Flying SAFETY

Trapped in Hell's Canyon

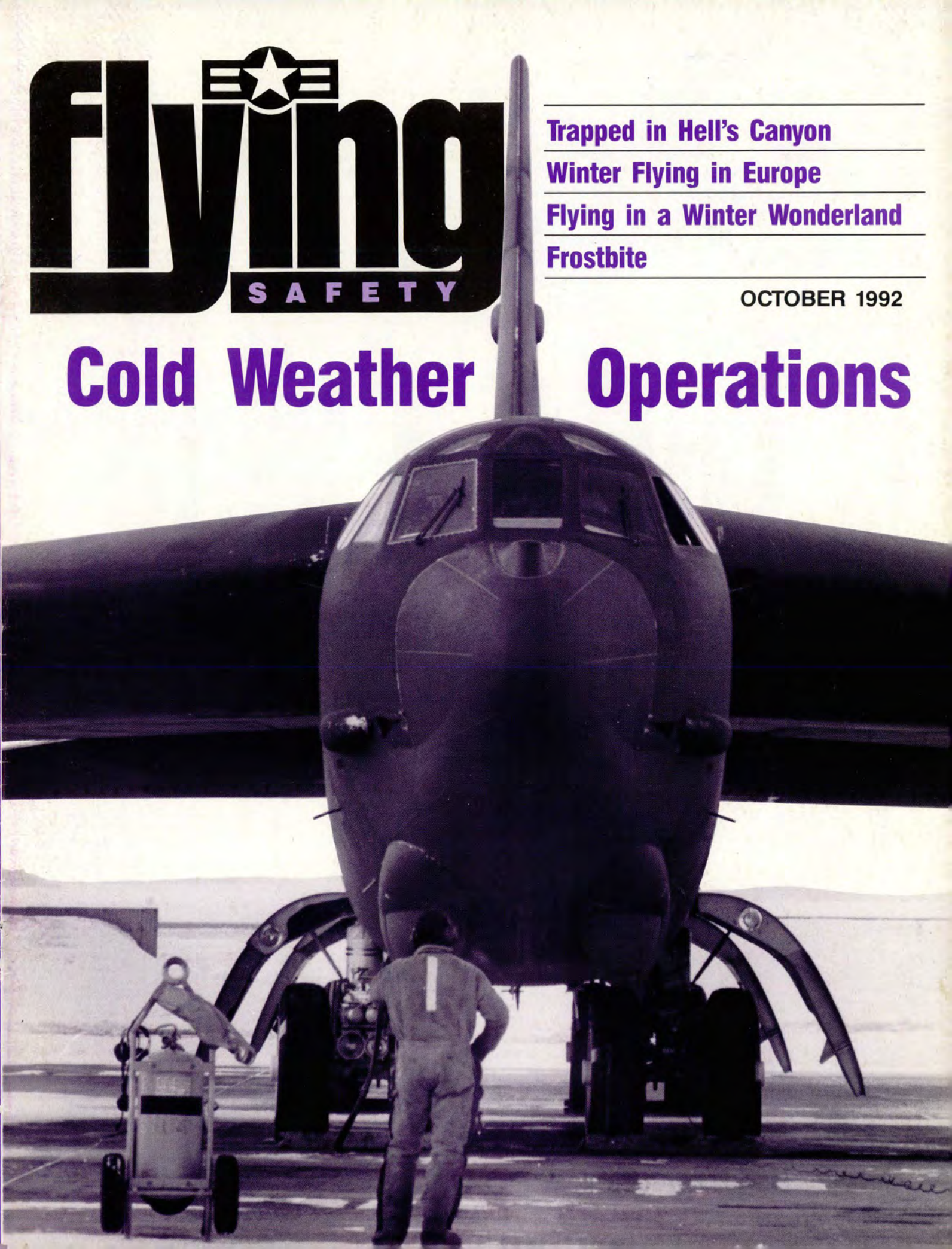
Winter Flying in Europe

Flying in a Winter Wonderland

Frostbite

OCTOBER 1992

Cold Weather Operations



THERE I WAS

■ It was the mishap pilot's first sortie in theater after an extended TDY to Nellis ... That's how the mishap report would have started, though I don't think it would have had any relevance. The sortie was pretty standard.

Gas-n-go to Wainfleet and Cowden. Weather was English standard — good enough to try, but not good enough to work. So pretty soon Cobra flight found itself on the usual European profile — BFM backup above the weather.

Owing to the fact it was one of two backup missions, the profile was pretty simple — HATF, fighting wing, 5-7,000-foot perch setups, 3,000-foot gun jinks, and a couple of high aspect neutral fights. Everything was going pretty smoothly, if rather uninspired, until the second 5-7,000-foot perch.

I was offensive and took the shot at approximately 7,000 feet. "Two" breaks for the missile and climbs a bit. I lag, stay level, and maintain energy for my corner velocity turning pull into his six when I see Two reverse.

Unsure, I continue for his six and watch him reverse again. Finally, I recognize a scissors developing. We end up with a horizontal multiplane scissors with Two above me. I let this go for two more reversals and then wonder about a terminate (hint) when I see Two gaining an advantage. I continue, figuring only a "wuss" would quit now.

Two sees an opportunity and tries pulling down to my six. I go down as well to defeat that and then decide to change the game as I have plenty of energy (280+ knots) and bring my nose into the vertical. Realizing the imminent loss of airspeed (and nose authority) would not be good in this situation, I roll onto my back and pull to level. Unfortunately, your opponent isn't always predictable. He had started back down again.

As I saw an enormous A-10 at 500 feet or less (who can judge in such an instant?) growing rapidly closer in my sight, I heard Two yelling "Pull" as I, less descriptively, began blathering "Knock it off" over Eastern's frequency.

As I sat in my jet, upside down and pulling for the ground, I waited for Two to smash into the back of my jet as I knew physics would demand. I wondered if I'd be able to eject after the impact. Fortunately, I was wrong, and the jets didn't collide (though I don't know how close they came), or this would be the mishap report (plus some notes on sleep patterns and last meals).

Did I screw up? First, I didn't terminate the stalemate. I thought Two was developing an advantage and wanted to see if I could neutralize it or if he could capitalize on it. Second, I didn't leave myself a big enough out. As I pitched up into the fight, I realized it wasn't so wise — a bit too late. Third, I didn't have enough respect for scissors. I doubt I've been in one since Holloman, and I wanted to see where it would go.

My recommendations? First, flying combat aircraft is dangerous, and we get paid extra money for taking the risks, but it doesn't hurt to minimize the danger.

Second, one way to minimize the danger is to be proficient so if you haven't done any scissors in a while, go out on your next BFM sortie and practice. Just remember you have two aggressive fighter pilots pulling into each other's high six, and that means into each other.

Finally, be ready to knock it off if things ever start not going right, and have respect for the risk, not fear. ■

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SPECIAL FEATURES

REGULAR FEATURES

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TRAPPED IN HELL'S CA

EDITED BY DOROTHY SCHUL

■ It was a warm, humid day in San Antonio. The crew of the C-119 was filing clearance, performing last-minute inspections, and checking fuel and oil. The pilot knew the destination (Hill AFB, Ogden UT) would have less-than-perfect weather, but this was well within his and the plane's capabilities. Three passengers waited impatiently for the flight — they were on their way home. This was the tenth day out, and so far, all had gone well. Everything was normal. No one expected trouble.

In the Pilot's Words

"There was a frontal passage in the San Antonio area. Several pilots reported heavy thunderstorms the night before and earlier that morning. I considered this, but by takeoff time the front passed, so there was no chance of getting into any of that. The weather at Hill was 200 feet, 1/2 mile. I believe the forecast was 300 feet, 1 mile, with snow anticipated. However, the weather officer at Brooks didn't feel it would be that bad, so he gave me 500 feet, 1 1/2 miles, with no particular emphasis on any heavy weather.

"There was a little turbulence right after takeoff. Slightly west of San Antonio, we broke out, and the flight was normal from there on. There were breaks in the clouds from Rock River to Fort Bridger (both Wyoming). Then it got a little rough. We put on the carburetor preheat and discovered the right carburetor heat wasn't working, although it was fine the previous 10 days. Left was okay.

