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Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT

LOW VISIBILITY LANDINGS

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PREFLIGHT

Pilots deliberately looking for socked-in airfields at which to land may seem like some kind of nuts. Well, that is what pilots of the Instrument Pilot Instructor School (IPIS) have been doing for two or three years but they are not nuts—there is purpose in their madness.

One of the toughest problems in modern aviation has been the inability of pilots to land their aircraft in low visibility conditions approaching zero-zero. But, like other obstacles, this one is being attacked and eventually will fall. Among those contributing to the solution of the problem have been the IPIS pilots who, in conjunction with the Air Force Flight Dynamics Laboratory and the FAA, have been landing a specially instrumented T-39 in weather approaching zero-zero.

Their experience, reported in "Low Visibility Landings," page 2, provides insight into some of the problems, both technical and psychological, that pilots of the future will face when operating in the low visibility environment.

For several years the term "Irreducible Minimum" has been mentioned when people talk about aircraft accident rates. Is there such a point? When we begin to look closely at the accident picture we find that many accidents were preventable. Some are discussed in "Toe Stubbing on the Flightline," page 10. As this article points out, during a recent four year period there were 64 major accidents in which aircraft collided with airfield obstacles. Irreducible Minimum???

Secondary accidents, like secondary, or sympathetic, explosions are frequently deadly and always costly. Perhaps some are inevitable, but careful pre-accident planning and training in the execution of the plan can keep the number of secondary accidents to a minimum. "Are You Ready?" page 17, states the need for a well thought-out accident reaction plan and details some of the ingredients that will determine its effectiveness. ★

LITTER DOWNS AN AIRCRAFT

Maj John T. Taylor, 2578 Air Base Gp, Ellington AFB, Tex

Recently a jet trainer was forced to land wheels up because the right main landing gear would not extend. The malfunction showed up when the aircraft fuel supply was very low. All activity up to this point had been routine – normal takeoff, climbout, etc.

During recovery for landing the pilot elected to practice a simulated flameout approach. When the landing gear handle was placed down, the left main and nose landing gear extended normally. Indicators in the cockpit revealed that the right main had not moved from the full up and locked position. This was confirmed by the control tower and by a pilot in another aircraft. Emergency procedures published and unpublished were tried without success. Finally the pilot successfully made a wheels up landing with flaps extended. The airplane received minor damage but the pilot was not injured.

The aircraft was hoisted onto a low-boy trailer and moved into a hangar where accident investigators could examine it further. It was necessary to saw two holes in the right main landing gear door to manually free the uplatch for gear extension. This done, the investigators saw that the uplatch was jammed in the locked position by a square cadmium plated nut. This nut is of a type not used in aircraft construction, but is used in quantity by electricians for fabrication and maintenance of power transmission lines, etc.

The electricians are required to make a daily check of airfield lighting. Examination of several vehicles including the electricians' vehicle, revealed loose objects in the cabs, under the seats and in the cargo areas. Only in the electricians' vehicle were cadmium plated nuts found; however, none were of the exact size as that removed from the damaged aircraft.

We can only cast suspicion on the electricians as the guilty party but we can fix responsibility in two other areas. First, supervisors were lax in permitting their employees to consistently operate vehicles on the airfield with loose hardware and other objects in and on them. And those elements of management responsible for ensuring that the airfield is thoroughly swept on a frequent basis are open to criticism for, (1) failure to demand expeditious repair of the primary sweeper, (2) failure to frequently spot check areas swept for effective cleaning, and (3) not demanding a daily sweeper availability. Currently during weekends and holidays, the sweeper does not operate even though these are often the heaviest air traffic periods!

Perhaps by sharing this experience we can help others eradicate conditions that could lead to an accident. ★

Pilots must adjust to profound psychological and procedural considerations in extremely . . .

Low Visibility Landings

Instrument Pilot Instructor School, Randolph AFB, Tex

Pilots of the USAF Instrument Pilot Instructor School (IPIS), participating with the Air Force Flight Dynamics Laboratory and the Federal Aviation Administration, conducted inflight research in the low visibility environment below existing landing minimums. Using a T-39 aircraft equipped with experimental control and display systems, project pilots flew over 200 approaches and landings in weather down to virtually zero-zero. They measured the effectiveness of lighting and runway marking systems and investigated fog structures as they relate to what a pilot will see during a low visibility landing profile. They also examined the aircrew's procedural role in this new and unfamiliar environment. Here the project pilots share their experiences in minimum visibility fog conditions for the benefit of all concerned.

Instrument approaches in shallow fog present an unusual challenge due to the insidious nature of cues available to pilots. This type of fog (usually to a height of not more than 200 feet) can instill a false sense of confidence in pilots due to the abundance of visual cues during the early part of an approach. The approach lighting system (ALS) with its flashing strobes and even the runway lighting may be visible as you pass the outer marker and you feel relaxed and confident. However, as you continue down the approach path the visual cues become more obscure.

Finally you find yourself with no outside references. You have but two alternatives. The first and most practical is a missed approach (if aircraft performance is adequate). The second is to continue in hopes of again becoming visual. This choice is like playing Russian Roulette. Conditions won't become better. In fact, if a mature, homogeneous shallow fog has formed, you can probably expect a visual segment (visibility down the runway) of from 200 to 400 feet. This is definitely not enough to visually

As you enter the fog

ABBREVIATIONS USED IN THIS ARTICLE

ALS—Approach Lighting System	CL—Centerline Lights
TDZ—Touchdown Zone Lights	HIRL—High Intensity Runway Lights

flare your aircraft and probably not enough for lateral alignment.

Psychologically, you are faced with a rapid deterioration of confidence and judgment. Confidence, because you're losing control of your vehicle; and judgment, because you're not quite sure what to do. Should you continue on instruments? Continue visually? Or make a missed approach?

Suppose you go back on instruments. You're plummeting toward the runway with impact only 10 to 15 seconds away. What do the instruments tell you? How to precisely control the vertical and lateral path of the aircraft? When to initiate the flare? How to decrab? Touchdown point? Runway available? No, none of these parameters are available on the instrument panel in usable form.

Pilots are most familiar with visual approach patterns, but much of that knowledge and experience is of little use on an instrument approach. Very little on the panel presents information comparable to a visual approach. It's a different environment. In the last few seconds of an approach, acts are condensed and time compressed. Acts must be now. They must be right. There is no second chance. Every effort must be directed toward the moment of truth. Apprehension, confusion, and time are psychological barriers which pilots must be prepared to accept and conquer, if low visibility approaches and landings are to be made.

How does a pilot become trapped in such an untenable situation? He has received a briefing derived from a sophisticated system of reports and analyses, and he has updated it enroute with data that was as accurate as possible. As he nears destination he receives terminal weather information, representing the most recent observation. This may be several minutes or as much as an hour old.

It is mandatory for controllers to report Runway Visual Range (RVR) when it is part of the criteria for an approach. This value is obtained from a transmissometer which may be located several hundred feet from the touchdown zone. And the value reported may be in error by several hundred feet, due to patchy conditions or because it is derived at night—or in daylight.

This, then, is the pilot's legacy, his endowment, for the approach he is about to begin. The visual cues will depend on the facilities available at his destination.

Assume you're on an approach with weather reported 100 feet obscured with fog and an RVR of 1200 feet. You realize your visual segment will be less than reported, due to slant range visibility and your aircraft's cockpit cut-off angle. Also, the effectiveness of the Approach Lighting System (ALS), Touchdown Zone Lights (TDZ), Centerline Lights (CL), and High Intensity Runway Lights (HIRL) will depend on the time of day in which your approach is conducted. At night, of course, the lights will be more apparent and afford much better visual information. In daylight, with the lights less discernible, your visual segment will seem shorter. But you'll be in a more familiar environment and you'll have the use of runway contrast and markings. Certain periods, such as sunrise and sunset, will cause other problems. In some cases lack of contrast may completely eliminate the use of lights as visual cues.

At night shallow fog presents a unique problem, since the ALS segment with its flashing strobe lights will be visible through the fog structure during the early part of the approach. As you enter the fog layer, you may lose contact with

layer, you may lose contact with the ALS . . .

the ALS, and the strobe lights cause a distracting effect as their light is diffused through fog. Your first usable cue for lateral alignment will probably be the 1000-foot bar. Then, in rapid succession, the last 700 feet of the ALS, the 200-foot red terminating bar, the red wing lights, threshold lights, and finally contact with the TDZ, CL and HIRL.

It should be pointed out that, as fast as you perceive these cues, they'll be lost as they pass from your field of vision.

The cues from the runway lighting environment will remain constant in a homogeneous fog condition. You will see five to six HIRL at each side of the runway and about a 1000-foot segment of the TDZ and CL lights. Actual visibility will be a slant range visibility that never equals the horizontal visibility. An RVR of 1200 feet will yield a slant range visibility of 810 feet at 100 feet altitude.

Darkness reduces the effectiveness of the touchdown zone, centerline and edge markings. In extreme darkness these markings will not be visible. Once you establish visual contact with the TDZ, CL and HIRL, and a visual segment of 1200 feet exists, it's a matter of using these cues to control the lateral and vertical path of your aircraft. In the IPIS test vehicle there was no problem controlling flight path in this condition.

Your first mental act is to determine lateral position by using all available cues. At night the project pilots used TDZ and centerline lights to determine flight path, effect lateral control and decrab. Once you determine lateral conditions, you may use a single row of lights to control lateral movements. After you ascertain proper lateral path control your attention must also focus on the vertical plane for flare control.

Your visual perception for flare initiation will be sharply limited at night and based totally on lighting cues. Pilots will have to adapt to using the shorter (1200-foot) visual segment. Although the TDZ and CL lights do not provide good visual reference for depth perception, you must use them to control flare attitude. And if you are not aligned laterally at initial contact with the lighting cues, you'll have to control three axes simultaneously.

