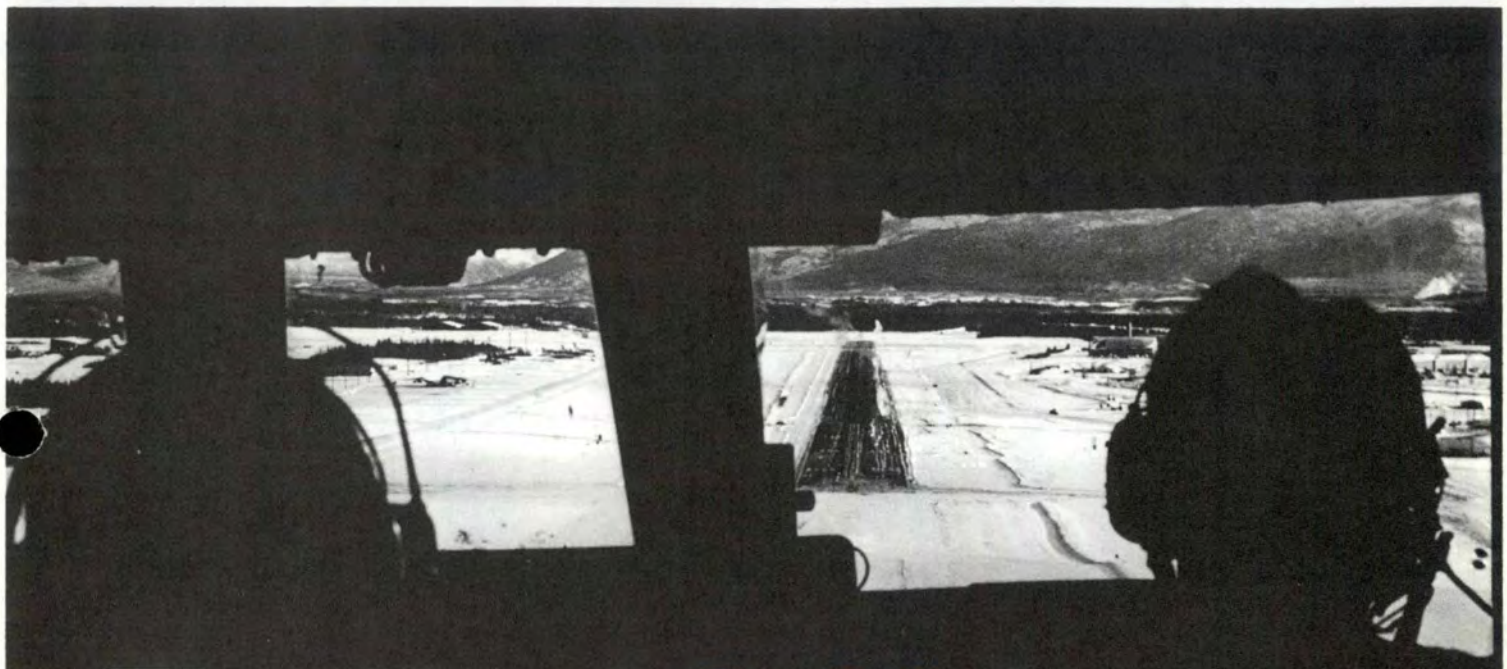
flying
SAFETY
NOVEMBER 1984

Knock It Off — You're On Fire!

The Early Go

A Winter Tale



The Hard Cold Facts (Page 6)

THERE I WAS

■ I was lead of a four-ship of F-4s returning from a three week deployment. Home base was forecast to be above minimums by our arrival time, so we departed our deployed base, rendezvoused with a KC-135, and proceeded home. At 300 miles from home, a weather update was requested and a decision to divert to our alternate was made.

An uneventful landing was made by all, and I briefed all the crews to go to internal only to prevent the drop tanks from filling, since home was only 200 miles away.

Because of crew rest and a forecast of gloom for home plate, we decided to RON. The next morning we flight planned for two flights of two with trail departures — since weather was not VFR.

When I got to my jet for pre-flight, I found a note from the night transient alert crew informing me that, for some reason, my drop tanks took fuel and were full. A minor irritation, but no big deal.

After a pre-flight that obviously wasn't thorough enough, my trusty WSO mentioned to me that the tank(s) sounded empty. I banged on one. It sounded full; so I decided that my trusty WSO needed practice at banging on tanks. We climbed in and prepared for takeoff. Fortunately, we had decided on 10 second spacing and radar trail until "on top."

I released the brakes and selected afterburner. I detected a tendency to drift left, but it was easily controlled. At 175 knots I was airborne using full right stick and a bunch of right rudder to keep from doing an aileron roll to certain disaster. As the speed increased through 200 knots, control was regained, and I was able to level the wings.

All the indications were available to us that we had one full drop tank and one empty drop tank. Why bells didn't ring in our heads until immediately after takeoff, I'll never know. Looking back on the incident, I shudder to think what could have happened had we elected to make a formation takeoff, since the winds favored putting the wingman on the left side.

Nowhere can I find mention of checking the external tanks for fuel. You can be sure our crews now do, especially when cross-country. Lucky. ■

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flying

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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Get The Kill

■ At the time, I was a very junior pilot in a Persian Gulf squadron, and life was idyllic — tons of exhilarating flying, no rules to speak of, and unlimited supplies of ice-cold Carlsberg.

The weather was brilliant and calm as usual, with a hazy horizon at low level over the sea. Flying as No 4 on a four-ship bounced HI-LO-HI Strike, I was desperately keen to mix it with the bounce — a flight commander with whom I was not on the best of terms. I fancied myself as a bit of a tiger at combat and once again felt that tremendous surge of adrenalin as I picked up the bogie — a mere speck in the deep blue, vertically above us — as we passed 20,000 feet in the descent over the sea.

In spite of my early pickup, the attacker was soon in the middle of our twisting and turning formation. Determined to keep contact with my hated adversary, I committed the cardinal sin of losing my element leader within seconds of the start of the fight. (This, next to refusing to fly with a hangover, was considered to be the ultimate sin at the time.) Desperate to retain some kudos, I threw myself at the bounce while screaming on the R/T that I would soon be claiming him. On hearing this, the rest of the formation promptly departed at Warp 9 heading for the IP, abandoning me to my well-deserved fate.

My personal duel with the bounce dragged on for a minute or two, and it became uncomfortably apparent that I was getting nowhere near to achieving a kill. Unbeknown to me, the bounce was setting me up for a runout and, having skillfully maneuvered me away from the last known position of my companions, he suddenly disengaged in hot pursuit of my erstwhile formation.

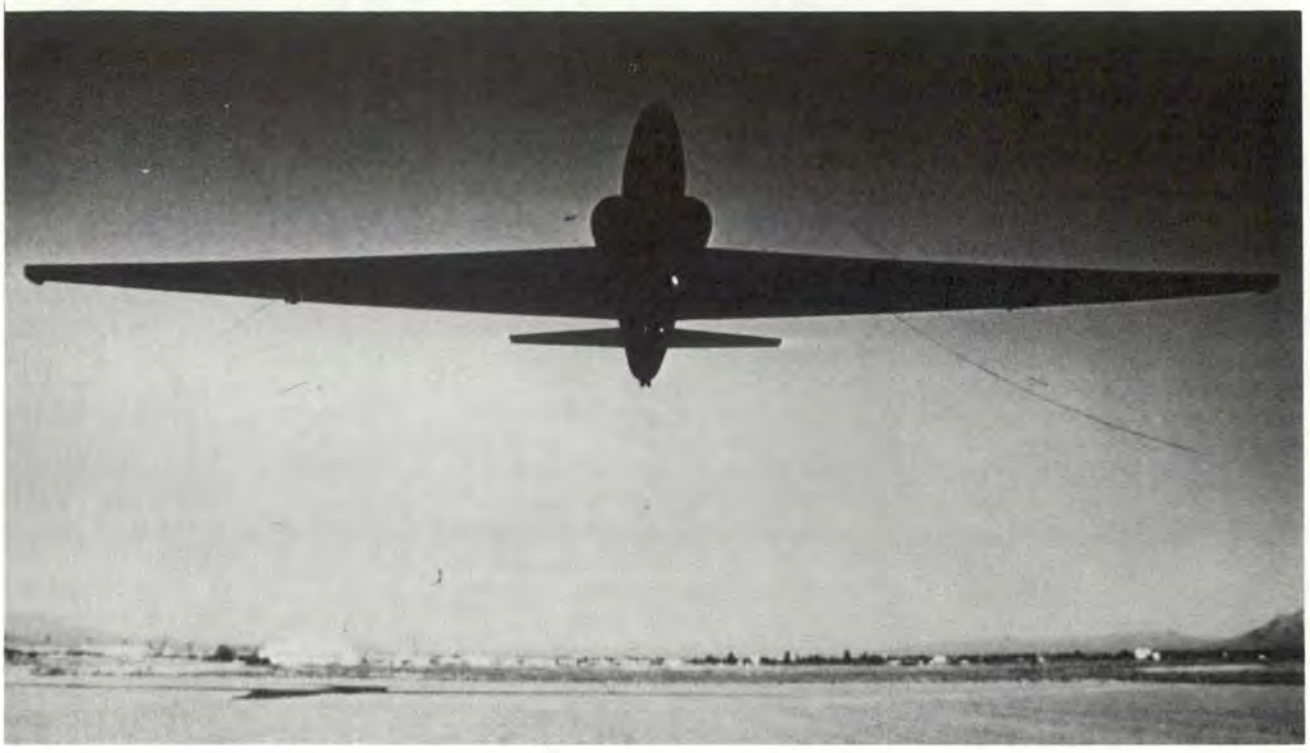
Incensed at the way I had been duped, I dived frantically for airspeed, simultaneously skylining the bounce as a dwindling speck just above the horizon. Throughout the whole of the engagement so far, I had paid only cursory attention to our height and fondly imagined that at this stage I was still at least 10,000 feet above the sea. My whole attention was riveted on the speck on the horizon as my aircraft began to hum with the famous "blue note" at high IAS. Should I lose "tally" then, I knew I would never pick him up again.

After a minute or two, the horizon in my peripheral vision slowly began to change color. Through the thunder of the 600 knot airflow, I dimly became aware of a tiny voice in my brain repeating the same message over and over again. In a flash I woke to the awful reality — *check your height!*

I was in a shallow dive with the altimeter slowly passing 200 feet. The sea was like glass and could have been 200 or 2,000 feet away from me. I pulled up violently to get away from the water that had so nearly killed me. Furious at my stupidity, I flew slowly home to receive a well-deserved bawling out for failing to stick in formation — I was too ashamed to tell of my near-diaster.

The lesson for me was simple; never let personal animosity cloud your judgment in combat — the stakes are too high, even in peacetime. — *Adapted from* Air Clues. ■

The following two articles, "Making the Right Decision Before You Fly," and "First on the Scene," recount the pilot's and SOF's view of a U-2 ejection.



Making The Right Decision Before You Fly

CAPTAIN TODD P. HUBBARD
9 SRW
Beale AFB, CA

■ "Get out, get out, get out," the supervisor of flying (SOF) shouted at me from the chase vehicle on the runway below. I suddenly realized that the large jolt and airframe buffet had taken away my ability to fly the machine, and the aircraft was going out of control.

Spotting the ejection ring between my legs, I grabbed it with my right hand and pulled up hard. I exploded upward into the air — free of the airplane. From that point on, the sequence happened just as briefed in life support training.

The seat pushed me clear, and my shoulders were jerked upward with the sudden opening shock of parachute deployment. However, I only had a full chute seconds before ground impact. As I let down with the chute, the airplane burst into a huge fireball right in front of me, and I was drifting toward the rising flames.

Two seconds later, my feet, hips and face hit the ground with the still-inflated canopy dragging me closer to a wall of flames fed by 1,000 gallons of fuel.

A sudden, sharp pain in the middle of my back slowed my progress as I attempted to get free of the chute. It seemed like an eternity before I could release the first Koch fitting letting the chute canopy wither to the ground. I started spitting out teeth once my helmet was off and then took inventory of the rest of my body for additional injuries. Sitting up was impossible because of severe back pain, so I settled down on my right side attempting to breathe normally.