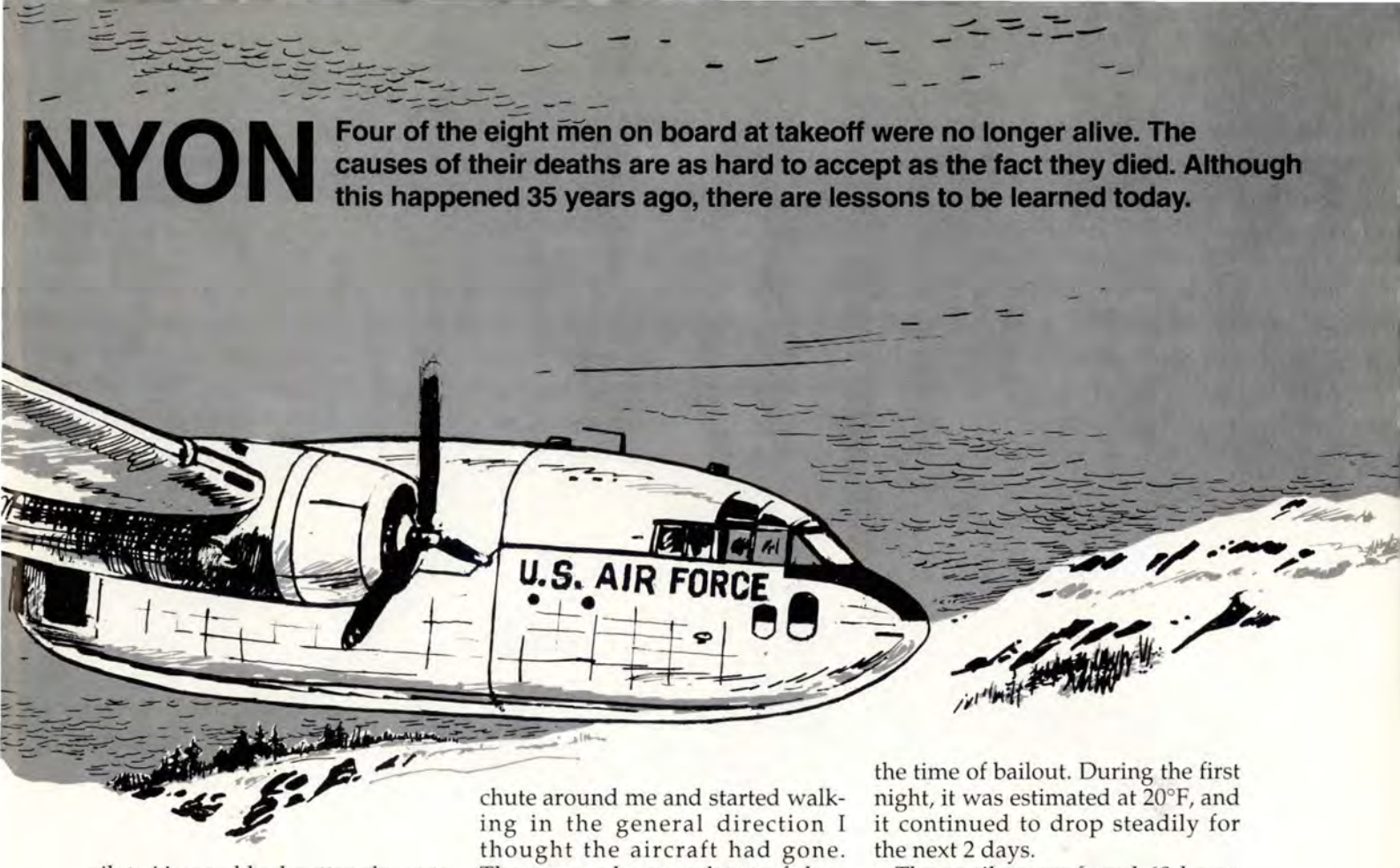
"After passing Fort Bridger (1553L), we lost the right engine and tried heat again (approximately 1605L), just in case there was a short in the switch or something. When we realized we wouldn't be able to bring the right engine back in, we added power to the left engine and feathered the right, losing altitude to probably 11,000 feet. Due to the loss of the engine and rough weather, we were unable to maintain altitude with METO power.

"We went to full rpm and manifold pressure and, for a few minutes, maintained altitude and safe single-engine speed. But we soon lost altitude and airspeed, so at 11,000 feet, the passengers and two engineers bailed out through the back paratrooper doors (1617L). We believed this was necessary because, according to our arrival time, we assumed we were in the Huntsville (Utah) area, or west, which put us very close to the mountaintops.

"We were able to maintain 10,500 feet for a short time, but 4 or 5 minutes later, the navigator and copilot also bailed out of the paratrooper doors. I was tracking outbound from Fort Bridger but couldn't pick up Ogden. I was on course, the heading was correct, and I attempted to set up the auto-

NYON

Four of the eight men on board at takeoff were no longer alive. The causes of their deaths are as hard to accept as the fact they died. Although this happened 35 years ago, there are lessons to be learned today.



pilot. Airspeed had gotten down to 80 knots, and the altitude was about 10,200 feet. The aircraft stalled the first time the autopilot was engaged. I disengaged it, retrimmed the aircraft, and reengaged it. Soon after, I left the aircraft through the rear paratrooper door.

"I figured I was 1 minute in the air. I landed in some trees low enough for me to reach the ground without hanging up in them, and I cut the shroud lines on the chute. I was in a small gully, in snow about a foot deep. I wrapped the chute around me and started walking in the general direction I thought the aircraft had gone. There was about an hour of daylight left.

"Shortly, I stumbled onto what appeared to be a road and followed it for a while, looking for some trees where I could get away from the wind and snow and stay for the night. I found a clump of pines approximately 2 blocks off the road.

"It was just about dark, so I started making a pallet of pine branches under one tree. I wrapped up in the chute and pulled branches in around me to keep the snow and wind out. I tried to settle down to wait for daylight so as not to walk in circles. About 0030, I heard rifle shots, and soon I was picked up by the jeep patrol."

Lucky Pilot

The pilot was the most fortunate of these men. He spent about 8 hours in the open, clad only in a blue gabardine flying suit, jump boots, and light-weight gloves. Deciding to wrap up in the parachute and holing up for the night were what saved him. The outside air temperature was at freezing at the time of bailout. During the first night, it was estimated at 20°F, and it continued to drop steadily for the next 2 days.

The copilot was found 60 hours after bailing out, wrapped in his parachute but dead from exposure. He was dressed in a summer flying suit and jump boots — no gloves or jacket.

The navigator was found 10 days after the mishap, about 3/4 mile west of where the copilot was discovered. He had tried to start a fire with a paperback book and some twigs which never did burn. Even parts of the book remained. He had taken off his shoes and socks and placed his feet close to the little fire, leaned back against a log, and crossed his arms with his parachute wrapped tightly around him. He survived at least the first night — a note he had written was found, and there were several cigarette butts nearby. Like the rest of the crew, he was lightly dressed — no hat, coat, or gloves.

The Army corporal paratrooper survived after a tremendous display of unselfish courage and great endurance.

The Paratrooper's Version

"When the engine conked out, the crew chief came back and told

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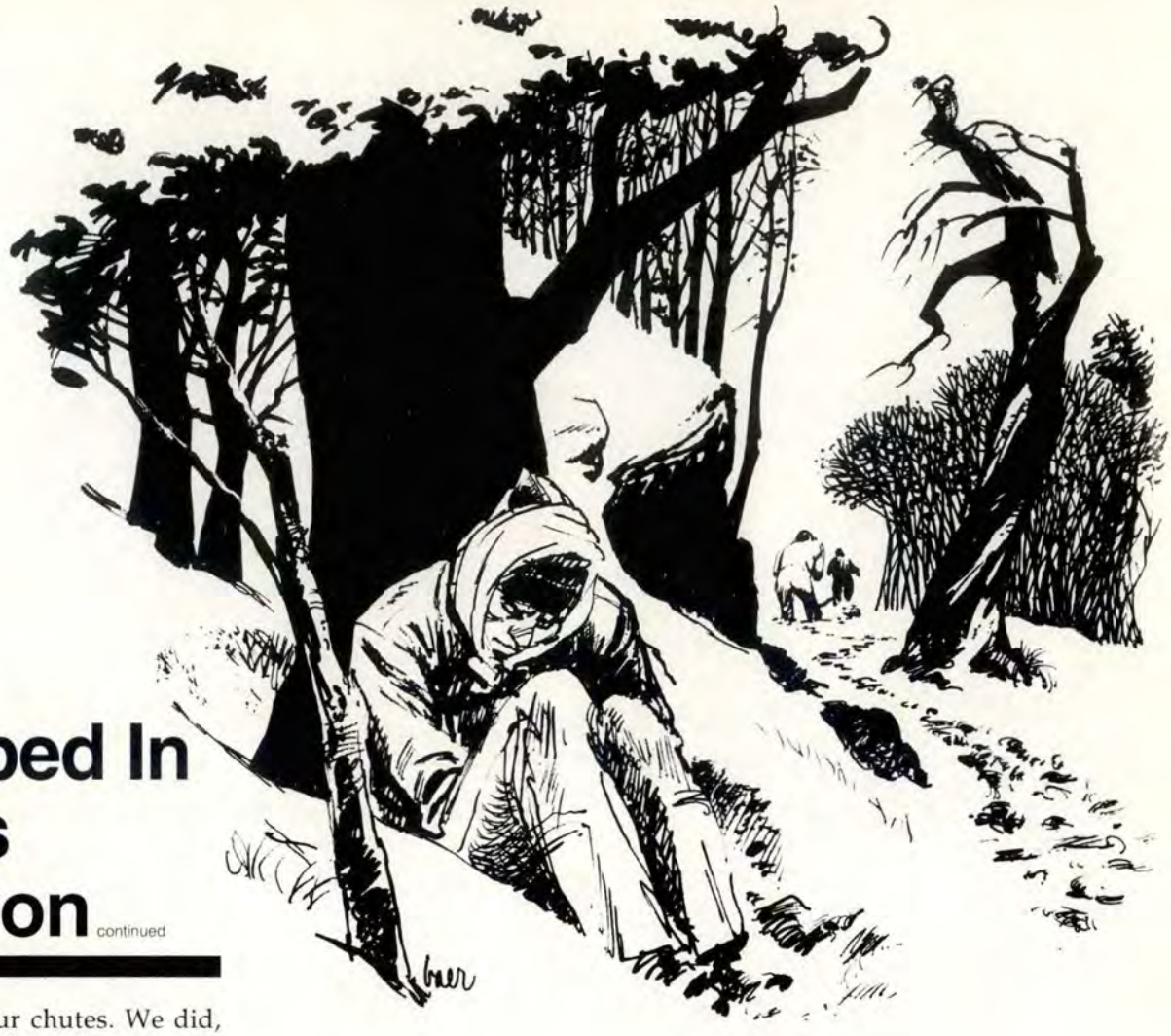


Trapped In Hell's Canyon continued

us to put on our chutes. We did, and he went back up front. A couple minutes later he returned and said we would have to jump. They opened the doors, and we went out. After we got on the ground, we weren't very far apart. (The five men, including the two flight engineers and the three passengers, landed within 500 yards of each other and regrouped easily.)

"We met down at the bottom of the canyon and talked over the situation. One of the crew chiefs took charge. We thought it would be best for two of us to start down the canyon for help since one of the passengers had a very bad ankle. About 1630, the sergeant in charge and I started while the other three built a fire and stayed where they were the rest of the night.

"We walked until about 1930. It was dark, the going was very rough, and we were having trouble getting through the brush. Since we didn't know how much farther it was to civilization, we decided we'd better go back and join the others at the fire. We were on our way back up when we found a cave. We were cold and tired, so we stayed in the cave the rest of the night.

"The next morning, we went to where we left the three, but they weren't there. We looked for them for 20 minutes but couldn't find them. There was nothing else to do but start back down the canyon again. We walked all day until about 1500 when the sergeant started getting weak and couldn't go much farther. After a while, he couldn't make any progress at all. I helped him as much as I could, but he was in bad shape.