Lateral and vertical control problems will be compounded at installations without TDZ and CL lights. The approach lighting system with strobes, red terminating bar, wing bars, and threshold lights provides the same cues, but once you pass these all you have are the HIRL for lateral and vertical control. Roll, yaw and especially pitch cues will be considerably less, placing more emphasis on using instrumentation for flare and touchdown.

Imagine you're descending into a black void at 140 knots, with an RVR of 1200 feet. You've been on instruments and transition to outside cues at 75 to 80 feet above the ground. Your first impression will be of blackness. You see only two segments of lights—no runway outline, no markings. Five or six lights on each side moving toward, down and then past the sides of the aircraft. Your visual roll and pitch information is limited in this environment. Due to the 1200-foot segment, you may feel high, which could cause you to instinctively lower the nose and create a false aiming point. If the aircraft is at an angle to the runway centerline, your first impression may be of a cross-track, causing a roll input which produces an actual cross-track.

The 1200-foot segment gives you enough information to perform the flare. However, horizon and usual background cues will not be visible. You must learn a different flare reference and a new set of values for judgment. Confidence must become part of your repertoire for approaches and landings in this environment.

After touchdown the HIRL provide adequate cues for rollout. Of course, TDZ and CL lights, when available, present better rollout information. Landing lights at night produce a blinding effect, hindering you both when you're on instruments and when you are looking outside.

Several factors distinguish day operations from night. Psychologically the pilot is more relaxed during day operations. His environment is more familiar, he can rely more on experience and not be hampered by the darkness. He is more assured of a successful approach since he sees more of the real world. The runway outlines

and markings provide more tangible cues than lights in the blackness. Although these thoughts go through a pilot's mind, he is faced with a more difficult situation than he realizes.

In fact, he will find fewer lighting cues on a day approach. On final the ALS and strobes will be washed out to the extent that he may not see them. If he does, only the last few hundred feet will be useful. In this case runway markings and contrast may provide better guidance than an in-runway system. As the pilot goes visual he will be drawn to the centerline striping, touchdown markings and runway contrast more than to lighting systems. The markings will provide adaquate lateral guidance and the available runway segment will be enough for a visual flare. The few lights visible will be of secondary importance. Runways without TDZ and CL lights, but with standard instrument runway markings may provide cues just as effective as lighted runways at night. If these cues are not kept in excellent condition, much visual information for lateral control, depth perception and rollout will be lost. Distance-to-go information on center line should be considered to avoid division of attention during the rollout.

Now let's consider RVRs of from 200 to 600 feet, where sufficient cues are not available for flare, night or day. As visibility approaches 200 feet lateral control becomes extremely difficult with present lighting and marking systems. The entire ALS can be considered ineffective for lateral control. The threshold, red terminating bar and wing lights may provide a cue for the pilot looking out (heads-up pilot), but the pilot on instruments (heads-down pilot) must remain on instruments to touchdown and will not see these cues. The key then to a successful approach is the interaction of each pilot.

The heads-up pilot will see cues from the TDZ, CL and HIRLs at night, or the washed-out effect of lights and markings in daylight. These cues provide a marginal visual segment for lateral alignment. The flare will have to be controlled by instruments.

In the critical transition to visual flight with a visual segment of 200 to 600 feet, we find crew procedures and concepts extremely important. The transition must be smooth and precise, and occur at the proper moment. This emphasizes the two-pilot control concept with each assigned specific tasks during the approach.

The heads-down pilot must mentally adjust when he comes heads-up. If he comes up too soon, there may not be enough cues for proper control; if it's too late, there may not be time to establish the proper flight path visually. The heads-up pilot's decision to call visual contact is a very critical one.

The project pilots overcame these problems by using three calls by the heads-up pilot. The first is "cue": some recognizable part of the lighting system or runway environment is in view and further cues will be seen.

Next is "lateral": the heads-up pilot has sufficient cues for lateral control through the rest of the approach. He will now make lateral control inputs as he deems necessary. The heads-up pilot does not take all lateral control at this point because, in the event of a go-around, the heads-down pilot must be prepared to take immediate full control. Had he relinquished partial control, the time required to reacquaint himself with roll and yaw parameters would be unacceptable.

The last call is "visual." This is for the heads-down pilot to control the aircraft visually. The heads-up pilot will assist as necessary through the remainder of the approach. It amounts to a total crew concept where each pilot shares responsibilities, and tasks are integrated to a common goal.

It takes a great deal of training, crew coordination, confidence and understanding to operate in this low visibility environment. As the visual range decreases toward 200 feet, the utility of cues decreases sharply. The heads-up pilot's tasks are to assimilate visual cues, supply quantitative and qualitative information and assist in control; first in the lateral axis, then the vertical axis if sufficient cues exist. It was found the heads-up pilot could assist in the lateral axis with visual segments down to 200 feet. If the heads-down pilot tried to come heads-up in this environment, he could not effectively determine cross-track rate and had no cues to initiate a flare. The heads-up pilot also had insufficient cues to flare the aircraft.

Reaction time is critical in the transition from heads-down instruments to a partial real-world environment. It takes approximately three seconds of visual integration to assume aircraft control with a visual segment of 200 to 600 feet. When the pilot sees the cues he knows his position, but he does not know exactly what his aircraft is doing in relation to the cues.

The time necessary to integrate and determine lateral movement will depend directly on the length of the visual segment and the cues available within it. Segments of 1200 feet or greater generally presented no problem to project pilots in either the lateral or vertical plane. With segments below 600 feet, lateral movement became almost unrecognizable to the pilot who suddenly went from instrument to complete visual control. A segment of 600 feet did not provide the perspective needed for the pilot to integrate cues within his capability.

Consider an aircraft moving forward at about 225 feet per second and downward at 10 to 15 feet per second. Suddenly, at 50 feet altitude, the pilot sees a visual segment of 600 feet. If adaption time is three seconds, the aircraft will be almost at touchdown before he is alert to the geometry of the flight path. Add control reaction and aircraft response and the situation becomes completely unacceptable.

At night a visual range of less than 600 feet is insufficient to perceive depth for the flare maneuver. The aircraft may seem to be sailing along several feet above the runway after touchdown. Another illusion may be of descending through a cone, caused by fixation on a single light or a circular scan about a midpoint. Daylight operation in the same weather allows use of the runway image for depth perception; however, the flare must be accomplished on instruments. Project pilots preferred to remain on instruments for the flare and touchdown.

Approaches and landings in deep fog or cloud base fog will be similar to those in shallow fog. The primary difference being that, as fog deepens, the chance of seeing the ALS during the early part of the approach decreases. A pilot will be on instruments for a longer time and therefore more prepared to perform the exacting tasks in the latter part of the approach.

Cloud base fog, forming above instead of on the runway, forms a more definite ceiling and provides greater visual segments once the ceiling is passed.

Regardless of the type of fog, light conditions when the approach is performed or the lighting facilities available, you must fly on instruments until the visibility dictates visual control is possible. In some cases this point is touchdown and rollout. Instruments, displays, control concepts, crew procedures, training requirements and the full realm of both airborne and ground-based facilities must be realistically evaluated in terms of the environment pertinent to the operations of today and far into the future. ★

*This article was adapted from a paper with the imposing title of "Psychological and Procedural Aspects Related to ILS Approaches and Landings in Visibilities Less Than 1200 Feet." The authors, Lt Col Edwin W. Johnson and Majors Donald L. Carmack and Larry M. Hadley, flew more than 200 approaches in near zero-zero visibility.

SNIFFLES AND FLYING DON'T MIX

Lt Col Robert H. Bonner, USAF, M.C., Directorate of Aerospace Safety

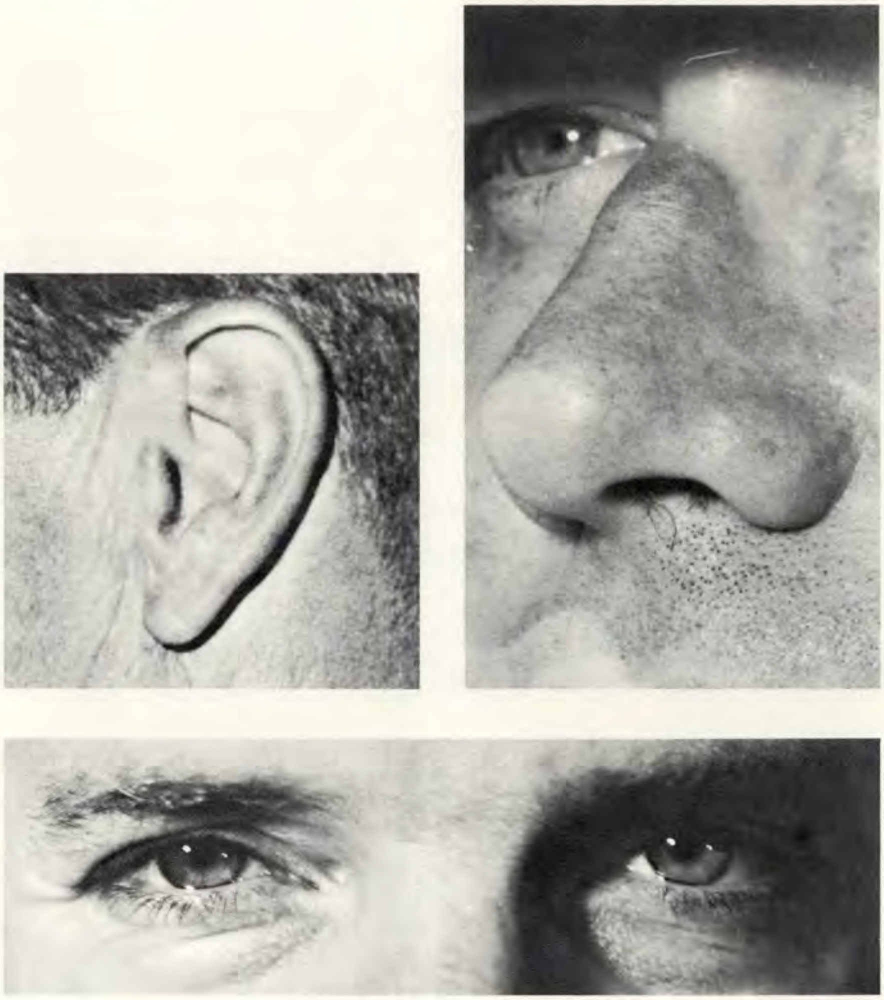
The most frequent affliction of mankind is the common cold. To have it is irritating, uncomfortable, and exasperating, but we always recover. The very name, "common cold," shows our familiarity and perhaps contempt for this upper respiratory problem. Unfortunately, familiarity sometimes lets us forget that flying with colds can cause problems.