The SOF sped over to my position and, running toward me, asked about my condition. Minutes later, the ambulance was wheeling me toward the hospital. I would survive.

Do you think you would have survived by making the decision to eject during initial climbout? Have you ever mentally put yourself in this situation? We all were exposed as crewmembers to critical action procedures for bailout or ejection during flight training, and we could

continued

Making The Right Decision Before You Fly continued

even mimic our instructor's judgment and decisions when asked to during ground evaluations. But, let me tell you, it never happens just like you think. Something will be different, but will your plan work? Let me outline how I made my decision, and then we'll compare your decision to your position as crewmember in your aircraft.

Nearly one week before the mishap, an "old head" pilot and I discussed catastrophic failure of engine and/or airframe and the correct pilot reaction during initial climbout. Additionally, we spoke of proper airspeed and pitch for all takeoffs which would afford the best angle of climb if such a situation occurred.

After our discussion, I chatted with several other "old heads." The consensus of techniques showed me that my takeoff climb angle was too shallow, that I was too concerned about bringing the airplane back, and that I had failed to adequately consider a bailout situation.

I determined to abandon my takeoff philosophy and use a safer takeoff angle. Along with the new climb angle on the takeoff leg, I decided to simplify my decision-making during those critical minutes. After lift-off, my attention would be divided between pitch and airspeed, but mainly focused on clearing outside. This would provide a good visual angle compared to the real horizon and, together with the attitude indicator, would confirm a safe climb.

No steps on the initial climb check in the U-2 are required for safe climb before 5,000 feet so all attention can be directed to airspeed, attitude, and engine instruments — in that order. Now, if something happens at this point to jeopardize the climb, my thoughts should include ejection, as well as determining whether or not the airplane is controllable enough to land.

U-2/TR-1 pilots are always launched by a fellow U-2 pilot who serves as SOF for the mission and observes the takeoff and landing from a UHF-equipped chase vehicle. Likewise, most Air Force aircraft launch under some kind of supervision, and that extra pair of eyes can make the difference between life and death.

As the aircraft started out of control during my incident, it was the SOF who first brought to mind ejection. As pilots, we are trained to fly, not flee; however, there is a time when fleeing becomes the only real decision. As crewmembers, we should always be aware of events inside and outside of the aircraft. The best decisions are made when all the facts are known. Those additional facts can come from the SOF who serves as an overseer for the safe operation of aircraft. It will be the SOF who first sees your aircraft breaking up or trailing smoke.

No matter what type of aircraft you fly, whether you use ejection seats or bail out through the crew entry chute, your best survival decisions are made before you fly, not during. In addition, all SOFs should be immediately available by radio to suggest crew actions if it appears the aircraft is on fire or breaking apart. It might be the SOF who jogs your better judgment about getting out. Let's face it, the pilot and crew are going to be task-saturated.

Here are a few suggestions for you before your next flight. *Know your life support equipment.* This includes the capability of the ejection seat or understanding of the bailout sequence. When are you in the bailout envelope, and what can you do on takeoff to get there sooner? Some pilots like to hold the jet on the deck to get more smash for an impressive closed pattern or departure. If you're relying on your elevator or slab to escape a critical situation, it may not be there when you need it. The only good situation is having more distance between you and the ground while holding a positive climb.

Additionally, *trust your seat.* My last thought before ejection was that this seat would get me clear of the aircraft and the ground and provide me with a full chute before ground impact. But, I had to be upright, and that was confirmed as I pulled the ring. Ejection seats were designed to save your life, but they all have limitations. However, only you can make the decision to get out while there is still time.

Lastly, *don't worry about the aircraft regarding its cost or uniqueness.* If the aircraft isn't airworthy, then you've killed yourself in a high priced coffin for nothing. We can rebuild jets, but we can't rebuilt the pilot.

Next time you brief your crew or supervisor of flying on your mission, include a realistic, yet simple outline of events about bailout or ejection. Then fly through the takeoff and initial climb with your decision ready for execution — just in case the situation falls apart. Your timely decision could be your only route to survival. Fly smarter! ■

First On The Scene

CAPTAIN CLIFFORD E. "NAP" NAPOLITANO
4029 Strategic Reconnaissance Training Squadron
Beale AFB, CA

■ As I unkeyed the microphone and stomped the accelerator of the mobile SOF vehicle, these horrifying words still echoed in my mind, "Get Out, Get Out, Get Out!"

The aircraft crashed on the east side of the runway on takeoff. I didn't know what to expect as I braked to a stop on the far side of the fireball. I wasn't even sure if the pilot of the out-of-control aircraft heard my radio calls. Fortunately, he had, and reacted by ejecting from the crippled craft.

When I stopped beside the pilot who was lying on the ground, I wasn't consciously thinking of first aid. Would you be? Luckily, the pilot was conscious, and the flames from the wreckage were blowing away from us.

The first thing I did was tell him not to move and ask him where he was hurt. He had some broken teeth, a cut on the chin, back pain, and one of his knees hurt. Most important at the time was the back pain, so I kept him immobile. Nothing else seemed that serious. When the medical aid arrived, I told the doctor about all the known injuries and let the professionals handle the situation. We were both lucky. He got out of the aircraft at low altitude with minimal injuries. I was lucky because he was conscious and could tell me where he hurt.

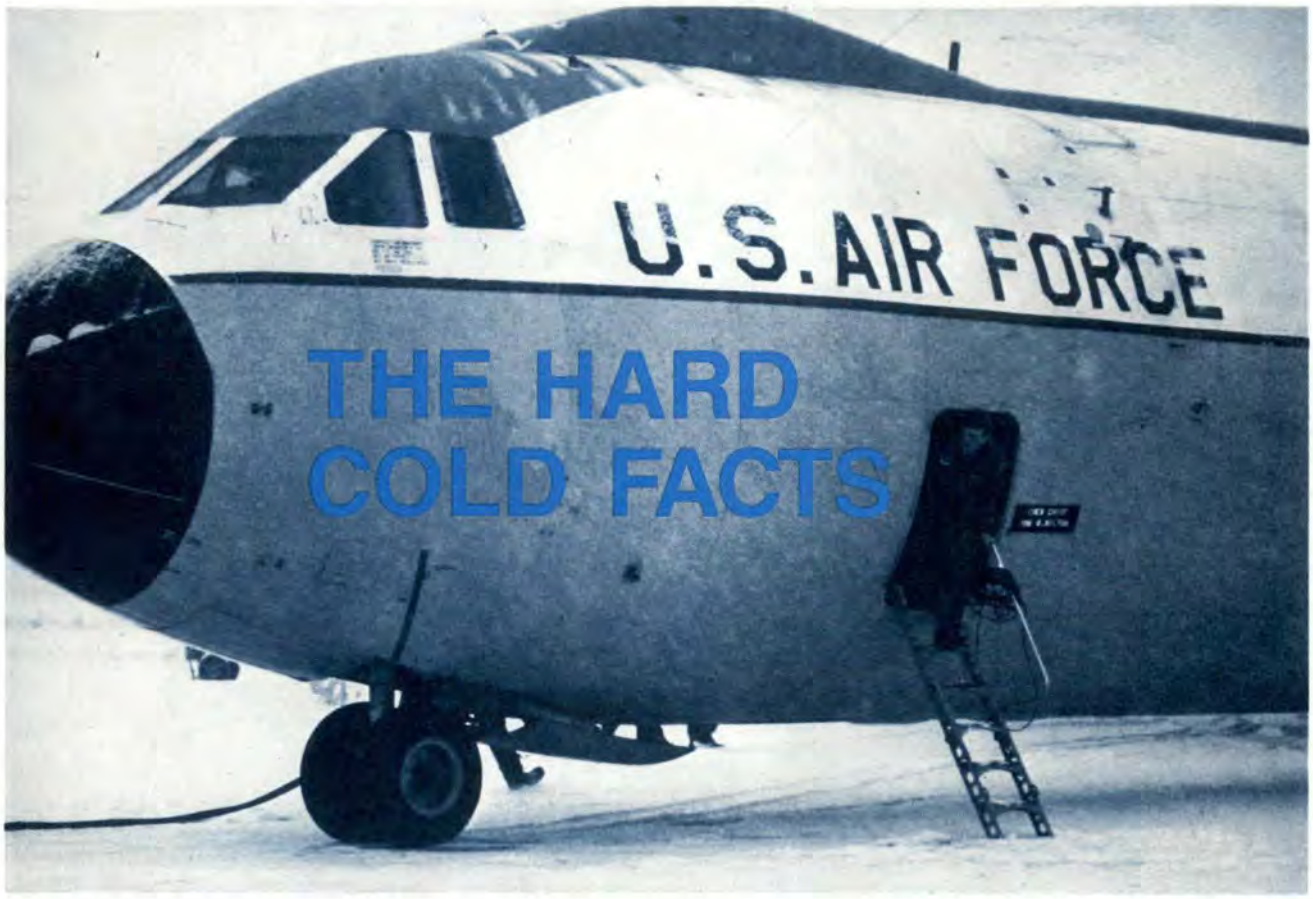
After some reflection on this incident, it occurred to me that it might be a good idea for all aircrews and maintenance personnel to give some thought to what they might do if they were the first one on the scene of an aircraft mishap — or any mishap for that matter.

These basic rules have been around for a long time, and they appear to work — at least they did for me.

- Keep the victim immobile, unless their safety or yours is threatened.
- Make sure he is breathing and continue to monitor. Just because he was breathing doesn't mean he couldn't stop at any time for an undetermined reason.
- Stop any bleeding. Use direct pressure or arterial pressure, but try to slow or stop blood loss.
- Treat for shock. Keep him warm and as comfortable as possible.
- If you must move him, whether there is a back injury or not, only move him out of immediate danger. The less movement the better.
- Find out as much from him as possible about his injuries, and pass this information as accurately as possible to medical personnel.
- If he is unconscious, follow the same rules and assume the worst possible injuries until told otherwise.
- Don't let your attention be diverted from the important areas. Breathing, bleeding, and shock by an injury must be attended to. Some injuries may look bad but are not fatal, i.e., burns or lacerations. Treat these injuries if you can, when you get the time.

Just a couple of thoughts about yourself if you ever end up in this situation:

- Are you, or can you be mentally prepared for what you find at the crash site? Probably not. You probably haven't convinced yourself that this is happening to you . . . it always happens to the other guy. After you realize it is happening to you, make the best of the situation.
- Remember, the victims aren't the only ones in shock. If you witnessed the mishap or responded to it, you are in at least a mild state of psychological shock. Be aware of this, try to make rational decisions, and remember the best way to do that in a crisis is stick to the basics. The simplest decisions are usually the easiest, so keep it basic and keep your head. Hopefully, this type of situation will never happen to you. If it does, maybe these hints will help. ■



THE HARD COLD FACTS

PEGGY E. HODGE
Assistant Editor

■ 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 an RC-135 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 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 inside 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 two 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 three 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 six miles from the base. *There were no survivors!*

What happened? Investigators concluded that the extreme cold was one of the major factors. The extended delay in the 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 crewmembers were cold causing distraction and reducing manual dexterity.

Could this mishap have been prevented through proper guidance in limiting flight crew exposure to extreme cold temperatures? "Hard Cold Facts" will take a brief look at the effects of cold climate on crew performance, as well as the extreme physical conditions cold temperatures can cause the crewmember. What do we need to "watch out for," and what preventive measures can we use?

■ **Crew Performance.** Modern day aircraft operate over a wide range of speeds and altitudes, which means that they are also exposed to a wide range of temperatures. Aircraft can be exposed to great temperature changes during a single sortie, even if the point of departure is located in a temperate climate. Within minutes of taking off from an airfield whose ground temperature may be more than 113 degrees F, an aircraft can be flying at

an altitude where the outside air temperature is −70 degrees F and over mountains where the temperature on the ground is below freezing. Aircrews must plan carefully if they expect any kind of temperature variance.

If the wide range of temperature variables becomes excessive to the point of discomfort, it can interfere with efficient crew performance. Temperature variations within extreme limits can have a detrimental effect on a person's ability to perform a specific task. It is difficult to relate this performance loss to the particular temperature level; but if the temperature deviates significantly from a "comfort zone," a decrement in skilled performance will eventually develop.