"The assistant crew chief caught up with us. We talked it over, and he said the other two guys were also doing poorly. We knew we had to get help or nobody was going to live. (At this point, the senior crew chief was left behind.) We walked for another 2 1/2 hours, came to a sheepherder camp, and sent help up to the three others. We were taken to a ranch house and from there to the hospital."

Heroes Come in All Sizes

This tough little paratrooper, just under 5 feet 6 inches, and weighing perhaps 130 pounds, actually gave his light uniform jacket to the senior crew chief who had to be left behind, propped against a tree, while the others went on for help. When help did arrive, however, it was too late. The senior crew chief was dead.

The Assistant Crew Chief Speaks

"After my parachute opened and I could breathe again (about 1620L), I could see there were four open parachutes besides mine, where they were heading, and where they landed. I drifted over the others and came down nearby.

One chute was tangled in a tree, and I hollered to the man to wait until I got there so he wouldn't unfasten his chute and break a leg in the fall.

"After we regrouped, I told the men they'd better retrieve their parachutes. The crew chief and the corporal said they couldn't because theirs were stuck in some treetops. At the time, we believed one of the passengers (a 230-pound Army sergeant) had broken his ankle when he landed in a creek — his foot had gone between two rocks. The other crew chief and the Army corporal decided they would start walking to look for medical help. The ranking Air Force NCO passenger agreed with this, so they left.

"We tried to find enough wood to build a fire, but what we found was so wet we couldn't get one started. I examined the ankle of the Army sergeant. It was badly sprained, but there didn't seem to be any broken bones, and he could stand on it.

"We thought we should find a better place to stay and build a fire. We walked about 2 miles around the side of the mountain and found a large pine tree. We dug underneath it, under the snow, found some dry leaves, and broke off a few dry twigs. The crippled man tore up his driver's license, his orders, a notebook, and some papers to use for kindling. We got a small fire going, and slowly it turned into a fairly large blaze. We spent 17 hours by the fire under that tree.

"The next day we came to the conclusion if we were going to die, we were going to do it walking. At 1030, I asked if I could go alone and make it out of there, but the other two voted against me. We decided the three of us would try to make it out, so we started back the way we had come. We found the tracks of the two who had left the night before and followed them down the canyon.

"The Army sergeant couldn't walk much because of his ankle. I had set a pace for myself I figured I could keep up for quite some time. The other Air Force sergeant managed to stay with me for about 4 hours, but then he seemed to lose all his energy. He had thrown away his part of a parachute he had used to keep warm. I gave him my part of it, but he kept going slower and slower.

"I tried to make him keep up with me. I hollered at him and cussed at him, trying to get him to realize he would die if he stopped. I knew if I stopped I wouldn't be able to start again, so I just kept going as slowly as possible without stopping completely. The sergeant didn't seem to comprehend he was barely crawling, so he fell behind.

"The next day we came to the conclusion if we were going to die, we were going to do it walking."

"I didn't know if the first two had made it out. Their trail was quite easy to follow until we got down into the narrows of the canyon. I walked right in the middle of a creek most of the time, but whenever I would get a chance to walk on the bank, I could see their trail quite clearly in the snow.

"I then came upon the other crew chief and the Army corporal, approximately 40 minutes from the time I had last seen the ones who fell behind me. The corporal was half carrying, half dragging the sergeant through the snow. I told them to get a move on so we could get out of there. The sergeant was so far into shock he didn't know who I was or what he was doing, and he kept falling down all the time.

"We tried to start another small fire. The only thing we had was a cigarette lighter, but it didn't work. We knew we wouldn't be able to pack the sergeant out because he weighed close to 200 pounds, and our own physical strength was almost gone. So the corporal took off the small jacket he had on and put it on the sergeant. We set him under a spruce tree and left him there.

"The corporal suggested we try to double-time it out of there. I told him we were going to walk an even pace as fast as we could without losing all of our energy, and I told him if he fell down he was going to have to get up by himself

continued

Trapped In Hell's Canyon continued

because I wasn't going to stop until we got help. He just looked at me and said, 'Sergeant, let's go!'

"We started walking. He stayed about 8 feet behind me and didn't falter once. About 2 hours after we left the sergeant by the tree, and 24 hours after we bailed out, we found a sheepherder camp at the mouth of Hell's Canyon. We pinpointed the canyon we came out of and told the authorities about how far up the others were. They started to search for them."

One More Survivor

The three men left behind when the corporal and senior crew chief (dressed in flight coveralls, a light flight jacket, and high-laced boots) decided to go for help managed to get a fire started. They stayed there for 17 hours before they, too, decided to walk out.

Hell's Canyon had now given up two of the five men it had held for over a day. Three were still somewhere in the brush-clogged streambed. Of these three, only one more came out, the passenger with the injured ankle. The two others died about 30 hours after bailout due to exhaustion and the bitter cold.

The man with the injured ankle kept moving for some time, caught up with the body of one of the others, and tried to drag him to the shelter of a tree. Then he sat down to die. Twenty minutes later, rescuers from the sheepherders' camp found him and brought him to their cabin.

Near, and Yet So Far

Looking at Hell's Canyon from the top of a plateau, the canyons fall away to the streambeds and valleys. It is bleak territory with knee-deep snow, and bare trees and brush are the only contrast. The scene is as desolate as any you're likely to see in northern Alaska. By air, this is only 20 minutes from the safety of Hill AFB. People fly over this route from east to west and back again all the time.

No one was ready for the sudden transition from complete security to extreme peril. Only 20 minutes from home base, tragedy had struck.

The spot where these eight men left their faltering plane was directly on a civil airway. Huntsville, a good-sized town, was only 17 miles away, yet these men might as well have been in remotest Canada for all the help others could give them immediately. The rescue efforts by military and civil agencies were quick, thorough, and untiring. But the snow continued to fall, and planes could not search effectively. Ground parties in jeeps were practically helpless until the weather cleared.

No Training, No Equipment, Very Little Common Sense

The wonder of this story is that anyone survived. The driving force which brought four crewmembers through this ordeal is hard to explain. Those who were fortunate enough to have landed together did not stay together for mutual help and protection. A fire was built but abandoned. No one was prepared, with either training or equipment, to face the situation in which they found themselves — light clothing, no survival kit. Men so poorly equipped for winter survival in the rugged mountains of Utah had little or no chance of living.

There are thousands of square miles of rough country in our great western states, yet some pilots fly with little or no thought of a possible emergency. The C-119 left from a southern Texas base in summerlike weather. Five hours later, it was over some of the wildest, fiercest terrain anyone could imagine.

The temperature had dropped over 60 degrees between the time of takeoff and bailout. No one was ready for the sudden transition from complete security to extreme peril. Only 20 minutes from home base tragedy had struck. These men will never forget their personal disaster. It could very well happen again.

The irony of this sad story is the plane, on autopilot, flew for more than an hour on a northerly heading before it crashed in a pasture in southern Idaho. The cause of the carburetor heat trouble was failure of a minute electrical motor which opens a small door to allow engine heat into the carburetor.

As the old line goes, "For want of a nail . . ." ■

Winter Flying in Europe

PEGGY E. HODGE
Assistant Editor

■ Crewmembers encounter a very different environment when flying overseas than what they are accustomed to when flying in the U.S. For example, if you fly with a C-5 crew on a long haul mission across the Atlantic — you face a long and sometimes tedious flight where jet lag can most certainly take its toll. Or, on the other extreme, if you are a member of a C-23 crew making five or six landings in a high traffic environment onloading and offloading cargo, fatigue will definitely play its part.

Even though English is the universal language spoken by ATC overseas, different pronunciation, accents, and terminology can present a highly dangerous situation.

But, whether you fly the short haul or long haul mission, one of the most serious concerns is the weather. Crewmembers need to know what to expect. Approaching the winter flying months, it is important to look at what happens in Europe and to review some of the things we can do in advance to prevent hazardous situations.

Most winter air masses over Western Europe come from the North Atlantic. Temperatures are quite moderate, considering the high latitude of the area. However, nearly every air mass is extremely moist. This accounts for the predominantly overcast stratiform clouds dominating winter skies. Frontal systems usually pass through Western Europe at the rate of 10 to 12 each month during the winter season.

It is important to remember storms may be hidden in a deck of clouds. Crewmembers can pick them up on radar, but because of cloud cover, cannot acquire them visually.

Expect more IMC conditions in Europe than in the states. You are

continued

Winter Flying in Europe

continued

definitely more likely to fly an approach in weather.

Winds and fog present a special problem to crewmembers. Winds over all of Europe are strongest during the winter months. At all levels, westerly winds prevail, but considerable variation exists from day to day. Wind speeds usually average 20 to 30 knots at 5,000 feet and 30 to 40 knots at 10,000 feet, and often exceed 100 knots above 20,000 feet. Strong, low level winds produce moderate to severe turbulence several days each month at most locations. Wind shear and crosswinds usually accompany winter wind conditions.

Fog reduces visibility 3 to 10 days each month — often for several days in succession under a stagnant high pressure system. The fog ordinarily forms by 2200 hours local time and does not lift until about 1000 hours local, if at all. Fog and low stratus conditions may occasionally be so widespread suitable alternates are difficult (if not impossible) to find.

Ice and snow on aircraft *and* on the runway present a problem as well. With all the moisture, it is not uncommon for runway conditions to become hazardous, especially at night when below freezing temperatures quickly change a wet runway into an ice-coated runway.

There is no sure-fire method to remove all combinations of ice and snow from an airplane. Slush or heavy snow must be removed by hand. However, snow covering the aircraft during preflight can obscure hard-packed snow and ice *underneath*. There have been documented cases of leading edge slats and other controls freezing.

Anytime snow is present, be especially careful because snow can obscure frozen control surfaces or other problems. Frozen snow, ice, or heavy frost will normally have to be melted either with heat or deicing fluid. If a deicing truck appears necessary, make sure one is ordered and planned for.