Now I realize that all of us have flown with a cold and have gotten by with no difficulty; however, occasionally problems do occur, such as an ear block or a sinus block. Those of us who have experienced these say, "Well, what's the problem? A little pain in the forehead, a little pain in the ear, but the mission can still be safely completed." To examine this, let's see what really happens when you have a cold.

A cold is caused by a virus which invades the tissues of the nose, eustachian tubes, throat, and ear passages. The tissue reacts to this "invader" by secreting a fluid. The secretion of this fluid results in the tissue becoming very spongy and swollen, and also accounts for the drippy nose. This swollen, boggy tissue blocks off the little holes or openings to sinuses and to the middle ear and prevents a free exchange of air. As we change altitude, we all know there is a change in pressure. If this pressure cannot be equalized in the sinuses or middle ear, it results in what we call an ear or sinus block, which is painful.

It has been shown that getting

Colds cause misery but vertigo may be the most serious result.



your first ear block or first sinus block makes you more susceptible to ear and sinus blocks in the future. In fact, if repeated, it may lead to a chronic condition which is present on the ground whenever you get a cold. I, for one, used to think that this didn't make sense, but twice having received a sinus block when flying with a cold, I now know it's true. So take it from one who knows—if you can avoid your first sinus block, your chances of developing problems in the future are much less.

These conditions, however, are not the most serious problem involved in flying with a cold. The most serious is vertigo. Whenever increased pressure occurs in the middle ear, changes in the vestibular apparatus can occur. Sometimes severe vertigo is the result. A good case was related by Lt Col Art Till, our Life Support Officer. While flying an F-86 on a unit deployment from Goose AB, he developed an ear block during descent to a base in Greenland. He was able to clear his ears easily. After landing he went to the flight surgeon and indicated his desire to continue with his unit if at all possible. He was given nose drops and an inhaler and told to "press on." (Inexperienced flight surgeons can also be misled about the serious consequences of flying with a cold.) The next morning the unit took off for Iceland. Major Till was Number 3 in a formation flight of four. Upon ascent out of the fjord, he developed a severe ear block and vertigo. Mountains, sky, and instruments were tumbling. His only control was to close his eyes.

As we all know, it is rather difficult to fly with one's eyes closed. He immediately advised the flight of his predicament and his wingman closed on him and verbally talked him through the flight. All attempts to clear his ear were unsuccessful. Only after reaching flight altitude did his ear block spontaneously clear which stopped the vertigo. Major Till is convinced that had he not had a wingman he would not be here to relate this story.

Another case of a more recent nature also illustrates this point. A student pilot in a T-33 experienced dizziness after doing vertical recovery and spins. The symptoms cleared when two touch-and-go landings were accomplished. On the third touch and go, he was dizzy and disoriented. The IP had to take the aircraft. The student still noticed symptoms on the ground. Physical examination revealed he had a left ear block. The flight surgeon felt the student's problem was a result of this ear block. Again, had this student not had an IP, the outcome of this case could have been entirely different.

So you see, that li'l old common cold can be a very serious matter in the flying business. The solution is simple and obvious: If you have a cold, don't fly. ★

TOE STUBBING ON THE FLIGHTLINE

The F-4, its pilot fooled by the runway lights being located 10 feet from the runway edge, touched down in a formation landing with the left main gear a couple of inches off the pavement. Moments later, the pilot had an accident on his hands when the aircraft went off the runway and hit the BAK-9 barrier pit housing.

If aircraft striking obstacles on the ground were an isolated incident, that would be one thing. Fact is, despite our many years of operating aircraft, this is one problem we haven't been able to lick, simple as it may seem. Five hundred and twenty-nine times in the past four years Air Force aircraft have collided with ground obstacles. Sixty-four of these encounters resulted in major accidents. There were 25 minor accidents and 440 incidents.

Our aircraft hit barrier housings —as did the F-4 above—ditches, buses, trucks, revetments, power carts, people, fire extinguishers,

piles of dirt, runway markers and light standards, just to mention a few.

It would seem that after 60 years we would learn to better control the airpatch environment so that, even in an emergency when a pilot has a hard time controlling a rolling aircraft—or loses it completely—there wouldn't be a ditch or some solid object for the aircraft to hit. Such does not seem to be the case, despite safety surveys.

In the early days of the buildup in SEA it could be expected that aircraft operating from and into primitive strips would encounter problems. And they did. They hit poles, buildings and other obstacles. Crowded conditions resulted in aircraft running into other aircraft, trucks and portable equipment.

Better pre-operational examinations of these fields and remedial action could have prevented many accidents. Soon this became a major undertaking and many of those obstacles were removed. Some of the problems, but not all, of crowding, sharing with another service, and the fixed wing-helicopter mix were eliminated by a lot of hard work. Strange that we have to relearn these lessons in every war.

Some of the hazards we simply have to live with. The small size of some forward bases means that there are going to be drainage ditches, roads and cramped quarters that threaten the aircraft that strays very far from the confines of the runway. Normally pilots can cope with this problem by adhering to on-the-money approaches and landings and by using care while taxiing. But emergencies, adverse weather, night landings with primitive lighting — or none — tax pilots to the utmost.

While obstacles on primitive airfields are to be expected, and removed as expeditiously as possible, there is little excuse for the many accidents, major and minor, that occur on modern Air Force bases. Many of these result from carelessness on the part of persons operating ground equipment — trucks, power carts, loaders, forklifts, etc. While aircrews must share the responsibility for many of these mishaps, the physical characteristics of the ramp, taxiways and runways have frequently led pilots astray. Edge and center line striping on runways and taxiways deteriorates and becomes extremely hard or impossible to see. Sometimes taxi lanes are changed and the old line is painted over. This has caused accidents when, at night, pilots were fooled by glare from the painted over lines and followed them into a collision. Various kinds of paint have been used for center and edge markings. Perhaps the use of reflective markers imbedded in the pavement, as on freeways, would solve this problem in many locations.

Frequently reports state that

Blown tire from wheel striking barrier tape guide resulted in F-4 mishap. Compare photos above. Note edge striping, location of lights.

There's always a ditch. Damage would have been light if ditch hadn't interrupted this C-47 which left the runway after pilots lost control.

wing walkers were not used, when obviously they were necessary. And there is at least one case on record where the airman wing walker had such poor eyesight that he was unable to see whether the wingtip of a taxiing aircraft would clear a parked bird. It didn't.

A couple of recent incidents are representative of the annoying taxi mishaps that are minor in themselves but which add up to a bundle of money in a very short time.

A transport was taxiing into takeoff position around a flight of four fighters. The fighter ground crew attempted to signal the pilot of the transport to stop but he thought they were indicating wing tip clearance. Both the transport and a fighter were damaged in the ensuing collision.

In the other case a bomber was damaged when its left wing tip struck a dump truck parked only six feet from the edge of the taxiway. The pilot assumed he had adequate clearance.

In the main the problems associated with taxiing aircraft can be solved with extra care on the part of pilots and others who taxi aircraft, marshalers and equipment handlers along with imaginative and aggressive attention to clearly marking traffic lanes and parking areas. But the problems that go with landing or aborting a takeoff with a blown tire or other emergency are somewhat different. An aircraft that leaves the runway at 100 knots is covering the ground at 166 feet/sec. At this rate it is obvious what will happen if the aircraft strikes an obstacle or runs into a ditch.

Sometimes obstacles lie in wait for years before they finally gobble up a bird. Obstacles such as concrete runway light bases (some nearly square bases are undoubtedly still around), arresting gear, approach light stanchions of concrete and steel, concrete manholes protruding above ground, banks and drainage ditches near runways, raised taxiway lips and, of course, runway lips, and in winter snow piles.

How many aircraft have hit piles of dirt and concrete, holes and other goodies produced during runway repairs is unknown, but there has been a goodly number.

How can these accidents be prevented? For one thing, a little extra care on the part of people who taxi aircraft, whether aircrew or maintenance types, will help stamp out taxi accidents. Ground equipment drivers and users can do their share by making sure their items are properly placed, parked, lighted, chocked, etc. There is a slogan that aptly states how to eliminate obstacles that are a menace to aircraft landing and taking off: *Inspect, Detect, Correct.* ★

the I.P.I.S. approach

By the USAF Instrument Pilot Instructor School, (ATC)) Randolph AFB, Texas

PRECISION RADAR APPROACHES TREND INFORMATION

Effective 1 April 1969, Change 7 to FAA Handbook 7110.8 *Terminal Air Traffic Control,* removed the requirement to state glide path deviations specifically in terms of feet above or below glide path and changed the terminology to "slightly/well above/below" glide path. The same terminology will be used for stating course deviations.

