flying

SAFETY

APRIL 1981

IN THIS ISSUE

THERE I WAS

■ Throughout my flying career, from the classes at physiological training to the war stories at the bar and the squadron, I had heard of the serious problems which could result from flying with a cold or congestion. I was even a believer, having ended up with a two week DNIF period, following a rapid descent in T-37's. My problem was my belief that all the trouble always occurred on descent.

My flight began as a routine out and back. Bad weather further complicated matters and I ended up with an unscheduled RON. During the evening, I had a minor ear block which subsequently cleared. I decided to make the return flight at a low altitude to preclude any problems on descent. The weather was great, 15 plus miles vis and no ceiling. I had my "emergency bottle" of decongestant just in case. I filed for an altitude of 5,000 and was cleared to 7,000. My cabin pressure never exceeded 4,000. On climb-out, my ears cleared by themselves although I did have a little difficulty. When I leveled at 7,000 I was in for a rude awakening. I had the worst case of disorientation I had ever experienced. I could not focus very far out of the aircraft. Center called opposite traffic, but I could not see far enough to clear. I informed my WSO that I had a case of vertigo, but I never told him how bad it was. I stayed on instruments until I made my first turn on course and then I engaged the autopilot. I sat upright and tried not to move my head very much. It took almost 20 minutes for the disorientation to pass. I made a slow descent to a straight-in and had no problems. The landing was uneventful.

Hindsight is always 20/20. I guess I was lucky I didn't have to descend immediately for any problems. A "war story," maybe; but a definite lesson learned. If the old body isn't 100 percent, keep it on the ground where it belongs. We don't need aircrews flying "partially mission capable."

Thanks to the author. A similar situation, in single place aircraft, in weather, immediately after takeoff could have ended in a much different way. You could end up non-mission capable. Thanks.

With six to ten personnel on board a B-52 and all of those very explicit checklists, it is impossible to land a B-52D gear-up. Or is it?

With the current emphasis to reduce fuel consumption, we have gone to flying VFR and IFR patterns gear-up and extending the gear when turning base. A recent checklist change will help the situation; however, about a month ago I came very close to a gear-up touch-and-go while shooting transition at Kelly AFB (not my home drome).

It was a student number 2 CCTS training mission with the student CP in the right seat and the IP (me) in the left seat. The student CP did not have it together at all, so much verbal instruction was in progress.

The vectors to an ILS final were like a trip to Grandmother's house, and we really never had a base leg. By some quirk, we ended up on final with the wheels still in the well. I am quite sure I had reported *gear checked* to the tower at the FAF; however, they were still up.

The student pilot was in the IP position. At approximately 300 feet AGL the student RN commented that he couldn't see the forward gear in the optics and asked if they were down or up. Needless to say, this got the ball rolling in the right direction, and a go-around was initiated. Kudos to the student RN. DBUS modification to the B-52D will remove the optics from the aircraft. Crews beware, and stay alert. Listen up for "gear down."

This sort of thing probably happens more than any of us want to believe. Offer thanks for an alert student RN. ■

Brig Gen Leland K. Lukens
Director of Aerospace Safety

UNITED STATES AIR FORCE

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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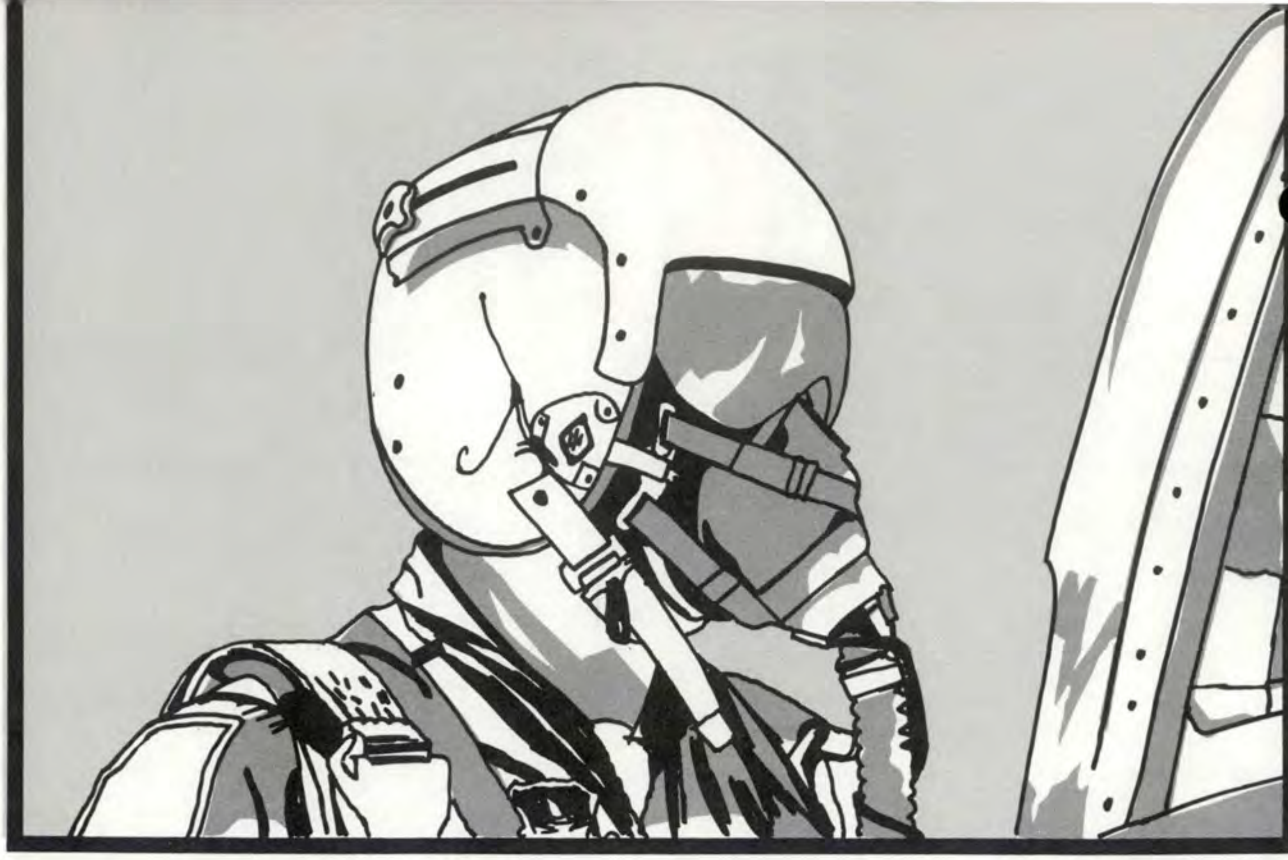

How do we prevent 'DUMB ACCIDENTS?'

COLONEL JACK HAZLETT, JR.
Directorate of Aerospace Safety

■ As Chief of the Flight Safety Division at the Air Force Inspection and Safety Center, I have the following quote hanging on my office wall:

> "We should all bear one thing in mind when we talk about a troop that rode one in. He called upon the sum of all his knowledge and made a judgment. He believed in it so strongly that he knowingly bet his life on it. That he was mistaken in his judgment, is a tragedy, not stupidity. Every supervisor and contemporary who ever spoke to him had an opportunity to influence his judgment, so a little bit of all of us goes in with every troop we lose – Author Unknown"

My job is to prevent flight mishaps – all kinds of flight mishaps. Of our 81 Class A flight mishaps in 1980, over 50 percent were operations factor mishaps. I firmly believe that the USAF has gathered the best pilots in the world flying the best airplanes in the world. We select those pilots, we train those pilots, we design the mission tactics, and we commit and schedule our pilots to fly those missions. Our pilots accept all that and try to the best of their ability to complete that mission. They make mistakes, and some of those mistakes are fatal because many times we fly in an environment that will not tolerate a mistake. Those are not "dumb accidents." Then what are?

I believe there are two kinds of operator-factor mishaps – pilot error and pilot caused. The type I mentioned above is a pilot-error mishap. Most of these can be prevented by developing sound tactics, selecting pilots wisely, providing the best training possible, and scheduling the most experienced for the most difficult. When that is all done, we instill in our pilots the philosophy that although mission accomplishment is paramount, the mission is never accomplished unless the aircrew and the airplanes are returned safely to fight again another day. Therefore, safety awareness is an integral part of each mission.

Awareness will not prevent all pilot-error mishaps. Some are caused by human design deficiency. "See and avoid" will not work when two aircraft are on a collision course at 1200 kts closure speed. Neither pilot will see the other prior to impact. Other elements in our system must work to prevent those.

Now, how about pilot-caused accidents? I define these as cases where unreasonable action or inaction on the part of aircrews and/or supervisors results in a tragic mishap. Here are some examples from our 1980 experience: Two observation types flying unauthorized low-level, air-to-air tactics, and one of them hits the ground. A tactical airlift crew buzzing a friend's orchard when a malfunction occurs from which they cannot recover because of their extremely low altitude. A trainer with an IP on board allowing his student to pitch tight, misidentify the landing runway, and then stall in the tight final turn. A tanker crew neglecting to turn on the aircraft hydraulic systems and running into a blast fence because they have no brakes or nose wheel steering. A couple of fighter pilots who, because of poor system knowledge, lost their airplanes when they failed to cope with relatively minor in-flight system malfunctions. These people were not "dumb," but their judgment, discipline, and professional airmanship are certainly questionable. Circumstances like those are as close as I can come to identifying a mishap as a "dumb accident."

How do we prevent them? The guy with his hands on the controls has to prevent them. Supervisors also have a critical role, and the first guy in the chain is the flight lead or aircraft commander. Then comes the flight commander, ops officer, squadron commander, and on up. They must know their people, their capabilities, and their attitudes. They must establish an atmosphere within their organization that leaves no doubt that all are expected to prepare themselves professionally and execute their missions with integrity and discipline. There can be no tacit approval of corner cutting and expediency to get the job done. It is a proven fact that most people will perform the way they think they are expected to perform. If we demand professionalism, good airmanship, and flight discipline, we will get them. No one said it would be easy. Training to be the best never is. ■

Alert C-5 Crew Saves Dutch Crew

Back row, left, Maj Frederick C. Bok, Maj David H. Comstock, Capt Laurence R. Klingbeil, Maj Edward M. Colwell, TSgt William R. Wyman, MSgt Gerald P. Land, SMSgt James B. Grose, A1C Anthony B. Bastone, and MSgt Stephen R. Pennypacker. Front row, left, TSgt Larry D. Davis, MSgt Michael J. Sandor, TSgt Edwin R. Sullivan, TSgt Judson L. Carnahan, A1C Donald A. Byrom, and Amn David D. Davis. One crewmember, SSgt Robert E. Mauro, was not available for the photo.

■ This crew of a Dover AFB-based C-5A helped save the lives of nine crew members of a Dutch aircraft down in the Atlantic. The Dutch aircraft assigned to the Royal Netherlands Naval 321st Sq., went down on January 15 off the coast of northern Ireland, in typical Atlantic winter weather: cold, stormy, low visibility. The C-5A aircraft commander, Maj Frederick Bok, diverted from a Rhein Main-to-Dover flight when the crew received a message on the downed Dutch aircraft. Major Bok descended from 35,000 to 1,500 feet and flew a search pattern until the Dutch crew was found. Major Bok then contacted a ship they had seen and directed them to the downed crew. Of 12 crewmembers, nine survived. Members of the C-5A crew are assigned to 709th MAS, 512 MAW (Associate) at Dover AFB. ■

Photo and text provided by TSgt Terry L. Shay, 436 MAW.

Helicopter Icing Hazards

■ Traditionally, helicopter operating manuals have addressed the issue of in-flight icing and its effect on helicopter performance by "CAUTIONING" or "WARNING" the pilot to avoid the icing environment. Such restrictions and limitations were at one time acceptable when helicopters were viewed as aircraft operating primarily in visual meteorological conditions (VMC). Since early helicopters lacked the equipment and sophisticated systems normally employed for flight in instrument meteorological conditions, there was little justification for expending time and resources on helicopter icing research and development.