As a reminder, be sure all ice and snow have been removed from the aircraft before taxiing. Be especially careful to check all static ports and control surfaces during your preflight. Watch for places where melted snow could pool and refreeze before takeoff. Also, ensure the aircraft is free of ice and snow just prior to takeoff, especially if you have been delayed since deicing.

Due to the geographical location of many European bases, they are subject to sudden, unpredictable

Moist winter air masses over Europe provide an abundance of ice and snow which must be removed prior to taxiing.

Parking an aircraft in covered revetments can help prevent icing and frost accumulation.

snowfalls. Unfortunately, an inch of snow (or less) is enough to obscure taxiway centerlines and runway markings. If you can't see where you are going, get a truck to lead you. Let the *truck driver* find the centerline for you.

Get yourself mentally prepared for the appearance of a snow-covered runway. It blends in perfectly with the rest of the countryside, and most pilots have a tendency to flare a bit high on landing when they have little or no contrast to aid their judgment.

A runway that has been plowed and used will have roughly an hourglass shape with the first 2,000 feet of either end in better condition than the center.

Once you get the jet in the air, winter flying is sometimes better than summer flying. Aircraft performance is considerably better.

At some time in your flying career — whether you fly the long or short haul overseas, being prepared can prevent you from encountering any unnecessary safety hazards. Be familiar with the appropriate portions of the foreign clearance guide; expect to hear different accents where clarification may be necessary; expect use of different terminology in some areas; and if you will be flying overseas this winter, be aware of the potential winter safety hazards. ■

WINTER FLYING PROBLEMS

If you are scheduled for a winter trip overseas — PCS or TDY — here are some winter flying problems you might think about:

- Fog will be prevalent at many bases in Europe.
- Clear air turbulence is more prevalent.
- It's dark out most of the time.
- Jet streams are lower and farther south.
- You must dress properly for winter survival.
- The tropopause is generally lower.
- Periods of unusable twilight last longer.

To make sure we are all around to enjoy spring, we offer these suggestions:

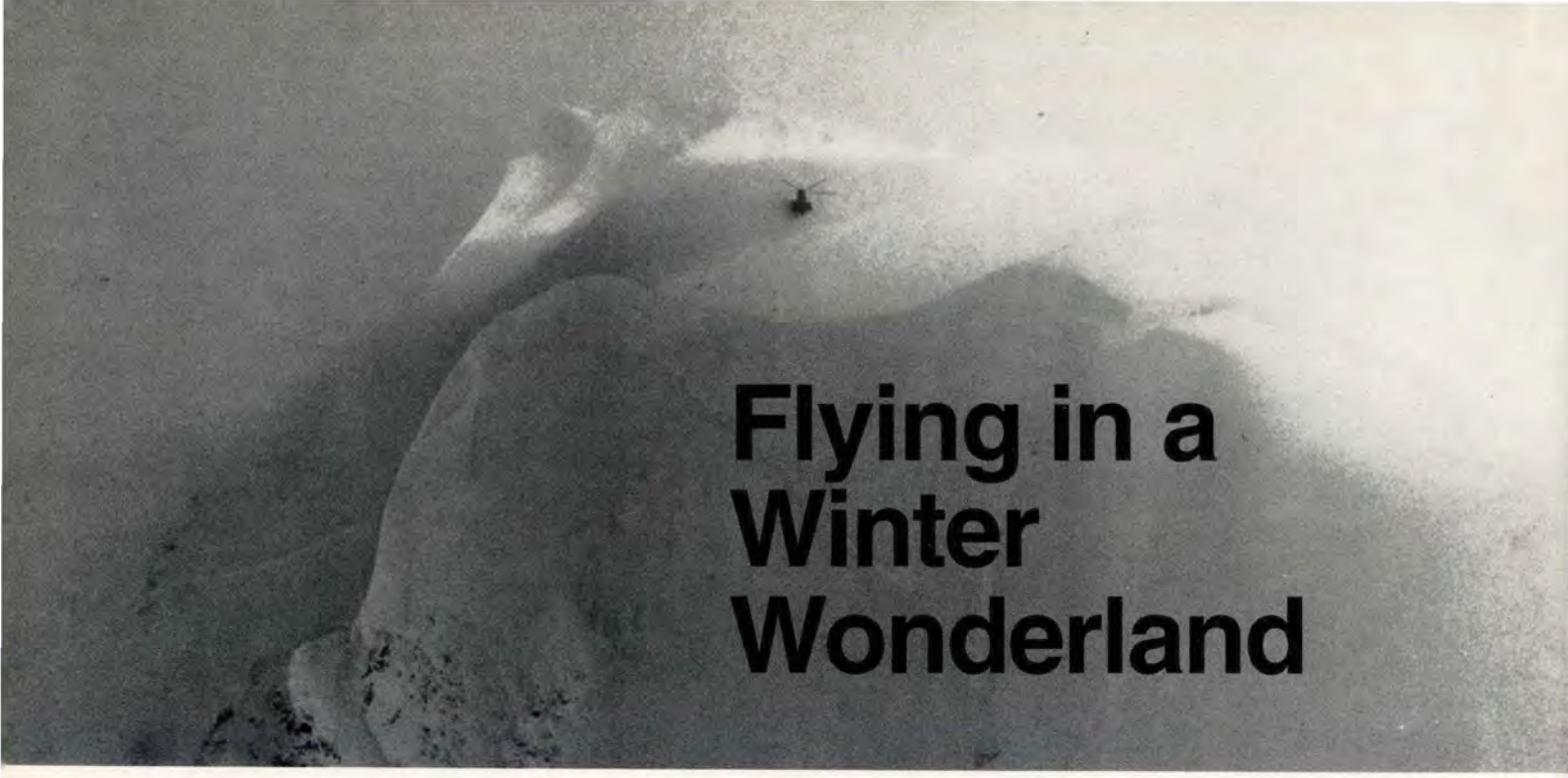
- Take extra time to flight plan carefully.
- Use extra care in selecting alternates — you may need them.

Don't let yourself get boxed into a corner with nowhere to go.

- Before departing, check the latest pilot report. Make it part of your after-landing routine to debrief the weatherman.
- Be sure to give in-flight pilot reports of any significant weather conditions.
- Watch those RCRs — especially the last few thousand feet. Taxiing off an icy runway means almost stopping first unless you want to skate into the snow.
- Be prepared for directional control problems after landing.
- Expect wind shear and crosswind conditions.

AIRCREW WINTER CHECKLIST
On the Ground

- Are you adequately clothed and equipped for the area you're flying into?
- Is the aircraft free of frost or snow?
- Are the flight instruments operating properly?
- Do you know the complete anti-icing and deicing systems of your aircraft?
- Do you know how to detect and combat engine icing?
- Do you know the correct technique for landing on snow or ice?
- Do you know the correct technique for landing roll on snow or ice?
- Are you physically fit?
- Do you understand cold weather survival techniques?
- Do you doublecheck with the forecaster when weather conditions are marginal?



Flying in a Winter Wonderland

EDITED BY PEGGY E. HODGE
Information gathered from
Northrop Aircraft Division

■ For many of us, the first reminder to review cold weather operating procedures is that layer of cold white stuff covering everything. That's right, folks, winter is coming up, and even if you fly in an area that never sees snow, cold temperatures and humidity can cause slick runways and icing problems. That being the case, let's look at the problems which come with cold weather and some precautions to take.

This time of year, we have three basic weather conditions to watch out for: cold, wet, and cold and wet. In cold, dry weather, there are three things in particular to watch for. On the positive side, all jet engines will have better acceleration due to the density of the air entering the intakes. When the weather is wet, even if surface temperatures are well above freezing, runways become extremely slick.

There is also a greater probability of icing at higher altitudes. When the weather is both cold and wet, we may run into real problems. In this instance, we must contend with all the problems noted above compounded by those wintery forms of precipitation: hail, sleet, and snow.

In a recent Class A mishap, the aircrew was faced with the circumstances cited above. Unfortunately, the mishap never progressed to the point where a descent was accomplished to an altitude low enough to allow the ice to melt. In this mishap, the sequence of events led to the aircrew's preoccupation with the airspeed increase to the point that the aircraft was slowed to a stall condition, and it departed controlled flight.

The crew successfully ejected, but one more aircraft bit the dust. During a prolonged aircraft down time, the departure base experienced heavy thunderstorms, and water most likely entered the pitot static system of the mishap aircraft. As the flight progressed at FL 370, the outside temperature caused the water to freeze, resulting in the vertical velocity indicator and the altimeter being captured at the existing readings and the airspeed indicator to increase.

The data base at AFSA contains numerous reports of in-flight loss of pitot static indications as a result of icing. Most were recognized for what they were, and the pilots safely recovered the aircraft. Periodically, however, history does repeat itself, and an aircraft mishap is caused by the insidious loss of aircraft instruments as a result of icing.

Prevention of icing, which on the

Key to operating safely in inclement winter weather conditions is a sound understanding of both you and your aircraft's limitations and a thorough weather briefing.

surface seems relatively simple, could have averted these mishaps. Modern aircraft are equipped with sophisticated systems to prevent icing. However, year after year these types of reports keep coming in.

Shortly after level off at FL 390, the fighter pilot reported loss of all pitot static system instruments. Climb to altitude had been accomplished through areas of heavy rain. Loss of the altimeter and vertical velocity were followed shortly thereafter by loss of airspeed.

An aircraft was scrambled to provide assistance. After rejoin, and during the descent, the aircraft's pitot static problems cleared and indications returned to normal. The pilot had inadvertently left the pitot heat switch off for the initial portion of the flight.

During the climb out in instrument conditions, while passing FL 210, the airspeed in the F-4 went to zero. The climb was continued to VMC-on-top using inertial ground speed and angle-of-attack indicators. Join-up with another F-4 was made. During a wing approach, the airspeed indications returned. The pitot heater was inoperative, and subsequent ice blockage of the pitot system occurred.

The student pilot in the T-38 noted an airspeed reading of 550 knots. The actual airspeed of 300 knots was confirmed with another aircraft. The altimeter showed an altitude of FL 285 when actually at FL 200. The VVI was unreliable. Later investigation revealed that while on the ground, following heavy rainfall, water had collected aft of the pitot static heater. Results were sticking and erroneous instrument readings when the system was subjected to below freezing temperatures at higher altitudes.

