing and anti-icing fluids and are equipped with the nonshearing pumps. They're capable of applying AMS 1424 Type I and MIL-A-8243 *deicing* fluids as well as AMS 1428 Type II and Type IV *anti-icing* fluids.

Benefits

For maintainers involved with winter aircraft operations, the 26 June 1997 version of TO 42C-1-2 is a superb document and a great training reference. It provides a comprehensive look at aircraft deicing and anti-icing operations. As a complement to the tech order, computer-based training (CBT) modules for individualized training are under development. When completed, these CBT modules will present a detailed look at the deicing/anti-icing process and come in individual "chapters," for identification of aircraft-specific training requirements.

Due to global commitments and the fact many of our airlift and air refueling aircraft transit commercial airports around the world on a daily basis, it makes good sense to fall in line with commercial fluids and global standards. Commercial fluids are often the only ones available at these commercial airfields. Also, some active duty Air Force units are based at joint-use runway locations—military and commercial carriers sharing the same runways—where resources could be shared in a time of crisis. A significant number of Air National Guard and Air Force Reserve units, flying the same missions as the active duty forces, are also based at joint-use airfields and could realize similar benefits. Finally, many Guard and Reserve pilots are also commercial aviators, well versed in deicing requirements of the commercial world.

Providing better deicing capabilities, adding an anti-icing capability, and aligning Air Force deicing/anti-icing operations to mirror FAA procedures provide several tangible advantages. Major benefits are increased mission capability and significantly enhanced safety during winter operations. The program is still evolving, so stay tuned for future developments. ✈

When We Get Cold, What Happens?

USAF Photo by MSgt Rich Moran

FREDERICK V. MALMSTROM, Ph.D. CPE
Embry-Riddle Aeronautical University
Flying Safety, Oct 96

Now that cold weather is nearly upon us, you're probably wondering again why nature didn't endow us humans with fur, feathers, or blubber. I can't answer that one, but it's obvious that the average naked human is extremely vulnerable to cold. As a matter of fact, humans have only a very narrow range of temperatures we can operate in efficiently. The naked human could survive only in a temperature range from 82° to 86°F (28° to 30°C). Outside those ranges, both our mental and physical skills deteriorate quite rapidly.

The Human Body Is a Leaky Radiator

Think of the human body as a leaky radiator. It's pretty good at throwing off unwanted heat, but it's inefficient at retaining it. Only about 30 percent of the energy we convert from food is usable. The rest is excess heat and, unfortunately, isn't retained very well. The body is *not* a reversible heat pump. That is, we don't stay warm merely by throwing our heat-generating mechanisms into reverse. The heating and cooling systems are quite different.

Take human skin. In the words of the physicist, it's a "black body"—that is, it both radiates and accepts heat well. As an insulator, in the colorful words of our former Vice President, "Cactus Jack" Garner, "It ain't worth a bucket of warm spit." Skin both freezes and burns readily, so it must be protected.

Skin color is immaterial to retaining heat. Dark-skinned people get just as hot and just as cold as light-skinned people. Don't ever think that just because you're of Scandinavian ancestry (like yours truly) you have a natural immunity to the cold. The body does have a few tricks which enable it to resist cold, but they are very few when compared to its ability to withstand heat. I'll describe some of them.

Acclimatization

When the body is exposed to cold, its first rule of survival is to shift heat production to the internal organs and maintain them at the well-known core temperature of 98.6°F (or 37°C). We're all aware that even brief exposure to cold makes us urinate more frequently. That's because blood is shunted to the kidneys, thereby increasing the production of urine. Ears, fingers, toes, and noses are the first to suffer effects of cold—nature considers them expendable.

When the body's core temperature drops below 95°F (35°C), apathy (*especially* apathy), disorientation, hallucinations, aggression, or even euphoria may develop. Imagine the multiplier effects of cold plus hypoxia on aircrew behavior. Drop the body core temperature further, and cardiac arrhythmia and heart stoppage may result.

When we shiver, body metabolism may jump two to four times normal. Shivering is nothing more than nature's way of making the body involuntarily burn up more energy. By this time, you're probably way ahead of me and have guessed that shivering for an hour or more can be muscularly *very* fatiguing, eventually reducing alertness and powers of concentration. Of course, vigorous physical activity can increase metabolism 20 to 30 times, but you're going to find jogging or weight lifting very difficult to accomplish either while sitting in an aircraft or while driving a truck. Either way, using physical activity just to boost metabolism and heat production is going to be fatiguing. Better you should just dress warmly.

Most people take about 1 to 2 weeks to adjust their metabolism from cold climates to hot climates. This is why those first few days of hot weather seem so unbearable. But after the second week, hot weather isn't so noticeable. Unfortunately, the reverse isn't true. The reasons aren't clear, but many of us who have moved from hot climates to cold may take weeks or even months to acclimatize. Some people acclimatize only certain parts of their bodies, such as the hands or feet. Some unlucky misfits never adjust to the cold. It seems (at least physiologically) easier for a Northerner to adjust to the South than the other way around.

Physical Performance Deteriorates

Everybody knows manual dexterity and grip strength drop off with exposure to cold, especially the poor football quarterback who fumbles the crucial snap. Hands are naturally about 10°F cooler than body core temperature. Some folks (as their complaining spouses will vouch) have naturally cooler hand temperatures—up to 20° or 30°F! Hand temperature may even go down to 40°F (5°C) without any long-lasting permanent physical effects (although the feeling is quite painful).

Physical dexterity may deteriorate as much as 25 to 35 percent within 5 minutes of exposure to extreme wind chill. At this low hand temperature of around 40°F (5°C), a mechanic can no longer feel the difference between a wrench and a screwdriver. The pilot can no longer feel the difference between a flap and a brake handle. This is when big-time mistakes can happen.

It's a fact that most injuries occur outside during the winter. The bulk of those outside wintertime injuries occur with drivers who have disabled vehicles. Ever try to change a tire or refuel an aircraft in a blizzard at night and without proper gloves? I can't recommend strongly enough having the proper cold-weather clothing, equipment, and survival gear packed and ready inside the vehicle or airplane. (I personally witnessed a security policeman who got frostbitten toes because he insisted on wearing fashionable jungle boots outside in the winter on a northern tier base.)

Odd Mental Performance Effects

Cold does not affect simple mental decisions, but it does slow down muscle movement time significantly. Therefore, if all a crewmember had to do was watch a light and make a decision to flip a switch, we could conceivably save on heating bills and let him or her slowly freeze. But since flying is reputedly more complex than that, I also need to state that the prolonged cold effects on judgment are quite strange—one of those good news/bad news things. Decision making is actually speeded up, but the errors increase. In other words, results of several experiments historically show that in freezing conditions, subjects actually make more errors, but they make them faster! Clearly, therefore, extreme cold affects our higher-order judgment skills. And, of course, apathy and disorientation are part of those judgment impairments. Most people do quite poorly when they are both cold and attempting to make complex decisions.

Age, Alcohol, and Tobacco (Again)

It's, of course, well known that alcohol and nicotine lower resistance to cold by restricting peripheral blood circulation. Drinking and smoking will numb your fingers and toes. And the effects are especially hard on older people. Older people naturally have lower metabolism, tend to lose heat faster, and are, therefore, more subject to cold stress. The good news is that the effects of cold stress can be partially countered by physical conditioning. Physical fitness seems to increase both the body's metabolism and its ability to acclimatize. If you're both old and cold, I recommend you throw away those cigarettes and pick up those barbells.

Recommendations for Cold Protection

1. Dress warmly to begin with, and be especially prepared with proper gloves and socks. Use several layers of clothing you can quickly don or shed. A good rule of thumb for cold protection: Below 20°F (-5°C), you need to add another layer of clothing for every 10°F (5°C) drop in temperature.

2. Be especially protective of fingers and toes. Most accidents happen outside during cold weather, often because of the natural clumsiness of cold fingers and toes. If you don't wear protective gloves and boots, nature will automatically sacrifice your fingers, toes, and ears to save your internal body core temperature.

3. Keep in good physical condition. Stop smoking altogether and curtail your alcohol. Healthy, fit people acclimatize to cold weather faster and better.

4. Don't put yourself in the position where you must make complex decisions during cold stress. Judgment skills deteriorate rapidly when you're both distracted and fatigued by cold. ✈

Nobody Survives 30 Gs

LCDR TOM GANSE
Courtesy *Approach/Mech*, May-Jun 96

Another ejection seat took center stage when an alert plane captain (PC) became suspicious of scratches in a canopy. Investigation proved the seat had not been securely attached to the top cross-beam, leaving it free to slide up the catapult tube. The scratches had been made by the seat's canopy breakers as they bounced and rubbed against the canopy.

A less-than-1-G flight would have sent that seat through the canopy had the canopy breakers completed their job. Airloads then would have slammed the seat against the aircraft's skin and empennage, crippling or killing the occupant. Even if the pilot had survived, he would have needed the altitude, presence of mind, and physical ability to pull the handle on a seat that had already ejected. Then he would have had to squeeze and pull the manual override handle. In other words, there was a mere 1/8 inch of plexiglass between a hazard report (HAZREP) and a Class A mishap.

When the gun fired, the ejection seat launched squarely into the technician's chest and face with a 30-G impact. That's like stepping face-first in front of a fast-moving tractor-trailer. It took less than a second for the ejection seat to catapult from the cockpit to the overhead of the hangar. Doctors surmised the victim was dead before his body smashed into the I-beams and tumbled 30 feet to the concrete deck below.

In the second incident, an alert PC thought she heard something fall into the cockpit while she was installing the ejection seat's headbox cover. Maintenance control downed the plane for a FOD check. Searchers found and removed a small metal grommet. During the search, technicians noticed a shim on the lower seat mount had slipped and wedged between two surfaces pulled together by the mounting bolt. They needed to remove the seat to get at the defective part, but decided there would be enough room if they just lifted (partially removed) the seat. There are no written procedures for partially removing that seat.