Modern helicopters have expanded the traditional concept of operating only in VMC and today routinely perform a broad range of tasks under instrument flight rules and marginal VMC. It is this expansion of the helicopter's operating envelope that compels a more thorough and comprehensive understanding of the hazards associated with in-flight icing.

Hazards of In-flight Icing

The risks associated with flight in subzero precipitation or moisture have been known since the pioneering days of fixed wing flight. Typically, we have characterized icing problems by their effect on lift, drag, weight and thrust. It is readily accepted that in-flight icing reduces thrust and lift and increases drag and weight, all to the detriment of an airplane's performance.

Rotary wing aircraft also suffer from these effects when exposed to icing conditions and, in addition, are susceptible to various complications that are *not common* to fixed wing aircraft. Although many questions remain to be answered regarding helicopter icing and its impact on aircraft performance and mission effectiveness, researchers are beginning to uncover significant insights into this facet of rotary wing development.

The rotor blade icing process on helicopters and its subsequent effect on aircraft performance cannot be analyzed in the straight-forward manner used to explain ice accretion on the leading edges of an airplane's wings. Spanwise elements of a rotor blade, unlike the leading edges of a airplane's wing, move through the air at various airspeeds. Rotor blade

ARTHUR J. NEGRETTE

icing is made even more complex by the constantly changing angle of attack experienced by the helicopter's main rotor blades in normal forward flight. These obvious and unique characteristics of the helicopter's lifting system, combined with other not so obvious characteristics such as differing surface temperatures along the blades' spanwise sections and smaller airfoil thicknesses, tend to make helicopter rotor blade icing more complex and extremely hazardous.

A major hazard associated with rotor blade icing is the deterioration of normal autorotational qualities. The adverse effect of main rotor icing on autorotational performance was documented during artificial and natural icing tests conducted by the U.S. Army in the mid-1970s. A major finding was that moderate ice accumulation (about one-half inch) on inboard portions of the UH-1H Huey rotor blade, and similar type aircraft, was sufficient to preclude a safe autorotation in the event of an engine failure. In some cases, as little as one-eighth inch of ice over one-third of the blade span was sufficient to seriously deteriorate autorotational qualities by causing a loss of 22 rotor revolutions per minute (rpm) during autorotation at 70 knots indicated airspeed (KIAS).

Deterioration of normal autorotational rpm results from ice accumulation in greater amounts near the inner portions of the rotor disc which directly affects the blades' efficiency with respect to upward airflows during autorotation.

The reported result is that with about one-half inch of ice on the main rotor blade's inner portion, minimum (safe) rotor rpm *cannot* be maintained during autorotation.

Pilots of rotary wing aircraft should not attempt to judge or estimate main rotor blade ice accumulation by observed buildup on the windshield or other parts of the aircraft, since icing occurs at an accelerated rate on the rotor blade as compared to accumulation on the fuselage. A more reliable method for monitoring the buildup of rotor blade ice on UH-1 type aircraft is to compare power requirements after the formation of in-flight ice to power settings prior to ice detection. Researchers indicate that blade icing of one-half inch or greater on the UH-1 will be accompanied by a 5 to 6 pounds per square inch (PSI) torque increase over the "before" or "no ice" power requirement. More generally, icing tests conducted in the United Kingdom document cases where significant autorotational rpm deterioration occurred with only a 6 percent power increase over the "no ice" power requirement.

Helicopter pilots should remember that even small buildups of ice on the main rotor blades can deteriorate significantly the available autorotational rpm to a level where safe landings cannot be assured. When in-flight icing occurs, most of the damage to autorotational performace is done by the initial ice accumulation, i.e., the first one-fourth inch of ice on the rotor blade. For helicopter pilots, this means that every encounter with icing should trigger an expanded cross-check with careful attention to power settings. If continuous increases in power are required to maintain altitude and airspeed, there is reason to suspect that autorotational rpm has been compromised and the icing environment should be left quickly. If the accumulation of rotor blade icing deteriorates autorotational rpm, then it would seem that the shedding of rotor blade ice would be welcomed. In-flight shedding of rotor ice can and does occur; unfortunately, it is as likely to create a problem as it is to relieve one.

Symmetrical (affecting all rotor blades simultaneously in the same way) shedding of ice in flight can be beneficial by restoring the rotor blades to a more efficient or clean configuration and by reducing the weight of the aircraft. Asymmetrical shedding (affecting less than all of the main rotor blades), however, can create extremely severe vibrations depending on the amount of ice discharged, the type of rotor system and other factors. The severity of these vibrations is documented by experimental test pilots engaged in conducting natural icing studies with helicopters. Their reports identify numerous occasions when in-flight icing tests have been aborted because of main rotor blade icing and subsequent asymmetrical shedding which caused vibrations so severe that it became all but impossible to read the instrument panel.

The severity of vibrations resulting from asymmetrical shedding of rotor ice are generally

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Photograph by AAVS

Helicopter Icing Hazards continued

thought to be a function of the unbalanced weight of the rotor system and therefore may be expected to be greater for two-bladed and three-bladed systems than those rotor systems employing four, five or more main rotor blades. Pilots can expect the vibration levels caused by asymmetrical shedding to decrease with an increase in the number of main rotor blades (for a constant rotor mass) since the imbalance represents a smaller percentage of the rotor mass. Conversely, vibration levels may be expected to be greater when asymmetrical shedding occurs on two- and three-bladed systems.

In short, vibrations resulting from asymmetrical main rotor shedding can be extremely hazardous if drive-train components are subjected to prolonged or severe vibrations. Needless to say, severe vibrations affecting aircraft control will add considerably to the pilot's workload when operating in instrument conditions. Natural icing tests with the S-61 helicopter indicate that vibrations are lessened if forward airspeed is reduced from 110 knots to 60 knots. Although actions by the pilot to reduce the helicopter's airspeed may mitigate excessive vibrations, one would be wise to remember that such a remedy treats only the symptom and not the illness.

Ice shedding from the main or tail rotor can also produce problems apart from an unbalanced rotor system. Though documentation is less than authoritative, researchers have experienced and expressed a concern for structural or foreign object damage to the helicopter's fuselage, rotors or engines resulting from rotor blade shedding. This particular hazard appears to be more threatening to large multi-engine aircraft (more than 12,500 pounds) and especially tandem rotor systems.

Asymmetrical shedding of rotor blade ice can be minimized by avoiding static temperatures lower than minus 5 Celsius. Research tests with UH-1 type aircraft suggest that by rapidly varying main rotor speed or entering autorotation, symmetrical shedding may be induced when static temperatures are minus 5C or warmer. *Collective and cyclic inputs were generally ineffective in producing symmetrical shedding and may result in asymmetrical shedding. At temperatures below minus 5 degrees, it is generally not possible for the pilot to induce shedding.*

Pilots and ground personnel should be especially alert when recovering helicopters after flights and suspected icing conditions to ensure that ground personnel stay well clear to preclude an injury by ice which is coming off the rotor blades during shutdown.

The disastrous effects of inflight icing on helicopter engines has been reported in many military and industry publications. Inflight icing presents a hazard to normal engine performance in two major ways, *ice ingestion* and *air starvation*. Ice ingestion is minimized on many helicopters by the availability of engine anti-icing systems used to prevent the accumulation of ice deposits in the area immediately forward of the compressor section. When these systems are operating normally and environmental conditions do not overtax the capabilities of the system, damage from ice ingestion is reduced considerably.

Even when aircraft are equipped with engine anti-icing systems, there remains a need for caution to ensure normal operation of the engine. Engine anti-icing systems will prevent the build-up of "ingestible ice deposits" only when outside meterorological conditions or aircraft operating conditions (most notably forward airspeed) do not exceed the systems' design capabilities. As an example, when operating normally, the engine air inlet anti-icing system on the HH-3 (S-61) helicopter will maintain the engine inlet surfaces at or above 37.8 degrees (100 degrees Fahrenheit). However, if outside air temperatures are very cold, extremely heavy icing conditions prevail, or the helicopter is maintaining a high forward airspeed, the engine air inlet anti-icing system will be incapable of maintaining a high enough temperature to prevent the buildup of ice in the engine inlet duct and the potential for subsequent ingestion of ice deposits exists. Many HH-3 pilots have experienced an occasion where cruise airspeeds in excess of 100 knots could not be

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Proficiency and the private pilot

CAPTAIN DENNIS STORCK
Directorate of Aerospace Safety

■ Proficiency, the state or art of being proficient; performing in a given art, skill or branch of learning with expert correctness; adept, skillful. That's what it means to Mr. Webster. What does it mean to you?

Proficiency gets a lot of attention in the military environment. You'll hear it talked about in the squadrons, at flying safety meetings, at the alert facility, and of course, at the bar. Basically, the discussion boils down to the fact that with the flying hours each of us are allotted each month, it's a real challenge to stay proficient, or skillful, in our flying machine.

The military realizes this, and through MAJCOM, wing, and squadron, specifies what is necessary to maintain proficiency. There are currency items, and each must be accomplished over a period of time. By accomplishing our command-directed events (CDE) and wing-directed events (WDE), we attempt to maintain a level of proficiency. Completion of the events is documented for us in the computer, and we can conveniently monitor our requirements at any time.

Where does this leave our friend the private pilot? There are more than 4,000 blue suiters participating in general aviation, with Air Force Aero Clubs alone. Proficiency is much more individual and personal in the general aviation community. The private pilot is master of his own destiny there. The Federal Aviation Administration (FAA) has established requirements for takeoffs and landings, but, they are minimal. Perhaps the coldest hard fact of all in the private world is that proficiency can be linked directly to your dollars. With fuel and maintenance costs continuing their upward spiral, the cost of general aviation flying grows higher and higher. Dollars are something we seem to have less of these days, and there are many necessities competing for those dollars. That means much less is left over for the luxuries such as private flying.

Does the private aviator really need to fly much to maintain proficiency? General aviation airplanes are far simpler than the Air Force's complex bomber, fighter, and transport aircraft. However, as simple as the aircraft may seem to be, it would be naive for any of us to believe that the airplane can't kill you. It definitely can and does, as accident statistics for general aviation operations point out each year.

So, what are you general aviation aviators to do? We know you are faced with limited funds and, in many areas of the country, limited good weather in which to fly.

What you must do is fly smarter! There are several things you can do to make the most out of the time you fly. I'm convinced after reviewing several reports on general aviation accidents, that you can ensure your flight safety, by improving your proficiency. I've assembled some things you can do for your review. The list is by no means complete; feel free to expand as you see fit.

First, there is the owner's manual, which, by federal regulation, must be on board the aircraft for flight. You can purchase or borrow one of these handy encyclopedias from your local flight center. This can be a great investment, especially if you fly one particular type of aircraft most of the time.

Inside, you'll find all sorts of good information about the flying

continued

Proficiency and the Private Pilot continued

machine. For instance, there is an explanation of flight maneuvers. It may have been some time since you have flown these maneuvers and this chapter will refresh your memory to ensure you are following procedures correctly. An important section to read over more than a few times is the one on landing irregularities. Information on crosswind landings, etc., may help you get out of a tight situation and back on the ground safely. Additionally, more detailed information on flight maneuvers can be obtained from special training manuals also available at the flight center.

Farther on, there will be a section on the stall characteristics of the aircraft. This will include stall speeds for various aircraft configurations and angles of bank. Notice particularly the configurations most used when you fly traffic patterns and approach to landings. It would be advisable to commit the speeds (maybe two or three at the most) to memory. If you're not the type who has a good memory for those things, write them down on a 3" x 5" card you can have for ready reference while you fly. You can review them just prior to entering the traffic area. Stalling can be extremely hazardous at the low altitudes of the traffic pattern and place you in a situation from which you cannot recover before hitting the ground.

Foremost in your mind, you should read and thoroughly understand the chapter on emergency procedures and operating limitations of the aircraft. These are items the aircraft manufacturer has decided are

important enough to warrant your special attention. He has thoroughly tested the aircraft and its capabilities before it was delivered. The procedures are designed to help you safely recover the aircraft when it performs less than advertised.

