flying

SAFETY JUNE 1983

VISION In Spatial Disorientation

It's Yours, IP

So You Are A NEW AC

Bio Logical Rhythms

THE URGE

■ *Hawk Two is rather surprised to see Lead disappear so quickly after rotation, but shrugs it off as the aircraft accelerates down the runway. Now, suddenly, with the increase in speed, he can make out only four runway lights, the fourth a hazy glow in the thickening fog. He increases back pressure as the airspeed says it's time to fly and the bird smoothly breaks ground. All outside references are gone and Hawk Two picks up his instrument crosscheck with the confidence born of diligent practice, reaching for the gear handle, glancing down as he does so. Returning his gaze to the instrument panel, he is overwhelmed by the feeling that he is in a steep climb. He slams the stick forward . . .*

Impact occurred three seconds later, at 195 knots, 15 degrees nose low, 30 feet right of the runway edge.

Couldn't the pilot hack it? Obviously not. Was the accident preventable? You bet it was! Let's take a closer look.

By take off time the weather was actually below minimums, but Hawk Lead had promised the Ops Officer that these two birds would be available for the Monday morning mission and was determined to get home. Hawk Two was junior birdman; assuming he had enough judgment to realize that he wasn't ready to tackle the cruddy weather, it's likely he'd be reluctant to admit it.

It all adds up to *Get-home-itis,* a widespread malady which usually runs its course with no bad side effects, but which sometimes causes symptoms of severe fright or even a tragic disaster like the one above. The severity of the disease is random and unpredictable; its symptoms will show on a pilot one day and be mysteriously absent the next. Symptoms occur most frequently on cross-country flights, when the decision for go or no-go rests with the pilot.

In a combat situation when there is an obvious requirement to fly, the extreme risk must be carefully calculated and weighed against mission requirements. In the typical case of *Get-home-itis,* the need to press on exists only in the mind of the crew. Invariably, hindsight says the mission wasn't worth the loss. — Reprinted from Aerospace Safety, July 1971. ■

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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The role of **VISION** in...

COLONEL GRANT B. McNAUGHTON, MC
Directorate of Aerospace Safety

■ We normally think of spatial disorientation (SDO) or pilot's vertigo as due to tumbling of our gyro — the balance organ or vestibular apparatus in our inner ear. While it is certainly true that vestibular inputs can cause vertigo, the vestibular apparatus is not the only source of conflicting information leading to SDO. Other sources of orientation information (hence conflicting inputs) include vision, the somato-sensory (feel of the aircraft and seat of the pants) system, and, to some extent, hearing. Of all these sources, the most consistent and possibly most important cause of SDO is conflict between two functional components within the visual system itself.

Though in some respects an over-simplification, the concept of a two-mode visual system is important to understanding the role of vision in SDO. The two modes are:

- A *focal mode,* which "focuses," used for tasks requiring acuity or resolution: e.g., reading the 20/20 line or the let-down plate, identifying the bogey, or aiming the gun. The focal mode is exclusively visual, requires good lighting and good optical resolution. It also requires conscious attention.
- An *ambient mode,* which orients us to the "ambient" environment, tells where we are, and whether we or the environment are moving. The ambient mode is hard-wired to the same terminals in the brain into which feed our other sources of orientation information — vestibular, somato-sensory and hearing (Figure 1). Rather than being an isolated ambient visual system, we actually have an ambient orientation system. In this system, vision and the other senses each contribute a share of the inputs. The ambient mode functions quite well at low light levels and does not require acuity correction. For example, though you can't read in the dark, you can orient, provided there is some light (Figure 2). The ambient mode functions at a reflex rather than a conscious level and, provided the stimulus is visible, orientation responses appear to occur on an "all or none" basis. The ambient mode acts in concert with the other senses to subserve spatial orientation, balance, posture and gaze stability.