Lifting the seat allowed an O-ring to extrude. When the seat was lowered, it came to rest on the O-ring instead of the top of the catapult tube. To a casual observer, it appeared normal and allowed the safety interlock to partially seat. The subsequent cat shot and flight maneuvers broke the interlock free and allowed the seat to slide up the tube and scratch the canopy.

These two incidents involved ejection seats, but the underlying misguided attitude can spread quickly in any work center. If you take a shortcut and get away with it once, it becomes that much easier to do next time.

That attitude toward maintenance manifests itself in other ways as well. What if the pubs are wrong? What if you think there is a more efficient or safer way to do the job? Do you do it your way, or are you going to wait until someone gets hurt before you say, "Yeah, I knew that was going to happen one of these days"? If you believe the pubs are wrong, draft a Technical Publication Deficiency Report (TPDR) and initiate a HAZREP as soon as you identify the hazard, and run it past QA and the maintenance officer for permission to modify that procedure.

What if the procedure is changed, especially if the new procedure is more difficult, time-consuming, or inconvenient? Will you keep doing it the old way "because we've done it that way for years and it always worked," or will you challenge the change? Perhaps it was instituted without operational considerations and needs to be revisited. No one can provide better information than you, the end user.

People do get killed when the pubs aren't followed. But preaching the "Follow the Pubs" gospel is not the answer. Technicians don't wake up in the morning, count their fingers, and say to themselves, "Hey, I've got too many fingers. I think I'll get rid of some of these extras at work today." A culture change is required. The leadership from maintenance control right up to the commander needs to establish an uncompromised commitment to professionalism, then train subordinates about what that means. ✈

LCdr Ganse is a mishap investigator at the Naval Safety Center.

C-130 Broad Area Review Results

A recovered 55-foot section of wing (small section of #1 main tank at left to #3 dry bay at right) is loaded aboard a flatbed trailer for transport.

MAJ GEN BOBBY O. FLOYD
Director of Logistics
HQ Air Mobility Command

In September 1997, then Secretary of the Air Force, Dr. Sheila Widnall, directed *"...a comprehensive review of flight safety issues associated with the C-130, including specifically the accident involving the HC-130P from the 939th Rescue Wing on 22 November 1996 and other incidents. The purpose of this review is to consider all the facts and theories of causation specific to the HC-130P accident and other incidents and to ensure that all appropriate steps are being taken to enhance the flight safety of the C-130 fleet..."* To complete this Broad Area Review, a team of experts and advisors, including representation from the National Transportation Safety Board, was assembled. I served as the group's chairman.

Together we examined numerous C-130 uncommanded power reduction incidents, determined the effectiveness of C-130 aircraft modifications, personally talked with aircraft maintainers and flightcrews, and examined aspects of training. We also scrutinized current operational and maintenance practices, evaluated the design of several aircraft systems and overhaul procedures for several of their key components, and performed critical ground and flight tests to better understand the C-130.

After nearly a year, our work is complete, and I am pleased to state that we are convinced the C-130 has been, and remains, a very safe and dependable aircraft. However, we found some areas where we could make improvements, and we made specific recommendations to do so in these areas. In all, we made 25 recommendations—all of them accepted by the Chief of Staff and Acting Secretary of the Air Force.

In some cases, we are already seeing the benefits of our recommendations. For example, we recommended updating, consolidating, and standardizing the C-130 flight manuals and operating guidance to *assure* crews have current procedures and performance data. This action has been completed, and vastly improved C-130 flight manuals will soon be distributed to the field.

Additionally, we suggested the Air Force obtain additional physical evidence to better understand the circumstances leading to the loss of King 56, the 939th Res-

continued on next page

Figure 1. King 56 Probable Fuel Loading

#1 Main	#2 Main	LH Aux	RH Aux	#3 Main	#4 Main
7000	7000	4000	0	7000	7000

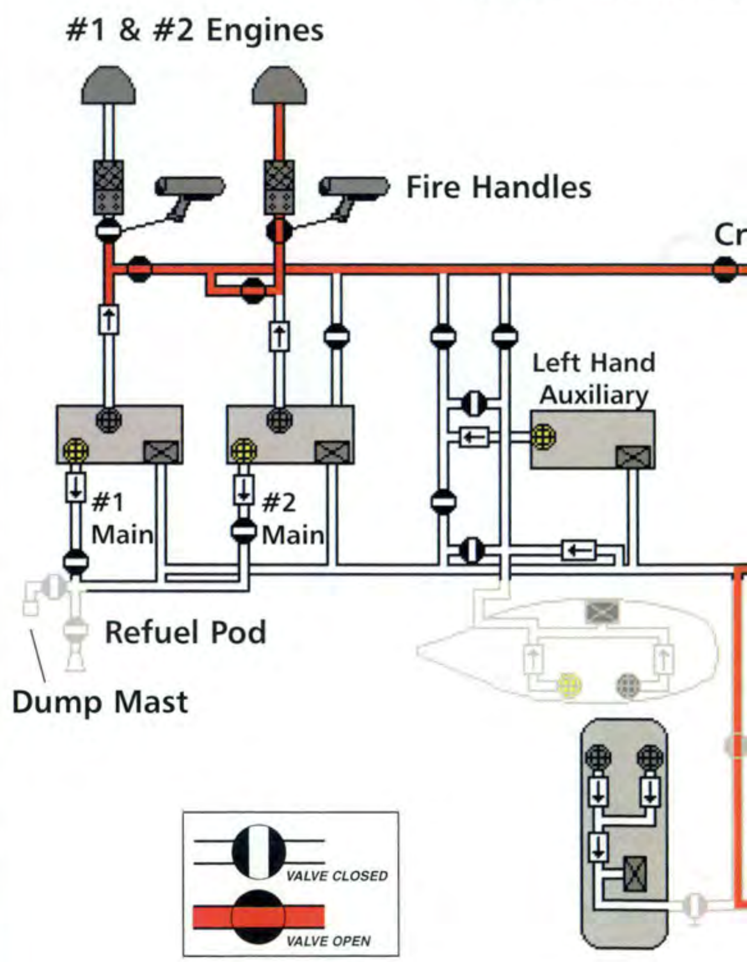
LH Ext	LH Fuselage	RH Fuselage	RH Ext
0	0	8000	0

cue Wing's HC-130P which crashed 22 November 1996. We recommended the selective recovery of parts from King 56, and senior Air Force leadership agreed with our recommendation. This past summer we concluded a very successful recovery operation. As a result, we now know beyond a reasonable doubt that King 56's engines sequentially flamed out as a result of fuel starvation. This condition most likely occurred because the main tank fuel pump switches were in the "OFF" position when the right-hand fuselage tank, which was providing fuel to all four engines, emptied. With this tank empty, pressurized cabin air was then allowed, via open fuel valves, to enter the fuel supply manifolds for the engines. How King 56 got to this point and how we came to this conclusion is explained as follows.

King 56 was to fly from Portland IAP, Oregon, on a routine night overwater navigation training mission with a planned destination of North Island Naval Air Station in San Diego. Their initial fuel load was 40,000 pounds, and approximately 20,000 pounds would be used during the flight. This initial fuel load is consistent with the crew chief's recollection, the structural monitoring form filled out by the previous flightcrew which indicates they landed with 12,000 pounds of fuel re-

The US Navy's Remotely Operated Vehicle (ROV) Deep Drone is prepared before one of its 30 dives in water as deep as 5000 ft. In all, the ROV logged 244.5 hours of dive time recovering wreckage from King 56.

Figure 2. Captured Fuel Valve Positic
When the Last E



Notes: Lightly shaded such as the #3 and #4 m
valves were not recovered. Of the recovered fu
dump valve, circled above, could not be detern
fuel valves is illustrated.

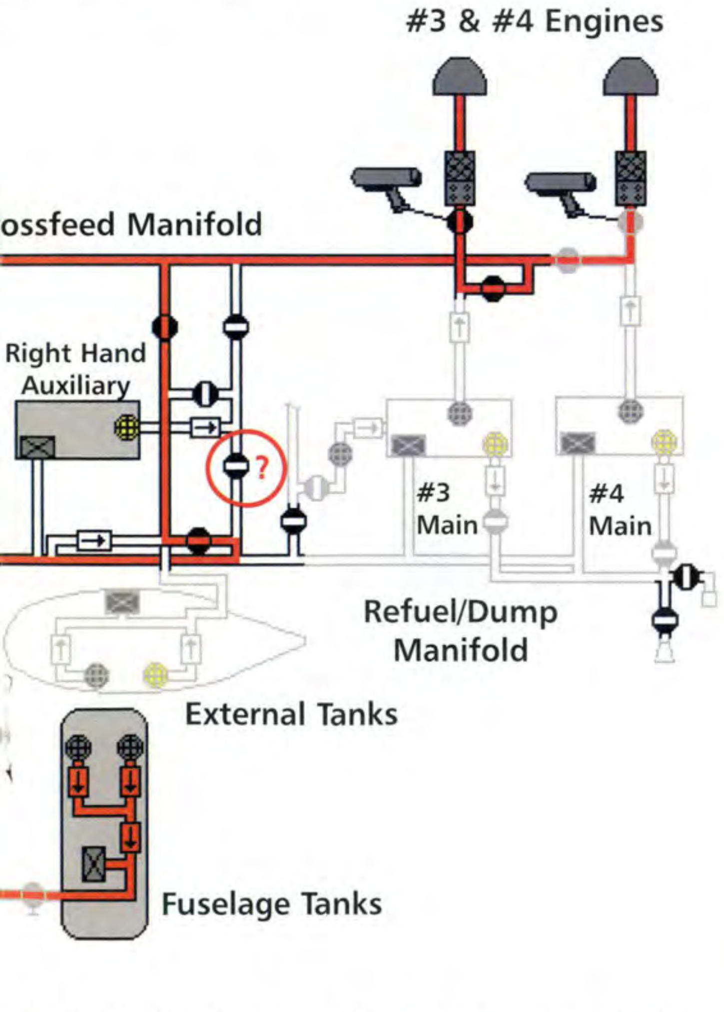
Figure 3. Captured Fuel Quantity Readings From Recovered Wreckage