The Air Force Communications Service (AFCS) expanded on this change in terminology by an Interim Letter of Instruction 60-1, dated 14 May 1969, implementing the inclusion of "trend information" to assist the pilot in conducting the approach. Following are examples of trend information phraseologies which may be employed individually, collectively, or in part:

"GOING ABOVE/BELOW GLIDE PATH"
"GOING RIGHT/LEFT OF COURSE"
"COMING UP/DOWN TO GLIDE PATH"
"ADJUSTING/CORRECTING TO GLIDE PATH/ON COURSE"
"HOLDING ABOVE/BELOW GLIDE PATH"
"HOLDING LEFT/RIGHT OF COURSE"

The above may be modified by the use of terms "RAPIDLY" or "SLOWLY" as appropriate.

Just how does this change in terminology affect pilot procedures in conducting a PAR final approach? It doesn't. The determination of aircraft position in relation to the glide path has always been a matter of scope interpretation on the part of the controller. Many variables affect this interpretation: radar blip size and clarity, radar beacon use, gain control setting, etc. AFM 60-5 *Air Traffic Control Procedures,* does not provide any guidelines for deviations inside of one mile, the most critical phase of a PAR approach. The previously used terminology of stating deviations in feet did not give the pilot an exact position but rather a controller's interpretation of the radar scope picture and his application of the guidelines provided in AFM 60-5. The present terminology more realistically aligns itself to what the controller actually sees on his scope.

The purpose of this terminology is to simplify, standardize and provide realistic trend data which will indicate to the pilot the degree of correction required to return the aircraft to the glide path. The pilot hearing the controller say "going slightly above glide path" can assume the controller has noted a slight deviation and need only make a minor adjustment in pitch/vertical velocity. Hearing the term "well above glide path" indicates a larger, more pronounced deviation has been noted and requires a more positive correction. Add to this the trend information and the pilot can now more positively and readily ascertain that his adjustments in pitch/vertical velocity are correcting the aircraft back to the proper glide path. The inclusion of this trend information provides the pilot with information which should be helpful in executing a more safe and precise PAR approach.

POINT TO PONDER HIGH ALTITUDE PREFERRED ROUTES

Are you aware that the Enroute Preferred Routes listed in FLIP Section II include both the low altitude airways and the high altitude jet routes? This is probably not new to you since the high altitude preferred routes have been included since 6 February 1969. But have you noticed the short paragraph, following the preferred route listing, that designates certain jet route segments as *single direction routes?* For example, J-6 between Little Rock, Arkansas, and Charleston, West Virginia, is usable only northeastward between 1200Z and 0400Z daily. Single direction route segments are not identified as such on the enroute high altitude charts. These routes can be found in FLIP Section II and the IFR Enroute Supplement.

★

In the August IPIS APPROACH the statement concerning transponders being modified to automatically squawk 7700 when the emergency position is selected should have read: *Air Force aircraft are being modified with new transponders which automatically squawk 7700 when the EMERGENCY position is selected.*

REX RILEY'S CROSS COUNTRY NOTES

AFTER A RECENT ACCIDENT one of the findings of the accident investigation board was that the number of directives and manuals covering the procedure being performed was confusing. This is evident when it is considered that, in order to perform the procedure, the pilot was required to know 14 specific items in five separate documents issued at four different levels of command, plus several other sources of guidance, restrictions and instructions.

As a result of that accident, perhaps some of the confusion that is sure to exist from such a plethora of directive material will be removed.

WATCH THOSE HANDS! My secretary, who reads all the accident messages that come through my office, said, "I know from experience that most men have trouble controlling their hands, and these messages this morning prove my point."

She was referring to the experiences of a couple of lieutenants. One was a student pilot on his initial familiarization ride in a T-37. Shortly after takeoff he attempted to adjust his seat downward one notch. His IP cautioned him to hold his left hand, palm open, on the left arming handle to insure that the handle would not be inadvertently raised. However, when the lieutenant pulled the seat adjustment lever with his right hand, the seat bottomed out and the canopy fired—$1,062.38 damage! The fired initiator was x-rayed, disassembled, recocked and tested. No discrepancies were found so apparently his "uncontrolled" hand did, in fact, raise the arming handle enough to fire the canopy when he attempted to adjust his seat.

The other young man was flying an O-2 in a flight of three O-2s controlling a flight of four A-1Es on the range. He had made three successful firing passes and was positioning the aircraft for a right roll-in to a 270 degree heading for his fourth firing pass. The IP saw the student place his hand on the glare shield above the armament switch panel and then turn on the master arm switch. One rocket fired immediately. He either hit the trigger button simultaneously with his actuation of the master arm switch or he was already pressing the trigger button when he actuated the master arm switch. In either case, that "uncontrolled" hand got him in trouble.

I asked my secretary if she had a solution to the problem of wandering hands. She said yes, but she wasn't going to share her secret with the Air Force—so I guess we'll just have to fall back on training and caution.

WRONG SWITCH. A T-39 pilot was taxiing his aircraft to reposition it for passenger loading. Since the ramp was pretty narrow, he had the IP and crew chief acting as wing walkers while he made several sharp turns. During the last 90-degree turn, nosewheel steering and normal brakes failed. Before the pilot could get to the emergency brake handle, the right wing of his aircraft struck a power unit.

Apparently the pilot, while running through his before-start checks, turned off the hydraulic pump after he retracted the speed brakes. He had meant to turn off the *auxiliary* hydraulic switch!

The two identical switches are located side-by-side on the overhead panel.

How about the airplane you fly? Are there switches or controls which are close together, look or feel alike, and are easily confused? Mark those particularly bad ones in your mind . . . and take the time for visual confirmation when you have to use them.

(Then talk to the maintenance folks about a UR to correct the situation.)

LET GEORGE DO IT. George may be the best jack-of-all-trades and handyman in the business, but there are times when the only one to rely on is oneself. Here is a "for instance."

The pilot and aircraft involved were scheduled for an air-to-ground mission. As the pilot completed his Before Taxi Checklist, he noted the red cloth streamer was not connected to the ground safety pin in the right handgrip of the ejection seat. He removed this pin and the canopy alternate emergency jettison safety pin and stowed them in the map case. Normally these pins are either connected together by a red streamer or have individual streamers.

After returning from the flight and before leaving the aircraft, the pilot informed the crew chief that he could not find the ground safety pin for the right hand grip of the ejection seat and that he would remain in the seat until the pin was found.

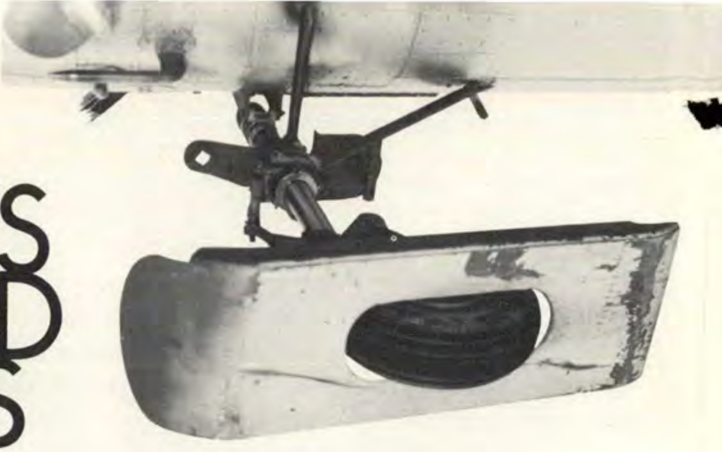
The crew chief made a quick search of the cockpit with the pilot still in the seat but could not find the pin. He assured the pilot that he would find the pin and install it after he had left the seat.

The pilot filled out the Form 781 and reminded the crew chief about the condition of the seat. After the pilot left, the crew chief made a quick but thorough search of the cockpit and map case without finding the pin. Then he started the aircraft postflight and instructed his assistant to remove the map case; he felt that the pin might have fallen behind it. The assistant, while removing the map case, inadvertently moved the arm rest up far enough to fire the canopy remover.

Who was to blame? Who was responsible for the expenditure of more than $300 and eight manhours required to repair the aircraft? The pilot who failed to complete his Before Leaving the Aircraft Checklist. It is his responsibility to insure that the pins are inserted or the system otherwise rendered safe, and this responsibility may not be delegated to another. He must remain in the seat until this action is taken. Checklists are prepared to be followed step by step. If a step cannot be accomplished, stop. Proceed only after that step has been satisfactorily completed.

This pilot relied on "George" with sad results. ★

BEAR PAWS AND BAKS



Pedros with bear paws and BAKs don't mix.

This may seem like gibberish, but not to HH-43 pilots. Re-stated, this means that HH-43 helicopters should never roll over barrier cables. Despite the fact that this frequently occurs, there have been at least two accidents that resulted from the bear paw catching the cable, which caused the chopper to roll over and crash.

The bear paw is simply a skid with a hole in it. The wheel protrudes down through the hole so that it can roll on the ground. The bear paw is there for landings on rough or soft terrain where it acts as a skid to prevent the wheel from digging in.

The most recent accident caused by the skid catching on a barrier cable resulted in extensive damage to the aircraft, although the crew managed to escape unharmed.

The pilot had just made a practice autorotation to a point approximately 75 feet short of the BAK-9 barrier, which was located 1000 feet from the end of the runway. Although the tower had reported winds calm, there may have been a tailwind of about three knots. With the aircraft rolling at about 25 knots, the pilot had three seconds to stop or get airborne before the chopper rolled over the cable. He lifted collective pitch in an attempt to get airborne before hitting the cable but, due to lag in engine response, he couldn't make it.