Without becoming too academic, it is easy to see many variables can impact icing problems. In the first example, the pilot failed to use the pitot heat until late in the mission. Not much can be gleaned here except Air Force and command regulations are explicit in regard to operation of anti-icing systems when flight conditions warrant their use.

In example two, the pilot had selected pitot heat but the system malfunctioned. The key point here is that when the capability exists, always verify the system is functional during pretakeoff checks.

Air Force and command regulations are explicit in regard to operation of anti-icing systems when flight conditions warrant their use. The time to review is *before* a mission.

The last example points out the necessity for maintenance to ensure all moisture is purged from the pitot static systems prior to takeoff.

In each case cited above, the ability to properly interpret the situation led to successful recovery of the aircraft which leads to the next important point. Probably the instrument most often affected by icing is the airspeed indicator.

Following a crash of a civilian transport jet in 1974, investigators determined ice-clogged pitot probes resulted in airspeed indicators behaving like altimeters. During the climb, airspeed steadily increased. The pilots continued to increase pitch in an attempt to arrest what appeared to be a dangerously fast airspeed.

The pilots continued to raise the nose until the aircraft stalled. Later, several professional pilots were subjected to simulator profiles duplicating the profile of the mishap aircraft. They misinterpreted the stall buffet as Mach buffet. More than half of them fixated on the erroneous airspeed indicator. The study went on to conclude that in a pinch, pilots tend to revert and react to airspeed indications.

Airspeed measurement is merely a comparison of pitot pressure and static pressure. If the static system is operational, but the pitot system becomes blocked with ice, then the airspeed indications will increase as the aircraft climbs or decrease as the aircraft descends. This was the prob-

continued

We cannot avoid operation in cold climates, but we can reduce the effects by being prepared.

Flying in a Winter Wonderland continued

lem encountered by the commercial jetliner aircrew.

Conversely, if only the static system is affected, then airspeed will indicate lower than it should as you climb and correspondingly, higher than it should during descents. And finally, for aircraft which have the static source located on the pitot tube, a blockage of the pitot tube affects both systems. Most often the airspeed will remain constant at the speed at which the system was blocked.

To say, "Your airspeed will either increase, decrease, or remain constant based upon the system which is blocked," falls in the category of a real "astute observation." However, a good understanding of the symptoms will probably lead to quicker diagnosis of the problem.

Since the Dash-1 warnings covering flying into precipitation are very thorough, we will just discuss icing here.

Engine Icing

Engine problems start when ice accumulates on the bullet nose, inlet guide vanes, and inlet duct lip. This icing usually occurs at high engine rpm and low flight speeds during takeoff, penetration, and approach. Taxi operations are also likely to cause engine icing problems. Conditions which are most likely to produce turbine engine inlet icing are visible moisture from ground level to 15,000 feet and temperatures from -5° to -18°C (+23° to 0°F). If the pilot turns on anti-ice *before* ice accumulation has a chance to get started, engine icing rarely occurs. Maintain the recommended engine rpm to provide sufficient hot air flow through the engine anti-ice system.

- The engine uses more fuel during anti-icing operations, and anti-ice also decreases the stall margin of the engine.
- *Engine anti-icing is not the same as deicing.* Ice accumulations can break loose in chunks and cause serious engine damage.
- Engine icing can result in a drop in rpm and an increase in EGT by decreasing air intake. Attempting to regain thrust by increasing your throttle position aggravates an already overrich fuel condition and increases the possibility of a compressor stall.
- When icing conditions are encountered, change altitude if possible, follow TO guidance for airspeed and engine rpm, and leave the area of icing conditions.
- If structural ice is visible, you should inspect the engines for ice ingestion damage.

A thorough snow removal job requires more than simply brushing off the aircraft.

Pitot Icing

Pitot icing causes all sorts of mischief including inaccurate airspeed, altimeter, and rate of climb readings. Pitot static system icing can be expected when there is visible moisture and temperatures between 5° to -18°C (41° to 0°F). Ground crews should double up on pitot static system (and fuel sump) draining duties during cold weather. Static ports must be open, and the sump drains closest to each port must be drained more frequently.

- Pilots, keep up a good instrument cross-check. If your cockpit scan reveals questionable gauge readings, you could have a pitot static problem.
- Descend, if possible, to an altitude where ambient air is above freezing. The system should thaw out in about 5 minutes.
- If inaccurate airspeed indications continue, maintain an angle of attack and power setting for a known airspeed to prevent stalling the aircraft. Request a chase aircraft for approach and landing.
- Pitot icing is possible as high as 40,000 feet in cumulonimbus clouds. Although it is most often encountered in winter, it can occur during any season.

Structural Icing

- *Frost* is a light, feathery, crystalline ice, almost like snow in structure. As a cold aircraft descends from a zone of subzero temperatures to a zone of above-freezing temperatures and high relative humidity, frost forms on its surfaces. Frost's chief danger is that it clouds up windshields and canopies, reducing visibility. Frost deposits are thin and sublimate or thaw off rapidly with continued flight in warm air.

Pitot icing, which can cause us serious problems including inaccurate airspeed and altimeter readings, is possible as high as 40,000 feet.

■ *Supercooled water,* which can coexist with ice in clouds at temperatures as low as -40°C (-40°F), will immediately freeze when it comes in contact with an aircraft. Speed is a factor in ice formation. Icing increases at speeds up to about 400 kts, but above that speed, the icing danger decreases due to the heat of friction. Above 575 kts, icing will rarely be a problem.

■ *Clear ice* is transparent and is the most serious form of ice because it adheres so firmly to the aircraft. It usually forms on the leading edges of such structures as wings, antennas, and intake ducts. Encountered most frequently in cumuliform clouds, clear ice also accumulates very rapidly on aircraft flying in freezing rain or drizzle.

■ *Rime ice* is a milky, opaque, granular deposit of ice with a rough surface. It is formed by the instantaneous freezing of small, supercooled water droplets upon contact with exposed aircraft surfaces. Rime ice usually forms on leading edges and protrudes forward into the airstream as a sharp nose. Although comparatively easy to remove by conventional methods, it distorts the airfoil and disturbs the airflow much more than does clear ice.

When departing an airfield that has snow and ice, making sure your aircraft is clean can prevent problems later.

Some Preflight Reminders

Having covered icing pretty thoroughly, let's close with some general preflight reminders.

■ Don't rely on the weather shop to be 100 percent accurate in all of their forecasts.

■ Have systems purged of moisture prior to takeoff.

■ Make sure all aircraft surfaces are clear of ice and snow.

■ Check for fuel and hydraulic leaks and make sure fuel system vents on the vertical stabilizer are free of ice.

■ Wear flight clothing appropriate to the *coldest* terrain you will be flying over.

■ Remember, runways may be slick.

■ **"DRIVE CAREFULLY!"** Cold weather always brings with it more hazards to the safe operation of all equipment. ■

FROSTBITE

COL (USAF RET) JOHN H. CALVERT, JR.
Medical Corps

■ 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. 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. (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

It doesn't take long to suffer the effects of frostbite. Think twice when removing your glove — hands and feet are most commonly affected by frostbite.

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 will possibly 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. ■

Be concerned about frostbite! At its worst, it can be a painful and disfiguring injury.

Cold Weather Maintenance

CMSGT ROBERT T. HOLRITZ
Technical Editor

■ One day you are sweating on a hot ramp, the next you're unloading equipment on an ice- and snow-covered tarmac at some desolate deployed location. With the ever-changing world and the warming of relations with the countries of the former Soviet Union, deployments to all kinds of cold places are now likely. And with the new Air Force motto, "Global Power, Global Reach," mobility is clearly the name of the game.

If you are stationed at Minot or K.I. Sawyer, you have a pretty good idea of the problems you would face in a subzero environment. But, if you happen to be a fighter mech at Eglin or Luke, maintaining your jets in the ice and snow of some northern tier location is an entirely new ball of snow.

Many simple tasks, such as starting a jammer (bomblift truck) or safety wiring a bolt, become difficult. More extensive maintenance, such as changing engines, take longer and may be impossible to accomplish on a snow-covered ramp.

People Problems

Another thing maintainers are quick to learn is the time they can work in a cold, windy environment is considerably less than in extreme heat. For example, with a chill factor of -26°F, frostbite becomes a hazard within only a few minutes. Therefore, people performing heavy maintenance, such as an engine change, have to take frequent breaks to warm up. A 3-hour job can take one or more shifts to accomplish.

Static Buildup

During cold and windy conditions, static discharge becomes an extreme hazard. Servicing crews and munitions loading teams must

Sweeping snow off the aircraft before it melts and turns to ice saves time and deicing fluid.

Deicing should be accomplished just prior to flight. Even short delays can result in further icing.

ensure proper grounding procedures and must ground themselves to the aircraft frequently. Ensuring a proper ground on an ice-covered ramp can also be a problem. One unit experienced a 2-hour refueling delay while trying to locate a static ground under the 6 inches of packed snow.

Driving

Driving on ice and snow is often a new experience for people deploying from a warm climate. One deployment commander required everyone to be recertified on every type of vehicle they would operate while deployed. Certification was done at an unused part of the ramp. Here the drivers were trained to stop on slippery surfaces and to avoid and recover from a skid. The training took less than an hour per person, but it prevented vehicle mishaps.

Towing Aircraft

Slippery surfaces are not the only hazard in towing aircraft on ice- and snow-covered surfaces. The fact taxi lines are often covered with snow makes the use of wingwalkers throughout the entire operation crucial. Snow banks tend to blend into the background and are a menace to wingtips and pod-mounted engines. Parka hoods also limit the crew's visibility.

AGE

Every effort should be made to store ground equipment inside. Nothing can slow, even stop, a maintenance operation quicker than an inoperable fleet of AGE. After a few hours standing idle in subzero temperatures, engine oil and hydraulic systems of AGE equipment turn to the viscosity of maple syrup and can quickly drain a cold battery.