#1 Main	#2 Main	LH Aux	RH Aux	#3 Main	#4 Main
7000	NR	4000	NR	NR	NR

LH Ext	LH Fuselage	RH Fuselage	RH Ext
NR	600*	300*	NR

NR = Not Recovered
* = Readings from both the Auxiliary Fuel Panel and the Fuselage Tank Control Panels

ns Reveal the Intended Source of Fuel
ngine Flamed Out



nain tanks, both external tanks, and some fuel
el valves, only the position of the right auxiliary
nined. Otherwise, the position of the recovered

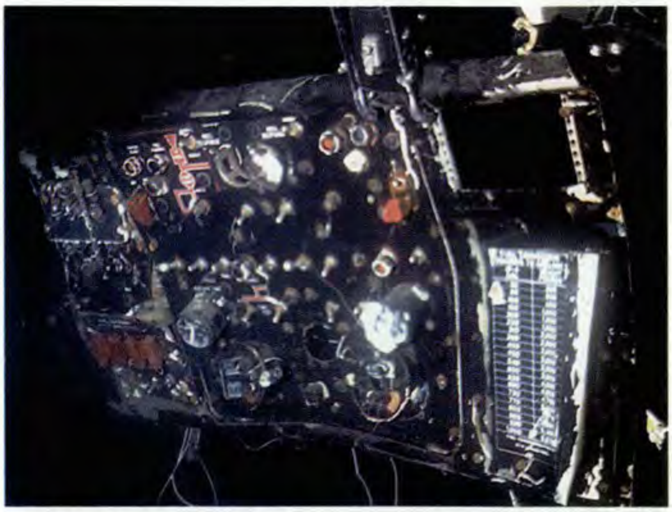
maining, and the fuel servicing truck's records which indicate an onload of 4,088 gallons (i.e., 27,800 pounds).

We also believe the initial fuel load of 40,000 pounds was distributed as shown in figure 1. This distribution is consistent with the crew chief's recollection and the aircraft records which indicate the right auxiliary tank had a leak and the left external tank had an inoperative fuel quantity gauge.

While unusual, it is permissible to fly with this combination of writeups provided certain restrictions are met. These restrictions include not putting fuel in the leaking tank, and in the case of the external tank writeup, flightcrew visual verification that both external tanks are either completely full or empty—a partial fuel load is not allowed. These are the only two ways to be completely certain the external tanks weigh the same and that lateral balance problems are avoided.

King 56 departed Portland IAP at 1720 PST. The flight was uneventful for the first hour and 24 minutes. At 1844, while cruising straight and level at FL220, the crew first noticed a problem with the aircraft. During the next 170 seconds, all four engines flamed out. When the fourth engine quit running, the ability to generate electrical power on the aircraft was lost.

continued on next page

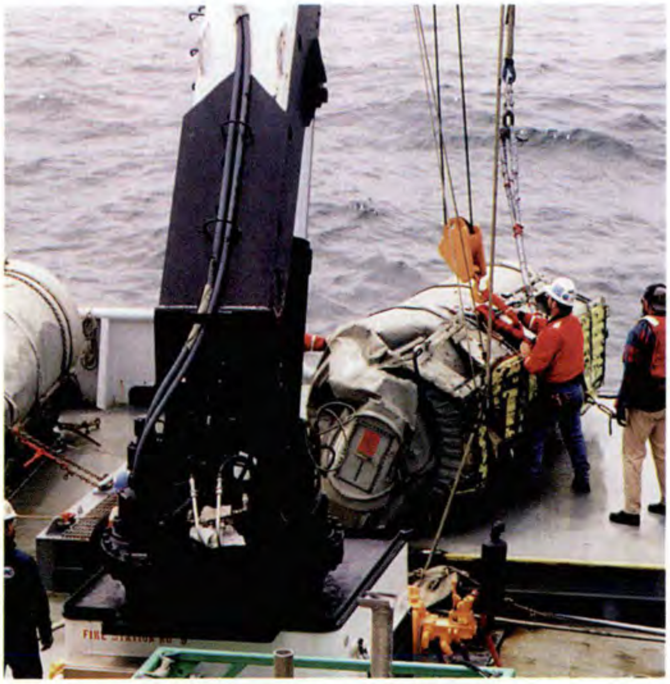


Underwater photo by ROV Deep Drone of the flight engineer's auxiliary fuel panel containing both fuselage tank fuel quantity gauges.

The left-hand fuselage fuel tank is lifted aboard the US Navy's motor vessel *Independence*.

Fuel valves recovered this summer from the Pacific Ocean proved to be extremely important in understanding what happened to King 56. All the recovered fuel valves operated via *electric motors*. When the last engine-driven generator dropped off-line, the valves could no longer be repositioned. Therefore, the positions of the valves at the time of recovery reflect their position when the last engine flamed out. The captured positions of the recovered valves indicate the intended source of fuel was the fuselage tanks. Based upon the crew chief's recollection that fuel was placed only in the right-hand fuselage tank, and that he closed the left-hand fuselage tank's manual isolation valve, we believe that the right-hand fuselage tank was most probably the intended source of fuel when the engines flamed out. See figure 2 for more details.

Like the fuel valves, recovered fuel quantity gauges also retained their last powered reading. The retained indications from the recovered gauges are shown in figure 3. Although the fuselage tank indicators reflected small amounts of fuel, when gauge tolerances are considered, it is reasonable to believe that the fuselage tanks were actually empty.



The right-hand fuselage fuel tank is lifted aboard the US Navy's motor vessel *Independence*. A portion of the left-hand fuselage fuel tank can be seen at the left.

Even though several of the main tank gauges were not recovered, it is also reasonable to believe that they would indicate values very near that of the No. 1 main tank because of lateral balance considerations and the short time they would have been in use. This implies that there was still approximately 32,000 pounds of fuel (i.e., 4,000 pounds in the left-hand auxiliary tank plus 7,000 pounds in each of the four main tanks) on King 56. Conversely, it implies that King 56 had used approximately 8,000 pounds. Calculations reveal that the amount of fuel theoretically used during engine start, taxi, takeoff, climbout, and cruise to the point where problems began is approximately 8,400 pounds.

With all the aircraft's fuel reasonably accounted for, the captured positions of the fuel valves suggesting the fuselage tanks were the source of fuel, and the fuselage tanks' gauges indicating empty, we concluded that engines were starved for fuel when the right fuselage tank ran empty. But how could this occur when there was still a substantial amount of fuel in the wings?

In hindsight, the answer is relatively simple. When fuel is pumped from the fuselage tanks, cabin air is allowed to enter into them. This assures the pressure inside the fuselage tanks is the same as the pressure in the aircraft, thereby preventing tank structural failure due to a pressure differential.

However, when a fuselage tank is run empty, cabin air now has an avenue to enter the fuel supply manifold. What prevents air from actually entering the fuel supply manifold is that the main tank fuel pumps, when operating, have an output pressure higher than cabin pressure. However, if all four main tank fuel pumps are "OFF," inadvertently or intentionally, cabin air will enter the fuel supply manifold and eventually work its way out to all the engines. This happens because the cabin air is pressurized, and its pressure is greater than the fuel pressure at the bottom of the main tanks which is trying to gravity-feed to the engines.

Flight testing on an HC-130 aircraft similar to King 56 repeatedly demonstrated that engines sequentially flame out when a fuselage tank was run empty with the main tank fuel pumps in the "OFF" position. With the main tank fuel pumps "ON," there is a smooth transition from fuselage tank fuel to main tank fuel. If either the main tank pumps had been turned "ON," or the crossfeed valves closed prior to the last engine flaming out, this aircraft could have been successfully recovered.

After the fourth engine quit running at 1846, the ability to generate electrical power was lost. Consequently, radio contact with the aircraft was lost, and the aircraft's two recorders—the cockpit voice recorder and the digital flight data recorder—ceased their recordings. Without engine power, the aircraft glided to the ocean surface, and the crew attempted to ditch the aircraft.

At approximately 1901, the aircraft impacted the water 40 miles west of Cape Mendocino. One surviving crewmember was rescued after nearly 3 hours in 52°F water. The remaining 10 people onboard the aircraft were fatally injured.

Despite what you may have read, heard, or seen elsewhere, the investigation into what led to the King 56 tragedy did not specifically focus exclusively upon fuel starvation. In all, 21 different scenarios were considered. Only one scenario, the one just described, is supported by all the physical evidence, test results, and system analyses currently available.

The King 56 mishap was a terrible tragedy. The fact this crew was a tightly knit group of skilled professionals makes the mishap even more difficult to accept. Although hard to understand, we know even the most highly trained individuals can make mistakes. Our duty is to learn all we can from mistakes to ensure they never happen again. In this case, we now know that gravity feed on a C-130 is not a certainty—it can be defeated. As a result, we now have a new "Boldface" procedure to address this problem, as well as others related to engine power-loss incidents. We also know we can improve in other areas as well, and these improvements are forthcoming.

This mishap should serve as a reminder to us all. No matter how safe we believe a weapon system or activity may be, there is always the possibility something unforeseen can drastically affect our mission or us. There is always room for improvement. I encourage you to continually strive towards the goal of improving the flight safety of the aircraft we maintain and fly. ✈

Editor's Note: The C-130 Broad Area Review report as well as its Addendum covering the King 56 salvage operation and the Broad Area Review's conclusions can be downloaded from the Aviation Safety section of the Air Force Safety Center's web page at http://www-afsc.saia.af.mil. It should be available NLT 30 October 1998.

Initial recovery of wing section on July 1, 1998. After this photo was taken, the attaching chains and lines broke. The wing was successfully recovered 9 days later.

It's Cold Out Here!

CAPT J. C. FINDLEY
Air Force Advanced Instrument School

I was recently in Canada, flying with the Instrument Check Pilot School in Winnipeg. We were on an approach, and the pilot flying asked me for the temperature correction for a 400-foot HAT MDA. It was -20°C. Having lived in Texas and Florida most of my life, I asked what he was talking about. He just gave me the dumb American look and got it himself. After we got on the ground, I started trying to figure out this temperature correction thing.