When temperatures are excessively cold, and especially if windchill is a factor, a crewmember's performance may be adversely affected during pre-flight procedures. Cold temperatures and windchill add to the stress of pre-flight operations. A crewmember will tend to "rush" through his checklist because he is cold! Remember to consider the human element during pre-flight.

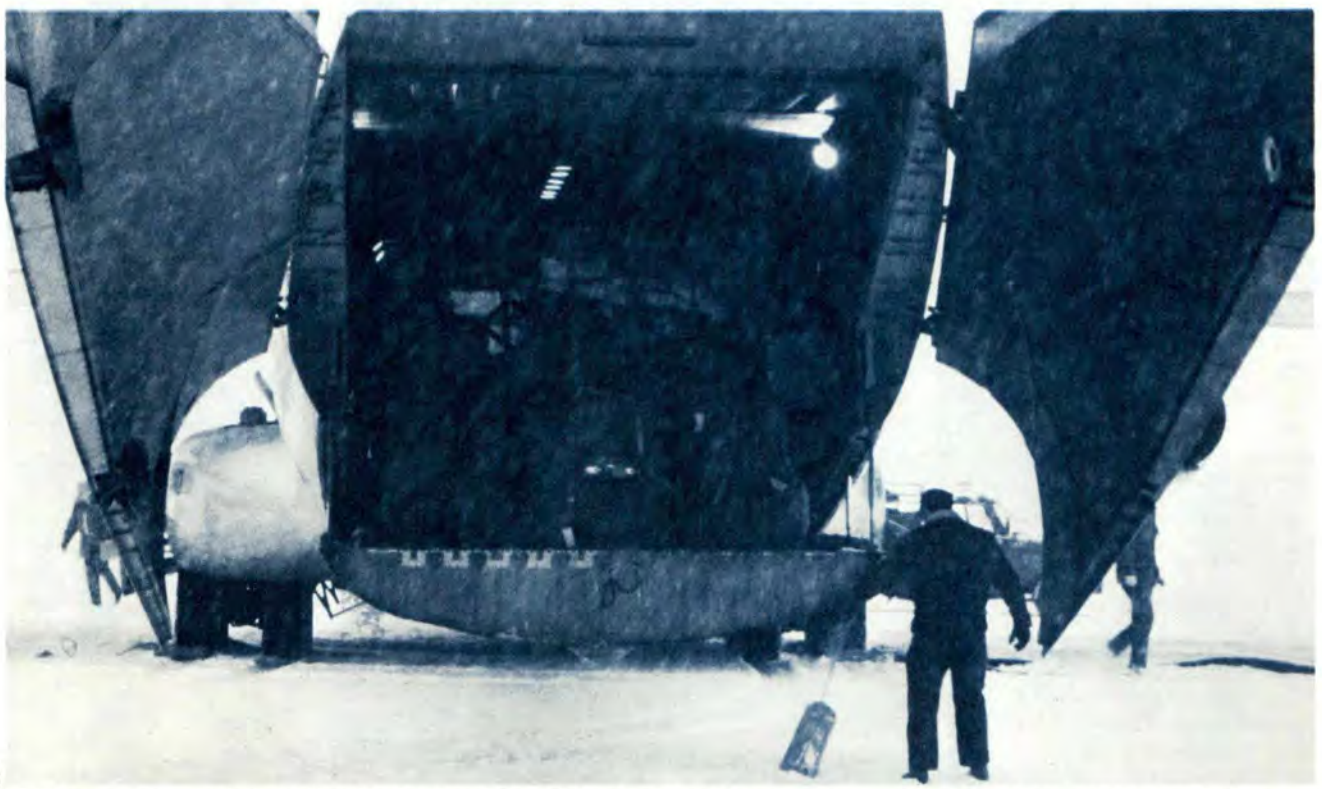
In order to operate and survive in extreme cold conditions, you must be aware of the serious physical hazards facing you.

Don't rush the pre-flight inspection because of the cold. Aircraft pre-flight inspections demand even more attention in cold weather.

Not only does the crewmember face performance problems in cold weather, but in order to operate and survive in extreme cold conditions, he must be aware of serious physical hazards facing him. He needs to be able to recognize and treat these conditions. Some of the more extreme conditions include frostbite and hypothermia. It is also important to realize the effects of windchill.

■ **Frostbite.** Frostbite may occur if a part of the body is exposed to very low temperatures. In such a situation, the natural closing down of the surface blood vessels is so complete that the circulation stops altogether. The onset of frostbite may be gradual and painless; but in some cases, a feeling of numbness or tingling may provide useful warning signs. In the early stages, the affected part is white and waxy and surrounded by a red zone. Later, it may become more obvious that the tissue has been seriously damaged.

continued



"Cold temperatures and windchill add to the stress of pre-flight operations. A crewmember will tend to 'rush' through his checklist because he is cold!"

The Hard Cold Facts continued

The most commonly affected areas are the extremities such as the fingers, toes, and nose; but in severe conditions, any area of skin which is exposed may equally be affected. It is most important to be on the lookout for the onset of this condition. Regular "buddy-system" inspections of areas of exposed skin should be carried out.

■ **Hypothermia.** Hypothermia is the lowering of the body's inner core temperature. Any time a person is exposed to severe cold weather conditions for a long period, he is going to suffer some degree of hypothermia. Signs of hypothermia include muscular weaknesses, stiffness of limbs, fatigue and an overpowering drowsiness, sight growing dim, staggering, falling, and eventually unconsciousness. The respiration and pulse may become almost undetectable. Obviously, you will want to prevent hypothermia in the early stages.

It is important to note that if cabin conditions become excessively cold, frostbite and/or hypothermia may occur.

■ **Windchill.** In low temperatures, the added effect of windchill can create a serious additional hazard by lowering the effective temperature and increasing the possibility of frostbite. Even when the temperature may not be particularly low, it is still important to remember the danger of windchill. Even short journeys out of doors should not be made without taking full precautions.

This good rule of thumb can usually be followed: For each mile per hour of wind, subtract one degree of temperature. For example: A −20 degrees F reading and a 20 mile per hour wind will give you a temperature reading of −40 degrees F. Note the windchill effects on the following table.

Frostbite, hypothermia, and windchill are indeed extreme cold weather conditions crewmembers need to be aware of and recognize. The following checklist for treatment of these conditions may prove useful; and even life critical:

FROSTBITE

■ Use body heat to thaw out the frozen area. If the hands are frozen, take the glove off and put the hands under the armpit, between your legs, or any part of your body that is warm.

■ Don't use your breath to thaw hands.

■ If ears are affected, use your hands to warm them by using one hand at a time. Make sure to put the hand back in the glove to warm it up again.

■ The feet are hard to warm, but if you have a buddy with you, put your frozen feet next to his warm stomach or under his armpits.

■ The water immersion method is best. The temperature of the water should be just above normal body temperature. The recommended temperature is 101 degrees F to 107 degrees F.

■ A warm room is good. The temperature of the room should be at least 70 degrees F.

HYPOTHERMIA

■ The best treatment is *rapid* warming. The victim has suffered a loss of the body heat reserve, and warmth must be restored immediately to help him recover. Rewarm the body as quickly as possible.

■ A good treatment is a hot

WINDCHILL EFFECTS

Dry Bulb Temp °C	Little Danger Up To These Wind Speeds	Dry Bulb Temp °C	INCREASING DANGER At These Wind Speeds	Dry Bulb Temp °C	**GREAT DANGER** Above These Wind Speeds	Dry Bulb Temp °C
−10	20	−10	20 − 45	−10	see	−10
−15	10	−15	10 − 45	−15	previous	−15
−20	5	−20	5 − 45	−20	column	−20
−25	5	−25	5 − 30	−25	30	−25
−30	0	−30	0 − 20	−30	20	−30
−35	see	−35	0 − 10	−35	10	−35
−40	next	−40	0 − 10	−40	10	−40
−45	column	−45	0 − 5	−45	5	−45
−50		−50	0 − 5	−50	5	−50
Dry Bulb Temp °C	Little Danger Up To These Wind Speeds	Dry Bulb Temp °C	INCREASING DANGER At These Wind Speeds	Dry Bulb Temp °C	**GREAT DANGER** Above These Wind Speeds	Dry Bulb Temp °C

NOTE: All wind speeds in knots
Based on maximum wind speed of 45 knots (22 m/s or 50 mph)

FORECAST DESCRIPTION OF WINDS:

45 knots	=	Fresh Gale	10 knots	=	Moderate Breeze
30 knots	=	Moderate Gale	5 knots	=	Light Breeze
20 knots	=	Fresh Breeze			

Proper clothing is the best means to protect our bodies from the cold and to prevent serious conditions from occurring.

bath and hot stimulants.

- If a patient has frostbite, treat him for hypothermia first.
- Use body heat to warm up a person if you are stranded.

Always — if medical aid is near, get it from qualified personnel.

Cold Protection — *before* the trouble ensues! Protective clothing is the best means to protect our bodies from the cold and to prevent serious conditions from occurring. Multiple layers of loose-fitting clothing afford the best protection from cold. These layers allow additional trapped air between layers which allows moisture to escape and keeps in the warm air. These layers also allow versatility in that they can be added or subtracted to cope with different work rates. Another practical principle in design is to employ a thick, open-weave undergarment as the innermost layer. This will also trap more air.

Keep dry. Wet clothing tends to conduct heat away from the body. Loosen heavy clothing when performing strenuous physical activity to prevent overheating and reduce sweating. Perspiration moisture retained inside heavy clothing causes a loss of the clothing's insulation qualities. Avoid wind.

Clothing insulation is greatly reduced by either wind or water penetration. An external windproof layer is therefore essential for cold protection in windy conditions. Generally, this external layer also serves to keep out rain.

Heads, hands, and feet present special problems in cold protection. Heat loss from the head can exceed half the metabolic heat production. Aircrew generally wear protective flying helmets, but these may be lost during a survival situation. Survival kits should contain additional head, hands, and feet protection wherever space and weight can allow.

Lead shot is often added to survival kits in order for the ejection equipment to function properly. In cold risk situations, lead shot should clearly be replaced with head, hands, and feet protection.

For arctic operations, clothing for outside use should include head protection. Anorak or parka hoods should project well forward of the face and possess a malleable edge to enable them to be shaped around the face. Fur trim improves this protection still further.

Good protection of the hands in the cold is generally incompatible with the maintenance of sufficient sensitivity and dexterity. This poses a difficult problem, and it is usually practical to wear only relatively thin flying gloves with fingerless mittens on top. These are adequate in flight as long as the cabin temperature can be maintained well above freezing point. In very cold aircraft, electrically heated gloves should be considered. For nonflight situations, the maintenance of sensitivity and dexterity is usually less vital, and additional thick gloves or mittens can be worn. For maintenance work, thin contact gloves prevent cold injuries arising from contact with metal objects.

The best form of footwear depends on the climatic conditions. In cold/wet environments, footwear must be waterproof and provide adequate insulation. In cold/dry conditions, however, insulation is the more important factor and, provided aircraft controls can be operated, the mukluk is ideal. This consists of a thick, felt inner boot worn beneath a rubber-soled canvas outer boot. Additional insulation to the sole of the foot can be provided by a felt insole over an incompressible nylon mesh insole.

Ultimately, whether on the ground or in the air, each crewmember is responsible for his/her protection against cold weather hazards. Mishaps due to extreme cold temperatures *can* be prevented through proper education and careful planning. Only through knowledge of cold weather problems and use of protective devices can we ensure safety against the "hard cold facts." Know your safety measures and use them properly. ■

— This article has been partially compiled from *Aviation Medicine*, Air Marshal Sir Geoffrey Dhenin, and the *Aeromedical Handbook for Aircrew*, Capt. T.G. Dobie.

Knock It Off — YOU'RE ON FIRE!

JOHN H. HILL
Pratt & Whitney
Customer Support Representative

■ Those words can make any fighter pilot's heart beat a little faster. You're max performing the aircraft, the engine in max AB, when you get the call. You check six and see a very spectacular trail of flames across the sky. . . .