The two front gear rolled over the barrier but the cable rode over the right rear bear paw and hooked on the wheel. This caused the aircraft to veer to the right and roll left. The left rotor blades struck the ground and disintegrated. The chopper rolled onto its left side, the tail booms broke off and the right rotor blades dug into the mud off the runway and shattered. The aircraft slid to a stop on its left side and the crew exited. Cost of repairs was estimated at $59,000.

Bear paws and BAKs don't mix. ★

Bent bearpaw is silhoutted against sky in this photo of wrecked HH-43 helicopter. Bearpaw caught on cable when aircraft rolled over BAK-9.

ARE YOU READY
for the accident that could happen tomorrow?

Possibly the most tragic, unnecessary and preventable mishaps are those that occur during the response to an accident. With few exceptions they are the result of inadequate planning and preparation, compounded by confusion and excitement immediately following an accident.

Take the case of the pilot who escaped from his crash-landed aircraft, ran a few yards and collapsed in some tall grass—only to be run over by a fire truck. Not much we could have done to avoid that one.

But truly preventable accidents have occurred too often during the response to an accident. In some instances, when an accident reacttion plan came unglued, secondary accidents did not occur, but the rescue and firefighting reaction was compromised.

Take a look at some recent ones:

• A bomb-laden aircraft on a tactical mission aborted takeoff and ran off the runway. Pedro, the rescue helicopter, scrambled to the scene of the burning aircraft. While the helicopter pilot was flying near the crash, attempting to determine if the aircrew had evacuated, the bombs exploded. Pedro did not know that the bomb time factor had expired and the fire equipment withdrawn. The helicopter was destroyed and two of the three persons aboard were fatally injured.

• A disabled O-1, being carried beneath a helicopter enroute to a repair base, swooped up into the rotors. The helicopter crashed, killing all occupants. The helicopter was reported to have been traveling at almost twice the safe speed for that operation.

• A tactical fighter with a full load of ordnance aborted takeoff on a temporary runway. It ran off the end and came to a stop in flames. The crash crew found a deep ditch between the end of the runway and the burning fighter. Unaware that there was an expeditious route around the ditch, the crash vehicles pulled back when the ordnance time factor expired. The pilot was rescued by personnel on foot, but the aircraft was destroyed by fire.

• A chemical explosion on the flightline incapacitated a few persons and injured several others. No one had told the base medical

people that the chemical was being stored and used on the base. Not knowing what its properties or effects were, they were unsure of what treatment to give.

Do you see it? A common theme running through all of these mishaps? Correct and timely information didn't get to the people who needed it. In most instances, if a plan existed, it was not thorough enough to cover all eventualities.

Let's go back to Pedro and take a closer look.

When the bomb-loaded aircraft aborted takeoff and ran off the runway, Tower activated the crash phone. Fire-fighting and rescue response was initiated and Pedro was scrambled. Because of a lack of communications discipline on the part of people answering the crash phone, it took two and one half minutes to pass the simple information about the aborted takeoff. Some of the information had to be repeated four times.

Once Pedro was airborne, Tower informed him that the accident aircraft appeared to be on fire. Pedro immediately asked for the time factor—the length of time it is safe to remain in the vicinity of a burning aircraft after the ordnance load is engulfed in flame. In this case, the time factor was five minutes. But at this point, neither Tower nor Pedro had this information.

Tower checked with the Command Post. They didn't know the time factor. Then Tower checked with Launch Control, who didn't know either, but would check with Command Post. Meanwhile, Command Post was checking with Maintenance Control who said they would find out and call back. They never did.

The Assistant Fire Chief, in one of the first vehicles to respond to the crash, started his clock as soon as he saw that the aircraft was on fire. Once at the aircraft, finding that the crew had apparently evacuated and the fire was burning in the vicinity of the bombs, he ordered everyone to evacuate the area. This was two minutes after Pedro took off. Tower was busy trying to learn the time factor and didn't hear the Chief's order to withdraw. Tower didn't ask the Chief for the time factor — the only person who would be sure to know.

Three minutes after takeoff Pedro asked Tower if the fire equipment was evacuating. Tower said to stand by, they were coordinating. But Pedro appeared to start moving out. At this point a question arose as to whether one member of the crew had actually been seen out of the aircraft.

Five minutes after Pedro's takeoff (which was nearly five minutes after the first observed fire in the crashed aircraft) Tower informed him that one member of the crew was still not accounted for. Pedro asked if they would like him to take another look at the aircraft. He knew the airplane was loaded, that it was burning, and probably had observed the crash/fire vehicles withdrawing.

In the rescue business, when lives are at stake, you take certain calculated risks. But you must make use of every available bit of relevant information.

The Pedro pilot did not know the time factor. He did not know the time factor was within seconds of expiring when he went back to the burning wreckage to look for the

missing crewman.

It was too late.

Ten minutes later the missing crewmember was identified when a maintenance truck delivered him to the base hospital with minor injuries. Maintenance Control had known that he was in the truck.

The investigation revealed that several factors teamed up to cause the loss of the helicopter. Thorough preparation, in the form of a well thought-out reaction plan, could have identified these factors. Corrective action could have been taken before the accident occurred.

- There was no direct communication link between Pedro and the Fire Chief. The only link was through Tower.
- Tower personnel were not aware that they were the only communication link between Pedro and the Chief.
- Personnel on duty in the tower did not know where to get information on the explosive time factor.
- Although the base crash/fire department and the rescue helicopter detachment each conducted drills and training sessions, they had not conducted joint drills to work out coordinated rescue procedures.
- Command Post personnel are normally the communications hub of an operational wing to whom everyone else turns for information during critical moments. They were busy notifying wing agencies of the fact that the aircraft and ordnance were engulfed in flame. But their check lists did not take into account the time factor. They did not know where to go to get it.
- The distances prescribed for withdrawing fire equipment from a potential ordnance explosion are based on blast effect. No data are available to local base rescue helicopter units to relate these distances to the effects of shrapnel or debris. And shrapnel is the greater hazard to a helicopter in the vicinity of such an explosion.

We've gone into detail on this accident for a reason. It is not to chastise the people who were involved. They have learned the lesson that we hope others may learn from this account. The obstacles to maximum, rapid effective accident reaction will change from base to base, but hopefully this will trigger some deep, honest study by everyone reading it who *might* be involved.

Incomplete or uncoordinated planning for the accident response on your base can lead to further tragedies in the wake of an accident – instead of limiting the damage and injury as the accident plan should. And many agencies on each base are involved. It takes imagination to visualize all the possibilities – all the situations and variations – that may occur.

You must drill, dry run, rehearse the accident response with maximum participation by the agencies and people concerned. This is when you usually find the holes in your plan.

Finally, it takes cooperation. A comprehensive, effective accident reaction plan is not the product of one or two people in the base Disaster Control office. Everyone involved – including the tenant organizations – must cooperate in developing the plan.

How about it–are you ready for the accident that could happen tomorrow? ★

Living With Cold*

Dr Horace F. Drury, Arctic Aero-Medical Laboratories, Ft. Wainwright, Alaska

Extremely cold weather presents many problems. The Air Force is meeting the challenge by applying the knowledge gained from experience and research to its arctic operations.

The death rate from accidents in Alaska is consistently more than double the rate in the United States as a whole. While some of these accidents are related to the type of work often required in the far north, heavy work performed under primitive conditions, and others, such as firearms and aircraft accidents, are associated with frontier living in general, a great many must be blamed either directly or indirectly on the climate and especially on the cold. For example, the death rate exceeds the national average. This is because the water is so cold that even good swimmers rapidly become paralyzed or inhale ice water in involuntary gasps. Fire is another notoriously effective killer in a land of overworked heating plants and frequently waterless fire departments. Carbon monoxide poisoning is commonplace where engines of standing vehicles are left running for warmth.

Although the normal individual has a limited reserve of body heat to carry him through shortlived emergencies, long-term survival requires the maintenance of thermal balance. That is, heat production must equal heat loss. All living cells produce a certain amount of heat as a by-product of the chemical processes they must carry out just to stay alive. This is called basal metabolism. Muscular work results in greatly increased heat production, and this work does not have to be mechanically productive. Thus, shivering alone can increase heat output fourfold over the basal rate.

Heat is lost from the body (1) by radiation from the surface; (2) as a result of the replacement of air which the body has warmed with cooler air through the process of convection; (3) by conduction to cold objects such as tools, metal seats, or the cold floor of a life raft; and (4) by the evaporation of wa-

*Adapted from a paper, "Human Problems in Cold Climates," delivered at an Air Force-Industry Conference on Cold Weather Operations.

ter in the form of sweat, rainwater, or melted snow, and to a very important degree, by the evaporation of fluid from the lungs.

When a man is exposed to cold stress, at least one of two things must happen if he is to stay alive—he must increase his heat production or he must decrease his heat loss. Preferably, he should do both. He may increase production by voluntary work, by involuntary shivering, and to a very slight extent, perhaps by involuntary chemical changes involving the thyroid gland. He can cut his heat loss by lowering his surface temperature through the constriction of blood vessels supplying the skin. He can reduce his surface area by pulling his knees and arms up against his chest as we do in a cold bed. He can stop sweating. He can even reclaim some of the heat he uses to humidify his breath by condensing the moisture in his cold nose. His nose will run, but it will be less likely to freeze. However, above all, he can add insulation in the form of clothes, sleeping bags, and shelters.

When thermal balance cannot be maintained, hypothermia inevitably sets in. The normal body temperature of 98.6°F begins to fall. Shivering starts immediately and rises to a peak at 95°F. Below this temperature, it decreases and stops entirely by the time 86°F is reached. At this time, the heart rate is low and irregular, breathing is slow and shallow, there is some muscle rigidity and consciousness is clouded. In the neighborhood of 77°F, the heart is apt to stop beating and start fibrillating, an ineffectual sort of trembling. Blood pressure falls and death occurs. The lowest temperature recorded with subsequent recovery was 64.4°F.