We were flying in Canada, so we were flying using Canadian Forces' rules and regulations. Their regulations state that if the temperature is below 0°C, a temperature correction must be applied to any altitude inside the FAF, i.e., MDA, DH, or step-down fixes. It also states that under certain circumstances, a correction will be added to other published portions of the IAP. The Canadian Air Regulations (the equivalent of our FAR) also require civil pilots to apply this correction. Canadian ATC will also apply a temperature correction to their MVAs.

What do Canadian Forces regulations and the CAR have to do with me while flying in the USA?

Can we agree that the Canadians are the experts at cold weather flying? While the CAR don't apply to us, we can learn a few things from them. There is nothing in the FAR dictating U.S. pilots apply temperature corrections to anything, *but* there is something in the USAF Flight Information Handbook. On page D-14, we have the same correction chart the Canadians use. (See figure 1.) There is nothing in AFI 11-206 or its replacement, AFI 11-202 ,Vol 3. There is nothing in AFMAN 11-217, Vols 1

TEMPERATURE ERROR

a. Pressure altimeters are calibrated to indicate true altitudes under International Standard Atmospheric (ISA) conditions. Any deviation from these standard conditions will result in an erroneous reading on the altimeter. This error becomes important when considering obstacle clearances in temperatures lower than standard since the aircraft's altitude is below the figure indicated by the altimeter.

b. The error is proportional to the difference between actual and ISA temperature and the height of the aircraft above the altimeter setting source. Height above altimeter source is considered to be published HAT or HAA for the approach. The amount of error is approximately 4 feet per 1,000 feet for each degree Celsius of difference.

c. Corrections will only be made for Decision Heights (DH), Minimum Descent Altitudes (MDA), and other altitudes inside, but not including, the Final Approach Fix (FAF). The same correction made to DHs and MDAs can be applied to the other altitudes inside the FAF.

TEMPERATURE CORRECTION CHART
(FEET)

AIRPORT TEMP °C	200	300	400	500	600	700	800	900	1000	1300	1500	1800	2000	2300	3000	4000	5000
0	0	20	20	20	40	40	40	40	60	80	90	110	120	140	180	240	300
-5	10	20	30	30	50	50	60	60	80	110	120	150	160	180	240	320	400
-10	20	20	40	40	60	60	80	80	110	130	150	180	200	230	300	400	500
-15	20	30	50	50	70	80	90	100	120	160	180	220	240	280	360	480	600
-20	20	40	60	60	80	100	100	120	140	180	210	250	280	320	420	560	700
-25	30	50	60	70	90	110	120	140	160	210	240	290	320	370	480	640	800
-30	40	60	60	80	100	120	140	160	180	240	270	330	360	410	540	720	900
-35	40	60	70	90	110	130	150	180	200	260	300	360	400	460	600	800	1000
-40	40	60	80	100	120	140	160	200	220	290	330	400	440	510	660	880	1100
-45	50	70	90	110	140	160	180	210	240	310	360	430	480	550	720	960	1200
-50	60	80	100	120	160	180	200	220	260	340	390	470	520	600	780	1040	1300

HAT/HAA

EXAMPLE: HI TAC Rwy 11 - Minot AFB, temp minus 30°C. (CAT "D")

Figure 1

or 2. Is the information in FIH mandatory for Air Force pilots? Yes! says the Air Force Flight Standards Agency at Andrews AFB. Even if it weren't mandatory, you'd better do it in the interest of safety.

Why does there need to be a correction to your MDA just because it's a little chilly out?

A barometric altimeter will be precisely accurate only on a standard day when both the pressure and temperature are standard. This exact condition rarely exists, so we set a correction in the altimeter. This is the setting that makes an altimeter read airport elevation when you're on the ramp.

Picture a 1,000-foot tower built at sea level. If it's a standard day (standard temperature and pressure), a 29.92 altimeter setting would show you at sea level at the base of the tower, and as you climbed the tower, it would show your actual altitude.

If it's hotter or colder than normal, you have to set a different altimeter setting at the base of the tower in order for your altimeter to read sea level. With this setting, your altimeter reads correctly at the base of the tower but starts to vary from your actual altitude as you climb.

On a day hotter than normal, your altimeter readout will not climb as fast as you do; e.g., at 1,000 feet MSL on the tower, your altimeter will read lower than that. In other words, you will be higher than your altimeter readout. How much varies with altitude and temperature deviation.

Being higher on final is no big deal, but let's look at a colder-than-standard day. As you climb the tower on a colder-than-standard day, your altimeter readout climbs faster than you do; e.g., at 1,000 feet MSL on the tower, your altimeter will read higher than that. In other words, you will be lower than your altimeter readout. As the temperature falls below 0°C, this difference between your actual altitude and what appears on your altimeter can become significant.

That should be enough science for one day.

How do I apply this as a pilot? If you're an Air Force type, you have a correction chart in the flight information handbook. (See figure 1.) The chart tells you these temperature corrections will be applied to any altitudes *inside* the FAF, i.e., step-down altitudes, the MDA, or DH. If I have an MDA that is 300 feet HAT and it's -10C, I would add 20 feet to my MDA. I added 20 feet—big deal. That's not a lot, but let's look at the LOC/DME BC-C, Helena MT. (See figure 2.) Let's assume it's -30°C (not at all uncommon in Montana). With a 1,300-foot HAA and the temperature at -30°C, we would add 240 feet to our MDA. The required obstacle clearance (ROC) on a LOC is 250 feet. Since this is a circling approach, this one would have a 300-foot ROC. If you don't add the 240 feet, your obstacle clearance gets mighty tight. Let's hope the altimeter wasn't reading 75 feet high during preflight.

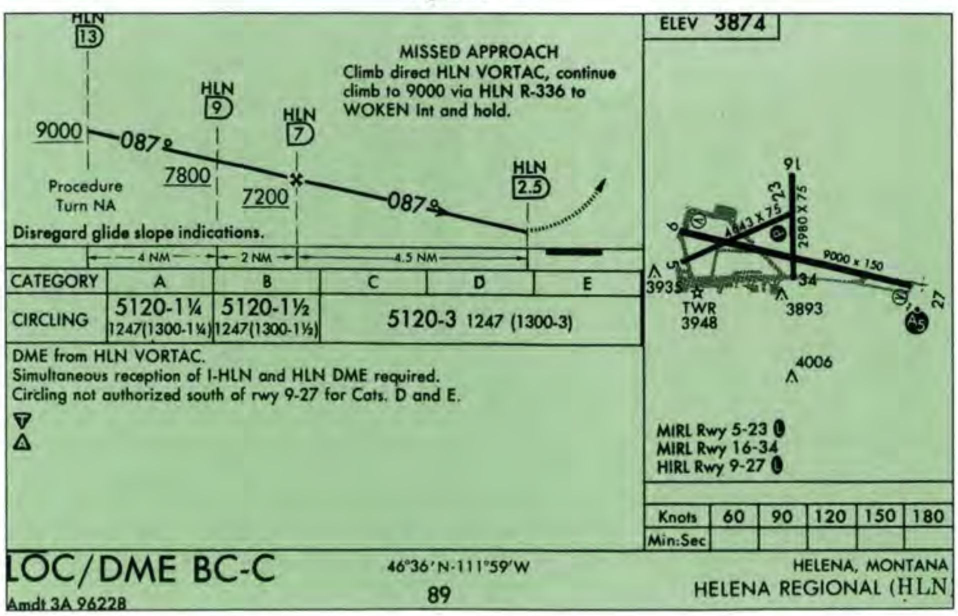
You have decided to apply these corrections inside the FAF. This is good. The directions above the chart tell us only to apply these corrections inside, but not including, the FAF. Don't believe everything you read! The directions given here are different than those Canada uses. Look at the LOC/ DME BC-C, Helena MT again. The FAF altitude is 7,200 feet. The airport elevation is 3,874. The difference is 3,326 feet. If the temperature is still -30°C, we would add over 540 feet to our FAF altitude. The required obstacle clearance at the FAF is 500 feet! You see the problem here? The CAR require that these corrections be applied to all IAP altitudes when the temperature is below -30°C, or if the initial or intermediate approach segments are greater than 3,000 feet HAA. I would recommend applying the temperature correction to any part of the approach where you might question your obstacle clearance. If any combination gives me more than 100 feet error, I apply the correction outside of the FAF as well as my MDA or DH.

I realize there are often "hard" altitudes on approach plates where you have to be level. You can always request a higher-than-published altitude. If ATC is unable to approve it, you might think about going elsewhere (Florida comes to mind). Communication is the key here. Always advise ATC of your intentions.

En route procedures are even trickier. Will your MEA or MOCA provide obstacle clearance on a frigid mountain day? Maybe. It might be a good idea not to fly the MEA if it's bitterly cold. Give yourself a little pad and fly the next higher altitude for our direction of flight.

Remember, no matter what the FAR say or don't say, regardless of Air Force direction, it is **your** responsibility for the safe flight of your aircraft. Fly safely! ✈

Figure 2



Crew Commo: Talking to Each Other

Cowboys Alive and Well and Flying Army Aircraft

CW4 GARY D. BRAMAN
Camp Humphreys, Korea

As an aviation safety officer and former accident investigator, I am always on the lookout for "high risk aviators," or what we used to call "cowboys."

Cowboys are not identifiable by age, gender, race, rank, or position. They can be anyone in your unit—the commander, the operations officer, an IP, or the ASO. They can be the best or the worst officer in your organization. Their behavior can be very obvious or very discreet. They don't like doing things by the book and don't understand why they should. They become defensive when confronted and will always have an excuse for their actions. They also have a very difficult time complying with the instructions on the mission briefing sheet. When flying, one of their favorite terms is "Watch this!"

I once served on an AH-64 accident investigation board. Shortly after arriving at the scene of the accident, we were handed the tape from the aircraft's video recorder. After viewing the tape, I knew we were dealing with cowboys. An accident had been inevitable during this flight; it wasn't a question of "if" an accident were going to happen, only "when."