I've attempted to highlight some of the more important things, but don't stop here. The owner's manual can really be your best friend. It allows you the freedom to ponder the manufacturer's recommendations while your body is safe and sound on the ground. If questions arise, it's much better they arise there than in the air.

So you've read the owner's manual and your confidence is overflowing. You now know things you never knew before and you can't wait to get in the seat and take off, but take a few minutes to further analyze your proficiency. As I said before, proficiency is personal — an individual thing. Get out your log book. When was the last time you flew? What maneuvers did you accomplish. Are you embarking on a journey with passengers? There's nothing worse than not being in complete command of every situation when you've got an audience watching. If it's been awhile since you last flew, you might consider a flight with an instructor. Nothing major, maybe just a few trips around the pattern, but it can be well worth it. He will ensure you're doing it by the book and, if you've developed some bad habits, he'll be there to demonstrate the right way. That's tough to do solo. Again, it's an investment in your future, and you know you're worth it.

Maybe an instructor flight isn't necessary, and you decide a solo flight is more appropriate. Instead of just droning around doing area reconnaissance, take a little time out to practice a few stalls here, a steep turn there. You'll be surprised at how little time it takes. When you come back to the traffic pattern, instead of flying normal traffic patterns and landings, practice those short and soft field patterns and landings instead. Try to get in some crosswind practice. Maybe there are some airfields in your local area where a crosswind prevails. This will be beneficial when that cold front moves a little faster than you thought and the winds kick up. And it's great practice for going cross-country to a strange field when you're not exactly familiar with the surroundings or wind patterns.

Cross-country is a whole 'nother ball game. This type of flying introduces more variables that can go wrong, and you must be prepared.

Mission planning is the best method of preparation. The longer its been since you flew cross-country, the more preparation you need to do. Make sure you know everything there is to know about your airplane, route of flight, and the enroute weather.

Weather is an important factor. It is the primary cause of many general aviation accidents. Accidents which were preventable if the pilot had just turned around and returned home. Instead, pressonitis caught him. Many times, the pilot didn't have the instrument rating to fly in weather, but, continued anyway.

Clouds make it tough to see mountains and other obstructions, as well as contribute to carburetor icing and reduced aircraft performance. Some weather phenomena are always in season, so take a good hard look at the weather while you're still on the ground. Consider alternative routes of flight or delay the trip a day or two until the weather gets better.

Additionally, consider the atmospheric conditions of your field of intended landing. What is field pressure altitude? If you're retreating to the mountains (i.e., high altitude) for the weekend, a high P.A. can drastically reduce your aircraft performance. If not accomplished properly, takeoff and subsequent climb out of ground effect may be impossible. Are you up to speed on leaning the engine prior to takeoff, if required? This procedure may be necessary if takeoff is to be successful. If you're not up to speed, an IP at your home station can review the procedure on the ground with you prior to embarking cross-country. Don't be afraid of asking that "dumb" question, especially if knowing the answer could mean the difference between life and death.

Also, the winds can do interesting things in high altitude areas—from creating a very turbulent environment on final to gusty crosswinds in the flare. You must be prepared for all of them. If it's been awhile since you flew in a similar environment, then it's time to rethink your plans. Postpone the trip till fair weather prevails. Next time the winds kick up at your home drome, call your friendly IP and get some good crosswind experience. You'll find it to be a great confidence maneuver.

Pack a survival kit in case you have an unexpected forced landing. The items you choose to include are up to you, but it is a good idea to include water, something energy producing to eat, and most importantly first-aid. Once again, a great investment. I do this whether I drive or fly, and the best thing I can say is that I haven't yet had to use it.

So you're ready to go. You've checked, double checked, and memorized the owner's manual, etc. You're gonna slip those glorious surly bonds. One more planning factor to remember. Know where the major traffic congestion will occur (i.e., other airport traffic areas, airways, navigation aids, terminal control areas, etc.). It's great to know all that we've discussed, but it can mean nothing if you get too close to some other aviating comrade. Call it clearing, see-and-avoid, whatever, just make sure you do it. Be especially courteous while in the traffic patterns of "uncontrolled" or "unicom" fields. I remember one time I was in such a situation. I made my base leg radio call only to hear someone else call base immediately afterward. Knowing that I wasn't flying formation with anyone, my head began spinning faster than a barstool to find out where this person was. Seems the individual was in more of a hurry than I. This person had been behind me on downwind and turned inside my base leg to beat me to the runway. This act was totally unnecessary, discourteous, and most importantly, unsafe. It probably saved him all of 3 or 4 minutes. For more information on where the "hot spots" of traffic congestion occur, see the article "Defensive Flying" printed in the June 1980 issue of *Aerospace Safety*.

One final pitch for Safety. Safety should be your primary concern when you rent an airplane. Consider the safety record of Aero Clubs. Aero Clubs are actually about twice as safe as their general aviation counterparts—a significant difference. Aero Clubs offer other important benefits: good aircraft, good maintenance, good instruction, and relatively low fees. They allow you more flying for your dollars, and that contributes directly to your proficiency. If there's an Aero Club nearby, consider the advantages it may have for you. For more information on Aero Clubs, I refer you to the excellent article, "The Other Pilots in the Air Force," printed in the July 1980 issue of *Aerospace Safety*.

Proficiency—you must decide what it means to you. Remember, you're a pilot—a professional. You've got a responsibility to your fellow aviators, your passengers, and yourself. In an era where the dollar is a limiting factor in the decision, I've suggested some ways to improve your proficiency while not lightening your wallet. Also, where the expense was necessary, I've shown how to get the most out of the dollars you spend. Put them all together and you have a method of flying smarter, allowing you to fly safer. Give it a try. ■

F-15 ENGINE FIRE ...No Foul Systems In The Eagle

■ Consider that you are a hundred miles into the enemy's homeland, egressing in full augmentor toward the forward line of troops. Your wingman suddenly calls out, "Lead, you're on fire!" Holy roastin' rickshaw! Now what do you do? There are no fire indications in the cockpit and all the engine instruments are normal. Your wingman now informs you that it is your right engine and it is burning out to your wingroot. Also, pieces are falling off your Eagle. Time to gather your gear, step over the side and spend the war's duration looking out from behind iron bars? Maybe not. The F-15 was designed and built with many safety/survivability features. One of the most significant aspects is the design of the aircraft to prevent or survive inflight fires in the engine and tail sections. The Eagle has no history of explosions due to engine fire.

This article is not suggesting that because the aircraft was designed to survive inflight fires that a decision to eject should be delayed or not considered. Judgment is the important factor that should decide whether to stay or go. The ability to make the correct decision should be based on knowledge and, by knowing your safety systems, you might be better able to make the correct decision to continue flying or to eject. Information concerning how the engine and tail areas were built to resist fire, what limitations restrict the fire detection and extinguishing system, and why the emergency procedures were written as they are will give you a big edge in making a critical decision.

A major factor in the F-15 to prevent catastrophic fires is the location of the fuel cells. No fuselage fuel is located aft of the forward edge of the engines. If a turbine disintegrates from battle damage and throws pieces through the airframe, the fuel cells are not directly in line for the debris. Also, a bullet through a fuel cell should not cause a leak into the engine compartment. The three inch fuel lines in the engine bays are titanium, covered with a self-sealing material that should keep minor holes from causing large fires.

All items not interfacing with the engines have been eliminated from the engine compartment. Components such as the hydraulic pumps and the generators, which make excellent spark producers when they are hit or malfunction, are now separated from the engine compartment. The only hydraulic line in the engine area is there for the arresting hook. Even if the hydraulic line is broken, only the small amount of fluid left in the line would leak out, unless the hook switch is activated; however, the hook will still come down if needed.

The other items in the engine compartment that could be possible sources of ignition are electrical leads to the fuel flow meters, fire extinguisher and the arresting hook. Also, the Environmental Control System (ECS) crossover bleed ducts and primary heat exchanger cooling air duct are in the engine area. Electrical current to the fire extinguisher and hook is applied only when those items are activated. As for the cooling air ducts, even though they carry relatively low temperature air, they are made of titanium for fire protection.

Firewalls have been used to separate the engine compartment, airframe mounted accessory drive (AMAD) and jet fuel starter. These firewalls are made of titanium and designed to withstand a 2000°F fire for ten minutes. Other strengthening items have been built into the Eagle to resist structural failure and buckling during a fire.

The F-15 was designed and built with many safety/survivability features. One of the most significant aspects is the design of the aircraft to prevent or survive in-flight fires in the engine and tail section.

FRANK BIANCA • Flight Safety Engineer • McDonnell Aircraft Company

Why, back in the hypothetical situation, did you not see a fire light? A quick check of the maintenance tech order shows that the most rearward part of the fire detection system goes only to the end of the compressor area. The F-15 has had some real barn burners going in the augmentor section where there are no fire detectors. So if your wingman yells, "Fire!" and you have no indication in the cockpit, that might give you a clue as to what is "cooking," the Eagle has a fire extinguisher to help save the day. The fire extinguisher has some excellent points, but it cannot be expected to handle all fires simply because of its limited discharge port locations. When the extinguisher is discharged into an engine bay, the agent is released on the outside of the engine case between the engine and the airframe. It lasts about 0.5 seconds and is sent overboard by the normal ventilation system which was designed to expel volatile fumes from around the engine case. Fire extinguishing agent swirling around the outside of the engine case may make you feel better because you have done something. It will, however, have no effect on the fire if it is burning inside the augmentor section.

What really makes the F-15 capable of withstanding fires is the incorporation of the emergency procedures with the design items already discussed. These simple actions tie all the other parts together. The Dash One procedures, along with some reasons why they were written, are:

1. Throttle – IDLE

Pull it out of afterburner and back where you can see if you have the correct engine analyzed before shutting it down. Possibly, if the problem was caused by augmentor operation, it might go out at this time.

If the warning light remains on or fire persists –

2. Fire Warning Light – PUSH

Do not wait too long to do this item. Pushing the light shuts off the fuel outside of the firewalls. Since the engines, when operating, are nothing but controlled fires anyway, with the fire light pushed, you have controlled the fire by shutting off available fuel except that which is still in the engine supply line. Unless there are other problems, such as oil spraying from the engine, this should put out the fire. Even without a fire light, if the fire is confirmed, push the respective fire light. The fuel shut-off valve works when the button is pushed whether the light is on or not.

If warning light still remains on or fire persists –

3. Throttle – OFF

4. Fire Extinguisher – DISCHARGE

As the Dash One indicates, shutting off the throttle after closing the main shutoff valve keeps from trapping fuel in the engine-supply line. The fire extinguisher might help if the fire is outside of the engine case.

If fire persists –

5. EJECT

This is where judgment comes in. One person's definition of "persists" might be different from the next. In one incident the F-15 experienced, the engine fire light went out in 30 seconds. On another, the fire went out in 7 minutes. In a combat scenario, had the second pilot given up on the craft early, it might have meant the difference between walking home through enemy country or flying the next day. Every fire is different. You must decide if yours is going to ultimately destroy your aircraft.

If anywhere up to step five, the warning light goes off or the fire is out –

1. Fire warning system – TEST.

2. Monitor other fire indications closely.

Remember, there is a firewall between the engines. If one engine has given a fire indication, followed by the other, you might have quite a fire behind you. A fire in the AMAD section should be handled promptly by correct use of the emergency procedures. Once again, it is separated by titanium firewalls to contain a fire from other critical structures.

Whether a fire is persisting or about to go out is hard to determine. With the engine fire light pushed, all fuel should be cut off to that particular compartment. If the fire appears to increase in intensity, then something else must be wrong, and your decision to eject must be made more quickly. In peacetime or in combat, go through the emergency procedures. Give them a chance to work before you depart your craft. Remember that many safety/survivability design features have been built into the tail section of the Eagle to help it survive a fire. Understand what you have working for you, then make your decision. – Courtesy *Product Support Digest*, Vol 27 No. 5 1980. ■

the Dirty Laundry Syndrome

MAJOR MICHAEL BLANCHARD
Directorate of Aerosapce Safety

■ Captain Bob McClean, flying safety officer for the 89th Bomb Wing, was disturbed even though he had just watched the B-52 make a successful 6-engine approach and landing. Earlier, the command post had notified Bob that both engines in the number 4 pod had flamed out during climbout and the crew was unable to restart either engine. What concerned Bob was the fact that he was a close friend of the IP on board and knew the IP would have followed Dash One procedures and checked all the possibilities, i.e., switch positions, air intakes, circuit breakers, etc., for engine flameout. So, why didn't the crew get a restart? Bob decided he would have a discussion with the engine specialists in QC and find out why.