Fortunately, in this case, the only problem is that you have just joined approximately 70 other F-15 and F-16 pilots who have experienced an F100 augmentor nozzle burn-through. Most pilots will never have this problem, which occurs approximately only once in every 17,000 F-15 flying hours and only once in every 30,000 F-16 flying hours. However, for those who do, this article will attempt to help you to differentiate this problem from a more serious in-flight fire and to react appropriately to the emergency. Although this information is slanted toward the F-16 situation, F-15 pilots should also find it useful, remembering that they have two engines and an onboard fire fighting system.

The first clue that the fire is associated with nozzle burn-through is the manner in which you initially find the problem. Most likely it will be a call over the radio from another aircraft. Less likely is the possibility of seeing the flames yourself. This is a "quiet" failure mode, with little to draw your attention. Except for a very spectacular trail of fire from the tail of the aircraft, there will be none of the bangs, thumps, or shudders that are usually associated with the causes of more serious engine bay fires.

After you have found the fire, a quick scan of the instrument panel will reveal a second very important clue. There will be no fire light. The design of both the F-15 and F-16 is such that the engine nozzle structure is external to the airframe. Therefore, there will be no fire loops near enough to the fire to detect it.

"Nozzle burn-through occurs approximately only once in every 17,000 F-15 flying hours and only once in every 30,000 F-16 flying hours."

A review of AFISC records on in-flight fires shows that both airplane's fire detection systems are very reliable in detecting actual fires in the engine bays. It appears that the lack of a fire light is a clue that can be trusted, at least until other clues indicate otherwise.

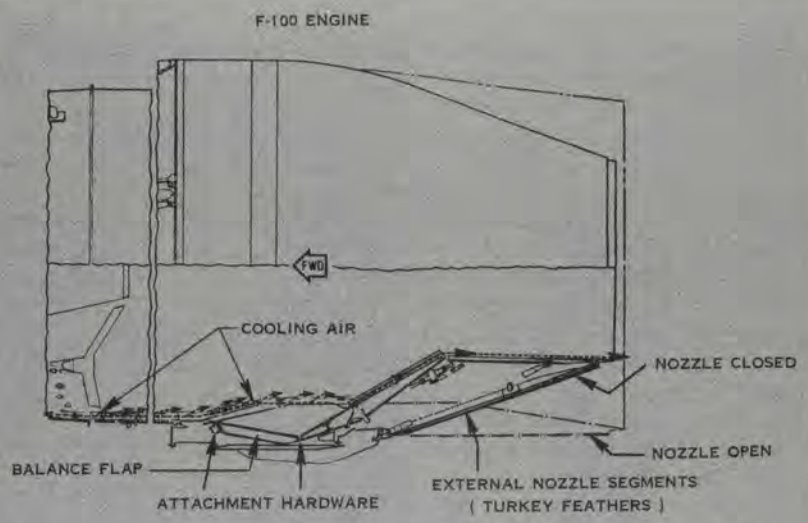
A final set of indications useful in determining the type of problem at hand are system instruments. Are the engine rpm, FTIT, and fuel flow approximately where they belong? Is the generator still on line? Are the hydraulics OK? No flight control warning lights? If so, it is doubtful that any major problems are occurring inside the fuselage.

When you get that call that your aircraft is on fire, you should remember that it is most important to *fly the aircraft!* Retard the throttle out of AB, wings level, and trade airspeed for altitude. Then analyze the situation. If the fire is indeed an augmentor nozzle burn-through, the flame should begin to diminish within 10 to 15 seconds. The fire should completely extinguish in 30 to 45 seconds, depending on how long the AB was used and whether or not any aircraft structure was involved. Remember, the fire will go out when AB is canceled. Maintain control and monitor the aircraft. If conditions indicate a more serious in-flight fire or if aircraft control deteriorates, be prepared to accomplish the appropriate Dash 1 emergency procedures for your aircraft.

When the fire is out, the emergency may not be over. When a nozzle burn-through occurs, it can cause major damage to the nozzle assembly resulting in lower thrust. The damage causes a loss of back pressure on the engine fan, which then tries to overspeed. The electronic engine control (EEC) prevents this overspeed by downtrimming the core. If you see the rpm in the 80 to 85 percent range with the throttle in mil, turning off the EEC will uptrim the core to approximately 90 percent rpm with sufficient thrust to return to base. Jettison stores as necessary per the Dash 1.

If the burn-through has been allowed to continue for a sufficient period of time, it is possible for the damage to progress beyond the engine nozzle assembly and into the airframe. Although airframe damage has not been a significant factor in the outcome of previous mishaps, you should be aware of the possibility and be ready to respond.

In summary, F100 augmentor nozzle fires are attention grabbers, but handled promptly should not pose a threat to the integrity of your aircraft. If the fire occurs in AB, retard the throttle, analyze the circumstances, and wait for the fire to go out. In the approximately 70 previous occurrences, the greatest risk of losing the aircraft (and the pilot!) has been due to ejection prior to the fire extinguishing. I hope these words will help to reduce that risk. ■



At max power the temperatures inside the F-100 augmentor are far beyond the melting temperatures of the metal. The balance flap system provides cooling air to protect the nozzles from burn-through.

■ When the F100 engine is at max power, the gas temperatures in the augmentor are approaching 3,500 degrees F. This is far beyond the melting temperature of the metal parts that make up the nozzle. Therefore, the nozzle depends on cooling air to live. There are 15 balance flaps in the nozzle assembly whose positioning is critical to the proper flow of the cooling air. Due to a variety of hardware and misinstallation problems, one of these flaps can fall out of position, leaving that section of the nozzle unprotected. The hot flames of the augmentor will quickly cut through the hardware and a nozzle burn-through has happened.

Why do signs of fire persist for so long after AB has been canceled? Remember, not only has the flame from inside the augmentor been deflected out through a hole in the nozzle, the titanium structure of the nozzle itself is burning. Turning off the fuel to the augmentor and draining the spray-rings will remove the high temperature source within 20 seconds. Although the fire is now self-sustaining, the hot, molten titanium will take longer to cool below its combustion temperature.

Pratt & Whitney is now producing new balance flap attachment hardware that should eliminate the durability problems and greatly reduce the possibility of misinstallation. This hardware is scheduled to be part of the Falcon 100 Safety Retrofit Program, with all F-16 engines completed by the summer of 1985. New augmentor phase inspections for both the F-15 and F-16 fleets will also go into effect shortly. These two programs will combine to ensure that the few F100 augmentor nozzle burn-throughs that now occur will be virtually eliminated. ■

The Early Go

MAJOR JOHN E. RICHARDSON
Editor

■ The clanging of the alarm clock seemed especially loud as it jolted Mike from a sound sleep. He shut it off and then sat on the edge of the bed for a moment trying to collect his thoughts. The faintly glowing hands of the clock pointed to 0155. Mike looked over enviously at his wife sleeping peacefully. "Man, it seems like I just went to bed. It sure doesn't feel like I slept six hours." Somewhat groggily, Mike pulled himself up and headed toward the shower.

A half hour later, Captain Mike Tanner, freshly showered, shaved, and somewhat more awake zipped up his flight suit and went into the kitchen. The aroma of the freshly brewed coffee his wife had thoughtfully put on the timer the night before was very welcome. Mike poured a cup and then tried to decide what appealed to him for breakfast.

The sound of his wife's clock striking the quarter hour alerted him that he better hurry to make the briefing, so, hurriedly finishing his breakfast, he kissed his sleeping wife and headed out the door.

Lieutenant Colonel Walt Simmons leaned against the Ops counter and scanned the schedule as he sipped his first cup of coffee. This was the last day of a week long surge.

As Ops officer, Colonel Simmons was concerned about the condition of the crews. Three sorties a day in the F-16 could be tiring, especially when the first briefing was at 0300. Walt remembered how tired he had felt the first two or three days, but as the week wore on, his body seemed to adjust. He didn't feel too bad this morning. Still, the concern was there, and as the pilots came in, Walt watched closely for signs of fatigue.

He had already taken four pilots off the early schedule in the past two days because they seemed tired. He didn't really have any evidence of a serious problem, but he was trying to be extra careful.

He smiled at Captain Tanner as he came in. Mike was new to the squadron. Out of F-4s and just completed mission qualification training, this was Mike's first surge exercise in the F-16. The pressure of the early go's and the heavy flying did not seem to be bothering Mike. He seemed alert and relaxed as he chatted with his flight lead, and then they disappeared into the briefing room.

"That concludes the flight briefing. If there are no questions, we'll break up into elements for the individual briefs. We step in 25 min-

utes." Major Al Richards, flight lead of Bobby Flight, picked up his maps and briefing guide and, with his wingman, moved out to another room. Mike Tanner turned to his element leader, Major Frank Jones. Frank, an experienced F-16 pilot, spent the next 25 minutes going over the intercept portion of the mission in detail. The briefing concentrated on radar and the procedures for intercept since Mike had had a bit of trouble on the last flight.

Mike listened attentively to Frank's briefing. He was a bit concerned about his previous performance, although he did not show it. He had always been an excellent pilot. While he was still confident of his ability, the substandard performance bothered him, and he did not intend to let it happen again. This would be a fairly easy mission — just some routine intercepts. The problem was darkness, but Mike had flown before at night so he did not feel any undue concern. Major Jones finished his briefing, and the two pilots gathered their gear and proceeded to their aircraft.

As he walked to his aircraft, Mike Tanner experienced the familiar sensations he associated with an early morning launch. The darkness and relative quiet of the flight line at this time of the morning gave a feeling of unreality. But this was soon dispelled as he reached his aircraft and entered the controlled, but hectic pace of a fighter launch.

This morning the crew chief was grumbling a bit about 12-hour shifts during the surge. Mike sympathized, commenting that getting up at 2 o'clock in the morning did get old in a hurry. Nonetheless, the preflight and start went as planned and right on schedule. Mike checked in as Bobby 4. Returning the crew chief's smart salute, he pulled out of the parking stub and taxied to join his flight.

The other two ships were delayed, so, as briefed, Mike and his element lead took off as a two-ship and proceeded to their working area.

"Compass Control, Bobby 3 and 4, flight of two F-16s for Bravo low." Major Jones' crisp transmission crackled in Mike's headset.

"Roger, Bobby 3, cleared Bravo low block 13 to 200. Ident and say intentions."

"Bobby is ident. We want 1 on 1 intercepts north to south, close control. Bobby 4 will be target first."

"Roger, radar contact, target altitude will be 180. Bobby 4, start a right hand orbit over the south point. Bobby 3, continue heading 355, vectors to the north point."

The first three intercepts went smoothly. With little to do except follow the heading changes of Compass, Mike's mind was occupied by thinking over the intercepts he would soon be making. He glanced out to the east, noticing the lights of the city providing a horizon in the distance. The situation was much different to the west where the dark, moonless night and lack of lights on the ground made the sky and ground blend together.