It is also vital to ensure all maintainers are trained to operate equipment peculiar to cold-weather operations. This equipment includes snowblowers and heaters. The latter can be especially hazardous if the operator is not properly trained. These units have a history of catching fire. Some have even exploded when not properly operated.

Lubrication

Depending on the severity of temperature, it may be necessary to change the type of lubricants during cold-weather operations. Many lubricants, such as grease, tend to harden, even solidify, during extreme cold. For this reason, during arctic operations, airlifters replace grease on the screw jacks and actuator rods with a light oil during arctic operations.

Canopy Care

Few things can frustrate a crew chief more than finding a thick layer of morning frost on his jet's canopy. It can't be scraped off, and deicing fluids can cause damage. One F-15 unit solved the problem by fabricating canopy covers.

These "Eagle Hoods" are installed after the last flight of the day and removed during preflight.

Deicing

Aircraft deicing is critical. A study conducted by a civilian airline showed a layer of frost only 1 millimeter thick can result in the loss of 50 percent of an aircraft's maximum lift. Add this to the icing an aircraft may encounter in flight, and it almost guarantees serious problems. Even worse is the situation where

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Towing on a snow-covered ramp is hazardous because there are no visible taxi lines.

Cold Weather Maintenance

continued

only one wing is coated with ice or frost. This can result in loss of control during liftoff. This can occur especially during early morning operations when the sun is low over the horizon.

How much icing does it take to cause problems? The best answer is: "Keep the aircraft free of frost, snow, or ice." This means your people should be trained on the use of deicing equipment and chemicals. Further, deicing should be accomplished as near to takeoff time as possible.

Icing should be looked at again in the event of a delay in departure time. Failure to properly deice again after a delay has caused the loss of at least two commercial airliners within the past few years. For this reason, the FAA has proposed a rule which requires deicing just prior to airliners departing the gate.

Leaks

The operating principle of an O-ring seal is for it to compress as it expands. In extreme cold temperatures, however, O-rings lose pliability and cannot expand. As a result, hydraulic leaks and collapsed struts are more common in a cold environment. Fortunately, the leaks usually cease after a few minutes of operation. Many strut problems can be avoided by wiping them with the lubricant prescribed in the maintenance manual.

FOD

During winter operations, it is especially important to keep intake plugs installed. Snow in an intake can melt and form a stealthy layer of ice capable of causing serious damage to an engine. Ice on the ramp is another winter hazard which even the most intensive FOD walk can't prevent. But prior to engine run, it is important to ensure the area around the intakes is free of both ice and snow.

In addition to the typical type of foreign objects, such as fasteners and safety wire, stray hardware from tire chains can also hide below the surface of a snow accumulation.

Launch Problems

Even a routine launch can be hazardous in a winter environment. Aircraft wheels can become stuck in snow or ice, requiring the pilot to use increased power to get the aircraft moving. As a result, the aircraft may leap out of the parking spot and catch an unsuspecting crew chief. On the other hand, chocks tend to be ineffective on icy surfaces.

Ground personnel should keep extra distance from engine intakes. The extra clothing and parka hoods greatly increase the distance from which an engine can snatch up an unsuspecting maintainer. Further, there is a greater danger of slipping and falling into the danger zone.

The Bottom Line

The difficulties mentioned in this article only scratch the surface of problems which a unit deployed to a cold-weather location can expect. As I mentioned in the first paragraph, virtually any unit is vulnerable for a cold-weather deployment. For this reason, a cold weather contingency plan will go a long way toward making cold weather maintenance easier and safer. ■

Personnel deployed to cold weather bases should be trained to operate equipment such as heaters and deicers.

Cold Realities

PEGGY E. HODGE
Assistant Editor

■ Cold weather is a major factor affecting operations at many air bases. Planning for cold weather operations should naturally include protection from cold injury, frostbite, and proper clothing. (See "Cold Weather Training.") Lack of preparation can be fatal.[1]

Aircrews face another potentially serious problem with the cold. The cockpit presents a number of problems differing from those outdoors. Lack of training and preparation in this area can be fatal, too, as in the following mishap.

[1]See "Trapped in Hell's Canyon," this issue, page 2.

It's Serious

It was a very cold December evening — the weather dispatcher reported -50 degrees F for this arctic base. The mishap aircraft was one of four tankers preparing to support a reconnaissance mission. It had been assigned as the spare aircraft.

Things were shaping up for a smooth mission — the crew reported no aircraft problems during their preflight and had required no maintenance after the engines were started.

Due to the extreme cold, portable heaters warmed the cockpit area and engines up to the time engine start was initiated. From this point on, there was no heat available in-

continued

COLD REALITIES continued

side the aircraft due to an inoperative auxiliary power unit.

Maintenance problems then interrupted what started out to be a smooth mission. These problems delayed departure over 2 hours and resulted in the reassignment of the mishap aircraft from spare to primary position.

About an hour before the scheduled departure, the tanker crew requested a portable heater for the cabin. Due to the impending takeoff time, this request was refused leaving the crew in extremely cold cabin conditions.

The mishap aircraft took off and, only 3 minutes later, reported a problem — they were unable to raise the gear. The crew requested a right turn to head back to the base. Departure control approved the request. At this point, the control tower lost radar and radio contact.

A search helicopter located the burned wreckage 6 miles from the base. *There were no survivors.*

A Cold Lesson

The extreme cold was a major factor. The extended delay in extreme cold reduced crew effectiveness to an undetermined — but significant — degree. The temperatures contributed to the crew's delayed judgment and lack of coordination. The numbing cold caused crewmembers to be distracted and reduced manual dexterity. This mishap could most likely have been prevented with proper cold weather precautions.

The Cockpit[2]

The cockpit does present a different set of problems from those of outdoors. While the flight deck is

[2] The Armstrong Laboratory at Brooks AFB, Texas, provided all cockpit information.

The cockpit is kept warm at all times. However, during the cold weather months, the cockpit does present some unique problems for aircrew.

protected from wind and is *relatively* warm, occupants engage in only limited physical activity, and they cannot wear high-bulk clothing. Manual dexterity and alert mental states are of great importance. The problem is to not only prevent frostbite but also to ensure optimal handling of the aircraft. Plus, the crew must retain an adequate capacity to cope with emergencies.

The following factors affect the overall cold stress on persons aboard aircraft while it is still on the ground:

- Climatic conditions (temperature, wind speed, and solar radiation) and presence of any blowing moisture.
- Heat availability and distribution (from engines, auxiliary power units, or ground carts).
- Location of open hatches.
- Clothing worn, especially handwear and footwear.
- Activity level.
- Duration of exposure.

What To Do

Persons working in the cockpit during cold weather should wear heavy flight clothing which can be easily adjusted as cockpit temperature changes. When heating is inadequate, tolerance is usually limited by pain in hands and feet. For this reason, maximum possible foot insulation should be worn.

Hands should have layered protection consisting of liners, gloves, and heavy mittens. The gloves should allow necessary manipulation of controls, with mittens worn over them during inactive periods. At cockpit air temperatures below 0°C, thin fabric "anti-contact" gloves should be worn to prevent direct skin-metal contact.

Once the extremities are chilled, it is difficult to restore warmth and dexterity. Planning is therefore required to insure the flight deck is adequately warmed from before crew entry until takeoff. Cold hands lose dexterity long before any pain develops.

As evidenced in our mishap example at the beginning of this article, severe cold weather is often associated with repeated delays before takeoff, resulting in prolonged aircrew cockpit standby. Commanders should ascertain crewmembers have appropriate clothing in the cockpit. The hazard of aircrew chilling can then be determined from outdoor equivalent chill temperature (ECT) and the following items. (See our back cover of this issue.)

- Hatch position, presence of moisture (fog, sleet, snow).
- Heat availability.
- Crewmember comfort.

The following guidelines can then be used to judge mission status:

CAUTION STATUS: Outdoor ECT warmer than -50°C and any one of items above is unfavorable. In this case, crew status should be reassessed every 15 minutes and, unless rapid resolution is obtained (e.g., hatches adjusted or heat supplied), nonessential flights should be canceled.

DANGER STATUS: Either outdoor ECT colder than -50°C or outdoor ECT warmer than -50°C *but* any two items on the list are unfavorable. In this case, all nonessential missions should be canceled. If the mission continues, aircrew self-assessment becomes of primary importance, and occurrence of any shivering, painful extremities, or symptoms of impending frostbite are unequivocal grounds for canceling the flight except in bonafide emergencies.

Cold Weather Demands

Cold weather demands we be prepared! It's nice for flying airplanes, but the cold does place an added demand on aircrew. ■

COLD WEATHER TRAINING

Personnel assigned to cold weather operations should receive thorough training in biomedical problems of cold, with refresher training immediately before each year's cold exposure. Lectures or reading assignments should cover at least the following:

- Climate
  - Local weather (average and worst-case conditions)
  - The windchill concept and limitations
  - ECT chart interpretation
  - Effects of precipitation
- Cold Effects
  - Injury (frostbite, hypothermia, other)
  - Prevention
  - Recognition
  - First aid treatment
  - Subtle effects on performance
- Clothing
  - Principles of design
  - Proper wear and maintenance
- Danger of wet clothing (precipitation, fluids, sweat)
- Associated hazards
  - Loss of mobility and dexterity
  - Impairment of hearing and visual fields
  - Generation of static electricity
- Regulations
  - Clothing issue and wear
  - Windchill alert system
  - Aircrew cold status checklist

When you weigh human safety against the esthetics of design, then safety must always dominate

...in the eye of the beholder

DAVE HARPER
System Safety & Engineering
AFSA

■ How would you view a proposal to have the ejection seat removed from a front-line fighter because it would make the cockpit area look less cluttered? How about a request to remove exterior egress markings from another jet because it would make that aircraft look prettier?

Well, nobody has suggested removing ejection seats for aesthetic reasons yet. But with increasing frequency, the Safety Agency is asked to coordinate on proposals to clean up the appearance of one type of Air Force aircraft or another by deleting or reducing exterior safety markings. These markings may include high-contrast door outlines, arrows pointing to canopy jettison or exit door handles, and instructions for rescuers.