At one point, the copilot was heard to say, "Yeeeeeee haaaaaaaa" as the PC completed a return-to-target maneuver.

The mission was a single-ship, day ATM training flight for an officer who had not flown much but was scheduled to deploy on a JRTC rotation. The training was to include high- and low-level reconnaissance, low-level flight, and nap-of-the-earth flight with target-engagement operations. The crew was briefed to conduct the flight in the local training area utilizing several different sectors and transition corridors.

As part of preflight planning, the crew checked the weather, computed aircraft performance data, and assessed the risks associated with the mission. Additionally, they conducted all mission and crew briefings. The crew then filed their flight plan and completed the preflight inspection of the Apache.

It was about 1400 when they took off. The PC, who was also a unit IP, was in the backseat on the controls, and the CP was in the front seat. They conducted ATM training consisting of low-level and NOE operations in several different training areas. They also practiced multiple target engagements and high- and low-recon of landing zones. This training was completely documented on the aircraft's videotape. The video also showed the PC operating the aircraft as low as 3 feet agl at 26 knots between trees and wires beside common-use roads. At one point, the copilot was heard to say "Yeeeeeee haaaaaaaa" as the PC completed a return-to-target maneuver.

The crew continued their flight along a common-use roadway until arriving at one of the large drop zones scattered around the reservation. The PC turned the aircraft left to a heading of about 320 degrees toward a stand of trees. As the aircraft approached the trees, the PC noted a gap in the trees and asked the copilot, "Do you think we can make it between there?"

The copilot answered, "Nope."

The PC then remarked, "Sure we can. Look how big it is. Oh, ye of little faith."

At 1532 hours, immediately after the PC's remarks, the No. 4 main rotor blade struck a 2 1/2-inch-diameter limb, breaking off an 8 1/2-inch piece of the blade. The Nos. 2 and 3 main rotor blades also struck the tree. The aircraft shuddered violently, but the aircrew was able to land in an open field and exit the aircraft unassisted.

The aircraft was at 16 feet agl and 76 knots when it struck the tree, resulting in more than $1 million in damage to the aircraft.

So, "cowboys" are still alive and well in Army aviation. As hard as we try to identify and eliminate them in initial flight training, some still manage to get through. As professional aviators, we have a responsibility to report and eliminate them once they have been identified.

Our business is a dangerous one, and the cowboys only increase the risk. We must not condone their behavior by doing nothing. ✈

MSGT JAMES K. ELLIOTT
HQ AFSC/SEFO

This is the second in a series of articles on the HATR Program. It covers program purpose, reportable incidents, and HATR information available on the Air Force Safety Center's new HATR web site.

The HATR Program

The Hazardous Air Traffic Report (HATR) Program helps prevent mishaps. As described in AFR 91-202, *The USAF Mishap Prevention Program,* Attachment 3, the HATR Program establishes procedures for reporting and investigating near midair collisions (NMAC), NAVAID anomalies, and other hazardous air traffic-related incidents and conditions.

The HATR Program has two primary goals: To crossflow HATR information through MAJCOM safety and Air Traffic Service (ATS) offices to identify hazardous air traffic trends or conditions; and to recommend ways to improve mishap prevention. While individual HATRs may not have AF-wide application in terms of generating policy and guidance, they do provide valuable lessons learned which may apply to other Air Force locations. An analysis and investigation of each HATR incident is conducted, and it results in recommendations/actions taken to prevent a similar situation from occurring again. The HATR Program creates a means to *proactively* correct hazardous aircrew, air traffic control, and airspace procedures before they lead to a mishap.

Reportable Events

Detailed guidance for events reportable under the HATR Program is found in AFI 91-202, Attachment 3. They are summarized here.

• NMAC: The aircrew took abrupt evasive action to avoid a collision or would have taken evasive action if circumstances allowed.

• Hazardous Air Traffic Conditions: Less than required separation existed between aircraft or any occurrence that did (or could) compromise flight safety.

• Communication or NAVAID anomalies: Any equipment indication that did (or could) contribute to a hazardous air traffic condition.

• Hazardous Procedures: Any system, publication, or directive that did (or could) contribute to a hazardous air traffic condition.

• Hazardous Ground Incidents: Any occurrence, including vehicle operations on the movement area, that endangered an airborne aircraft or an aircraft on the ground.

HATR Web Site

To access the HATR web site, go to the AFSC's Aviation Safety Operations Branch home page at www-afsc.saia.af.mil/AFSC/RDBMS/Flight/fltops/home.html. It has three links: the HATR Summary link, the HATR Guidance link, and the HATR Information link. "HATR Summary" offers a sanitized snapshot of reports and provides the opportunity to extract lessons from individual reports. "HATR Guidance" will soon contain all of the information found in AFI 91-202, Attachment 3, to facilitate easy access to HATR program directives. "HATR Information" furnishes news about future changes to the HATR Program and past HATR articles from this magazine.

Remember: We're on your side. The purpose of the HATR Program is to prevent mishaps—not to provide a metric to investigate bad performance and punish individuals. Send your comments to HQ AFSC/SEFO, 9700 "G" Avenue, S.E., Kirtland AFB NM 87117-5670, call DSN 263-2034, or e-mail elliottj@kafb.saia.af.mil. ✈

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FROSTBITE

USAF Photo by MSgt Rich Moran

COL (USAF RET) JOHN H. CALVERT, JR.
Medical Corps
Flying Safety, Oct 92

The Lapps, who live in the northern part of Sweden, where temperatures often go below -30°F, even herd reindeer with snowmobiles. These folks don't have any special built-in protection, but they do know how to dress and live in a cold climate.

You should be concerned about frostbite, however. Frostbite is the worst of a series of cold injuries starting with frost nip, or chilblains, and trench foot. At its worst, it can be a painful and disfiguring injury. Frostbite is the freezing of the moisture in your body's tissues. Generally, frostbite is classified as either superficial or deep.

Superficial frostbite damages only the outer surface layers of the skin, and you can usually make an unscarred recovery. Deep frostbite, on the other hand, is serious business because muscles, nerves, and sometimes even bones may be frozen. Quite often, deep frostbite results in gangrene and amputation of the affected areas.

Frostbite can sneak up on you because there isn't much pain associated with the freezing process. You may feel some tingling, stinging, or a dull ache as the flesh freezes, but this is soon followed by numbness. If the cold stops hurting, it's likely you already have been injured.

At first, the exposed skin may look red. Then it becomes progressively pale or waxy white. Next, the affected body part may feel wood-hard, and if it's truly frozen, the skin will be dead white and brittle.

Now you're in real trouble, but it won't hurt since the frozen member lacks sensation. Studies show every part of the body can be frostbitten, but ears, nose, hands, and feet are most commonly affected.

Destructive Duo

Low temperatures and wind team up to destroy tissue. The wind velocity is important because your body loses heat faster when the wind sweeps away the thin layer of warm air next to your skin. See the wind chill chart. (Low humidity or precipitation also increases body heat loss.) Any movement of air past your body—walking, running, or riding in an open vehicle—will have the same effect as the wind.

Keep C-O-L-D

The keys to preventing cold injury are conserving body heat and maintaining good blood circulation. The supply folks will give you special winter clothing, and if you use it right, it will protect you. Here are a few simple rules, with an acronym (**C-O-L-D**), to help you remember them.

Clean. Keep your clothes clean. Dirt, oil, lubricants, and moisture clog the air spaces in clothes and rob the material of its insulating properties.

Overheating. When you're working or if the temperature rises, avoid overheating by removing excess layers of clothing before sweating gets the inner layers wet.

Loose layers. Wearing loose layers of clothing traps air between the layers where it acts as insulation. Loose clothing also allows efficient blood circulation. Be extra careful not to restrict blood flow to hands and feet.

Dry. Keep outside clothes dry. Wet clothes actually increase heat loss. The outer layer of clothes should be water repellent, but not waterproof (except for footwear), so the garments can "breathe."

Another preventive measure is early recognition of cold injury symptoms. If you're outside with another person, you can check to see if your partner's skin is becoming red or waxy white. By yourself, your only warning may be tingling, stinging, or a dull ache in the affected body part. If you recognize the symptoms, immediate treatment will prevent any serious injury.

Get Warm

If you suspect a cold injury, the best thing to do is get to a nice warm hospital and let us medical folks take care of you. However, if you can't get medical help right away, here are some basic first aid rules to follow.

First, get warm! Get out of the cold and protect the injured part from further damage.

Next, remove any constricting clothing, then wrap up in blankets to help your body use its own heat. Drinking hot liquids such as tea or coffee is okay, but *alcohol* is a *no-no.* Alcohol (like nicotine) has an undesirable effect on the circulatory system and may do more harm than good.

Resist the temptation to rub the affected area. The skin is already damaged, and rubbing can lead to permanent damage. Don't apply direct, dry heat to the injured area because frozen skin doesn't have any feeling—you could burn the already frostbitten skin. Don't break any blisters—an open blister is an invitation to infection. The injured part should be wrapped in a clean, loose-fitting dressing.