As he turned north for the third intercept, Mike squirmed a bit in the seat to find a more comfortable position. In a way, he wished the flight was over. It had been a long week, and he still had another flight to go. He hadn't really realized how tired he was till just now. It sure would be good to get back to a regular schedule. At this point, his reverie was interrupted by the com-

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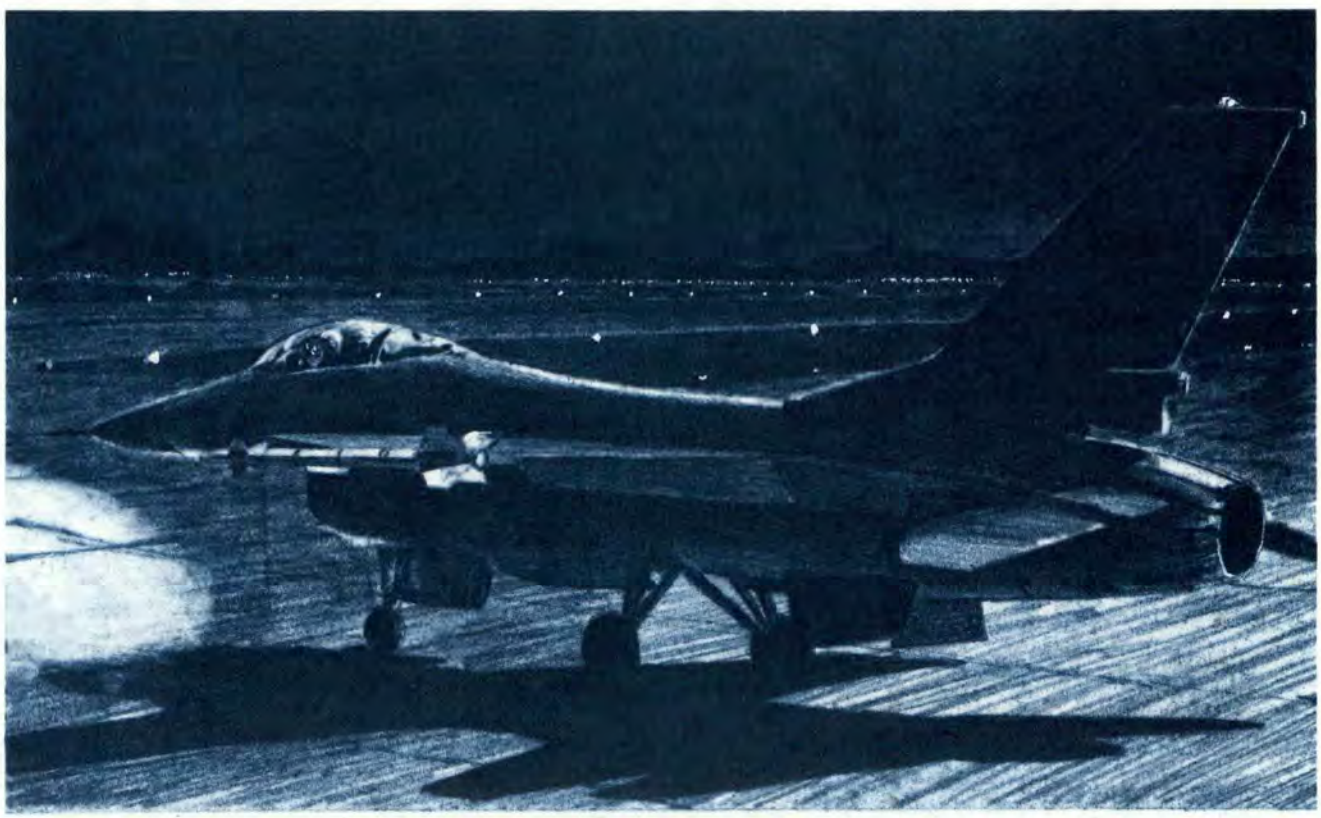


The Early Go

continued

pletion of the intercept.

"Bobby 4, proceed to south orbit point. Orbit right at 16,000. Stand by for clearance to begin intercept."

"Roger, Compass. Bobby 4 to south point."

Mike turned to the orbit point and started his orbit while Bobby 3 moved north again to set up as the target. During the delay, Mike's mind wandered again, only to be jerked back by a slightly sarcastic call from the controller.

"Bobby 4, Compass. That was your *other* right for an orbit. You are now outside area boundaries. Expedite your turn back to the north."

Mike quickly tightened his turn, grumbling to himself for his mental slip in turning the wrong way. He looked outside to check his turn but the black hole effect of the ground and sky to the west made it difficult to get any references. Nonetheless, he completed the turn, and the controller began the intercept, calling the target as 1 o'clock, 50 miles. Mike started north tuning the radar and, once he had a lock on, maintaining an offset to establish the stern conversion turn. At about five miles, Mike began to look outside hoping to get an early tally on Bobby 3. It was very dark, but then he spotted the lights.

"Bobby 4 has a tally."

"Compass, Roger."

"Bobby 4, Judy."

"Roger, Judy."

Mike strained in the darkness to divide his attention between the dimly lit instruments and the lights of the target. The reflections on his canopy did not help matters. It seemed that things were just happening a bit too fast. He was losing control of the situation. He glanced inside at the radar, then back, but now he had lost the target.

"Bobby 4, Compass. Target is 2 o'clock, 3 miles."

"Bobby 4 has lost tally," Mike acknowledged disgustedly.

"Bobby 4, this is 3. Let's skip this one and set up again."

A bit frantically, Mike searched the sky for the target. He did not want to miss this intercept as he had those on the last flight. Then suddenly, there it was. Mike was a bit surprised at the position — slightly ahead and to his left — but he rolled smartly into the turn for the conversion. It was really dark out to the west, but Mike was confident that he could complete this intercept successfully.

"Bobby 4, turn heading 190."

Compass, observing Mike's turn away from the target, assumed that he was breaking off the intercept and gave the heading to the orbit point.

"Bobby 4 has a tally."

Frank Jones, in Bobby 3, observed Mike start his turn to the west. Everything appeared normal, so he started his turn back to the north for the next run.

"Bobby 4, Compass, radar contact lost."

Frank was instantly alert. Somehow that didn't seem right. He looked over his shoulder to the south and saw a glow on the ground. A tight feeling started in his stomach as he keyed the mike.

"Bobby 4, Bobby 3."

"Bobby 4, 3."

"Bobby 4, Bobby 4, Bobby 3 on Guard, come up voice."

"Bobby 3. This is Compass."

"Roger, Compass. We've got a problem."

A little over a week later, a group of officers was gathered about a table in an office at the F-16 base. The table was littered with papers and photographs. This "board of officers" — as it is called in the news releases — was pondering what happened to Bobby 4.

Lieutenant Col (Dr) Hillary Andrews, Flight Surgeon, and Major Arnold Brasfield, Human Factors Specialist, were discussing the effects of fatigue. Major Brasfield started the discussion. "It is clear from the 72-hour history that Captain Tanner did not get adequate rest during the exercise. Even though the crew duty day and crew rest complied with 60-1, Captain Tanner was involved in other activities and did not use his 12 hours to get adequate rest."

"It's more than that," added Dr Andrews. "During the exercise, Captain Tanner and the other pilots on the early schedule were taking off at a time when they normally would be just waking up. This is the time when the body's circadian rhythms are at their lowest point."

Colonel Martin Samuels, the Board President, broke in. "That's fine, but we have testimony of several witnesses that Captain Tanner seemed alert and not at all fatigued."

"That's quite possible, sir," responded Major Brasfield. "A person experiencing chronic fatigue may not show any remarkable symptoms. However, the effects of fatigue include increased error potential, increased reaction time, deterioration in timing, increased willingness to accept lower standards, breakdown in scanning pattern,

tendency to channelize attention, a tendency to neglect relevant cues, and the list goes on."

"Are you telling us that he crashed because he was fatigued? All of us were tired. Why should he have been different?" asked Captain Bill Jackson, the pilot member.

"No, I'm not saying that fatigue caused the mishap," said Major Brasfield. "But I am saying that the effects of fatigue which I outlined may have influenced the pilot's behavior during the mishap sequence."

"Let me go a bit farther," said Dr Andrews. "We know that the conditions were right for spatial disorientation that night, particularly during a turn to the west. It had already happened twice that we know of during these exercises. Just suppose that a combination of the desire to complete the intercept, coupled with a subtle form of spatial disorientation, led the pilot to mistake a light on the ground for the lights of the target F-16. The effects of his fatigue hampered his ability to recognize his mistake until too late."

"So, what can we recommend to correct the problem?" asked Colonel Samuels. Major Brasfield leaned back and thought for a moment, then said, "The Air Force is obviously going to have to continue to fly at all hours of the day and night and aircrews of all kinds, not just fighter pilots are going to be facing the effects of fatigue. There may be some design and engineering fixes which could help, but they are limited in application. At present, the only solution I see is crew knowledge. Aircrews must be made aware of the causes of fatigue, particularly the more insidious cumulative fatigue and the effects it can have on performance. The information currently available to aircrews is inadequate, although there is a lot available in medical literature. One thing we have to do is to find a better way to cope with fatigue as crewmembers. The medical community is working hard on this, but so far there are no breakthroughs."

Colonel Samuels pushed back his chair. "Well, gentlemen, it does not appear that we can resolve this problem today. I recognize that fatigue is a serious problem, but we don't have any solutions at present. I suggest that we adjourn and start fresh tomorrow morning."

The board members walked out of the room, still talking about fatigue and its effects, while half a world away: The clanging of the alarm clock seemed especially loud as it jolted Captain Terry Wilson from a sound sleep. The faintly glowing hands of the clock pointed to 0155 as he groggily pulled himself up and headed for the shower . . . ■

"Aerospace Medicine" Aerospace Safety . . .

WHO'S THE FLIGHT SURGEON?

LT COL DAVID E. PORTERFIELD, MC
Directorate of Aerospace Safety

■ The flight surgeon . . . who is he, how did he get here? When? What does he do? And where does he end up? Why isn't his "preventive medicine" responsibility better understood? What are some misconceptions about him? How does he have to adjust? How can you help him make a contribution to safety?

When I drive by the "Aerospace Medicine" sign on a hospital or clinic, I often wonder what the term means to the uninitiated. "Someone obviously practicing some refined aspect of healing arts having to do with those who have slipped the surly bonds of earth." Then I wonder what it means to the initiated. "Someone, obviously, who wants to find an interesting problem in *me!*" Or perhaps "one of those gates I have to pass through to get to another year of what I'm paid to do!" Or even, "That's where 'ol quackus aviatorus lives. I don't like hospitals, but he seems interested in us."

Hopefully, the flight surgeon is someone you know and consider in the latter light. That's what we hope for in a physician who will be asked to look after us. It might be helpful to understand who "flight surgeons" are in order to know a bit of what to expect. They have been a part of aviation since WWI and are really an important part of the safety team. They are called "surgeons" as a hangover from the days of military surgeons attached to cavalry units. (No cutting is done in the air, if you treat 'em right.) The name does not describe their primary responsibility — preventive medicine.

If the flight surgeon is recently graduated, he may have had an Air Force-financed education under the "Health Professions Scholarship Program" or perhaps at the Uniformed Services University at Bethesda. If so, he had some military exposure at least during the summer. If not, he may have had the "learn how to salute" orientation course of two weeks at Sheppard AFB, Texas, followed by the Aerospace Medicine

Program (AMP) Course at Brooks AFB, Texas, with or without intervening active service in some USAF medical facility. He is then launched into "Aerospace Medicine" and probably some local squadron environment for flying. The transition from the orientation of sophistication (designed to care for the seriously ill and to do research and training) to the demands of operational aeromedical support can be abrupt and requires adaptation.

Many flight surgeons have practiced in the civilian world and want the challenge of such a change of pace. Others who are in other USAF medical positions attend the AMP course to improve their knowledge of Air Force medical support and, hopefully, to improve medical readiness. Those physicians who choose to stay in flight medicine and enjoy it often enjoy family practice and the operational context. These find this type of practice stimulating while others who are "specialty" oriented may move on to other areas. Many specialists, however, return to or choose flight medicine, bringing that extra expertise with them.

The vast majority of what "patients" (that's you) experience is unsophisticated plain old "sickness." Primary-care oriented providers understand that. In addition to the specialty oriented I've mentioned, there are some physicians who employ a "holistic" approach essentially founded on good primary care. Some of these are flight surgeons or aerospace medicine specialists.

Aerospace medicine specialists are generally USAF residency trained and certified by the American College of Preventive Medicine. Their background includes the nine or more years of post high school education, some years of field flight surgeon experience, a masters degree in Public Health, and a least a year in residency training at the USAF School of Aerospace Medicine (the "RAM" Program). These physicians (a few more than 120) head "Aerospace Medicine" at base or command levels, hold other aeromedically critical posts, and are often responsible for such policies as those which guide flight medicine activities. Many of these have chosen to do this after "getting the bug" of flying and having the opportunity to work with a "patient" population consisting of aircrew members and their families. We are seeing more competition for this challenging privilege, and we can expect continued improvement in aeromedical support to match the increasing needs of you who fly more and more advanced systems. We will also see more "applied accident epidemiology" in the safety area.

Preventive medicine is, on the level of primary prevention, felt by some to be ignored in civilian medical practice. Third party payers do not support it, and so large corporate medical programs and military organizations are responsible for putting most primary preventive medicine into action. Flight medicine, with the multiple "additional duties" expected of the flight surgeon in environmental health, bioenvironmental engineering, and physical examinations and standards, *is* primary preventive medicine designed to ensure health and safety for you and your family. Secondary preventive medicine, consisting mainly of early disease detection and intervention, has been a major effort for all American medicine. The results have been impressive, though costly.