The treatment of hypothermia depends upon how rapidly the condition developed and how long it has lasted. But the important thing from our viewpoint is that a man becomes accident prone very early in the process. Numb fingers and aching joints due to reduced blood flow, violent shivering and a preoccupation with bodily discomfort are not conducive to safety. It is also important to realize that the cooling power of water is vastly greater than that of air so that severe hypothermia can develop in a matter of minutes in water. Furthermore, the water does not have to be freezing. Almost all long-range Air Force flights, including flights by the great circle route to Southeast Asia, pass over waters cold enough to produce death within a few hours for a man wearing ordinary clothing.

Frostbite, the actual freezing of tissue, may occur with or without hypothermia and may even occur while the subject is still in general thermal balance. Theoretically, it could be prevented under almost any circumstances by the use of proper clothing and with adequate precautions and, in fact, it is not much of a problem for well trained troops under peacetime conditions. However, it is almost certain to cause serious trouble in wartime or emergency situations and is an ever present hazard for the ignorant or careless. There is no cure at all and there never will be. Frostbitten tissue is dead tissue. All that can be done is to protect the surrounding live tissue from further injury and from loss of blood flow. This is best done by rapid thawing in very warm water, protection from mechanical damage, exercise to prevent muscle degeneration, and above all, by *not* hastily amputating any part that is still alive.

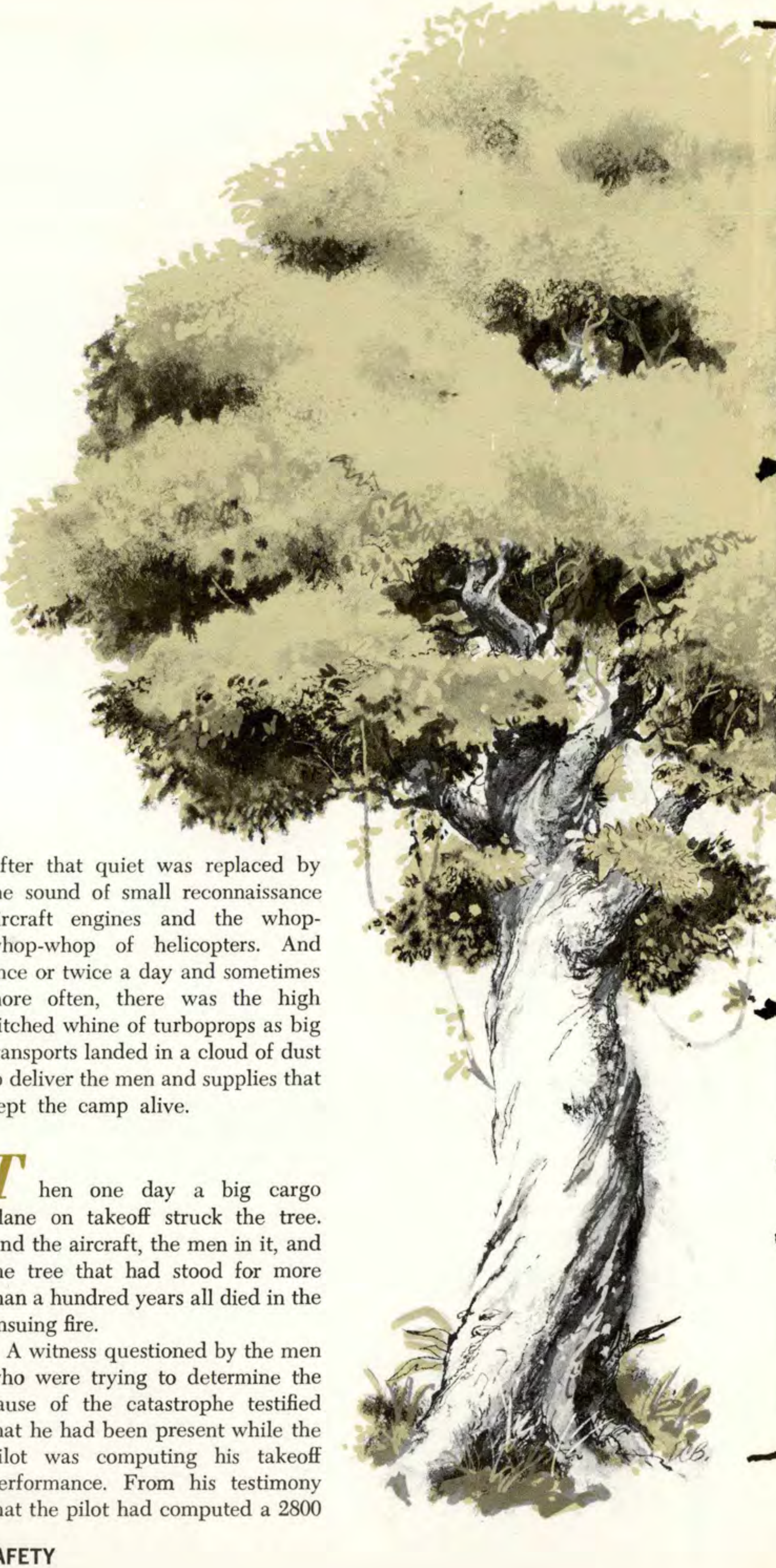
As everyone knows, wind makes the effects of cold much worse, but it does not actually lower the temperature as many people believe. Above 32°F, you cannot possibly freeze even if the wind blows 100 miles an hour. You will, however, lose heat much more rapidly if the wind is blowing, and if the temperature happens to be below freezing, you will freeze sooner. If the wind also carries snow particles, you will have the worst possible conditions. In this case, you can indeed freeze above 32°F. In fact, a relatively warm wind might be worse than a cold one if it caused melting snow to stick to your face.

Well, what can be done in a practical way to combat the effects of cold on the body? First, our men can be furnished with, and required to wear, the best possible clothing.

Second, we can provide adequate supervision, including careful monitoring of personnel at work in the cold for signs of stress and intelligent scheduling of work to establish safe cooling – rewarming cycles. Experienced supervisors are not doing too badly on this, but we could use more basic physiological information for their guidance.

Finally, practical experience with cold weather on the part of the worker is of great benefit. Alaskans don't even notice conditions that would bring traffic and work to a complete halt in Chicago. I'm not referring to mechanical difficulties caused by two feet of snow, but to the partly psychological hazards of an inch of freezing slush on a freeway during rush hours. With experience, one can operate even under these conditions with reasonable safety. Similarly, one can learn to go about his business reasonably well at 30° below zero in Fairbanks. At least, it's better than 50° below zero. But even −30° is catastrophic in Anchorage where people are not used to it. It seems to me that it is very important to try to see that, at all times, there are enough people in the Air Force with fairly recent cold weather experience to serve as catalytic nuclei for an expanding operation. ★

IS THERE A TREE IN YOUR FUTURE?

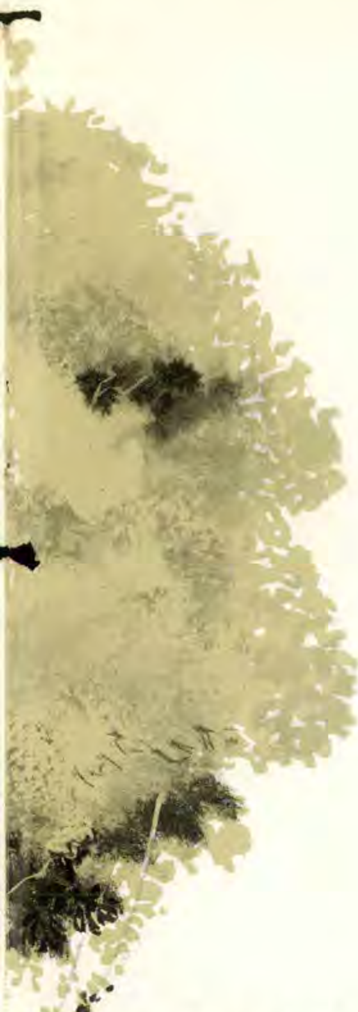


The tree had stood on this spot for over a hundred years untouched by man, its roots burrowing far into the soil for anchorage and sustenance. Then men came and they hacked away the jungle farther down the slope where the land flattened out. They dug holes for bunkers which they covered with huge timbers and lengths of railroad track, then dumped dirt on top and piled up bags full of dirt and sand. And they leveled nearly a mile of land and covered much of it with steel mats locked together to provide a relatively stable surface.

Then more men came with guns and trucks and barrels and other impedimenta of modern armies and soon there was a mighty roar and a huge airplane touched down on the far end of the runway that, had it continued for another 500 yards, would have bisected the old tree. After that quiet was replaced by the sound of small reconnaissance aircraft engines and the whop-whop-whop of helicopters. And once or twice a day and sometimes more often, there was the high pitched whine of turboprops as big transports landed in a cloud of dust to deliver the men and supplies that kept the camp alive.

Then one day a big cargo plane on takeoff struck the tree. And the aircraft, the men in it, and the tree that had stood for more than a hundred years all died in the ensuing fire.

A witness questioned by the men who were trying to determine the cause of the catastrophe testified that he had been present while the pilot was computing his takeoff performance. From his testimony that the pilot had computed a 2800



foot takeoff roll the investigators were able to figure out what probably caused what they called an accident.

The area around the airfield was for the most part hilly land which rose in the distance to some fairly high mountains. Off the north end of the runway the land rose slowly to culminate in a ridge that dropped off sharply to another valley beyond. The old tree was located on the gently sloping ground some 1500 feet beyond the end of the runway.

On the day of the accident the wind was very light, ranging from calm to occasional eddys of five to eight miles per hour from the south. Normally, because the area south of the base was considered hostile, landings were from the south with a close-in pattern and takeoffs were to the north.