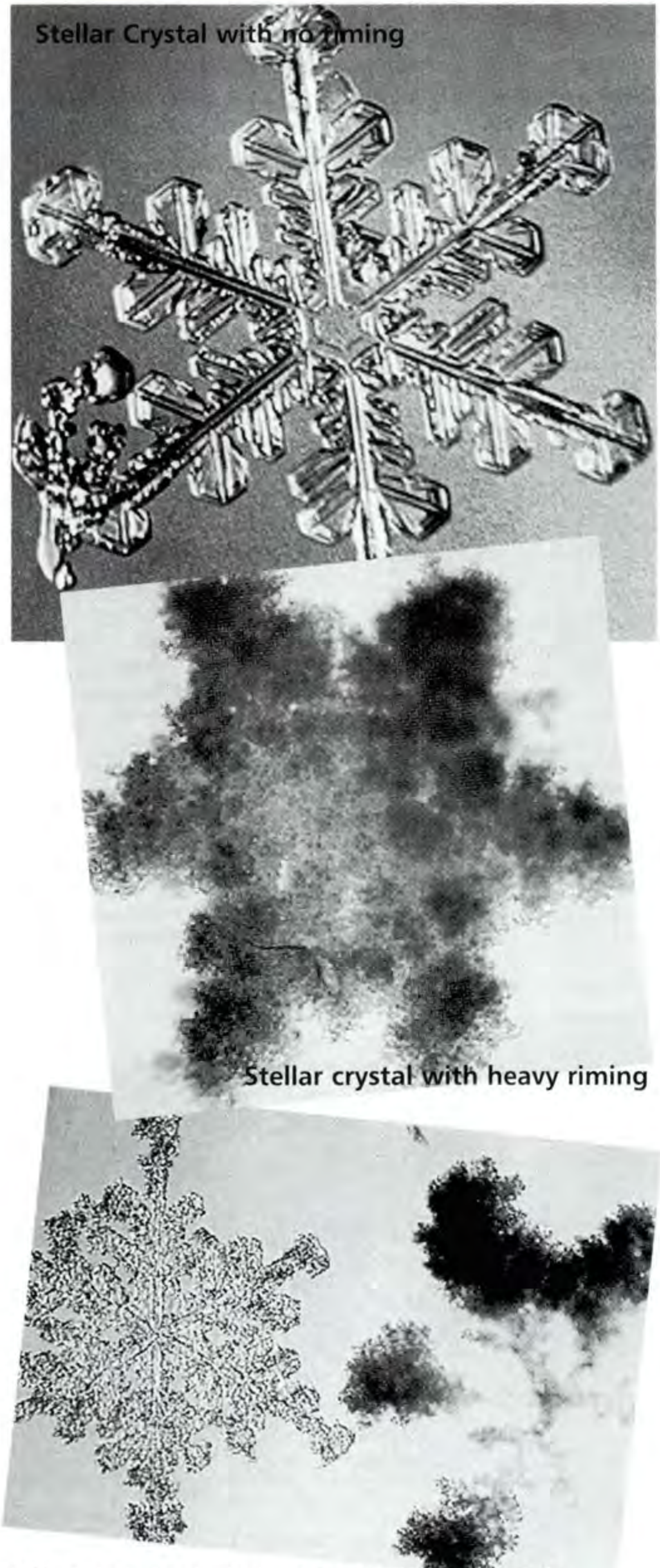
The next step, if at all possible, is to get medical help. It's possible to thaw a frozen part, but it's best done at a medical facility. To prevent further injury, the temperature used in the thawing process must be carefully controlled, and an antiseptic environment is a must. And it's going to hurt a lot. With proper treatment, however, the injured part can usually be saved and restored to full useful function.

Remember *prevention* is the best cure. If you wear the right clothes, you should stay warm and safe during your exposure to cold. If you do get frostbite, get out of the cold as soon as possible and seek medical help promptly. ✈

COOLING POWER OF WIND EXPRESSED AS "EQUIVALENT CHILL TEMPERATURE"																						
WIND SPEED		TEMPERATURE (F)																				
CALM	CALM	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-60
KNOTS	MPH	EQUIVALENT CHILL TEMPERATURE																				
3 - 6	5	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50	-55	-65	-70
7 - 10	10	30	20	15	10	5	0	-10	-15	-20	-25	-35	-40	-45	-50	-60	-65	-70	-75	-80	-90	-95
11 - 15	15	25	15	10	0	5	-10	-20	-25	-30	-40	-45	-50	-60	-65	-70	-80	-85	-90	-100	-105	-110
16 - 19	20	20	10	5	0	-10	-15	-25	-30	-35	-45	-50	-60	-65	-75	-80	-85	-95	-100	-110	-115	-120
20 - 23	25	15	10	0	-5	-15	-20	-30	-35	-45	-50	-60	-65	-75	-80	-90	-95	-105	-110	-120	-125	-135
24 - 28	30	10	5	0	-10	-20	-25	-30	-40	-50	-55	-65	-70	-80	-85	-95	-100	-110	-115	-125	-130	-140
29 - 32	35	10	5	-5	-10	-20	-30	-35	-40	-50	-60	-65	-75	-80	-90	-100	-105	-115	-120	-130	-135	-145
33 - 36	40	10	0	-5	-15	-20	-30	-35	-45	-55	-60	-70	-75	-85	-95	-100	-110	-115	-125	-130	-140	-150
WINDS ABOVE 40 HAVE LITTLE ADDITIONAL EFFECT		LITTLE DANGER					INCREASING DANGER (Flesh may freeze within 1 minute)						GREAT DANGER (Flesh may freeze within 30 seconds)									
		DANGER OF FREEZING EXPOSED FLESH																				

Ground Icing—*A Slipp*

CAPT ELIZABETH A. COATES
HQ AFFSA



Stellar Crystal with no riming

Stellar crystal with heavy riming

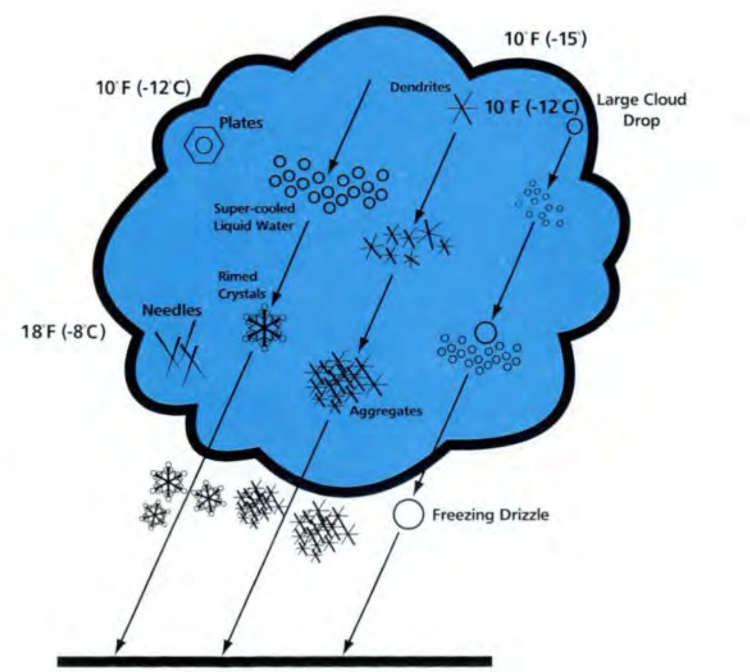
Differences in riming on large stellar crystals

Most of you probably don't realize that weather services use visibility estimates to categorize snowfall intensity. The problem with this method is that a visibility estimate alone can be misleading to pilots and ground deicing decision makers.

Recent research findings by Dr. Roy Rasmussen and Jeffrey A. Cole of the National Center for Atmospheric Research (NCAR), *How Snow Can Fool Pilots,* report that visibility estimates *alone* can be a poor indicator of ground icing potential.

How is this possible? Well, simply put, snowflakes with large diameters and those formed from more than one crystal have a greater potential to obscure visibility. Depending upon upper-level cloud temperatures and cloud structure, a larger snowflake may contain less water. Likewise, snow can also form from a process known as "crystal riming." The crystal riming process makes snow appear white and frosty, and when it occurs, water content is higher, diameter of the snowflake is reduced, and visibility increases.

So what does this mean to you? Imagine for one moment that you're preparing for a flight. You glance out of your window and observe 1/4-mile visibility with heavy snow (snowfall intensity based on reported visibility). Weather reports indicate the liquid precipitation rate is



ery Affair!!

about .1 inch per hour. You observe the flakes are fairly large (about 3 to 5 mm) and not rimed. Well, for the same liquid precipitation rate (.1 in/hr), the observation could also be 3/4 miles w/light snow. These snowflakes could be small (about 1 to 3mm) and rimed, which would account for the higher visibility.

Although the crystals are smaller and the observed visibility is higher, the crystals could be formed from the heavy crystal riming process we discussed earlier and have a higher water content than the larger fluffy snowflakes. These differences in crystal type and size would account for the differences in visibility, similar water content, and in these two examples, an equal threat to ground icing hazards.

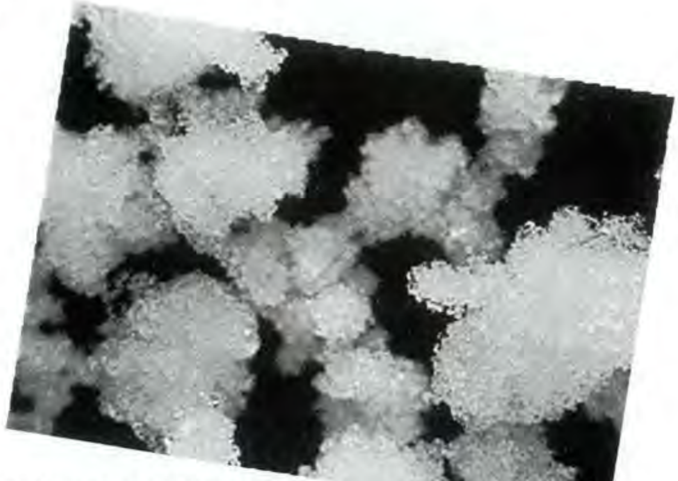
There is another related situation that could mislead one into underestimating icing potential. At night, light scattering from the snow decreases, and for the same snowfall rate, visibility is twice as good as during the day. In this scenario, one would need to pay attention to the crystal characteristics as well.

According to Rasmussen and Cole, "Accurate real-time measurements of liquid equivalent snowfall rates need to be made and reported to pilots and ground operations personnel, not just visibility measurements." In the same study, previous ground icing accidents had common values of (1) precipitation rate—.08 to .1 inch per hour; (2) temperatures—25°F to 31°F; and (3) wind speed—8 to 13 knots.

However, reported visibilities varied from .25 to 2.0 miles, demonstrating again that visibility alone may be a poor indicator for snowfall rates. It also points out that temperatures near 32°F are particularly hazardous. As snowflakes melt, the diameters decrease and the process has the same effect as rimed snow. That is, visibility will increase.