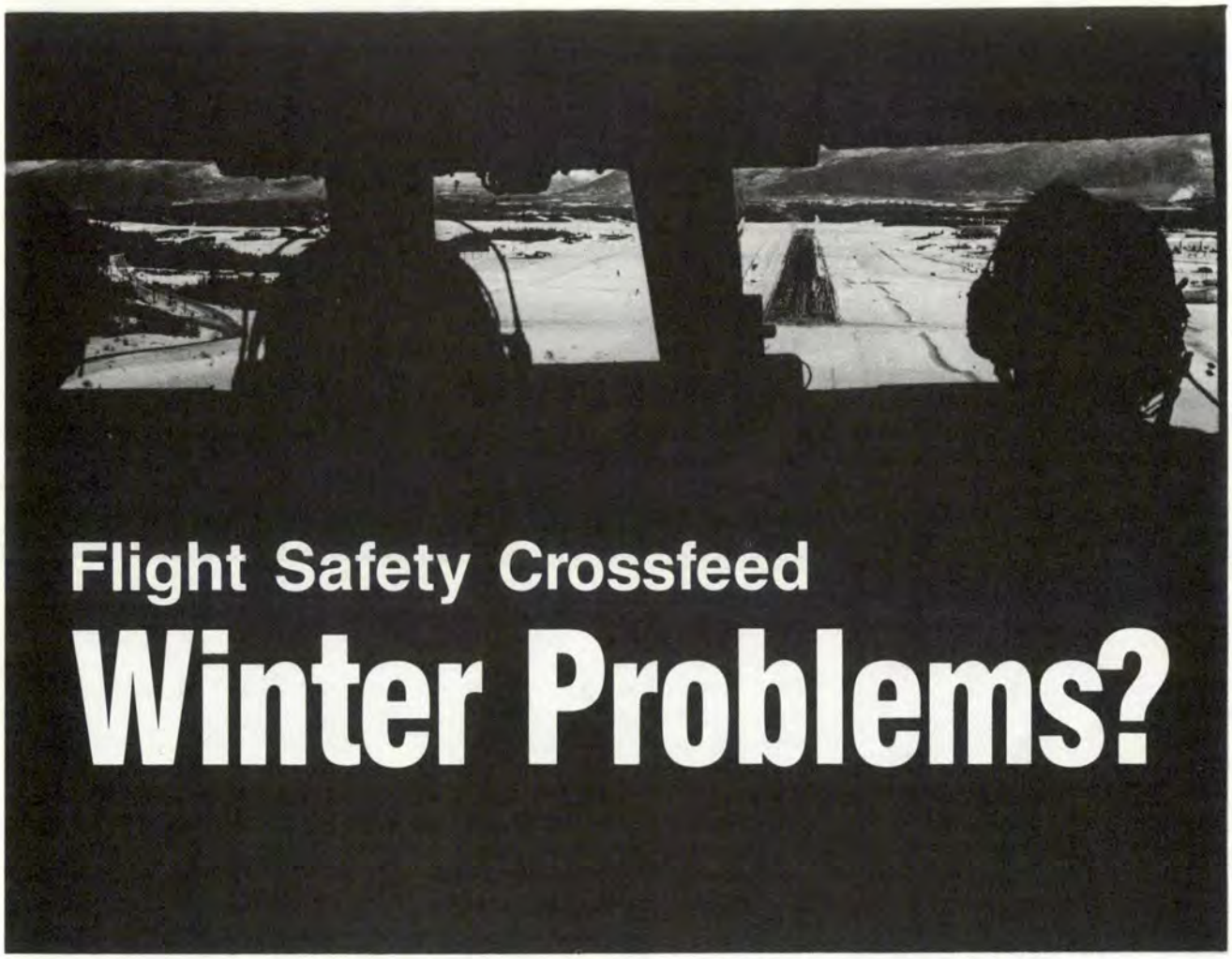
Nearly all flight surgeons enjoy taking care of the families and get to know them as your supporters. That is, in part, because they are from "primary care" orientations, and, in part, because Air Force families tend to be interesting, colorful, and stable. (Really!)

Don't forget though, . . . the flight surgeon who is new isn't about to admit he doesn't understand, but the transition into the squadron environment can be a big adjustment. He needs your help. He doesn't mean to be a spy; he is trying to learn what life is like out where you live, in the air or on the ground. If he doesn't ask, tell him anyway. (He will appreciate it even if he pretends to know.) Ask him questions. Don't wait for him to see you making an "over-the-counter" drug purchase at the BX or commissary before asking about that headache, cold, or backache, fatigue or whatever! (I've seen my "good friends" in that position.) He really is there to help you.

He may function in sick call under the illusion that *he* is deciding whether you should fly. *You* already decided that! Ask him questions so he will teach you how to make that decision most effectively. If he can speak (not read . . . speak), invite him to flying safety meetings. If he blows it, tell him how he can do better, and give him another chance. He knows a lot that would be useful to you. Let him educate you. After all, that's just what preventive medicine is. Nutrition, risk reduction, exercise, judicious use of medication, awareness of physiologic and sensory functions in the air, and the like are all examples of applied preventive medical education for you — the aircrew. That's true whether you get it at the club, on TDY, at the gym, or in a squadron briefing, during a doc's office visit, or at a flying safety meeting. Encourage him to spend more time in the squadron *and* the cockpit. Please remember him when get-togethers roll around too. That will be one of his better chances to get to know you. (Drag him out of you must!)

An increasing, but still small number of aircrew have decided to become flight surgeons. These folks are extra valuable, having been on both sides. Perhaps you can be one if you like (in five or six years of all your time)!

It may be repetition to some, but it's nice to know who the flight surgeons are, how they got where they are, when, and for how long. There have been some misconceptions about their role. For you, they are most importantly a source of valuable information. On the other hand, you can be the same to them if you look for the chance. ■



Flight Safety Crossfeed

Winter Problems?

MAJOR JOHN E. RICHARDSON
Editor

■ It's winter again! — Time for the flying safety officers and magazine editors to dust off those files of ice and snow horror stories. I was in the process of that very thing when the thought occurred to me that maybe there was more to the winter flying problem than just ice and snow. Oh yes, I know that snow and cold are problems. In fact, the article on page 6 of this issue addresses that subject. But, have we really identified the whole problem? Being somewhat skeptical, I decided to do some research. Fortunately, the Safety Center has an excellent source of information for such research. So on a nice hot smoggy day with the temperature at around 110 degrees, I decided to cool off by reading about winter mishaps.

An analysis of Class A and B mishaps for the past 10 years uncovered some interesting facts and trends. For the rest of this article, I will discuss the most important of these trends. Since this is an aircrew magazine, I will not cover maintenance or material mishaps. Those I will leave to the people who can affect those causes. Instead, I will look at the factors that aircrews and supervisors can do something about, the ones the Safety Center coded as "operations factor" mishaps.

One thing the analysis made clear immediately; the common causes of mishaps don't change much from season to season. We've heard about all of them before, but using the perspective of this analysis, we may be able to discern some trends. The analysis covered the months November through March for the years 1974-1984. Let us look at some of the more common mishap categories for those 10 years. One other point. This analysis looked at second level factors as well as the standard categories. To make the analysis more meaningful, I have separated the mishaps by these second level factors; therefore, the total numbers do not always match other published data categories.

Wait, before you say to yourself — oh no, not another statistical analysis and turn the page. I promise, no statistics this time. All I intend to do is show you some examples of the kinds of mishaps we have had during the winter. You can then draw your own conclusions.

It should not be a surprise that the most common category is Collision with the Ground.

I know, your immediate reaction to that bit of information is, so what? Airplanes hit the ground — that's what causes mishaps — that doesn't help me fly. I agree, but if we start looking behind that gross categorical description, we begin to find some more useful information.

One of the more familiar problems on the range and one closely related to collisions with the ground is pressing. Here is a typical example:

■ A singleseat fighter was part of a strike sortie. Just prior to the target, the flight received a simulated SAM launch signal. The flight turned to honor the threat, then the pilot of the mishap aircraft reversed his turn and started a shallow popup to attack a known target. The initial dive angle was about 50 degrees, and the pilot was unable to reduce this in time to prevent ground impact.

In this case, we don't know why the pilot did not recover or why he initiated the excessively steep dive. But in others, we can draw some more definite conclusions.

■ The pilot of this fighter was flying in an exercise following an extended layoff. He was also due for a Tac Eval which would include low angle popup deliveries. The pilot was not proficient in this event, yet planned the mission anyway. He made two clearing passes over the target. Then on the first hot pass, the pilot pressed well inside the normal pullup point and flew to an apex altitude well below that necessary for a successful attack. The pilot did not abort the attack and maneuvered the aircraft into a position from which he could not recover.

The range is not the only place we have had problems. In fact, there is one area in collision with the ground that is related to winter. That is the area of bad weather. Over the years, there have been many examples of aircrews getting involved in bad weather and hitting the ground still in control of a perfectly good airplane.

■ A flight of fighters was handed off to Approach Control for landing. The weather was deteriorating with rainshowers on the field and on final. The flight lead requested separate ASR approaches which were acknowledged by Approach Control. At this time, the runway supervisory officer checked in on Approach Control's frequency and advised the flight that the weather was getting worse. Although Approach Control had acknowledged the ASR request, the service provided was radar vectors to final only. Lead was directed to go missed approach when he did not have the field in sight at two miles. As he passed over the field on the missed approach, the pilot reported the field in sight and requested a visual pattern. After approval, he turned left to a tight downwind. As he turned final, the aircraft entered the clouds and rainshowers, emerging halfway around the final turn in steep left bank and a diving flight path. The pilot, seeing his predicament, selected afterburner and attempted a pullout, but the aircraft struck some trees short of the runway and was destroyed.

Although the common causes of mishaps don't change much with the seasons, winter does add some special stresses.

■ The flight was scheduled as an RF-4 single ship, day, low level mission. It was to be flown in conjunction with a locally generated practice exercise. Despite poor weather in the target area, the mission was launched.

The crew took off and flew to the target area above an undercast. They then used a low approach to an airfield near the target track IP to get below the clouds, and then proceeded to the planned route. After intercepting the route, the crew was forced to deviate approximately four miles south of track for weather. Shortly after turning to reintercept the planned track, the AC found that the weather ahead was too bad to allow continued flight in VMC. He decided to abort and started a 60 degree climbing right turn to remain VMC. After starting the turn, the AC realized that the aircraft would enter the clouds in the turn so he decreased both pitch and bank to enter the clouds in a reasonable attitude. Shortly after entering the clouds, the AC heard and felt a grinding and grating sound as the aircraft struck trees. He applied power, pulled the stick full aft, and ejected himself and the backseater.

■ A helicopter was launched on a search and rescue mission to locate and recover the pilot of a downed light aircraft. The weather in the search area, a mountain pass, was marginal, and the ground area was covered with fresh snow. Shortly after entering the search area, the helicopter crew spotted a red flare and landed near the ground search party which had located the crash site and the body of the pilot. The helicopter was tasked to bring the body out. Takeoff was delayed a short while due to poor visibility. Then, the first attempt had to be aborted because of a white out. A second takeoff was attempted but had to be aborted after a short time because of poor visibility and lack of ground references. A third attempt was made but the pilot became disoriented, began inadver-

continued

FLIGHT SAFETY CROSSFEED • **Winter Problems** continued

tent rearward flight, and froze on the controls. The aircraft's main rotor blades struck the side of a hill, then swept downward through the cockpit and the tail boom causing the helicopter to crash and burn.

A subset of the weather/collision with the ground problem is the instrument approach under low ceilings and visibility. This is not the VFR approach in IMC like the earlier example. Here, we are talking about the true instrument approach, precision or nonprecision, where for some reason the pilot doesn't make it.

■ A C-130 was making a PAR monitored ILS approach to an en route stop. As the aircraft passed the FAF, the controller transmitted to the aircrew visibility of ¼ mile and RVR of 2,200 feet (below Air Force minimums). The aircraft continued the approach, and at decision height, the pilot attempted to go visual. He continued the approach despite inadequate visual cues. The aircraft descended below glidepath and struck the approach lights 1,100 feet short of the runway.