When the accident investigators looked at the facts available it was pretty obvious that the pilot of the aircraft that crashed into the tree had failed to take field elevation, 5000 feet, and a slight tailwind into account. These two factors added 1200 feet to his takeoff roll, which witnesses said was about 4000 feet. This estimate was thought to be pretty accurate because the runway was 4100 feet long and the transport left the ground just about at the end. The extra long roll, high density altitude and rising terrain contrived to place the old tree directly in the path of the slowly climbing aircraft. Other trees closed the trap and the pilot had nowhere to go.

This story is fiction but it is based on fact. And it has been repeated many times over the years, most often, perhaps, and most recently in Southeast Asia where airfields such as the one described abound.

Conditions vary somewhat from field to field – some have ravines off the end, others are surrounded by hostile territory, tiny enclaves where aircraft make tight turns both during the approach to land and after takeoff in order to remain over friendly territory while flying close to the ground. Some have downdrafts off the ends and some have runways that are bisected by roads. The list could get pretty long.

But accidents such as the one described have occurred all over the world, wherever Air Force aircraft operate. And they have happened to just about every type of aircraft you can name.

On rare occasions the situation is strictly no-go. Usually, though, careful planning will enable pilots to avoid such pitfalls and perform their mission. Elevation and temperature must be taken into account. Weight of the aircraft and length of the runway must be worked into the formula, and wind is always a factor to be considered in operations at marginal airfields. If all of these add up to a green light, then engine condition before takeoff must be closely checked to keep the formula in the green. And you must know and be prepared to use short field techniques for your aircraft.

Some of the shorter strips don't permit an abort, even if the situation changes on the roll. In other cases, some recent, we've lost aircraft and crews to obstacles off the end of runways in excess of 10,000 feet in length.

The secret is to use that computer between your ears. Compute and re-compute, if necessary, until you know you're right. Also, find out what is off the end of the runway—does the land rise? Is there a downdraft? If the wind shifts to a crosswind or a tailwind can you still make it? Will aircraft performance at this elevation and temperature permit a climb that will clear rising ground and obstacles in your flight path?

Know the answers to these questions. Your life may depend on having the right answers. ★

Watch That Quick Release Cover...

SSgt Nollie A. Wilson, 852 Med Gp, Castle AFB, Cal

During parachute descent it is standard and proper procedure to remove the quick release safety covers.

CAUTION! Use extreme care, for if the fingers slip under the cover it is possible to pull on the wire loop as the cover is removed, thus releasing one side of the canopy.

TRY IT! Take any parachute and remove the quick release cover. First, make sure that your fingers are on the flanges of the cover. Actuate it correctly to see that it works as advertised.

Now reset the cover and grasp it a little lower, fingers on the bottom edge of the flange and grasping deep. Notice that as the cover rocks away, your fingers are on the wire loop, pulling it up into the space between the cover and its hinge. Continue to pull on the wire loop and it will release the parachute riser.

THINK! If your life depended on that riser—what would happen?

CAUTION! Since it is possible to release one side of the parachute inadvertently, take a precautionary step. T. O. 14D1-2-1, para 3-43, describes the best procedure:

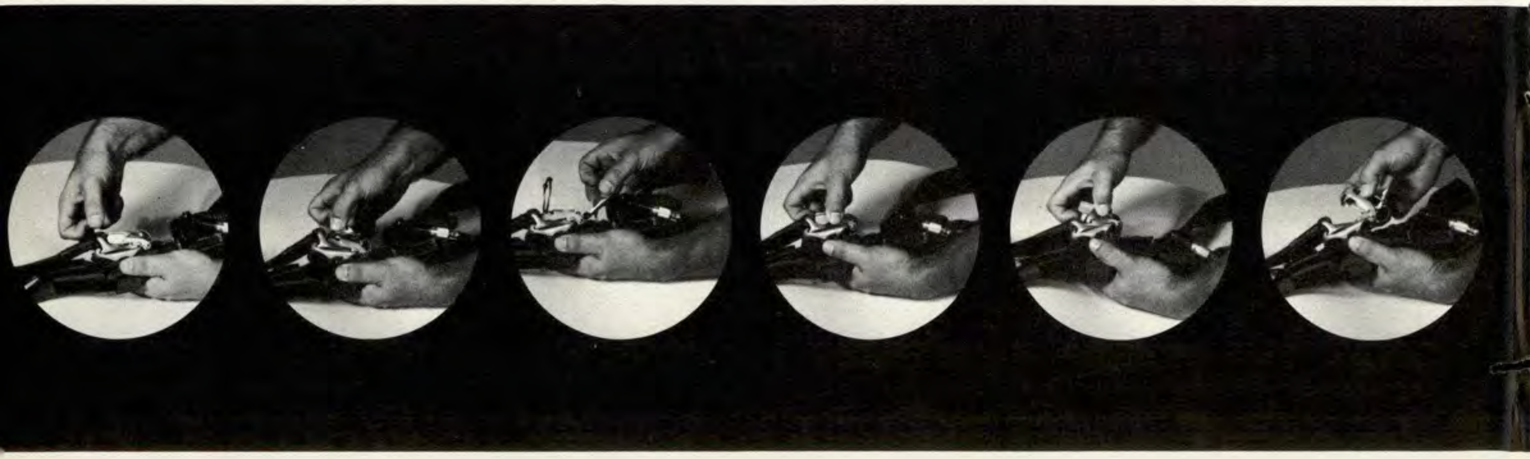
Hook your arm through the V in the riser, fist closed, and visually locate the safety cover underneath your bent elbow. With your opposite hand reach across using the thumb and forefinger, pull down the safety cover. Slowly remove your arm and repeat the process on the opposite side.

If for some reason the quick release fails or you unintentionally release the riser, the V of the riser will be held down in the crook of the elbow and will prevent the riser from flying free . Since you are not able to hold that much weight for an extended period of time you should not remove the covers at too high an altitude.

NEVER! Intentionally release the quick disconnect before contacting the surface, whether land or water. Striking the ground without one riser connected results in a speed of impact that is not conducive to longevity.

The above mentioned T. O. directs that crewmembers practice the operation of this quick release until they are familiar with the operation and can do it "quick and easy." Try it wrong once and try it correctly several times. A little extra caution and practice may save your life. ★

Practice removing covers on quick release. (1) Grasp flanges at top of cover, (2) rotate cover downward, (3) wire loop springs up. (4) Wrong way — fingers are too low, (5) wire loop catches, (6) release is raised, there goes lifeline. Practice correct way until you have it pat.



ARE YOU "OUT OF CONTROL?"

R. D. Hunt, Flight Safety Engineering, McDonnell-Douglas

That headline may strike most of you F-4 drivers as being a rather funny question (funny peculiar, not funny ha ha), but for some it's a question worth giving some thought. "Out-of-control" incidents and accidents are on the rise, and every Phantom pilot should be sure he knows just what kind of gyration his aircraft is in and the correct recovery procedure.

What constitutes an "out-of-control" maneuver — spirals, stalls, poststall gyrations, departures, incipient spins, upright and inverted spins, and flat spins? Take your pick, but be sure you know the correct recovery procedure for that time when you suddenly find yourself face-to-windscreen with your selection.

I don't have anything new or startling to say about recovery from these maneuvers; it has all been said many times and in many ways. But now that I've got you here in the Ready Room, there are a few quiet reminders I'd like to drop your way.

Sure, the F-4 will stall, and if the pilot incorrectly positions the flight controls, it will also spin. And it will just as surely recover from either of these conditions if the pilot uses correct control techniques. One "out-of-control" mode, the flat spin, is almost impossible to recover from, but before the Phantom enters a flat spin it must first stall, then be put in a normal spin, and then it may or may not end up in a flat spin. So you have ample opportunity to regain control before the aircraft enters a flat spin.

I am convinced the F-4 will not spin unless forced to do so. For the F-4 or any aircraft to spin, it is necessary to generate a yawing moment to impart the spinning motion. The generation of the required yawing moment in the F-4 is accomplished by use of the ailerons and/or rudder, with the ailerons being the more efficient of the two. So—if you stall the bird but quickly and smoothly neutralize the flight controls, then no spin. The secret of success is to avoid any aileron or rudder deflection. In my opinion, the best way to do this is to release the stick instantly and let the flight controls neutralize. This procedure eliminates any chance of inadvertent or unconscious aileron or rudder deflection. Most pilots would swear that they absolutely did not deflect the ailerons but the results generally prove differently.

Learn to recognize the stall and break it immediately by neutralizing the flight controls. Review the aircraft characteristics for the maneuvers and the recommended recovery procedures for each. If the aircraft doesn't respond immediately to stall recovery procedures, deploy the drag chute — it can only help recovery. Don't attempt a new maneuver until you have analyzed its implications, its possible results, and the proper recovery. Lack of knowledge rather than the inability to perform is what usually gets pilots in trouble. Become knowledgeable. ★

(McDonnell Douglas Product Support Digest)

AERO BITS

. . . AND IT ONLY TAKES A SECOND. The pilot had ejected successfully, made radio contact after his parachute landing, and the helicopter arrived over him to start the rescue. Lowering the forest penetrator to the full length of the cable, the helicopter crew found they had to hover below the level of the surrounding trees. While they maneuvered to get the penetrator to the pilot on the ground, the rotor blades struck vines and trees surrounding the area and a vibration began to develop throughout the airframe.

The helicopter crew chief saw the pilot on the ground give a signal to raise the cable after he was on the penetrator seat. He was not in sight while he came up through the dense foliage, and when he cleared the top of the trees he was hanging from the penetrator by his hands.

He was about 60 feet from the door of the helicopter when increasing vibrations made it necessary to travel horizontally to gain lift. The pilot, almost rescued, lost his grip and fell to the ground in a ravine approximately 500 feet below.