During the course of his investigation, Bob discovered that the flameout occurred when a new copilot had inadvertently turned off the wrong fuel switch, thereby causing fuel starvation of numbers 7 and 8. The IP had taken appropriate action to reroute fuel to the affected engines, but was unable to restart either engine by Dash One procedures.

The investigation revealed that the failure to accomplish an airstart was due to the fact that the cannon plugs for the fuel control units were switched. The result was that the throttle for number 7 operated the fuel control to number 8 and vice versa. After finding this out, the first question that came to his mind was: "How did the crew get those engines started in the first place?" The answer was found in the normal starting procedures for the B-52. After two engines have been started separately, the remaining engines are started simultaneously; therefore, 7 and 8 started as if they were operating off their own throttle. However, during airstart procedures each engine is started separately.

Now, Bob's problem was how to report an incident like this without making the wing look too bad. He had wrestled with various wordings, but had finally given up and decided the wing would just have to "bite the bullet" and tell it like it is. After all, doesn't Murphy's Law apply? If an aircraft part can be installed incorrectly, someone will install it that way! Bob completed the report and sent it to the wing commander for release.

The next morning, Bob received a message that the Old Man wanted to see him. As he approached the commander's office, the Old Man looked up and smiled.

"Come in, Bob."

"Good morning, Sir. Did you want to see me about that mishap report? Is something not clear?"

"Not really, Bob. It's a good report, but I'm not sure we should send it out."

"Sir, we really don't have a choice. AFR 127-4 requires a report on all 2-engine shutdowns. Even more important, it might save someone else from doing the same thing and having an accident."

The commander leaned back in his chair and stared at the ceiling a moment before he replied. "Let's be realistic, Bob. If we send this out we will embarrass the wing. We would be hanging out our dirty laundry for the entire command to see. You really don't want other wings making jokes about our crews and maintenance men, do you?"

"No, Sir, but this report might prevent someone else from making the same mistake and possibly getting hurt or losing an aircraft. I think it's our professional responsibility to report this."

"Oh, I don't know, Bob. I think you might be exaggerating a little bit. This really was a fluke incident that wouldn't happen again in 100 years. I really doubt if a report would do anybody any good. It will just make us look bad. I appreciate your good work, but let's just leave this mishap report here in the wing. You work up a procedure so it can't happen to us again, and we'll let it go at that."

Bob was tempted to argue further, but he had discovered early in his military career that you can press your opinions only so far with the boss and then you must desist. He felt he had reached that point. Besides, he rationalized to himself, if I were truly honest with myself, I would admit a measure of relief at not sending out the report. After all, it could reflect poorly on me as a flying safety officer.

As Bob walked back to his office, he knew he would not sleep too well that night. He felt he should have sent out the report. Even the best wings have people who make mistakes, he mused. After all, a wing is made of humans and "to err is human." What does the Old Man expect? Why in the hell can't we just be mature enough to admit our errors and let everyone learn from them?

By the time Bob finished his second beer at Happy Hour that night, he had convinced himself that it really wasn't such a big deal and he would forget the incident and keep trying to do his job the best he could.

Exactly two months later, Bob was checking the daily distribution in his in-basket when he noticed a mishap report from another B-52 wing. The message read, "On attempted 6-engine missed approach, pilot lost control of aircraft. The crew ejected, but the occupants of downward ejection seats received fatal injuries. . . ." Bob felt a tight constriction in his throat as he skipped down to the findings and cause factors.

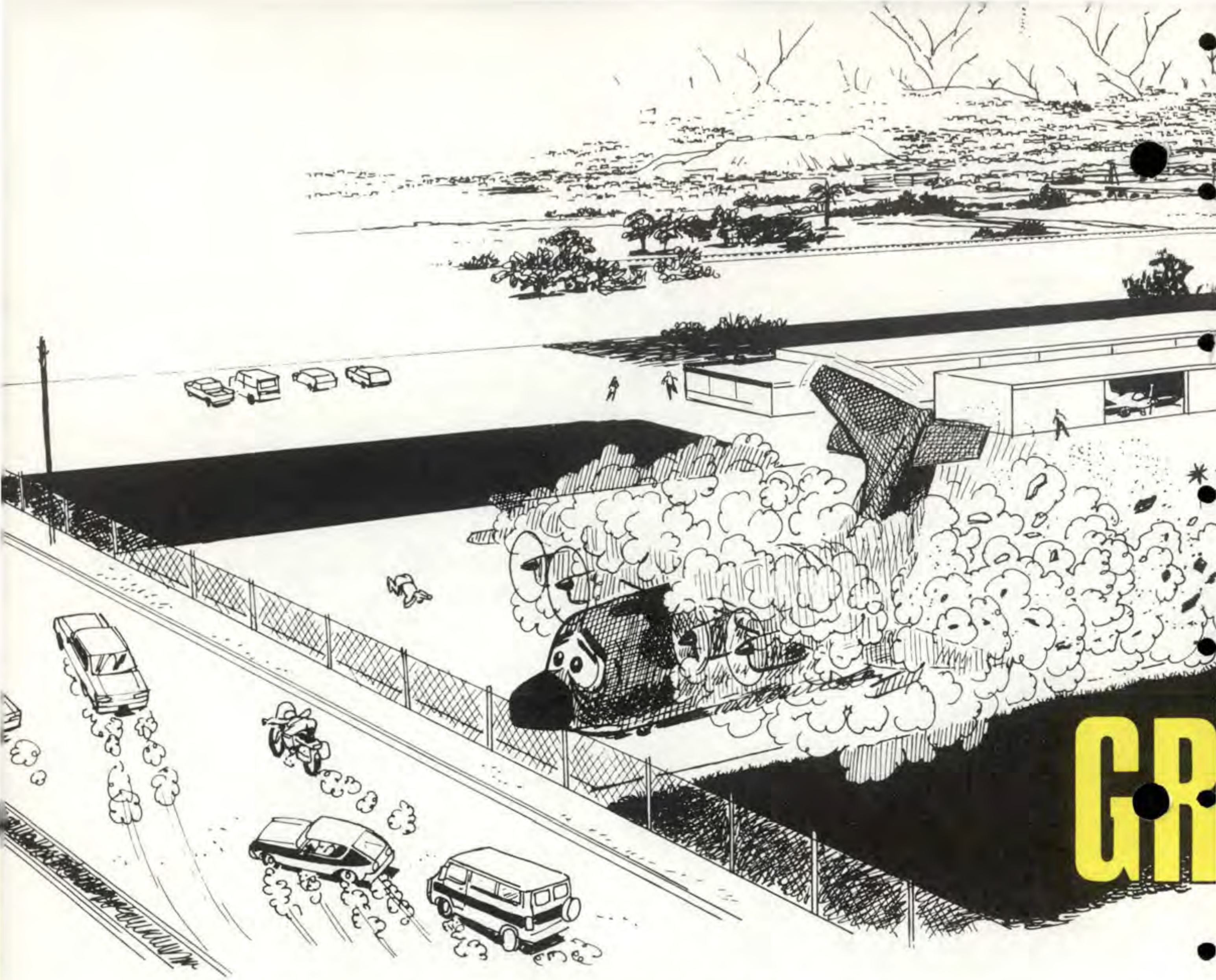
FINDING 1. Number 1 and 2 engines flamed out during flight due to copilot fuel mismanagement. (CAUSE).

FINDING 2. Number 1 and 2 engines would not restart because cannon plugs for fuel control units and throttles 1 and 2 were switched. (CAUSE).

Bob didn't read any further; he had a sick feeling in the pit of his stomach. He knew the price his wing had paid to prevent embarrassment was the highest extracted in Air Force aviation — loss of human lives, fellow crewmember lives. . . .

This story is fiction. As many of you know from previous safety meetings and publications, the problem of switched cannon plugs actually occurred in a B-52 unit, but it was reported through proper channels — with strong support from the wing commander. ■

Adapted from Approach *magazine article, "Don't Embarrass the Command," by Richard P. Shipman.*



■ Recently a UPT IP and student landed their T-38 on a runway under construction at an international airport. The left main gear wheel, door and flap were damaged on contact with a raised part of the surface.

A couple of weeks previously an airliner landed on a runway under construction at a California international airport and received some damage. Both runways were maked with Xs to indicate they were closed.

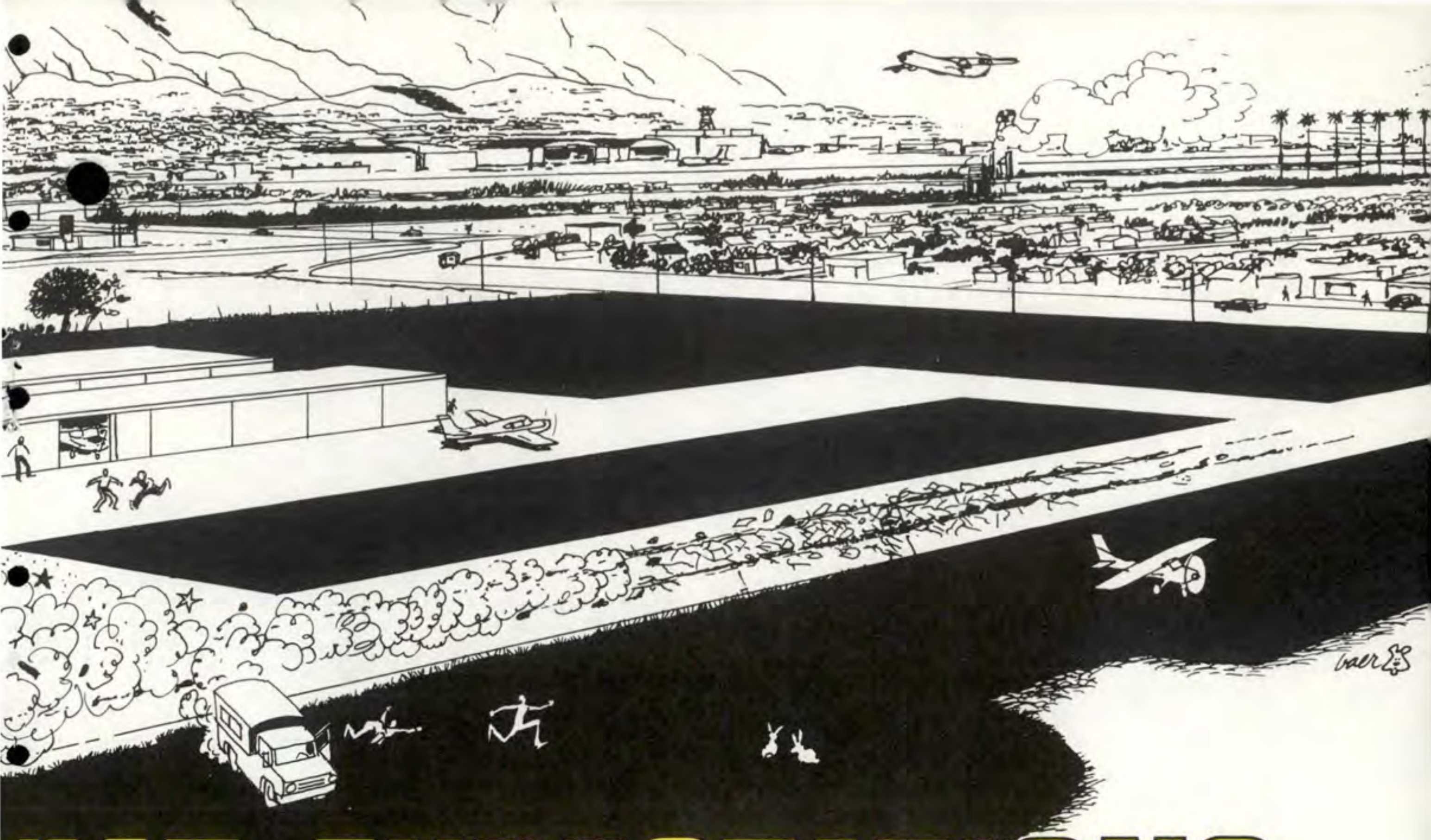
In the California case, low visibility was reported as a factor, because the bright new surface made the new runway stand out in haze. At the other airport the crew reported the black surface of the new runway stood out against the terrain in the poor visibility caused by the setting sun. Apparently neither of the crews saw the Xs.