■ A trainer had made an unmonitored ILS approach in snow and fog to his intended landing base. At decision height, the pilot could not see the runway and asked tower if the runway lights were turned up. Shortly after the tower replied affirmative, the pilot saw the runway ahead and to the left. He "S" turned to the left and back to the right to line up for landing. In the right turn, the right main gear hit the runway causing the aircraft to veer left. It departed the runway approximately 1,000 feet past the initial touchdown point.

■ A fighter was making an ILS approach in marginal weather at his home base. There had been unusually heavy snowfall, and the snow banks were piled high next to the runway. The pilot allowed the aircraft to drift left of course without correcting. In the reduced visibility from the bright approach lights and heavy snow, the pilot did not have the visual cues necessary to complete the landing. Nonetheless, he did not go around and impacted in a large snowbank off the left side of the runway.

The second most common type of mishap in our survey period is Loss of Control. Two secondary factors, both involving weather, are especially noteworthy. The first is quite understandably spatial disorientation. It can happen at any time.

■ A fighter took off from its home base on an instrument mission. Immediately after entering the clouds at about 900 feet, the pilot came out of AB and began the prescribed noise abatement climb schedule. The pilot felt that the aircraft was in a constantly increasing pitch attitude so he applied forward stick. The pilot could not sense any recovery until the aircraft broke out of the base of the clouds in an uncontrolled dive. The pilot ejected, and the aircraft hit 200 feet left and 4,800 past the departure end of the runway.

■ An F-4 departed on a single ship cross-country flight. The first leg was planned as an IFR departure, VFR low level, and IFR recovery. Shortly after takeoff, the pilot reported VMC and canceled IFR. While on the VFR low level, the crew encountered weather below VMC minimums. The pilot did not abort the route, and probably due to spatial disorientation, lost control of the aircraft in IMC.

■ A flight of two F-4s was scheduled for a BFM mission. Clouds restricted the vertical operating area

to the airspace below 16,000 feet MSL. The flight lead, therefore, restricted the engagements to military power. The mishap pilot was practicing defensive maneuvering against a gun attack. He performed a 6-G defensive turn followed by a break maneuver and an attempted reversal underneath as the attacker overshot. The attacker then lost the other aircraft in a cloud. During the break and dive recovery, the pilot stalled the aircraft too low for safe recovery and ejected.

The other factor involves supervisory inattention. By this I mean cases where IPs or squadron supervisors fail to consider the implications of pilot proficiency, weather, and other factors.

■ The pilot and aircraft were on a night target mission for intercept training. The mission briefed and flown was shorter than normal because the tip tanks did not feed during the previous flight.

After completion of the intercepts, the aircraft began recovery with a heavy fuel load including full tip tanks. Weather for recovery was 500 feet overcast with 10 miles visibility. The PAR at the recovery base was out so the aircraft was vectored to a TACAN approach to a downwind landing. The recovery and approach were normal until the aircraft broke out at about the missed approach point.

The weather was much lower than forecast. A fact which was known but not reported by other pilots on previous approaches. The pilot, seeing that the aircraft was not aligned with the runway, rapidly advanced the throttles to mil power and attempted to maneuver visually for landing. The asymmetric acceleration of the engines, aggravated by reduced aileron effectiveness from the full tip tanks, caused the aircraft to go out of control and crash.

■ A relatively inexperienced F-16 pilot was scheduled for a demanding mission. Shortly after completion of air refueling, the primary instrument lighting failed. Due to weather, the pilot elected to recover with a TACAN penetration to a precision radar final. During the final approach, the pilot did not follow the controller's azimuth instructions which resulted in a displacement too far left of the approach course for a safe approach. Rather than go missed approach, the pilot elected to go visual at two miles. Lack of instrument lighting and inadequate visual cues led the pilot to allow an excessive sink rate to develop during final approach maneuvering for alignment. The aircraft struck the ILS antenna 60 feet short of the overrun causing loss of hydraulic systems, loss of control, and forcing the pilot to eject.

What can we say about our conclusions from the analysis? Well, there are some special problems in winter. Bad weather is definitely a factor in many collision with the ground and loss of control mishaps. Unfortunately, the influences of weather are often more subtle than we realize. In most of the mishaps we discussed, the weather was not totally unmanageable; the crews just were not prepared for it. In the lazy, hazy days of summer, it is easy to forget the hard, cold, foggy days of winter and let our instrument proficiency slip.

There are other winter problems — wet runways, aircrews flying when sick or under self medication, and some problems that are always with us — like midair collisions. But these problems are best left to future articles. ■

I Thought I Knew What You Thought I Said

MAJOR JAMES M. TOTHACER
Directorate of Aerospace Safety

■ The English language is a funny thing. Sometimes you say something you don't mean only to discover what you said was understood by someone else to not be what you thought you said. On the other hand, even when you have said what you meant to say, somebody understood what they thought you meant to say and not what you said at all. And sometimes, things get downright confusing.

How far along in your flying career were you when you first heard the story about the copilot who was really in the doldrums one day? On takeoff roll, the aircraft commander, in an attempt to lift his copilot's spirits, told him to "cheer up." As the aircraft skidded to a stop on its belly, the copilot swore he heard the AC call for "gear up."

Never happen in real life, you scoff? Just an anecdote to emphasize a point, you say? Well, let's look at some real life occurrences.

At an out base on a cross-country mission, a dual aircrew experienced considerable delay prior to taxi. Because of the delay, the crew elected to refigure their takeoff and landing data (TOLD) while taxiing to the active. A radio call was made to ground control requesting temperature and pressure altitude. When ground returned the call, the frontseater said, "I've got it" over the intercom. The backseater, who was taxiing the aircraft, assumed the frontseater had taken control of the aircraft (the frontseater really meant he would compute the TOLD). Both pilots were now focused on figuring TOLD while the aircraft took the bit in its teeth. The now uncontrolled aircraft departed the hard surface. The aircrew looked up in time to shut off the engines just as the aircraft rolled onto the grass. Luckily, no damage was done — save maybe to the pilots' egos.

In another recent happening, a front canopy opened rapidly and departed a taxiing aircraft when the canopy handle was moved to the unlocked position. The Dash 1 for this aircraft contains information about checking the cabin pressure before opening the canopy. Specifically, if the cabin altimeter reads below field elevation, the cabin pressure switch should be placed to the RAM DUMP position. The cabin altimeter was checked by the inexperienced frontseater, and he reported to the backseat instructor that the cabin pressure was "down." The instructor pilot interpreted this to mean the cabin altimeter read field elevation, and thus it was safe to open the canopies. There was no discussion of what the cabin altimeter actually read. Post mishap investigation revealed the reading was below zero with a field elevation of over 1,000 feet.

How about the infamous orientation ride a few years ago? It seems the individual receiving the orientation ride was briefed on the ejection seat and, referring to bailout, was told, "If we have to get out, we'll pull these handles." The orientation ride was wholly uneventful until it came time to exit the aircraft. After engine shutdown, the pilot conducting the orientation ride said to his passenger, "OK, let's get out," and looked away momentarily to perform cockpit duties. Meanwhile, the orientee, somewhat unsure of the functions of the ejection seat but taking the pilot at his word, raised the handles and squeezed the triggers. As advertised, the seat went up the rails and deposited the occupant on the concrete flight line. Amazingly, no significant injuries were incurred, only minor bumps and bruises.

We could go on and on with stories like the fighter aircraft that entered a spin, and while the backseat instructor called for "chute, chute," the frontseat pilot was frantically searching for exactly who he was supposed to "shoot." All these scenarios reinforce the importance of proper communication. If you remember the children's party game where you whisper a phrase and then pass it on to the next child until it goes completely around the room, you will remember just how unrecognizable a phrase can become after a little personal interpretation.

Communication is difficult enough in a static environment, and it is further complicated by the fast-moving, dynamic environment in which we operate jet aircraft. The potential for disaster looms ominously large whenever aircrews fail to communicate effectively. Flying is too unforgiving an occupation to take anything for granted. Don't substitute assumption for clarification. ■

A Winter Tale

MAJOR JOHN E. RICHARDSON
Editor

■ There can be a lot of difference of opinion about the real hazards of winter flying. As is noted in another article in this issue (page 18), many of the flying safety problems are the same year round. However, there are some unique difficulties associated with winter. This story is about one of the more common.

It had been a typical B-52 mission — 9+15 with air refueling, low level and termination with a straight-in full stop landing. The mission had gone well with no deviations or aircraft malfunctions. When the aircraft commander requested clearance for descent and approach, he was informed that the RCR was slush on runway, and snow removal equipment was working. The AC remained at altitude to conserve fuel since the aircraft was approaching diversion fuel limits.

Meanwhile, the SOF was on the runway checking conditions. He was concerned about the snow, two scheduled bomber recoveries, and an alert force exercise scheduled to begin in about 20 minutes. The SOF observed that the snowplows had cleared the center of the runway about 25 feet either side of centerline. At that time, the snowfall was about one inch per hour. The SOF determined that the RCR was 15 with loose snow on the runway for the first 8,000 feet and 08 for the last 4,000. The SOF did not mention slush in his report. Meanwhile, the Chief of Airfield Management was also taking runway readings. He reported that the entire runway was covered with slush, but, because the SOF's report was filed first, that became the official RCR report which was passed to the tower.

The aircrew had also heard the SOF's report over the radio and proceeded to set up for the approach. The AC briefed the crew on slippery runway landing procedures, and the aircraft was vectored to a 12-mile final. At this time, the vice wing commander advised the crew over the radio of the impending exercise and to plan accordingly. At six miles, the aircraft was given a restricted low approach due to exercise initiation. The AC immediately informed the Command Post that any significant delay would require diversion. The aircraft had only 4,000 pounds of fuel above diversion minimums. The crew was told to expect approach clearance in nine minutes. The aircraft went back out to a 15-mile final and, three minutes prior to the expected clearance time, the AC was cleared for the approach with an RCR of "LSR 25 feet ESC, RCR 08 remainder." The crew had been listening to the Command Post frequency and understood this to mean an RCR of 8 for 25 feet either side of centerline and 6 for the remainder of the runway.

The aircraft broke out at 400 feet AGL with good visibility. At 2NM, the AC saw the runway environment and established a stable glidepath aligned with the sequential flashers. In the flare, the crew was able to see the runway in the landing lights, but the snow on the runway obscured the pavement and centerline. The AC was forced to complete the flare and landing looking at the side of the runway for alignment. The pilots believed that they were on centerline at touchdown, based on their estimates of the distances from the runway lights

continued

A Winter Tale continued

(there was no centerline lighting at this base).

The aircraft touched down smoothly, on speed, and, at 100 knots, the pilot tried the brakes. The crew felt no deceleration or antiskid cycling. The pilot released the brakes and, noticing that he was slightly left of centerline, tried to correct with rudder. There was no response, so he added more rudder and reapplied the brakes. There was still no response, and the aircraft kept moving left, so the AC shut down all but two engines. When it became obvious that the aircraft would leave the runway, the pilot neutralized the rudders to prevent a violent maneuver as the aircraft left the pavement, and about 15 seconds after touchdown, the B-52 departed the runway at the 4,000 foot marker. The aircraft immediately slowed, and the crew was able to stop the aircraft without damage.

The investigators determined that the runway was covered with a half-inch of slush, with larger chunks along the edges where they had been thrown from the snow removal operations. The aircraft had landed at a speed which was very vulnerable to dynamic hydroplaning. This, plus the lack of runway references, allowed the pilot to land some 30 feet left of centerline, with a slight left drift. It was this combination which made the runway departure inevitable.

But, there were several other factors which complicated the pilot's problem. First, he was under some pressure to get the aircraft on the ground. After a 9+ hour mission, the prospect of a lengthy divert was certainly not appealing. And, based on the information available to the crew, they had no reason to doubt their capability to make a successful approach and landing at home base. The additional pressures of the changes during the approach due to the exercise and the delay that entailed, made it probable that the pilot did not really have time to fully consider the lack of good information about the runway condition. Then, there was the problem of the RCR readings. Both the SOF and the airfield manager took readings. The SOF, being relatively inexperienced in winter operations, failed to fully consider the impact of the snowfall and the slush on the runway. This would not have mattered if a communications foulup had not prevented the report of the much more experienced airfield manager from reaching the aircrew.