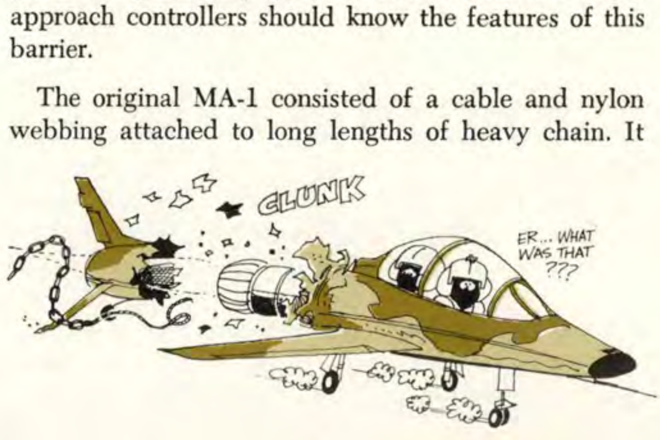
He had not fastened the penetrator safety strap around himself before being lifted off the ground.

BARRIERS. A few years ago a Marine aviator wrote to suggest some publicity on Air Force barriers for the benefit of our friends in the other services. And he had a reason for making such a recommendation. He had landed at a USAF base with the intention of making an approach end arrestment. However, an alert controller warned him in time or he would have taken the MA-1. Then he found out what kind of barrier the MA-1 was and realized what would have happened if the hook had latched on to all that chain.

About a year ago an Air Force fighter took a Modified MA-1A from the wrong direction. The aircraft was damaged but the cable broke or there might have been a more serious ending to the story.

Possibly some confusion still exists over the capability of the modified MA-1A arrestment gear. All pilots flying hook-equipped aircraft and all tower and approach controllers should know the features of this barrier.

The original MA-1 consisted of a cable and nylon webbing attached to long lengths of heavy chain. It



was designed to be engaged in one direction only—toward the overrun at the far end of the landing roll. When the aircraft nosegear engaged the barrier the cable flipped up and caught the main landing gear and the momentum of the aircraft was absorbed by dragging the chain.

A few years ago a cable was added for hook-equipped aircraft. This cable may be tied to the chain or have a hydraulic retardation system. If it is tied to the chain, never try to take it from the approach end, whether the MA-1A is erect or lying down.

You don't have to know how to build a barrier in order to use one, so we won't go into all the technicalities. If you consult your Dash One and read the info presented on page 7 of the IFR Supplement, "Jet Barrier/Arresting Gear," you should be up to speed on barriers.

LUCKY IS WHAT YOU CALL IT. Only minor damage resulted recently when an overseas F-4 crew found themselves bouncing off the water during a practice low-level navigation mission. They could have fared a lot worse! Here's how it all came about:

Skimming along 500 feet above the water at about 420 knots, the aircraft commander noticed an area of sea fog ahead. Before he could start to climb, the aircraft entered the fog and the cockpit immediately fogged up. About ten seconds later the crew felt a

slight bump of the control stick. The aircraft commander pulled back hard on the stick, registering two and one-half to three G. He noticed the ADI rotating to a climb attitude and then felt a thump as if the aircraft had struck something. He saw that airspeed had decreased to 300 knots and went to military power, picked up to 330 knots and climbed out.

Flight Lead came around and joined up to assess the damage. He saw gashes under the left wing and fuselage. The right wing drop tank was torn off. Both engine nozzles and an area around the tail hook were damaged. Also, forward mountings for the right engine were broken, allowing the forward section of the engine to rotate downwards. The crew made a successful approach end engagement at home base.

Your first reaction to one like this is, "Better turn up the heat control at low altitude." But in a hot, humid climate, such as SEA, this approach could lead to melted aircrews!

We all recognize that the Phantom's air conditioning system is inadequate. Its inability to cool at low altitudes is a real problem.

SEA experience has identified a couple of techniques that do about as much as the aircrew can to combat the problem:

- Dry out the moisture in the system while you're taxiing back after landing by turning up defog and heat to full hot. This eliminates moisture that the water separator didn't separate.

- Fly with about half defog at all times. This blows cockpit air over the windscreen and canopy. Not very comfortable on a long, refueled mission, but it does help correct the problem.

WATCH 'EM! The T-39 had been at FL 390 for an hour and a half and the pilots were well accommodated to the dark outside. When lights of another aircraft showed up ahead, it took them only moments to decide it was closing. And the lights were staying at 12 o'clock level. Collision course, for sure.

When the T-39 pilot reached down and flashed his landing lights a couple of times, he received a reasuring reply in kind from the other aircraft. "That's better," he thought, "at least the guy knows we're here."

But the relaxed atmosphere in the T-39 cockpit didn't last very long. The stranger's lights remained at 12 o'clock. And they remained level. When they were about two miles away, the T-39 pilot started to climb and take evasive action.

The stranger passed directly under the T-39 without any apparent evasive action. With their Tiny 'Liner squared away again and back at assigned altitude, the T-39 crew called Center and learned that yes, the other aircraft was at FL 390, too!

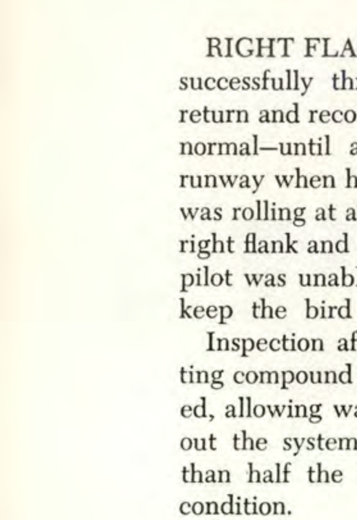
Even when a problem appears to be solved—when the other guy signals that he sees you—you can't afford to relax. Distances and altitudes can be deceiving at night and the lights of another aircraft don't give a reliable indication of the track it is on.

AERO BITS

CONTINUED

RIGHT FLANK, HO! The Thud driver had made it successfully through the combat mission, refueling, return and recovery. Landing and rollout were normal-normal—until about 800 feet from the end of the runway when he engaged nosewheel steering while he was rolling at about 30 knots. The Big '5 did an abrupt right flank and marched smartly off into the grass. The pilot was unable to disconnect the steering in time to keep the bird on the pavement.

Inspection after the fact turned up the cause: potting compound on steering components had deteriorated, allowing water to enter the cannon plug and short out the system. Further checking showed that more than half the birds in the wing were in the same condition.



CALL FOR MR. CLEAN. Static ports and drainholes perform a useful function only when they are open and free of contamination. The subject comes to mind because ice and frost can effectively plug these holes, especially those little bitty static ports. Rain followed by a freeze can do a good job of closing these holes, so they should be carefully checked on the walkaround.

Even in warm climates dust, grains of sand and bugs can do the job and we've heard of spiders and wasps (mud daubbers) doing the dirty work.

While we are on the subject, last winter an aircraft with twenty-odd passengers nearly bought it when an accumulation of water following unusually heavy rains flooded a nacelle and shorted out the electrical system. When the aircraft got back on the ground and the nacelle was opened several gallons of water spilled out. In another case a T-39 had to abort because the airspeed indicators didn't agree by a whole lot. Sure 'nuff — heavy rains, bird parked outside: water in the pitot static system. ★

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.

Lt Col Winthrop W. Wildman Aircraft Commander | **Maj Jack G. Womack** Instructor Pilot | **Lt Col Lawrence L. Waitt** Navigator | **SSgt Richard L. Gage** Flight Engineer

12th Special Operations Squadron, APO San Francisco 96227

On 13 December 1968, Lt Col Wildman and crew flew lead in a formation of UC-123s on a low level defoliation mission against a target approximately 15 miles north of Bien Hoa AB, RVN. The spray run and level turn were normal. As roll out from the turn was initiated and before climbout was started, Lt Col Wildman's aircraft received intense automatic ground fire. He told the formation to advance power on the jet engines to 100 per cent and begin climbout. When his airplane suddenly began a roll to the left, Lt Col Wildman alerted the crew for a possible crash landing and applied full right aileron. At 1200 feet the climb was discontinued and Maj Womack idled the right jet engine, leaving the left jet at 100 per cent. With asymmetrical thrust and full control deflections the wings were brought to a level attitude. SSgt Gage dropped his body armor and left the protection of his armored box to assist in the emergency. He advised the pilots that the left aileron was in a 45 degree up position, the control cables to the left aileron were loose, and the aircraft had taken many hits from ground fire.

To keep the airplane in a wings level attitude required full right aileron trim, almost full right aileron control, a large amount of left rudder control and differential power. However, both pilots felt there was sufficient control to attempt a landing. Lt Col Waitt gave the pilots a heading to Bien Hoa AB. A straight-in approach with a no-flap landing and negative reverse was decided upon. The crew was directed to prepare for a possible crash landing and SSgt Gage was standing by to manually lower the landing gear if necessary. An above average airspeed — just below the maximum gear down speed — was used on the approach and landing to insure adequate airspeed for lateral control. Directional control was maintained primarily by rudder and power, as full right aileron was necessary to hold the wings level.

Immediately after touchdown the main system hydraulic pressure dropped to zero and the aircraft began a veer to the left. Normal brakes and nose wheel steering both failed. Lt Col Wildman applied the emergency air brakes and Maj Womack reversed number two propeller to stop the aircraft on the left side of the runway.

Postflight inspection revealed a total of 18 .30 calibre hits. The left aileron control cable and the nose wheel steering hydraulic line were severed. The left main tire had been hit, which resulted in it going flat on the landing roll causing the aircraft to veer to the left.

Due to the quick action and sound thinking of both pilots and the other two crewmembers, a major aircraft accident was averted. WELL DONE! ★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