These bring to mind similar events in which pilots apparently saw what they wanted to see – not what was. One Sunday night, A C-130 landed on a dirt strip about two miles from Norton AFB's 10,000 foot main runway which is very closely aligned with its neighbor. The crew slammed the Hercules into reverse and managed to stop in a cloud of dust before going off the end where there is a busy thoroughfare. The embarrassed crew finally got their bearings, took off and landed minutes later at Norton.

One of the worst cases of mistaken runway identity occurred in Vietnam when a supposedly experienced bunch of flyers got lost in a C-47. After their elapsed time was up and no airfield in sight, they started tooling around looking for the lost base. Eventually they saw a runway and landed. To their surprise their Goon rolled off the end and, as I recall, into a ditch. Somehow or other they had confused the short strip at an FOB with the mile of runway at their destination. The two were something like 75 miles apart.

Last year two airliners landed at the wrong airport in Florida. Never have figured out how they managed that.

So, you say, it's bound to happ[en] once in awhile. To which I say, it



EAT EXPECTATIONS

R. W. HARRISON • Editor

shouldn't. Oh, there are all kinds of reasons, like fatigue, anxiety, poor visibility, complacency, etc. There is another factor which I believe is a strong one and one which is seldom addressed. That is *expectation* or *anticipation*.

In your mind recreate an approach to an airport/air base with a brand new runway parallel to an old one. The new one probably is wider, longer, and stands out because it's clean — no rubber and oil. The temptation would be to go for the new one.

Another *illusion* has been reported at Kelly AFB where a taxiway parallel to the main runway has been used as a runway by mistake. Photos of the airfield make clear how such a mistake could happen.

There are NOTAMs, both military and AIM, that warn of airfield hazards, but a civilian airport may not be covered in our NOTAMs. How many Air Force pilots see the AIM? Besides, the latest AIM NOTAMs dated Feb 5, 1981, contained no mention of the new runways at either of the airports mentioned at the beginning where aircraft landed on closed runways.

As an author pointed out in an article in *Aerospace Safety* last year, you — the pilot — have the stick. No one else is going to land your airplane on the wrong runway. Don't let an end-of-mission expectation lead you to not see the Xs on a closed runway. Or cause you to land at the wrong airport because it's where you *expected* it to be.

This phenomenon of expectation has been cited as a cause in accidents where the pilot should have gone around, due to bad weather, and didn't. Habit and years of experience condition us to expect certain things. When it comes time to land, we expect to land, because we always have. The idea of going around may be foreign to our thinking.

The bottom line, therefore, would seem to be *don't let great expectations* lull you into a mishap that you — with the stick — could have avoided. ■

Life In The

MAJOR ROGER L. JACKS
Directorate of Aerospace Safety

■ Tuesday, 1000

"Hey Bruce, our T-38 cross-country for this weekend has been approved."

"No kidding," replied Bruce. "Did scheduling slip up and do something good for us? No, wait a minute; what's the catch?"

"The catch is we get the aircraft at 1600 on Friday, we have to log 12 hours of time and have the bird back by 1400 on Sunday."

"See, I told you those guys are regular Simon Legrees—that's eight hops!" quipped Bruce.

"Yeah! The way I see it, we'll have to two-hop it Friday, four-hop it Saturday, and then two-hop home on Sunday. We'll have to watch our crew duty day restrictions on Friday and be prepared for a long day on Saturday."

"You can say that again. I've got two simulator rides on Friday—one of them is a check ride. It will be a long day, but I wouldn't pass up a chance to get away for a couple of days."

"I hear what you're saying, Bruce. I'm ready for a change of scenery myself. I'll get in touch with you tomorrow, and we'll set a time to do a little mission planning."

Friday, 1430

"Well, Bruce, how did the simulator periods turn out?"

"Man, I'm beat. Johnston gave me every malfunction in the book. I passed the ride, but I think I must have sweated a bucket of blood. How's your day going?"

"Not too bad. I really get ticked at scheduling sometimes when they keep me on the dead run for days at a time. I've projects sitting on my desk in stan eval that need immediate attention, but I just can't get to them—maybe Monday—at any rate, let's get the show on the road. I hear Randolph has a good Friday night crowd at the O Club."

With that, the aviators of our story filed their paperwork, completed their preflight, fired up their airplane, and launched out on their weekend cross-country. Both hops on that Friday afternoon were uneventful. Doug and Bruce arrived at their destination around 2000. Base transportation got them to their quarters around 2100 and, by 2130, Doug and Bruce were cleaned up and ready for a night out on the town. Since they were getting started a little late and were facing an early go on Saturday, they made the decision to skip dinner and head on over to the O Club bar to see if they could run into any of their old buddies. They figured that a bar snack or two would get them through until morning.

As luck would have it, the O Club bar was swinging and several of their old buddies were in the crowd. Doug and Bruce had a great time and couldn't believe the time of night it was when people started drifting out of the club. Since they had the early takeoff, they hadn't been drinking, but both, by this time, were experiencing a great deal of fatigue. They agreed to meet at Base Ops at 0700.

Saturday, 0700

"Morning, Doug, hope I look better than you do!"

"I've felt better, but I'm OK. You don't look like a ball of fire either. Let's hope we don't have any hassles today—a good airplane, clear skies, and fast turn-arounds."

"Roger that! Remember, we've promised the gang at Willie we'd meet them for dinner tonight."

"Yeah! I haven't seen some of those guys in a couple of years. Well, let's get it on!"

Things did not go as smoothly as Doug and Bruce had hoped. In fact, it turned out to be a frustrating day. Breakfast came out of a vending machine at Base Ops; stale but filling. On the first hop, number one engine refused to start. After an hour delay, maintenance found the problem, and the crew was on their way. On hop number two, the front seat ADI failed on the ground during pretaxi checks; another hour delay. By now both airmen were getting a little uptight as mission accomplishment, crew goals, and social commitments were getting closer to a mental collision.

In an effort to save time, Doug and Bruce decided to forego a designated lunch break; rather, they would grab something while the

Fast Lane

aircraft was being serviced. A half-cooked, greasy burger and a Coke were the end result. The last two sorties went well mechanically; however, the weather turned bad. Doug and Bruce took turns piloting the aircraft around thunderstorms and putting up with light to moderate turbulence. Poor visibility, heavy rain, and turbulence made the final landing of the day nerve racking and capped a long, fatiguing day. They were a little late for their dinner party, but things worked out well. Maybe too well because it turned out to be another late night for our two aviators.

Sunday, 0700

"Whew! I'm really glad we're heading home. I think I'll head right for the rack and sleep until Monday morning!"

"Not a bad idea, Bruce! This has been quite a grind. Fun! But boy, I'm whipped! Well, we've only got two hops to make today, so let's take it easy. If we get back a little late, we'll just take the blame—no sense pushing it. I think we did enough pushing yesterday!"

The first hop went well. On time, no mechanical problems, and good weather along the entire route. Things were going even smoother on the last hop. Doug was flying the aircraft, his mind jumping from subject-to-subject but mostly how tired he was and how nice it would be to unstrap that airplane from his behind and relax on his own couch with an ice cold beer.

Bruce was trying to get a little ahead of the game and complete the 781 entries. As they approached their home field, they contacted the base and got the weather. Not too bad, some gusty crosswinds but good visibility. Doug, in the front seat, would make the final landing. Two miles from touchdown everything looked good. Bruce took a quick check of the instruments, a fast glance outside and assured himself they were in good shape. He laid his head back on the headrest and sighed a breath of relief. Boy! What a weekend he thought to himself as his mind replayed the weekend activities. By this time, the aircraft was nearing the approach lights.

Suddenly Doug shouted, "My rudder pedals have gone full forward!! I can't hold her!!!"

Bruce, brought back to reality by Doug's emotion-filled statement, tried to grasp the predicament they were in, but his senses had been dulled by fatigue and inattention. His mind had finally comprehended the situation, and his body had started to correct the problem when the right wing impacted the runway. With a lot of luck and some timely skill, Doug and Bruce managed to bring the damaged aircraft to a stop without incurring any physical injuries to themselves.

An investigation revealed that the rudder interconnect cable had failed causing the front cockpit rudder pedals to go full forward. The rear set of rudder pedals were completely functional.

Could this mishap have been prevented? Yes. Did chronic fatigue play a part? Probably, but we'll never be able to measure its full impact. Behavioral scientists tell us that chronic fatigue can cause the following effects:

- Increased error potential.
- Increased reaction time.
- Deterioration in timing.
- Increasing willingness to accept lower standards.
- Instrument scanning patterns break down.
- Tendency to neglect relevant cues.
- Tired pilots who are rough on flight controls.
- Crewmembers who become more aware of, and spend more time thinking about, physical discomforts.
- Attention span reduced.
- Fatigued crewmembers who overlook important elements in a task series.
- Fatigued crewmembers who are not objective or reliable when asked to reconstruct what has occured.

There are many other things that can produce chronic fatigue. Behavioral scientists group these cause factors into three groups: psychological, pathological (disease), and physiological. In this article, I have directed my attention to the physiologically-induced fatigue which is basically not getting enough rest, exercise, or proper nutrition. We can all ensure that we get the right amount of all three; all it takes is a little planning and a lot of self control. Give yourself a break when you go to fly. Be physically fit! You'll definitely be more mentally capable of coping with the potential Murphy's that may be coming your way. ■

Quench Your FATIGUE

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Aerospace Physiologist
1099 Physiological Tng Flt
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■ How many times in your life have you felt like a million bucks? If you make your living in the flying business, you can probably remember a number of times when you were feeling like less than a million bucks because of plain old fatigue. Obviously, we're talking about something more than not getting enough sleep. Let's use the term to include mental and physical fatigue but, even greater than that, let's use it to sum up all the stress factors that cause you to feel and perform at less than your best.

Think of all the contributors to fatigue defined in those terms! I don't have to tell you aircrew members that one of the most dangerous effects of fatigue is the detracting effect it has on your mental motor-eye performance. In fact, most crewmembers vote fatigue as the single most threatening contributor to an altered performance: perhaps unsafe performance.

Well, that's no surprise; look at the list of some common causes of fatigue for aircrew members: circadian factors, long flights, minimal crew rest, noise and vibrations, G-forces, anxiety due to certain missions, poor eating habits (greasy spoon dining), stress associated with personal life, stress of military life in general, fatigue due to being overweight, smoking, alcohol intake, the mild hypoxia brought on by long flights at even low cabin altitudes of 8,000 feet; but of all causes of fatigue, perhaps one of the most treatable causes is plain old dehydration! Notice, I didn't say it was necessarily the biggest contributor to fatigue but that it was certainly one of the most treatable causes since all we need to do is increase water intake to correct the problem.

That's right, dehydration! Consider all the contributing sources of dehydration for the aircrew member. You lose about a quart of water a day in your urine and bowel movements alone. Sweating in the hot weather can cause humans to lose up to an unbelieveable 4 quarts an hour; of course, in the cockpit you won't lose that much but you'll lose some. Then there is a good amount of water lost due to the dehydrating effect of pressurization systems where the humidity can be lowered to that of the Sahara Desert. And how about just due to having your body at altitude? Remember, as you go to altitude, there is less nitrogen, less oxygen, and less water too. The tendency is for the human body to try to share its water with that virtually water-free atmosphere (at higher altitudes).