Unless the aircraft's mission dictates camouflage, such markings should be "readily distinguishable from the surrounding fuselage surface"[1] so they are distinct and conspicuous. The markings are required by various Mil Standards, Air Force Design Handbooks, and Federal Aviation Regulations (FAR), and their sole purpose is to enhance the safety of the aircraft occupants.

The importance of such markings is ideally exemplified by a case from mishap files. An Air Force-operated business jet was involved in a survivable crash, coming to rest in a pasture near a civilian airfield. The two pilots were both alive, but one was unconscious and the other suffered injuries which incapacitated his legs. Witnesses responded immediately to render assistance as a fire started in the rear of the relatively intact wreckage.

These courageous civilians, who were unfamiliar with airplanes, could not identify a means of entering the aircraft to assist the

[1]Guidance from FAR Part 25, Section 25.811. This FAR also specifies minimum reflectance differences for the contrasting colors and other such technical requirements.

crewmembers. Seeing one pilot flailing in the cockpit, desperately trying to escape, they found a board and began trying to break the windscreen, unaware of the door just a few feet away. The strong, bird impact-resistant windscreen would not give way to their pounding, and after several minutes, the would-be rescuers were driven back by flames, where they watched with horror as the fire consumed the cockpit, killing both pilots.

On the mishap aircraft, the operating command did not use the conspicuous 2-inch-wide door outline markings normally required by FAR[2]. In reviewing this mishap for lessons to be learned, it was obvious the indistinct exterior door markings had prevented civilian rescuers from locating an entrance/exit to assist the cockpit crew. So, shortly after this mishap, emergency exit decals were requisitioned, and the aircraft manufacturer agreed to install them at no additional cost on the remainder of our fleet.

When egress marking waiver requests arrive at AFSA, they usually have the considerable momentum of a well-intentioned staff who have been sold on the enhanced appeal of a shiny paint job. They envision a fuselage unadorned by those unsightly arrows, bold lettering, and lines, which invariably clash with the artistic motif and trendy new color scheme being proposed.

Our reasoned, dispassionate responses to these requests invoke lessons learned from the two Class A and two Class C mishaps where lack of markings was a major factor in the mishap. But such arguments have a hard time competing with the emotional appeal of glossy 8 X 10s and artist concepts showing the airplane as an *objet d'art*.

It would be nice if the families of those tragically lost crewmembers, or the civilians who attempted to rescue them, could have a short discussion with the image-conscious proponents of marking deletion. Certainly then we could expect more willing adoption of the philosophy which a well-known billionaire related several years ago to aviation safety expert S. Harry Robertson. When asked why he eschewed vanity by having garishly prominent exit markings painted on the exterior of his own Learjet, the businessman reportedly responded, "If I ever crash in this airplane, I want people to know how to get me out of there." Our point exactly.

Take a look at your own airplane (or at any new paint schemes you may have under consideration). Have the egress markings somehow faded to obscurity? Look at it from the perspective of potential rescuers who know little about aircraft. Would they have any difficulty locating the exits in an excited post-crash environment? What if they approach from the other side? Don't give the Air Force a chance to repeat an event that has already cost us lives. It will not console your loved ones to know that you perished inside a very handsome airplane.

Correct any problems now, and learn to look at the obtrusive markings as potentially beautiful. After all, there are plenty of pilots walking around today who will tell you that the ugly parachute they always had to lug around became one of the prettiest things they'd ever seen when the unexpected happened and they really needed it. ■

Many well-meaning commanders request waivers from the Safety Agency to remove egress and rescue markings from aircraft. Most requests are denied in the interest of safety.

[2]Military aircraft have a statutory exemption from compliance with FAR exit marking requirements, which also do not apply to some categories of civil aircraft when used in certain, mostly noncommercial, operations.

CROSS-COUNTRY NOTES . . .

■ This month I shuffled the list of Rex Riley bases more than I normally have to. Base closures force me to honorably retire two more bases from the list, with more to come in the following months. Seven bases were surveyed which resulted in one new base, one dropped base, and five bases recertified.

Honorably Retired

Eaker AFB, Arkansas. Eaker AFB initially won the Rex Riley award back in February 1984 when it was still called Blytheville AFB. During the last 8 years, they have continued to demonstrate a commitment to providing quality transient aircrew service.

George AFB, California. Located out in the high desert of southern California, George AFB did not receive a high volume of transient traffic. But for those aircrews who did venture out there for business or pleasure a warm (pun intended) and gracious welcome was always extended.

New Award Recipient

Edwards AFB, California. Edwards AFB had been overlooked for the Rex Riley Award in the past under the mistaken impression it was difficult for transient aircrews to get in there unless they had special permission or official business. Nothing could be farther from the truth. Edwards welcomes and encourages all transient traffic and provides excellent service once you get there.

Transient Alert is operated by enthusiastic military professionals who know their job and are proud of the work they do. Transportation is prompt and reliable but can be overwhelmed if you arrive with a group of other aircraft all looking for a ride. Base ops is a user-friendly facility with state-of-the-art equipment in the weather shop and knowledgeable, friendly people behind the desks. The Prime Knight Program works at billeting, but be prepared for a distant ride into town if you have contract quarters.

The weather is usually hot, but dry. Clear skies prevail with a moderate wind. Nearby Palmdale Airport will accommodate just about any type of instrument or transition training you need. Edwards is PPR primarily because of an airspace briefing they want to give to all aircrews unfamiliar with their extensive testing operations. A few strategically placed phone calls prior to arrival might even get you a visit into the Test Pilot School or a closeup of the C-17 or other test-bed aircraft on the ramp.

Rex's home station is the Air Force Safety Agency, Norton AFB CA. For questions about the Prime Knight Program, call Rex at DSN 876-2226.

Retaining the Award

Elmendorf AFB, Alaska, continues to be one of Rex's favorite stopovers. The service is first class and the people are very sensitive to the needs of the transient aircrew. AMC transient maintenance works very hard in varying weather conditions to keep the aircraft airworthy. Crew transportation is always there when you need it. Billeting works the Prime Knight Program flawlessly. Charters on the base are outstanding.

Williams AFB, Arizona. Overall, Williams provides excellent services and facilities for transient aircrews. The base taxi was available to take Rex wherever he needed to go. Transient Alert did a nice job keeping Rex informed when his T-38 aircraft broke. The quality service provided is especially commendable considering the base is scheduled to cease operations shortly after the first of the year and complacency could set in.

Hickam AFB, Hawaii. Hickam gets a lot of transient traffic, and the system works very hard there to make sure quality services are a way of life. The base ops and weather facility remains one of the best in the Pacific. Quarters on or off base are excellent. If you'd like a sample of the best Korean BBQ in Hawaii, try the restaurant at the Par 3 Golf Course. Excellent food and service at a good price are the goals of Mr. Jay Shin and family, proprietors. Breakfasts and standard Haole food are also available.

Congratulations also go to **Eglin AFB FL** and **Randolph AFB TX** who were certified during recent surveys.

Removed From the List

Base X. This base failed to meet Rex Riley award standards for several reasons. Prime Knight service was confirmed when reservations were made with billeting. When Rex arrived, no one knew he was coming and billeting had lost his reservation.

Billeting personnel were very unresponsive in trying to resolve a problem when Rex requested a room change when assigned a smoke-filled room overcome with smoke from the previous occupant. He was told there were no other rooms available, contract quarters would not be offered, and he was handed a fan to try and blow out the room. When this proved unsuccessful, he called billeting again. After more discussion, he was finally offered an acceptable room.

The smoky room was not the big problem here. It was the attitude of the billeting clerks while trying to resolve the room issue that did not meet Rex's standard. ■

Loring AFB	ME	Pope AFB	GE	Bitburg AB	GE	Hickam AFB	HI
McClellan AFB	CA	Dover AFB	DE	Keesler AFB	MS	Kelly AFB	TX
Maxwell AFB	AL	Griffissl AFB	NY	Howard AFB	PM	Travis AFB	CA
Scott AFB	IL	KI Sawyer AFB	MI	Peterson AFB	CO	Norton AFB	CA
McChord AFB	WA	Reese AFB	TX	Moody AFB	GA	Tinker AFB	OK
Myrtle Beach AFB	SC	Vance AFB	OK	RAF Lakenheath	UK	Charleston AFB	SC
Mather AFB	CA	Laughlin AFB	TX	Zaragoza AB	SP	McGuire AFB	NJ
Lajes Field	PO	Monot	ND	Torrejon AB	SP	Incirlik AB	TK
Sheppard AFB	TX	Vandenberg AFB	CA	Bergstrom AFB	TX	Selfridge ANGB	MI
March AFB	CA	Andrews AFB	MD	Davis-Monthan AFB	AZ	Nellis AFB	NV
Grissom AFB	IN	Plattsburg AFB	NY	Hahn AFB	GE	Hill AFB	UT
Cannon AFB	NM	MacDill AFB	FL	Kunsan AB	KOR	Osan AB	KOR
Randolph AFB	TX	Columbus AFB	MS	Ramstein AB	GE	Kadena AB	JA
Robins AFB	GA	Patrick AFB	FL	Johnston Atoll	JQ	Ellsworth AFB	SD
Seymour Johnson AFB	NC	Wurtsmith AFB	MI	Wake Island	WQ	Yokota AB	JA
Elmendorf AFB	AK	Williams AFB	AZ	RAF Alconbury	UK	McConnell AFB	KS
Shaw AFB	SC	Westover AFB	MA	Hurlburt Field	FL	Homestead AFB	FL
Little Rock AFB	AR	Eglin AFB	FL	Carswell AB	TX	Tyndall AFB	FL
Offutt AFB	NE	RAF Bentwaters AFB	UK	Altus AFB	OK	Rhein Main AB	GE
Kirtland AFB	NM	RAF Upper Heyford AFB	UK	Grand Forks AFB	ND	Misawa AB	JA
Buckley ANGB	CO	Andersen AB	GU	Fairchild AFB	WA	Edwards AFB	CA
RAF Mildenhall	UK	Holloman AFB	NM	Mountain Home AFB	ID		
Wright-Patterson AFB	OH	Dyess AFB	TX	Barksdale AFB	LA		

OPS TOPICS

Obtaining Water

■ Most doctors suggest we need between 8 and 12 glasses of water per day for our bodies to function properly. Add to that the fact our bodies are largely made up of water, and you can see the need to drink water plays a very important role in our daily lives.