". . . the pilot neutralized the rudders to prevent a violent maneuver as the aircraft left the pavement . . ."

There are no right and wrong answers in this mishap. At least not in the sense that we normally look for after a mishap. But there are some lessons to be learned, or relearned. Mission pressure, get-home-itis, lack of experience, and poor communications all combined here. No one made any big mistakes or violated any rules, but a collection of "little things" all came together at the wrong place and the wrong time. The result — an occurrence which could have been far more serious. How are things on your base? Are you really ready for winter? ■

OPS TOPICS

Shale-Derived JP-4 Fuel Begins Operational Validation

■ F-111s and transient aircraft at Mountain Home AFB, Idaho, will begin filling up late this year with JP-4 fuel derived from oil shale rock. F-16s and other aircraft at Hill AFB, Utah, will follow suit early in 1985.

Use of shale JP-4 fuel marks the beginning of a two- to four-year Air Force operational validation phase. Air Force Chief of Staff Gen Charles A. Gabriel approved this phase July 9, and it will be managed from Air Force Logistics Command headquarters at Wright-Patterson.

Operational development follows an extensive program by Aeronautical Systems Division to develop and test shale JP-4 as an alternative fuel source. Air Force Systems Command was tasked to assess acceptability of shale JP-4 from quality assurance, performance, system safety, and environmental and health considerations. ASD's Air Force Wright Aeronautical Laboratories recommended that the validation phase proceed after completing a comprehensive assessment of ASD's test and evaluation program which concluded the fuel was acceptable for operational introduction.

Shale-derived fuel is slightly more costly at present than conventional fuel, but because estimates of U.S. oil trapped in shale rock are as high as one trillion barrels, the Air Force has been investigating it with the long-range goal of ensuring acceptable quantities of JP-4 in the event of a petroleum shortage, as well as providing an excellent opportunity for the United States to become less dependent on foreign crude.

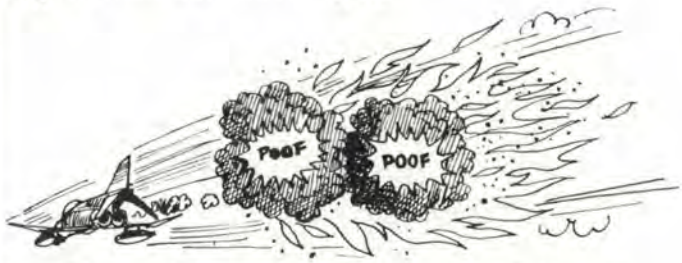
As with conventional JP-4, shale JP-4 is a mixture of heavy naptha and kerosene, has a maximum freeze point of minus 58 degrees centigrade, and contains additives to control corrosion, lubricity, oxidation, icing and bacterial growth.

Sufficient quantities of JP-4 were refined from crude shale oil to conduct ground tests to determine any adverse effects to the engine or fuel system prior to operational testing. An F-111 engine, the TF30, was operated with shale derived JP-4 in the laboratory's sea level engine test stand for the equivalent of almost 1,000 flight hours. The engine then was dismantled at the Oklahoma City Air Logistics Center and thoroughly inspected to ensure there were no adverse effects from the use of the shale fuel.

Tail Scrape

After touchdown, an F-15 pilot habitually went to 15 degrees of pitch on the HUD while aerobraking. There were 5 knot gusts reported with a 90 degree crosswind. Shortly after the 15 degrees pitch attitude was established, a wind gust raised the right wing.

The pilot was unable to correct in time to prevent the tail cones from dragging.



Dual Engine Flameout

An F-4 was making an FCF mach run at 40,000 feet. The crew noticed that the ramps had not started to schedule by the time the aircraft reached 165M. The pilot started to ease the throttles out of AB when the CADC failed. As the throttles came out of AB, both engines stalled and flamed out.

The pilot managed to get the right engine relit by about 35,000 feet. The left engine took four tries before it lit at about 21,000 feet. The remainder of the approach and landing was successful.

continued

OPS

Surprise, Surprise!

It's almost time for snow removal again, so a reminder of something which happened last year is in order.

An aircraft was cleared to land on a runway at a northern base. The pilot was advised of "loose snow on the runway." Snow removal operations in progress were interrupted to allow the aircraft to land. Imagine the pilot's surprise when the "loose snow" turned out to be between 8 and 15 inches of snowplowed banked-up slush. The failure to follow Air Force procedures for snowplowing and failure to communicate the real runway condition to the pilot were real contributors to this mishap.

The people involved in the various operations on the ground were not talking to each other and so vital information was not passed to the pilot.

ASD Awards INEWS Definition Contracts

The Aeronautical Systems Division has awarded contracts totaling nearly $15 million to five teams of electronic firms to develop an integrated electronic warfare system (INEWS) for future Air Force and Navy combat aircraft.

The INEWS joint venture teams are tasked with defining a generic, next generation electronic warfare system to be integrated with other systems in future combat aircraft. It will give combat crew members a timely attack warning and automatic countermeasure response and will include detection and countering, or confusion, of hostile weapons-associated emitters or sensors operating anywhere in the electro-magnetic spectrum.

The program is structured into three phases. The first will include two subphases: (1) concept definition investigation and (2) advanced engineering development coupled with preliminary full-scale engineering development. The total phase one effort could last about four years. The second phase will be full-scale development, and the third will be production.

A joint venture team, composed of several aerospace companies will be selected for full-scale development. Finally, these companies will compete with each other for full production of the system which is anticipated in 1993.

Birdstrike!

While on a terrain masking profile at 300' AGL and 180 knots, the copilot of a C-130 saw a large bird maneuvering up and to the right of the aircraft. The bird appeared to be moving rapidly away from the aircraft, and the crew lost contact with the bird until it struck the center of the copilot's windshield.

The impact cracked the outer panels of the center and copilot's forward windshields, causing the inner panes to implode into the cockpit showering the crew with glass fragments. Both the copilot and flight engineer were cut by the flying glass; however, the crew was able to recover safely at a nearby base.

TOPICS

SEE and Be Seen

The pilot of a T-37 was cruising at 5,000 feet on an IFR flight plan, but in VMC. Approaching his next fix, the Tweet pilot saw two A-10s, 12 o'clock, coaltitude, heading toward him. He made a hard evasive turn to avoid the A-10s. The A-10 lead later stated that he saw the T-37, but did not think there was a problem.

Investigators partly attribute the A-10 pilot's failure to perceive the conflict to the small size of the T-37. Compared to the A-10, it looked much farther away. The T-37 is about the same size as many general aviation aircraft.

Those "bugsmashers" are nowhere near as maneuverable as a Tweet. Let's not have any more midairs.

They're *Still* Out There

The pilot of a B-52 was making an en route descent to an ILS final at a midwestern base. Approaching 13,000 feet, the center controller advised the crew of traffic at 12 o'clock, 13,000 feet, 10 miles.

As the copilot acknowledged, the pilot made a hard left turn to miss a tan, twin engine civilian aircraft at 13,000 feet going in the opposite direction.

The center tapes show that there was traffic at 10 miles, but no indication of anything closer. The civilian aircraft could not be identified.

Blown Tire

An F-4 suffered utility hydraulic failure, so the pilot brought it back home for an approach end arrestment. Everything went well until shortly after the hook caught the cable. At that time, the right main wheel locked and the tire blew.

On landing roll, the pilot asked the WSO to pull the emergency brake handle. Then the pilot, after barrier engagement, applied enough pressure on the rudder pedals to lock the brakes and blow a tire.

Cabin Pressure Lost

The pilot of a CT-39 took off for a flight to a southern base. During the climb check, the cabin pressure altimeter indicated that the pressurization system was operating. At about FL 210, both crewmembers began to feel dizzy.

A check of the cabin altimeter showed it indicating an altitude of 21,000 feet. The crew went on oxygen, declared an emergency, and returned to base.

There were three separate failures in the cabin pressure and oxygen systems that led to this mishap. ■

MAIL CALL

EDITOR:
FLYING SAFETY MAGAZINE
AFISC (SEDF)
NORTON AFB, CA. 92409

"Surviving in the Aviation Jungle"

I just wanted to let you know I think Captain Greg Trebon's article, "Surviving in the Aviation Jungle," (June, 1984, *Flying Safety)* is one of the most outstanding discussions of flying in the general aviation environment I've ever read. Greg's explanation of the airspace and of civilian VFR rules was clear and logically organized, and the resulting impact on military operations was especially well developed.

As an A-10 pilot and occasional light plane driver, I have a fair amount of experience operating VFR in and amongst the general aviation environment, and Greg's article contributes much to understanding that "jungle." I think every military pilot who operates VFR should read and heed it.

Keep up the good work!

Captain Jerry Sink, USAF
APO San Francisco, CA

We published a couple of complimentary letters about Captain Trebon's article in our Mail Call feature in the September issue. Here's another one.

We appreciate your comments and the feedback on our articles. Keep those cards and letters coming!

Subscriptions

I have been retired for 19 years from the Air Force and still enjoy reading your *Flying Safety* magazine while at the McClellan AFB Health Clinic. Is it possible that I could subscribe to your publication? Reading your magazine felt like I was still a crewmember and active with the Air Force mission. Thank you.

MSgt George A. Farias, USAF (Ret)
Sacramento, CA

Thanks for your letter. We really appreciate hearing good words about Flying Safety.

The magazine is available on subscription through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for $26.00 per year, domestic.

"Fighter Pilot Survival Kit"

Thank you for the consistently high standard of article to be found within the covers of your magazine. We may be mostly ex-Air Force in this corner of the profession, but the messages are inevitably both relevant to the operations we supervise and timely, yes, always timely! The piece by Colonel Rost (Fighter Pilot Survival Kit," March 1984) — the most recent number to hit my desk — was particularly appreciated. . . .

R.J. Marchant
Narrabundah, Australia

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Robert Hawvermale

FIRST LIEUTENANT
James C. Long

STAFF SERGEANT
Glenn J. Davis

STAFF SERGEANT
Dean F. Larsen

601st Tactical Air Support Squadron

■ On 16 March 1984, Lieutenants Hawvermale and Long and Sergeants Davis and Larsen were on the first leg of a cross-country flight in a CH-53. They were cruising IFR at the base of a cloud deck in and out of scattered clouds at FL 080 when the aircraft began picking up trace ice each time they entered a cloud. Upon entering another cloud, they encountered heavy snow showers and additional icing. Immediately after requesting a 180 degree turn and descent to exit the area, they saw a bright flash to the left of the aircraft. This was accompanied by a loud bang and violent aircraft buffeting. The number two generator dropped off line and the numbers one and two servo-out caution lights illuminated, accompanied by the overhead servo fail advisory lights. Lieutenant Long reset the master caution and servo fail advisory panel lights and set the transponder to emergency. Sergeant Larsen reset the generator, lowered the landing gear, and started the auxiliary power plant. Lieutenant Hawvermale maintained aircraft control and descended while making a Mayday call to the local controlling agency. Sergeant Davis scanned the left side of the aircraft to monitor the tail rotor, which they suspected had been damaged. During the descent, vibrations were severe enough to shake several flight instruments from the instrument panel. HF, VHF radios, and RHAW gear, mounted in gimbals in the rear of the aircraft, tore loose and fell to the cabin floor. The aircraft broke out of the clouds at 2,500 feet, and the crew began looking for a suitable clearing in the forest below. Lieutenant Long kept Lieutenant Hawvermale informed of airspeed, altitude, and descent rate, although the flight instruments were almost unreadable due to the severe aircraft vibration. Lieutenant Hawvermale successfully executed a power on landing on a 10 degree left slope among numerous tree stumps in a recently logged area. Post flight inspection revealed the CH-53 had suffered a lightning strike, resulting in the loss of 75 percent of one rotor blade and damage to another. The quick thinking, superior airmanship, and exceptional coordination demonstrated by this crew resulted in the safe recovery of the crew, passengers, and aircraft. WELL DONE! ■

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