This water loss due to the low humidity at altitude increases the rate of another important mechanism of water loss for the body we call insensible perspiration: insensible, because we don't notice it but we could call it evaporation just as easily. You see, our bodies, which are 75-80% water, are like wet sponges on the desert, continually losing water through evaporation. The rate of insensible perspiration is increased when the body goes to altitude. And how about your aviators' oxygen which is water-free to prevent internal freeze-up at altitude, a good deal of water is lost to the moisturization of that dry gas as it enters and leaves the body.

Sure, a lot of this dehydration is "mission-imposed" but some of it is "self-imposed," right? Like the fact that you probably don't drink enough water in the first place. How many of you routinely ask for water with your dinner? Not many of you from my observations, and why? Because you want something sweet with sugar in it, right? Sure, like a cola, or kool-aid, gatorate, ice tea, hot tea, coffee, juices, milk, etc.; in fact, almost anything but plain old water. Now come on, you're not W.C. Fields (who would spit out water with disgust when he would mistakenly take it for alcohol). You know, when the human body gets thirsty, it's already about a quart low and drinking sweetened drinks is sometimes the last thing your body needs, because sugar can complicate the absorption of water in the body.

You know, when the human body gets thirsty, it's already about a quart low, and drinking sweetened drinks is sometimes the last thing your body needs.

And let's not forget alcohol and coffee, both of which can cause the body to lose more water than it gains.

As if things weren't bad enough, I need to warn you that your thirst drive tends to be somewhat diminished at altitude. Let me explain. Your body, which was created to survive on earth, usually loses most of its water by sweating and not by this insensible perspiration or "evaporation" as we called it at altitude. As we sweat on earth, we lose not only water but we also lose body chemicals called electrolytes or "salts." The amount of salt and water lost in the sweat changes the concentration of the salts left in the blood which flows throughout the body. As the blood flows through the brain, the brain detects the change in salt concentration and decides that you've been sweating and have lost some water and so you must be "thirsty." For aircrew members, that mechanism may be delayed by the fact that the change in salt concentration is not as dramatic when we lost water through insensible perspiration rather than sweating, so your thirst lags behind in many cases.

Yes, I'm wondering the same thing you are; why haven't you dried up like a piece of jerky by now? Well, fortunately we get water in our foods, and our body produces water as a by-product of cell respiration as well; put that together with the water you get the hard way through sweetened drinks, etc., and you manage to remain alive, but you're usually walking around dehydrated to some extent (some of you may be almost freeze-dried) and you no doubt feel the associated fatigue factor due in part to dehydration. Now remember, I'm not talking about the average person on the street, although dehydration can be a problem for many other lifestyles in America today as well.

You need to drink more water folks! I have had flight surgeons who have told me that when they hospitalize an aircrew member, they routinely have to add a couple of liters of fluid to a guy just to "top him off!" Still other docs advocate that crewmembers stop and take a couple of swallows of water from every water fountain they pass. Even the early stages of dehydration can lead to emotional alterations and impaired judgment, not the sorts of changes that go well with flying.

Fatigue through dehydration must be realized and treated. Drink more water and *quench that fatigue;* after all, treating that day-to-day dehydration may be one of the easiest ways to give yourself a better shot at feeling like that million bucks! Go on, have a glass of water if you haven't forgotten how, it's not going to hurt you and we all know you've earned it. ■

Captain Carpenter graduated from the University of California, Berkeley, with a Bachelor of Science Degree in Bioenergetics. His current assignment is Aerospace Physiologist, 1099th Physiological Training Flight (MAC), Andrews AFB, MD.

E-3A Flight Training on the ground

■ Air Force crews learning to fly the E-3A Airborne Warning and Control System (AWACS) aircraft are practicing in a unique flight simulator.

The crews are assigned to the Air Force's 552nd Airborne Warning and Control Wing at Tinker Air Force Base, Oklahoma. The 552nd AWACW manages the entire Air Force inventory of the advanced "Sentry" aircraft.

The flight simulator is used to instruct the pilot, copilot and flight engineer in the intricacies and special thrust characteristics of the Boeing 707-320B airframe which has been modified to meet the functions of the E-3A.

The modification includes the placement of a 30-foot wide, by 6 foot high rotating radome on the dorsal side of the aircraft. The radome is the most outwardly visible component of a sophisticated radar and communication system which is capable of tracking and monitoring air traffic over a wide area. Also, the airplane has been equipped with 20,500 lb. sea level thrust Pratt & Whitney TF33 turbofan engines.

The flight simulator was installed by the Redifon Corporation of England in 1976 for $10 million. Another $3 million has been invested into the program since then for maintenance and modification. Yet, the system had paid for itself by early last year and is now turning a profit, just in terms of savings of jet fuel costs alone.

The simulator had to be programmed to react with response actions comparable to the E-3A in live flight. The technician's term is "fidelity," which means sameness in characteristics between live and simulated flight. While the simple physics of inertia and friction on the moving parts of the simulator limits the fidelity of the system, the simulator has been proved an efficient, effective training aid for E-3A flight crews.

The terrain model is mounted vertically, measures 15 x 48 feet, and represents a hypothetical 5 x 15 mile terrain area. The camera moves on precisely aligned rails, horizontally and vertically, to represent aircraft position, and laterally for altitude.

Physically, the simulator is an exact copy of the E-3A flight deck, mounted on a hydraulic motion base. The student crew flies the simulator utilizing computerized instrumentation and visual cues projected from a 720 square foot terrain model board, which represents a hypothetical 5 x 15 mile terrain area. Through the cockpit windshield, the crew sees a closed circuit color TV picture representing the aircraft's altitude, attitude, and relative position. The instructor pilot, at his own position, (which has replaced the navigation station) monitors the performance of the students. The instructor has computerized control of the entire simulator and inputs different flight conditions and simulated malfunctions as he sees fit.

According to Major Dean Metzgar, Chief of the 552nd AWACW Flight simulator Training

The motion base for the flight deck can move in six different directions: horizontal, vertical, lateral, roll, pitch, and yaw. The 18,000 pound flight deck can move 51 inches horizontally in less than two seconds. It can generate one half "G" of acceleration forward, zero "G's" downward, and two "G's" in an upward direction. Pitch can vary from plus 25 degrees to minus 29 degrees, a roll can be plus or minus 27 degrees, and yaw plus or minus 32 degrees.

2nd LT VICTOR WARZINSKI
552nd Airborne Warning and Control Wing
Tinker AFB, OK

Office, "The sysem trains aircrews in all types of maneuvers that could possibly happen, but in a safer, more controlled environment. The training involves everything from starting malfunctions and aborting the aircraft, to three engine landings with rudder boost out."

He continued, "In the simulators we can introduce an electrical system failure that would be pretty dangerous to orchestrate in live flight. Thus the crew can familiarize themselves with the scope of the situation and proper response in as realistic a setting as possible, without having to jeopardize flight safety.

"For instance, we can work on rapid descents in response to rapid decompression in altitude. We are limited in doing this in live flight by decompression regulation, by airspace restriction and concerns for the safety of aircrew members."

Major Metzgar related an instance where there was a partial hydraulic system failure on an E-3A mission necessitating a crew reaction with established checklist procedures. Said one crew member, "Boy, this is just like flying the simulator!"

The E-3A flight simulator is unique in that it was the first Air Force simulator with the capability to accomplish refueling hook-ups with a KC-135 tanker. The system projects a picture of a model tanker complete with operable refueling boom and lights. The simulator sound system provides an even greater degree of realism by sounding the tell-tale "clunk" of the boom making contact with the E-3A refueling slot. As a result of the simulator training, a new E-3A pilot achieves an effective tanker hook-up after only 3-4 live flight attempts, as compared with the 9-10 tries he would need without the simulator training.

Major Metzgar said, "Thus we benefit from safer, more comprehensive training. It is difficult to assess just how successful the simulators have been in contributing to flight safety, given the relative youth of the E-3A program and the top caliber of people it attracts. It's too early to credit the simulators, for instance, with the fact that there has not been a Class A or B flight safety mishap with the E-3A."

"We can't rely on this statistic forever and thus realize that flight emergencies will occur. Flight simulator training and familiarization will help crews to respond to emergencies more effectively."

The latest development in the E-3A flight simulator system was the recent Air Force approval to procure a Computer Generated Imagery (CGI) system. CGI will replace the model board system, and increase simulator fidelity by reducing the time lag in the present mechanical system due to the physics of moving parts.

CGI will replace the need for the model board, as well as the coexistant time lag in transmitting a pilot's controls through a computer, to a camera, through a hydraulic system, and so on. CGI will also improve the visual accuracy of the simulator, allowing a wider field of vision than the 80 degrees of view the simulator pilot now sees.

Finally it will also improve the fidelity of spatial relations between different objects on the flightdeck screen, allowing a more realistic "3-dimensional" picture. The shift to CGI will constitute a move to even better training methods and materials.

The 552nd AWACW is simulator intensive (utilizing two more simulators to instruct the mission crewmembers who work the advanced radar system's computerized display consoles). Here students react to instructors working their own adaptable computer display consoles in alternate roles of friendly or aggressor forces. As in the flight simulator, situations can be programmed in rapid succession into a controlled environment, thus providing a widely diversified training curriculum in a relatively inexpensive setting. More important, students are taught to react to a wide range of possibilities difficult to arrange in a real-world situation.

Additionally, the E-3A program is continuing to grow and develop while faced with numerous worldwide no-notice response missions. As the value of the AWACS becomes more evident to world leaders, the demand for the limited number of aircraft will continue. The simulators provide a workable alternative to committing scarce resources to routine training functions.

If commercial airline simulators are any indication of the advances to come, then expect even better teaching systems. The current reading indicates that commercial airlines are moving to phase three simulation, which means that the first time the pilot moves the controls of an aircraft new to him, he will have paying customers on board. ■

The computer, in addition to driving the simulator equipment, provided two important training tools. A line printer permits printing a diagram illustrating how closely a student followed the correct glide path for landing or how well he stayed within the envelope during in-flight refueling. Two magnetic tape storage units allow storing all activity in the last 45 minutes of a mission. These tapes can be played back, causing the simulator to be flown automatically, as the student watches an exact replay of his actions.

Helicopter Icing Hazards continued from page 6

maintained without illuminating the engine inlet anti-ice caution lights—an indication that inlet air surfaces are not being maintained above 37.8 degrees and that the potential for ice ingestion has increased significantly. A common remedy for such conditions is to reduce airspeed to about 70 KIAS which provides the engine air inlet anti-icing system(s) an opportunity to recover from the high airspeed and/or the harsh outside conditions.

Even when the engine air inlet anti-icing system is capable of sufficiently heating the engine inlet surfaces, there is still the threat of random ice ingestion if deposits on rotors, fuselage sections, antennas or windshield surfaces shed and are directed into the engine air intake stream. Shedding ice deposits from the helicopter, often larger than household ice cubes, can be devastating on engine compressor blades if ingested into the helicopter engines.

Perhaps the most insidious and subtle aspect of engine icing is the case where engine anti-icing systems have been activated and fail to perform as expected with ensuing engine failure. Recent research by the U.S. Air Force has discovered that some engine anti-icing systems may be inoperative under in-flight conditions due to the internal failing or malfunctioning of a pressure valve used to channel heated air from the engine tenth-stage compressor over the inlet guide vanes and the struts of the front frames of each engine in the HH-3 helicopter. This pressure valve unit is reportedly used in other types of helicopters configured with engine anti-icing systems.

When a failure or malfunction in the pressure valve system does occur, there is no cockpit annunciator light or instrument to alert the pilot of a failure in the engine anti-icing system, thus creating a false sense of security and no warning that an engine failure may be imminent.

Air starvation of the engine due to accumulation of ice on the engine inlet screens has been reported by the U.S. Navy and others. Several Navy H-46 helicopters have experienced a dual engine flameout because of ice accretion on engine inlet screens, and in one case air starvation of both engines occurred only a few minutes after ice was first noticed forming on the aircraft. Flight in icing conditions with inlet engine screens installed is extremely dangerous and pilots should make every possible effort to *avoid* a combination of *inlet screens and icing conditions*.