During survival situations in a snowy environment, one of the first impulses people have is to eat snow to satisfy their thirst. This is a very dangerous practice. The body uses a great deal of calories heating and processing the snow, and the cold temperature of the snow can lower your body core temperature and hasten hypothermia.

There are several solutions to obtaining water in a winter survival situation. One method is to gather snow in a waterproof container and melt it by putting the container between some of the layers of your clothing. Another method (the best) is simply melting snow by using a fire.

If you have a choice, use ice rather than snow when melting. Ice will yield a one-to-one ratio, where it will take 10 to 15 times the amount of snow to produce the same amount of water. If you don't have the choice, make sure to get the maximum amount of snow in your container by tightly packing it.

Remember, one of the big keys to staying healthy in a cold-weather environment is the introduction of water into your body — drink lots of it. ■

Submitted by 3636th Combat Crew Training Wing, Fairchild AFB WA

FSO's CORNER

Cold Weather Guide

MAJOR DALE T. PIERCE
919th Special Operations Group
Duke Field, Florida

■ While I was visiting the 302 TAW, I was shown a wallet-sized Space Command visual aid which contains some useful information for both the novice and experienced winter traveler. Its title is "Snow Routes and Winter Survival for Air Force Space Command Installations in Colorado Springs." It was designed by Mr. Don Bertoli (formerly of the 302) primarily for base populace use because not everyone grew up in snow country.

The winter survival guide includes a recommended list for the contents of a vehicle survival kit. The kit is broken down into personal survival items and vehicle equipment, with a checklist for staying alive if stranded in your car. There's even a section on preventing carbon monoxide poisoning, hypothermia, and dehydration. The guide also includes a list for the contents of a recreational survival kit and what to do if trapped outdoors.

Driving on ice and snow can be hazardous at best. The guide provides some driving tips on how to regain control of your car if it starts to skid on a slippery road. For that cold, wintry morning when you turn your ignition key, only to hear the dreaded "click-click-ugh" sound, the guide provides instructions on how to jump a battery.

Of course, no cold weather guide would be complete without a windchill factor table. Naturally, it's provided, right next to the map of local snow routes.

So what else could be included to make it complete? How about a list of local radio stations to whom the base sends announcements, complete with a glossary of key words used in those announcements.

Like your spare tire, the winter survival guide is probably generally ignored until it's needed, then it's a very handy addition to your vehicle survival kit.

The official designation for the guide is 21 SPW/SE VA 127-1, Jan 88, OPR 21 SPW/SE, Peterson AFB, Colorado. Distribution F.

What are you doing in your program that could help other FSOs if they knew about it? If you know of something, call me (Dale Pierce) at DSN 872-4858 (USAFTAWC), or send a short note to 919 SOG/SEF, Duke Field, Florida 32542-6005. ■

Checklist for Cold Weather Operations

Cold-weather operations present special challenges to aircrews. To help reduce the hazards of cold-weather flying, FM 1-230: *Meteorology for Army Aviators*, suggests aircrews abide by the following checklist:

■ Check weather carefully. It's a good idea to ask the aviator who just came through what conditions were like.

■ Check notice to airmen (NOTAM).

■ Remove all frost and snow from aircraft before takeoff.

■ Check controls for restrictions of movement.

■ Hover or taxi slowly. Use brakes with caution.

■ Check for ice in rotor or propeller wash areas after runup in fog or rain.

■ Wear sunglasses if glare is bad.

■ Avoid taking off in slush or wet snow and avoid snowbanks in fixed wing aircraft. Rotary wing aircraft crews should maintain a high hover over such surfaces to reduce blowing snow.

■ Use pitot heater when flying in rain, snow, clouds, or known icing zones.

■ When flying in freezing rain conditions, climb into the clouds where the temperatures will be above freezing, unless the temperature at a lower altitude is known to be high enough to prevent ice.

■ Report all in-flight weather hazards encountered.

■ Choose the altitude of least icing if icing cannot be avoided.

■ Watch airspeed. Airfoil stalling speed increases with the formation of ice. Higher revolutions per minute are required for safe autorotation of helicopters when blades are covered with ice. Maintain an appropriate amount of extra airspeed while landing fixed wing aircraft.

■ Avoid making steep turns if the aircraft is heavily coated with ice.

■ Before takeoff, ensure anti-icing and deicing equipment are operating properly.

■ On aircraft with reciprocating engines, use carburetor preheat to prevent ice formation.

■ On fixed wing aircraft, check wing deicers; use them properly. Do not land with deicers on. ■

MAINTENANCE MATTERS

Torquing Troubles

■ During a battle damage check, the Falcon's wingman noticed several "turkey feathers" were disconnected and streamlined in the windstream. The pilot accomplished an uneventful, straight-in approach and landing.

During the post-flight inspection, the crew chief found damage to two turkey feathers and the speedbrake. Two self-locking nuts, washers, and bolts were missing from the turkey feathers.

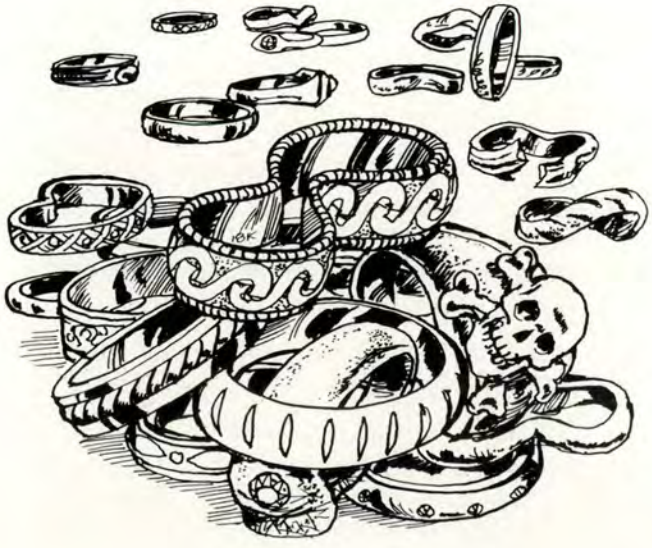
According to the aircraft records, a modification had been completed on the turkey feathers prior to the mishap flight. The torque wrench used during the modification was checked and found to be properly calibrated, and the crew chief remembered torquing every nut.

What the crew chief failed to do was to check the locking capability of the self-locking nuts. The locking feature of self-locking nuts 3/8 inch or smaller can be checked by the "finger tight" method. If the nut can be run down with the fingers after the locking feature is engaged, it must be replaced. The minimum friction for nuts over 3/8 inch can be found in table 5-7 of TO 1-1A-8.

The crew chief, like many maintenance folks, was under the impression the purpose of torquing a nut or a bolt is to prevent it from coming loose. Not so. The main reason fasteners are torqued is to provide a clamping force (preload) to prevent the part from moving and avoid fatigue.

Actually, it is not the torque but the locking feature of a fastener which prevents it from vibrating loose. The fact is, no matter how tight a fastener is torqued, it will probably back off because of vibration unless some kind of locking feature is used.

Investigators were not surprised when they found several other turkey feather nuts partially backed off because their locking mechanisms were no longer effective. ■



Finger Losses

■ According to the ground safety folks at the Air Force Safety Agency, in FY90, 32 Air Force members lost fingers in both on- and off-duty mishaps. Although FY91 showed a slight improvement with only 23 missing appendages, there are obviously still many Air Force people who are not aware of the hazards of wearing rings around vehicles or equipment.

During the first 6 months of FY92, seven more people have lost fingers in preventable mishaps. The latest was a supervisor who lost his ring finger jumping off a stakebed truck.

Supervisors can help reverse this trend by ensuring their people don't wear rings:

- When climbing into and descending from vehicles.
- During materials handling.
- Around exposed energized circuits.
- Any time you determine they should not wear a ring due to a hazardous condition. ■

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UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

MAJOR

JAMES J. FRANKLIN

401st Tactical Fighter Wing

■ On the morning of 25 April 1991, Major (now Lt Col) James J. Franklin, 401 TFW Chief of Quality Assurance, took off from Torrejon Air Base to perform a functional check flight (FCF) on an F-16C. The aircraft had been in maintenance to correct an afterburner malfunction. The FCF profile went as planned until Major Franklin began his recovery.

Seventy miles from the base, he felt the throttle bind. He immediately advanced power and was able to attain 90 percent before the throttle froze in position. At 15,000 feet, Major Franklin lowered the gear, opened the speed brakes, started the jet fuel starter (JFS), and activated emergency power unit (EPU).

In this configuration, the aircraft could slow to no less than 280 knots. After consulting the Supervisor of Flying, he decided to fly a flameout pattern and landing from high key by shutting the engine down with the fuel master switch.

Major Franklin flew a flawless flameout approach and landing, stopping the aircraft using aerobraking and backup wheel braking supplied by the JFS. Expecting the parking brake to be unavailable due to throttle angle, Major Franklin stopped 100 feet short of the departure end BAK-13 and placed the hook down. He shut down the EPU and held the brakes until assistance arrived.

Major Franklin's actions, in conjunction with thorough mission preparation and emergency procedures knowledge, allowed him to flawlessly execute a well-thought-out and coordinated plan. The safe recovery of this valuable combat asset during an emergency situation is the direct result of Major Franklin's capabilities and professionalism.

Since 1976, only 13 similar emergency landings have been completed successfully. Lt Col Franklin is a member of an elite cadre of pilots whose brilliant performance under pressure has saved valuable combat assets.

WELL DONE! ■

USAF Windchill Chart

WIND SPEED		COOLING POWER OF WIND EXPRESSED AS "EQUIVALENT CHILL TEMPERATURE"																			
KNOTS	MPH	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
		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 min)						GREAT DANGER (Flesh may freeze within 30 seconds)								