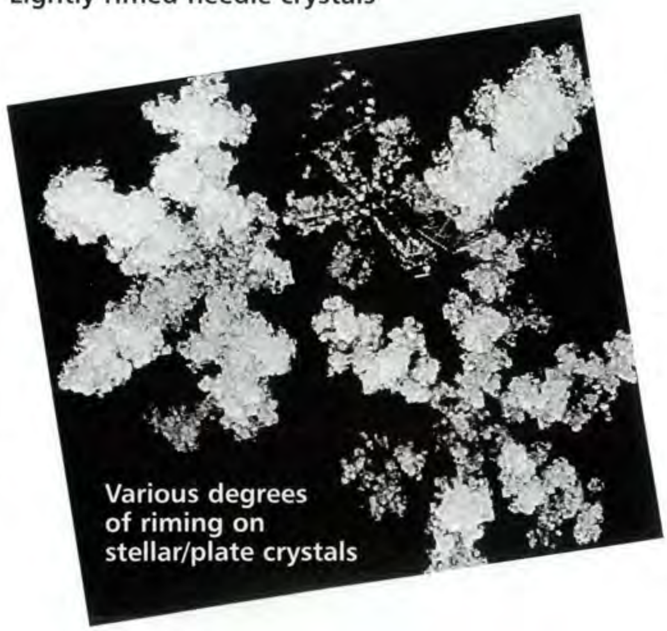
Aimed at producing a systematic, comprehensive approach to providing support to deicing operations, the NCAR (Rasmussen and Cole) and FAA (Warren Fellner, Ken Leonard) are working on the Weather Support to Ground Deicing Decision Making (WSDDM) project. The WSDDM approach uses data extracted from a matrix of Doppler radar, snow gauges, and the Automated Surface Observation System (ASOS) network. Resultant improved forecasting techniques should improve situational awareness for operators by adding value to decisions involving deicing activities, snow removal efforts, and holdover times during winter ground operations. ✈

For more information on the WSDDM project, see http://www.faa.gov/aua/awr/prodprog.htm.



Graupel or pellet snow

Lightly rimed needle crystals



Various degrees of riming on stellar/plate crystals

Maintenanc

The Human Chock

How many times have you transferred equipment from one vehicle to another and *not* gotten hurt? Probably dozens of times, at least. But a recent mishap revealed that a moment's inattention, even while performing so mundane a job, could have potentially deadly consequences.

It started out quite simply, with two people in a pickup truck. They were detailed to transfer some equipment from a parked vehicle to their truck and transport it elsewhere. They located the vehicle containing the items to be moved, and while the driver remained in their idling pickup truck, the other person got out and transferred the equipment. Simple enough, but the loader couldn't get their pickup truck's tailgate to close. Seeing the difficulty, the driver got out to assist with closing it. Before you could say "Yikes!" the equipment loader was turned into a human chock and pinned between the parked vehicle and the idling vehicle.

Did the driver (a) forget to put the truck in "Park"? (b) forget to set the truck parking brake? (c) forget to turn off the vehicle ignition? or (d) forget to take actions a, b, and c?

The correct answer is "d." Fortunately, in this case, injury to the person doing the loading was limited to an awful scare, painful bruising, 1 day in the hospital, and 7 days on quarters. It should be obvious that this mishap could easily have been much more serious. Reminder: In accordance with *AFMAN 24-306, Manual for the Wheeled Vehicle Driver,* when exiting a vehicle, the driver must turn off the engine, place the transmission in Reverse (manual) or Park (automatic), and set the parking brake.

As a sidebar, you'll be pleased to know that neither of the vehicles involved suffered any damage, although we suspect the pickup truck driver may have suffered short-term hearing loss after getting an earful from "the human chock."

Loose Panels Plague Planes

A Strike Eagle departed home station on a routine training mission, its second sortie of the day. Shortly after takeoff, while maneuvering with his wingman in a left-hand turn at 400 knots, the mishap pilot heard a "bang" and saw a blur go by over his left shoulder. Bird strike? Nope. Most of panel 6L had departed the aircraft. Before it fell to earth, it punctured the fuselage in two places, bent the left AOA probe upward 20 degrees, and—scariest of all—banged the canopy twice.

Investigation revealed that the original crew chief left 3R and 6L open so the aircrew could set Mode II and check circuit breakers, but he was pulled for other work prior to crew show. The pilot and WSO arrived and started doing their preflight a short time later. They both noted that panels 3R and 6L were closed but not secured during their walkaround. In the meantime, the Expediter dropped off another crew chief, and he assisted the aircrew in final preparations for launch. The crew chief secured 3R and noted that all other panels *appeared* to be secure for flight. Since he'd gotten 3R, the aircrew *assumed* the crew chief had also gotten 6L, but didn't query him. And because the panels weren't documented in the forms, the trap was set. Neither the crew chief nor the EOR crew caught that 6L was not secured, and well, you know the rest. Mishap cost was $20 thousand-plus,

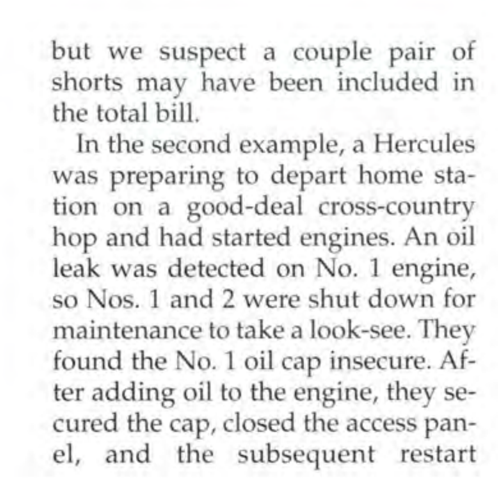
ce Matters

but we suspect a couple pair of shorts may have been included in the total bill.

In the second example, a Hercules was preparing to depart home station on a good-deal cross-country hop and had started engines. An oil leak was detected on No. 1 engine, so Nos. 1 and 2 were shut down for maintenance to take a look-see. They found the No. 1 oil cap insecure. After adding oil to the engine, they secured the cap, closed the access panel, and the subsequent restart confirmed the oil leak was fixed. On arrival at the good-deal location, the No. 2 prop—*that's right, No. 2 prop*—was discovered to have prop boot damage to all four blades, requiring a propeller change.

Investigation here revealed the crew chief who started the combined PRE/ BPO prior to flight had failed to secure the access door on top of the No. 2 engine nacelle. *And he failed to document that the panel had been opened.* If only the loose oil cap had been on the No. 2 engine, or the insecure panel had been on the No. 1 engine, maybe the mishap would have been prevented. Of course, good forms documentation would have been even better than either of those two alternatives. Total mishap cost: $35 thousand-plus.

It's often the simple things that come back to haunt you, and failing to document removed/insecure panels in 781As is just one of them. Remember: There are no new mistakes, just people who repeat mistakes that have been made before.



How Not to Get an Eagle to Roost

We generally associate the term "aircraft Weight and Balance (W&B)" with processes like verifying W&B data accuracy before doing a jack job and ensuring aircraft W&B calculations are correct/updated prior to flight. Here's one more process to add to your list of associations with "aircraft W&B": *cannibalizations.*

The designated cannibalization (CANN) bird had been in CANN status for only a week. But a considerable number of parts had already been removed from the F-15, and it was targeted to be the "donor" for several more items in order to replenish the unit's Mobility Readiness Spares Package (MRSP).

Several airmen were working to remove the necessary parts, and as one of them climbed down the ladder from the "fleet replenishment aircraft" and stepped off, the Eagle's nose started rising. He yelled a warning to his coworkers and jumped back on the ladder in an attempt to keep the nose from continuing skyward, but to no avail. The F-15's nose continued moving up until the aircraft came to rest on the left and right tail cones, right stabilizer, and band three antenna, causing more than $25,000 in damage.

What caused this mishap? An unusual series of circumstances led to many more parts than usual being taken from the CANN bird. Investigation revealed that a cumulative total of 1,100 pounds worth of parts *forward* of the MLG had been removed, allowing the nose to get light enough to become airborne.

Reminder: The 1F-15C-2-10JG-00-1, *Aircraft Parking and Mooring,* states that an "unusual" W&B condition exists when 1,000 pounds or more of weight forward of the MLG is removed and requires mooring the NLG. Unit procedures have been implemented to identify situations that may give rise to "unusual" W&B conditions and prevent further recurrences. *Are the maintainers in your unit aware of situations mentioned in the 1F-15C-10JG-00-1—such as an "unusual W&B condition"—which require mooring the NLG?* ✈