Meteorological Conditions Conducive to Icing

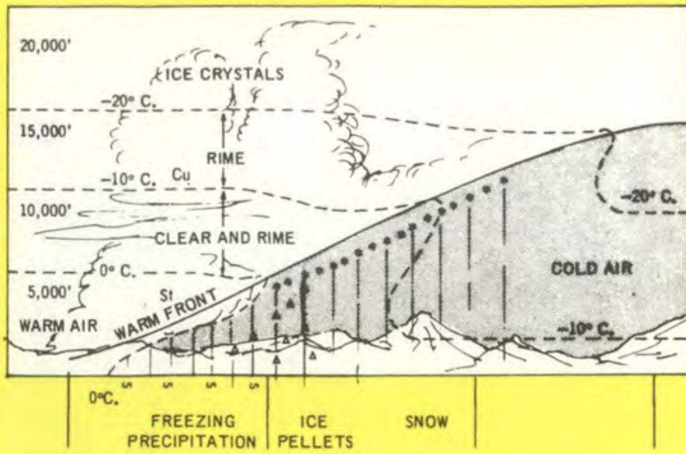
Aviation weather classes have oriented pilots to think of aircraft icing as a function of the following two atmospheric conditions that must prevail simultaneously: free air temperature at or below freezing (0 degrees), and supercooled visible liquid moisture or high humidity. Though this explanation provides some insight into aircraft ice formation, it presents only a meager perspective of the icing environment for helicopter pilots. The inherent limitations of rotary wing aircraft (service ceiling, range, endurance, speed and power availability) and the previously discussed icing hazards require a more comprehensive understanding of in-flight icing conditions and their relationship to helicopter operations.

Cloud Types

Aircraft icing normally occurs in cumuliform (meaning "accumulation" of "heap") clouds or stratiform (meaning "spread-out") clouds. Variations of these two cloud forms dominate the airspace utilized by rotary wing aircraft, i.e., mean sea level (MSL) to 15,000 feet and thus deserve detailed consideration.

Cumuliform Clouds Clouds of this type are generally noted for their billowy or lumpy appearance, indicating unstable air and strong vertical air currents (updrafts) which are capable of supporting larger than average supercooled liquid moisture drops. These large drops tend not to follow the airstream as it is deflected by the airfoil and upon impact with an aircraft, spread slowly over the aircraft's surfaces before turning to

Figure 1: Warm Front



ice. The resulting clear ice, often called "glazed ice," adheres firmly to the aircraft and can create extremely hazardous flight conditions for rotary wing aircraft.

To successfully avoid or minimize the threat of clear ice, some understanding of the principal meteorological variables which affect aircraft icing in cumuliform clouds is necessary. Apart from ambient air temperature, the liquid water content (LWC) and droplet size have the greatest effect on ice deposits and accumulation rates. In general, the average liquid water content within cumuliform clouds increases with altitude to a maximum and then decreases near the clouds' tops. Droplet size is also known to increase within cumuliform type clouds as altitude increases. *The combined effects of increased* LWC *and larger than average water droplets results in the most intense icing region of a cumulus cloud being the upper half of the cloud.*

Stratiform Clouds Stratiform clouds appear in horizontal layers and are normally formed when complete layers of stable air rise, are cooled and condensation subsequently occurs.

Droplet size in stratiform clouds normally will be smaller than that found in active cumulus clouds given the stable air of stratiform clouds and lesser cloud depths. Unlike icing in cumulus clouds, vertical icing layers in stratus type clouds are rarely more than 3,000 feet thick. Further, the icing environment in stratus type clouds may extend 25 to 30 miles horizontally while the horizontal extent of an icing encounter in cumulus type clouds is considerably less.

Droplet size may be expected to increase with altitude within stratiform clouds; however, the predominance of stable airflows tends to support or suspend only small water droplets or ice crystals. Consequently, stratus type clouds are far less likely to produce severe icing, and fast buildups of in-flight ice are rarely reported in stratus type clouds.

The existence of predominantly small moisture droplets in stratiform clouds has two important effects on the potential and magnitude of in-flight icing. First, and perhaps most noticeable, is that those small water droplets tend to be deflected within the airstream and thus avoid collecting on the aircraft's surfaces. The second and equally important characteristic of icing in stratiform clouds is that when moisture droplets do impact an aircraft, they freeze instantaneously, trapping large amounts of air between each droplet.

Icing formed by the instantaneous freezing of small supercooled water droplets is categorized as rime ice and described as an opaque granular deposit, appearing white or milky. The opaqueness or rime ice results from trapped air within the deposits which also makes rime ice somewhat brittle and subject to unpredictable shedding after buildup.

Although rime icing in stratiform clouds is often dismissed with little concern by operators of rotary wing aircraft, a potentially hazardous condition can develop because of the extensive horizontal nature of those clouds. The accumulation of substantial rime ice deposits resulting from prolonged flight in them is hazardous, not only because of increased weight and reduced aerodynamic efficiency but also because of the potential for ice shedding after buildup.

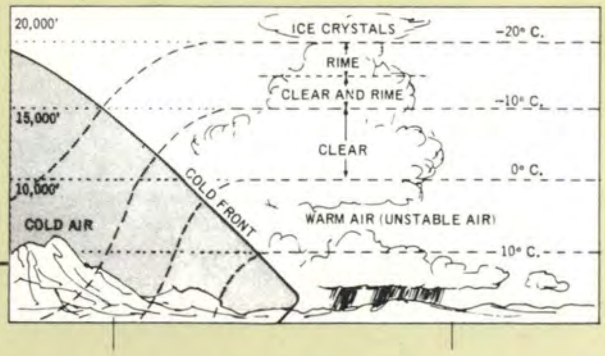
Frontal Systems

Research studies indicate that in-flight encounters with icing conditions occur most frequently in the vicinity of frontal zones. In addition to the threat of icing in frontal clouds, frontal systems also create the necessary conditions for in-flight icing "outside of clouds."

Warm Fronts Warm-front icing may occur both below and above the frontal surface. Figure 1 illustrates how freezing rain or drizzle can be produced by precipitation falling through the front into the subfreezing cold air below and is most often found when the temperature above the frontal

continued

Figure 2: Cold Front



Helicopter Icing Hazard continued

inversion is greater than 0 degrees and the temperature below is less than 0 degrees. Where temperatures above the frontal surface are subzero, ice pellets or snow may be noticed below the front and do not normally concern helicopter operators.

Icing in the clouds above the warm front's surface is characteristic of icing found in stratiform and stratocumulus clouds and usually consists of rime or mixed rime and clear ice.

Cold Fronts Cold-front icing normally occurs in an area preceding and succeeding the front (Figure 2), and aircraft are likely to encounter the most intensive icing in clouds immediately above the frontal zone. Aircraft penetrating a cold front can expect clear icing to be prevalent in the system's clouds at the lower altitudes (0 to 15,000 feet MSL) and a mix of clear and rime ice at higher altitudes.

Freezing rain or drizzle also may be experienced in a shallow or slow-moving front where the warm air is lifted over the advancing cold front. This condition often produces clouds and precipitation well behind the surface position of the front. Upon falling through a subfreezing cold front, the rain becomes supercooled and freezes on impact with the aircraft.

Geographical Considerations Affecting Aircraft Icing

Aircraft icing is more probable and severe over mountainous or steep terrain than over low or flat elevations. The presence of a mountain range causes strong upward air currents on its windward side which are capable of supporting larger than average water droplets, thereby compounding the icing hazard.

The movement of a frontal system, with its companion turbulence and updrafts across a mountain range, combines the normal frontal lift with the upslope currents of the mountains to create an extremely hazardous environment for rotary wing aircraft. The severest icing occurs above the crest and to the windward side of the ridges. This zone usually extends 4 to 5,000 feet above the mountains and can extend much higher when cumuliform clouds have developed.

As previously noted, the size of water droplets in a cloud is an important factor in determining the type and extent of icing to be encountered. While droplets tend to be larger in cumulus than stratus type clouds, they also will be considerably larger in any clouds that form over open water or in clean air.

Icing Forecasts

Icing forecasts prepared by the National Weather Service or the USAF Air Weather Service are of little use to helicopter pilots and may be misleading to the uninformed. The methodology and terminology used to characterize and classify the icing environment was developed from in-flight icing tests conducted on DC-4 and DC-6 type aircraft. Thus, such labels as "trace icing," "light icing," "moderate icing" and "heavy icing" which are used to relate the rate of ice accretion on a fixed cylindrical probe on a DC-6 are of little use to the helicopter pilot in ascertaining or predicting the rate of ice accretion on a complex rotor system.

As an example, light icing is defined as an accumulation of one-half inch of ice on a small probe per 40 miles. The rate of accretion is sufficient to create a hazard if flight is prolonged in these conditions but insufficient to require diversionary action. While the prior definition may well be appropriate for a 100,000 pound airplane, there is no assurance that the rotating surfaces of a helicopter will accumulate only one-half inch of ice over 40 miles as an airplane's wings might. Further, while one-half inch of ice on the wing of a large airplane might appropriately be called light icing, there is every reason to believe that one-half inch of ice on the leading edge of most helicopter rotor systems could result in tragic consequences if autorotation became necessary. ■

About The Author

Arthur J. Negrette is president and chief executive officer of the Flight Safety Institute, a nonprofit corporation chartered to promote and further flight safety. In addition to consulting and conducting research on helicopter accidents and aviation safety programs, the author flies HH-3 helicopters with the 129th Aerospace Rescue and Recovery Squadron, California Air National Guard. He also served as an Army helicopter pilot in Europe and Vietnam.

Go-Around and STAY AROUND

CAPTAIN GORDON N. GOLDEN • Directorate of Aerospace Safety

■ How many times have you made a low approach, "gone around," in your flying career? No, the training and check ride low approaches don't count. Most of us can count our low approaches and go-arounds and not have to take off our shoes to do it. What am I getting at? How many times have you started to go-around and then decided to tough it out? For example:

■ Screwed up the pitchout but cross controlled or max performed around final to get it on the ground.

■ Hit turbulence on short final, but got out of it before the threshold.

■ Were forced to adjust a pattern due to traffic and ended up finessing an approach that bore no resemblance to anything reasonable.

Any of these sound familiar? You're still around, so whatever you did couldn't have been all that dangerous, right?

This story is about pilot-induced control losses.

"Whoa, buddy, who changed the subject?" you say. "A mishap category labeled pilot-induced control loss should be chuck-full of airplanes falling out of the sky in the midst of low-speed turning fights, so why are we talking about go-arounds?"

Well, in 1980 there were a couple of last ditch maneuvers where getting "shot" would have been less embarrassing and one incident of unauthorized low-level hasseling where a couple of jocks paid the ultimate price. However, five of 1980's 19 pilot-induced control loss Class A's occurred in the approach and landing phase. Four of those pilots were determined to land until it was too late to do so. Two more mishaps, classed as pilot failure to cope, could have been avoided with a timely low approach.

Why didn't they go-around? They'll never be able to tell us, so all we can do is speculate.

We're all goal oriented. Everybody and everything from Psychocybernetics to Management by Objectives forces us in that direction. Therefore, when we start an instrument approach or pitch out over the numbers, we have every intention of succeeding in our goal to land. The only exception is when we demonstrate to a check pilot that we haven't forgotten the go-around procedure.

Other things that push us to make that landing on the first try are those first cousins, peer pressure and pride. "Pride goeth before destruction, and an haughty spirit before a fall" (Proverbs 16:18) may never be applied better than to the flying game. Pride and peer pressure can make that loused-up approach look salvageable.

One of the mishaps we're talking about involved a two-ship formation where lead, for some undetermined reason, continued the pitchout 10 to 20 degrees past the normal downwind heading. When the final turn was started, the pilot realized his error but instead of going around (don't want to look bad in front of number two), he attempted to complete the turn. When this proved to be beyond the capabilities of the aircraft, he decided too late to go-around. A sink rate had developed that the pilot either did not recognize or was unable to overcome before the aircraft hit short, and both crewmembers died. Mishap files are bulging with similar examples.

So, maybe we don't put enough emphasis on the low approach as a valid option to landing. Maybe the pilots who "went in" had pressed before, just a little, and everything came out okay. "Why go-around?" they said. "I made it last time . . ."

Now is the time to review your own rationale for when to gut it out and when to take it around. You may not be able to brainstorm every variable involved, but you'll be a quantum leap ahead of the fool with the attitude of "I refuse to decide now; I'll have to wait and see." ■

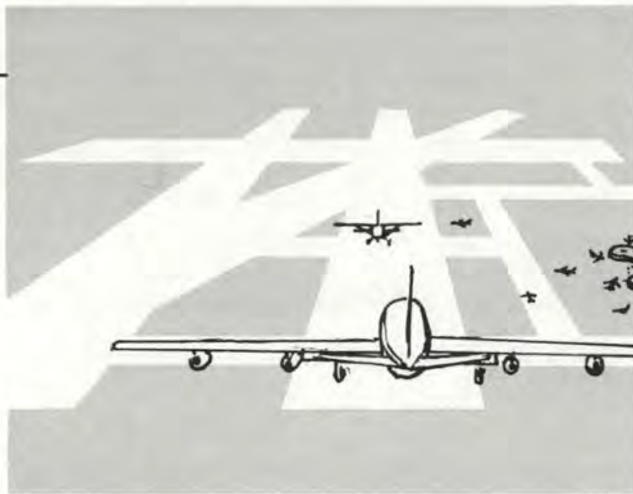
OPS topics

IFR Landing Rule Change

■ Under a rule change effective May 8, 1981, the provisions of FAR Part 91.117, "Limitations of Use of Instrument Approach Procedures," have been incorporated into an expanded Part 91.116, "Takeoff and Landing Under IFR."

See Correction Inside Front Cover July Issue

The rule states that an instrument approach may not be continued beyond the minimum descent altitude or decision height unless the *flight* visibility is at least that prescribed in the approach chart, regardless of the visibility being reported on the ground. Also, the runway itself must be "distinctly visible and identifiable" to the pilot at the MDA or DH—not merely some nearby landmarks. Pilots must see one of the following runway markings or lights, the threshold, threshold markings or lights, touchdown zone markings or lights, or a visual approach slope indicator.—Courtesy *FAA General Aviation News* Jan—Feb 1981



A Near Miss

This gets a bit complicated which means a full rendition would be too long for this page. So, we'll just give a few bare facts. A Cessna 172 was cleared to land on the left runway and was asked if he had seen a '135 on final to the right hand runway. "Affirmative," the pilot said, but evidently he was mixed up because he drove toward the right hand pavement with the '135 nibbling at his tail. The miss was estimated at 50 feet. Now that's close when two aircraft have the same speed. It gets a lot more sporty when you match up a '172 and a C-135. The big one had to duck under the small bird, which isn't SOP at that point in space. A passenger in the C-172 saw the '135 and warned the '172 pilot who rotated the aircraft and tried to climb away. He made it because the big airplane took immediate evasive action.

Dis-Track-Shun

The pilot was busy with poor weather and radio problems as he began an approach. The RF-4C was heavy and the runway was wet so he had decided to dump some fuel. Just as he was about to hit the dump switch, GCA called and he moved his hand to acknowledge. There was a thump, and the crew thought they had hit a bird. Nope—off went the tanks. Guess the message here could be that when you are loaded down with banana skins, be very careful where you step.

Smart Approaches

A recent civil aircraft mishap highlights the need for pilots to fully review the IAP prior to commencing the approach. The mishap occurred at Spokane International while executing the LOC Rwy 3, a localizer approach with collocated DME. The Spokane VORTAC is an IAF for the approach and is physically located near the localizer centerline. The subject aircraft intercepted the localizer, (may have failed to properly tune the DME, began descent to MDA approximately four miles early, and struck high terrain. Investigation brought forward several other pilots who had made the identical mistake and research revealed additional IAP's with the same potential hazard. All pilots are cautioned to thoroughly familiarize themselves with the IAP prior to execution. Special care should be taken when executing localizer with collocated DME type procedure to insure proper DME is tuned. Quoted from a recent AL-SAFECOM for the benefit of all pilots.

FSS Regulation Plan Revised

Site selection for future modernized flight service stations, which will eventually replace existing stations, has been completed, with an emphasis on locations at general aviaiton airports. Earlier plans to co-locate FSSs with Centers or situate them at other off-airport sites have been discarded.

Modernization would replace the 318 existing flight service stations with 61 highly computerized stations. These will be able to service pilots at a much faster rate and enable FAA to keep pace with the projected increased demand for such services without incurring unmanageable expenditures for added personnel — Courtesy *FAA General Aviation News* Jan — Feb 1981

It's a Bird

Birds continue to be a nemesis we apparently have to live — sometimes die — with. A pilot was killed last November when a turkey vulture slammed into the front cockpit of an F-4E. Since then there have been several bird-aircraft collisions in which the bird carcass penetrated the cockpit. Pilots have received minor injuries, which we probably can attribute to luck. But visors down and alert WSOs have helped keep the situation under control. In most cases, the hits have occurred at low level — below 1,000 ft agl — and at relatively high speeds. If you want some idea of the potential of one of those strikes, figure out the foot pounds of force involved when a 4 lb. duck hits headon with an aircraft doing 480 kts. Pilots and WSOs, brief the bird hit and keep those visors down when operating down low.

Energetic Electrons

The pilot of an F-15 flying at 3,000 MSL/AGL in a radar pattern, noticed a small rain shower and asked to be vectored around. Moments later ". . . he experienced an extremely bright and loud electrical discharge. The phenomenon was so bright and loud that another F-15 four miles away thought he had been hit, and the SOF saw and heard the flash from 12 NM away. The pilot was immediately blinded, so he made a gentle 'seat of the pants' roll to wings level and initiated a shallow climb. He also reached over and turned the cockpit flood lights on. His vision returned in approximately one to one and one-half minutes. He found himself in a 2,500 fpm climb, wings level, at 5,000 feet MSL/AGL, in the rain shower. The HSI was spinning, but eventually stopped, and the central computer was knocked off the line and would not reset. The radio receiver was temporarily knocked out, but the transmitter was OK. The receiver came back on the line in a short time. The pilot was quickly out of the shower and back into VMC, saw the field about 12NM away, turned to final and landed."

The weather wasn't bad but there was a high probability of lightning near showers. The aircraft was in the clear and proceeding to avoid a shower when the strike or static discharge occurred.

Smart IP

Aviation history is replete with accounts of aircrews who pressed on after a component failure, or two, or three, or more, eventually to come to disaster. Recently when an IP and UPT student in a T-38 found themselves above an undercast with both main ADIs and HSI inop, but with the standby ADI working, the IP wisely decided to ask for a chase aircraft. The flight ended uneventfully. Not spectacularly, but smart. Good thinking like that saves aircraft and people. ■

Letters To Rex

■ Last fall my wingman and I had the opportunity to bring two A-7D's into Outwest AFB for a normal refueling and Friday night RON. We both feel obligated to let you know that we were treated discourteously by two members of the Transit Alert Crew. Not only did they begrudgingly take our SOAP samples, even after we offered to help them, but the next morning they were very reluctant to come out to help us preflight and start. If this is the standard type of service they provide, then we both feel you should take a good look at them before you give them the Rex Riley Award next time around.

Disappointed A-7 Jocks

Dear Jocks

Thanks for passing on the word! We've forwarded your letter to the Wing CO of the base in question. He can't help unless he knows that there's a problem, and your letter is the best way we can let him know. Fly smart and safe!

We've just recently been re-evaluated and once again remained on the Rex Riley list. We've added the new date to the bottom of the certificate and worked up an article for the base paper 'cause we're proud to still be on the list. One suggestion—we've taken down the mini-certificates from Inflight, Billeting, etc., and added the same type of date lines and updates section to them. It gives all the players involved a chance to display the fact that they are providing *continuing* good service. It's a team effort.

Airfield Management Chief

Dear Chief

A super idea! Thanks and keep up the good work.

Last December, I called long distance to the Apathy AFB weather facility for a weather briefing. At first I was told to "hold" before I could explain that I needed a briefing for an *emergency medical mission*. When the forecaster came back on the line and I explained that it was for an emergency medical mission, he told me that he was very busy and if I had to have a briefing right away for an emergency, I could call elsewhere. I thanked him, hung up the phone called Neighboring AFB, received an immediate, excellent and comprehensive briefing and was on my way.

I am writing in hopes that passing on this incident will let folks know that an "Emergency Medical Mission" may mean life or death for a patient. Generally, the service we receive from USAF Wx facilities is superb, but one bad one at the wrong time could be fatal.

Med-Evac Rotor Pilot

Dear "Med . . ."

Wow! Thanks for writing! I'd like to say one out of two isn't bad, but in this case, as you said, it could have been fatal. I think your letter may help Wx Det CO's to run a priority and attitude check.

I would like to take this opportunity to thank the Westover folks for the fine support and hospitality shown one of my crews recently. The crew was leaving the U.S. for Europe when oil loss forced an engine shutdown and an emergency recovery at Westover near closing time. In spite of the late hours, all personnel went beyond the normal call of duty to take care of the crew.

Tower personnel, in addition to prolonging their normal tower duties, initiated billeting arrangements. An extremely helpful clerk came into the billeting office in the middle of the night and patiently ensured that all crew members got quarters. The Security Police made their office available so my men could advise 21st Air Force of the diversion and request help. The SPs also shuttled crewmen and baggage from the flight line to quarters. To repair the aircraft, two engine men worked late into the evening under miserable conditions. The Open Mess staff delayed closing the breakfast line to accommodate crewmen.

In these and many other ways, my crew members were made welcome to Westover. Please pass on my thanks and deep appreciation for a show of support in the finest spirit of the Total Force and Air Force hospitality.

Airlift Wing Commander

We'll be proud to pass on the good words. We've always observed the same outstanding service and attitudes when visiting with the Westover folks. They are a fine example of the intent and spirit of the Rex Riley Transient Services Award program. ■

☆U.S. Government Printing Office: 1981—683-214/06

UNITED STATES AIR FORCE

Well Done Award

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

CAPTAIN

Wright W. Matthews

Detachment 1, 87th Fighter Interceptor Squadron
Tyndall Air Force Base, Florida

■ On 9 June 1980, Captain Matthews was flying an air defense practice scramble mission in an F-106A. Midway through the mission, a pushover maneuver was made to gain airspeed. As the control stick was moved forward it rapidly drove to the forward right corner. The flight control dampers were turned to direct manual. The generator was turned off followed by the master electrical power switch to stop any electrical inputs to the flight control actuators. Switch action produced no effect. Aircraft control was regained by brute force, and control stick forces gradually returned to normal. Captain Matthews performed an initial controllability check and found that a roll to the right with a slight forward stick movement again caused the control stick to drive to the forward right corner. Control was regained, and the aircraft was configured to determine if it could be landed safely. The aircraft was slowed to 170 with no problems, then power was advanced. As the airspeed increased, the nose was lowered and again the control stick drove to the forward right corner. It was determined that any forward movement of the control stick caused it to violently position to the forward right corner. Control was regained and the aircraft trimmed for level flight at 190 knots. A 25 NM straight-in approach was flown on standby instruments (electrical power off) using the rudder for runway alignment and power for glide slope. a 100 ft/min descent rate was established and flown to a power-on touchdown at 4,000 feet. The drag chute was deployed, the tailhook dropped, and the midfield BAK-12 (B) engaged at 170 kts. During engine shutdown (at approximately 20% rpm) the control stick was bumped forward and the stick once again drove rapidly to the forward right corner. The flying skill and knowledge displayed by Captain Matthews prevented personal injury and loss of or damage to the aircraft. WELL DONE! ■

APRIL SHOWERS BRING MAY FLOWERS

AND SLIPPERY RUNWAYS