I Don't Need to Define th

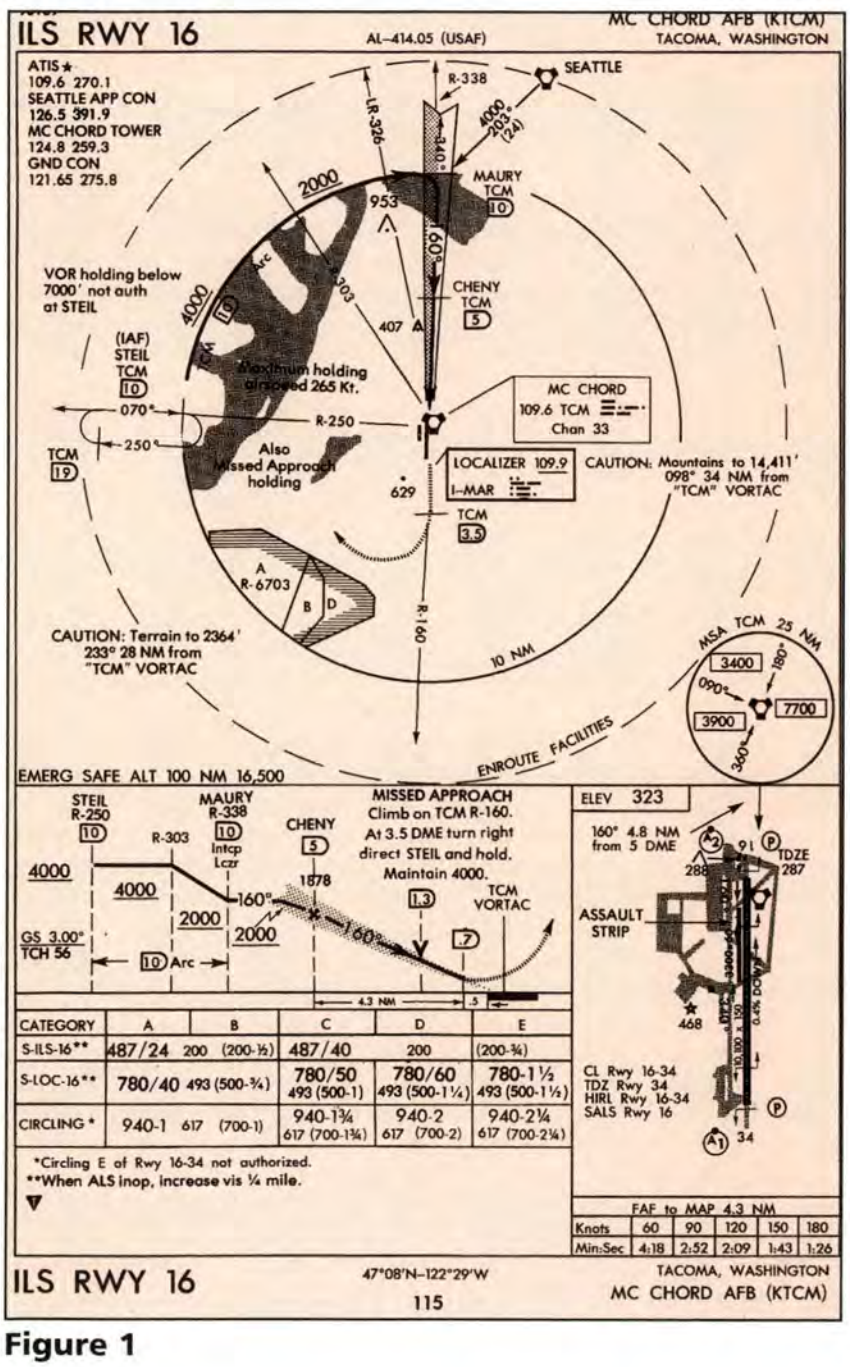


Figure 1

CAPT JC FINDLEY
Air Force Advanced Instrument School

Remember back in UPT when your Tweet IP asked if you could fly certain approaches? Imagine an ILS with an NDB defined final approach fix. If you don't have an NDB in your aircraft, may you get vectors to intercept the localizer final and then intercept the glideslope and fly it down to DH? No, you may not!

You will note I used "may" instead of "can." The FARs and the TERPs manual state that an ILS consists of several parts, to include an outer marker or alternate means of identifying the FAF. I believe the FARs are written by lawyers for lawyers and that interpretations sell for a dime a dozen. Let me give you some commonsense reasons why you need to be able to define the FAF on an ILS. More specifically, you need to be able to see if you are at the glideslope check altitude at the FAF. (See figure 1.)

When was the last time you saw an ILS checkpoint on the ground? "Never" should be your answer. Many pilots check to see if the antenna is receiving a good signal on the ground. Some check to make sure the localizer and glide slope "look right" on the ground. There is really no way to tell if the glideslope on your aircraft is operating properly while you are still on the ground. (Self tests never fail, right?) The only way to accurately check the glideslope on your airplane is to check your altitude against the check altitude when you are over FAF. This assumes you are on glideslope, of course.

Have you ever had the wrong altimeter set? Maybe you misheard the altime-

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e FAF on an ILS, Do I???

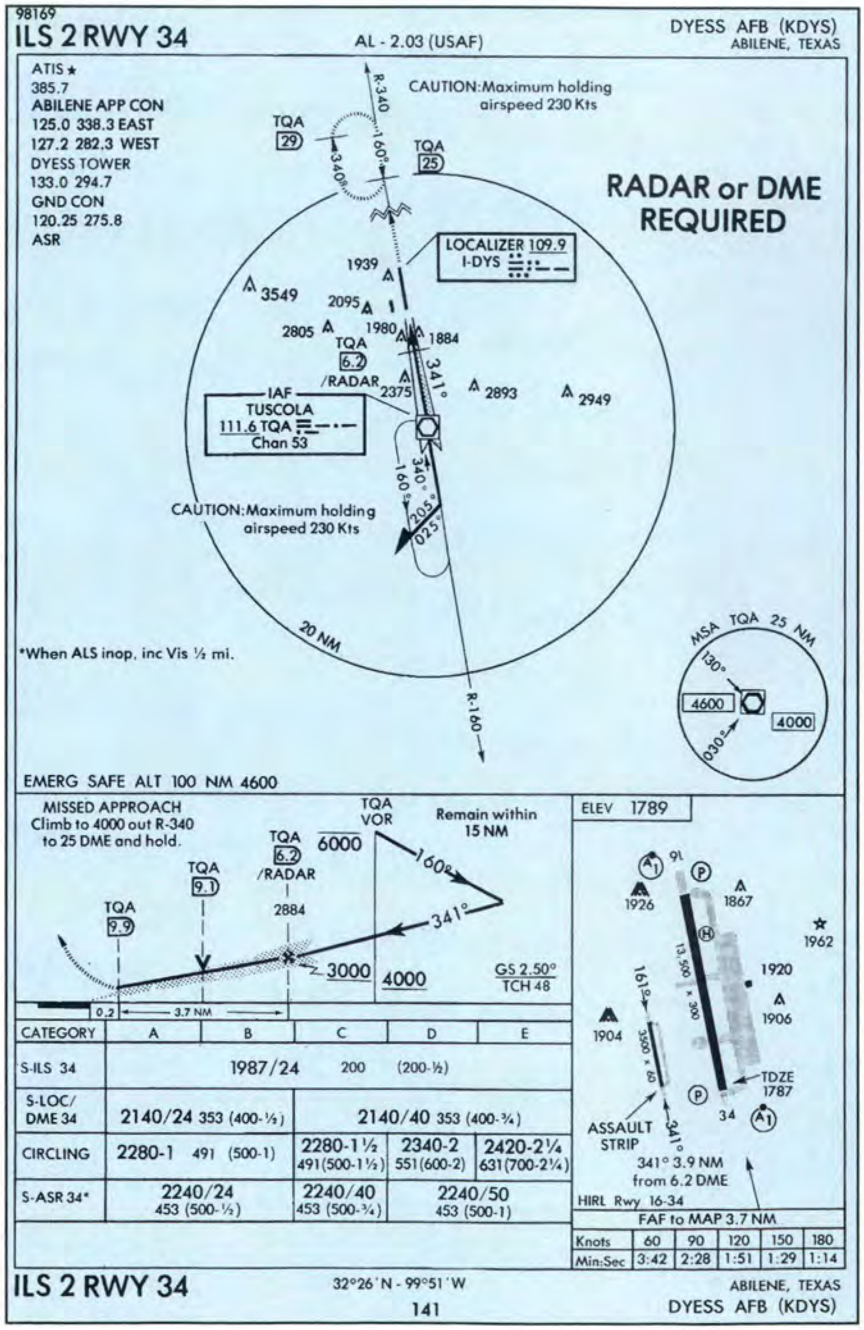
ter setting, or maybe you left 2992 set on your way down through the Transition Altitude. Properly checking your altitude at the FAF on an ILS should catch any gross errors.

How would you know if you captured a false glideslope? They only happen *above* the true glideslope, but that is only true without any interference. What if some heavy aircraft holds short of the runway *inside* of the instrument hold short line? They are not supposed to if the weather is below 800-2, but it does happen. This situation could interfere with the glideslope and move it up or down. This could be a dangerous situation unless you catch it at the FAF.

How far off the published altitude can you be and still be safe? Some pilot judgment comes into play here. Your altimeter is good ± 75 feet for takeoff. I have heard of guys using that as a tolerance for the glideslope check altitude also. I don't really want to be 75 feet "low" at my DH, so I use -50 feet + 100 feet. If I am off more than that, I start looking for possible reasons. If it's a gross difference, I'll start working another approach.

Can you ask the controller to identify the FAF for you using radar? It depends. The TERPs manual states that only ASR or PAR radar may be used to identify the FAF. It also has to be flight-tested. The only way you know this has been done is if it shows "radar" on the approach plate. (See figure 2.)

Our interpretation at the school and that of Air Force Flight Standards Agency, Flight Test, and the TERPs School is that you must be able to identify the FAF to fly an ILS. The TERPs expert spent a lot of time producing the check altitude for you to use—it's even corrected for the curvature of the Earth. Let's use it. ✈



CATEGORY	A	B	C	D	E
S-ILS 34	1987/24 200 (200-½)				
S-LOC/DME 34	2140/24 353 (400-¼)		2140/40 353 (400-¾)		
CIRCLING	2280-1 491 (500-1)		2280-1½ 491(500-1½)	2340-2 551(600-2)	2420-2¼ 631(700-2¼)
S-ASR 34*	2240/24 453 (500-½)		2240/40 453 (500-¾)	2240/50 453 (500-1)	

Knots	60	90	120	150	180
Min:Sec	3:42	2:28	1:51	1:29	1:14

ILS 2 RWY 34 — 32°26'N - 99°51'W — 141 — ABILENE, TEXAS — DYESS AFB (KDYS)

Figure 2

Laws of Aircraft Maintenance

- Know the aircraft you're working on.
- Interchangeable parts won't.
- The availability of a part will be inversely proportional to the need.
- A dropped tool will always land in the most inaccessible spot.
- A failure will not appear until the job has passed final inspection.
- If you have time to do it over, you had time to do it right the first time.
- If you mess around with it long enough, it will break.
- The most delicate part is the one you drop.
- Any wire, tube, or sheet metal, cut to length, will be too short.
- A shortcut is the longest distance between two points.
- You will always find the problem in the last place you check.
- A reputation as a good mechanic is hard won, but easily lost.

CMSgt Joe King
ATC Flight Safety
Date Unknown