Figure 1

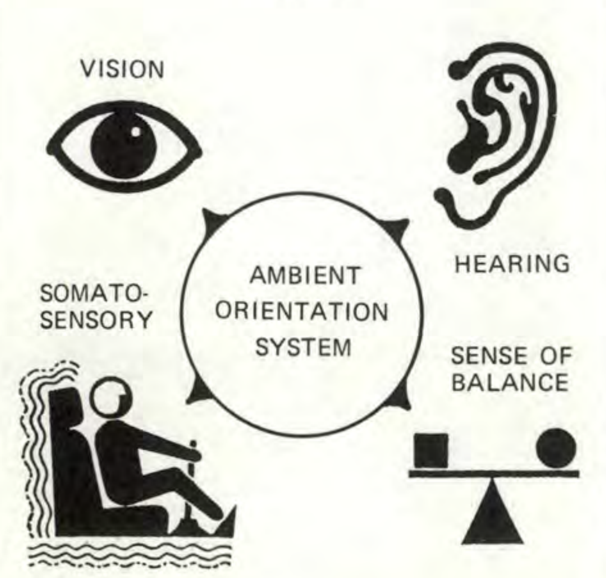
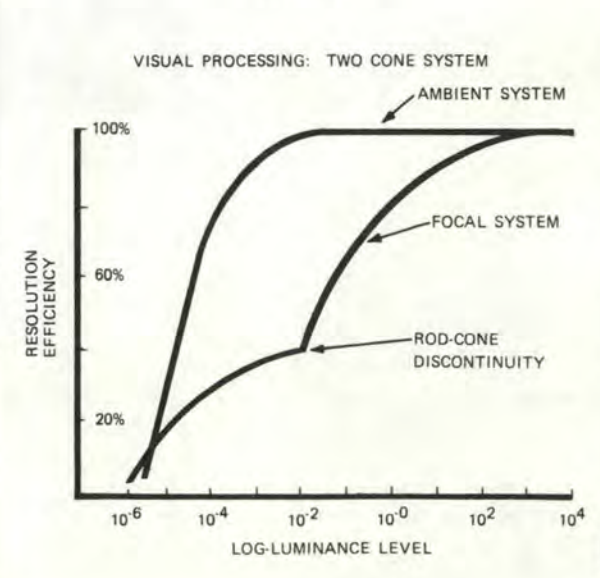


Figure 2



SPATIAL DISORIENTATION

An important aspect of these two modes of processing is that they can be dissociated, as demonstrated by the fact that you can read while walking. This dissociation has some impact on night driving, for example. You steer by your ambient mode, which is relatively unaffected at night. As long as you can steer, you have confidence in your ability to drive, so you drive at the same speed as during daytime, or commonly a little faster. The problem is that your focal vision (hence hazard recognition) has been selectively degraded, and you may not see obstructions such as joggers, animals or potholes in time. (Also, your reactions are slower at night.)

There are other fundamental differences between the two modes. The focal mode is confined to the optical center of the eye but the ambient includes the entire retina — over 3,000 times as much area. The ambient mode functions on the "mass rule" and reacts in proportion to the amount of it that is stimulated: big objects or big motions are more commanding. This, coupled with the fact that the ambient mode is not particularly discerning, (i.e., it can be fooled) provides the basis for the overwhelming sense of self motion — known as the "vection" illusion — generated by full visual simulators. It also accounts for the disorienting "Star Wars" effect of bubble-type canopies at night.

Another difference: whereas the focal mode actively focuses on objects for recognition and detail, the ambient passively takes in the "quality" of the surroundings — for example, the quality of "surfaceness" of a surface, or the "horizoness" of a horizon.

Of interest is the discovery that visual areas of the brain subserving the ambient mode appear to contain receptors specifically responsive to lines, and are quite ready to accept uncritically any line with the quality of "horizoness" as a horizon line. Thus, the commanding nature of sloping cloud decks or terrain, of a lighted shoreline or highway through an uninhabited region at night, or other false or misplaced horizons can subtlely misorient the pilot. In keeping with the mass rule, the larger or longer the horizon, the more commanding.

Think of the most disorienting situations: formation, flying in and out of clouds, then, suddenly, totally IMC; flying high above the desert on a moonless night, no discernible horizon, and stars and ground lights blending; taking off into weather; night weather penetration with your external lights on; approaching through rain, snow, or weather with landing lights on. And you can think of others. In all these situations, you're visual; you're not under the bag. This does not imply you can't get disoriented under the bag; you can, from your unbridled vestibular inputs, but not nearly so easily as when your ambient visual system is bombarded with confusing and reflecting stimuli. What's common to these situations is:

continued

- Lack of a true horizon or reference to the surface.
- Mass stimulation of the ambient visual system (by watching your flight lead, canopy reflections, clouds, stars, rain, blowing snow, lights, etc.) causing the vection illusion.
- Situation worsened by anything which tumbles your gyros, such as accelerations (linear or angular), or abrupt head motions.

Whereas excessive erroneous inputs to the ambient mode cause one type of SDO (the powerful vection illusion), lack of ambient inputs causes another: the target displacement illusion. This can occur in shooting an approach over "black hole" terrain, devoid of lights or any visual cues to the ambient mode. As you maneuver toward the distant approach lights, with no ambient inputs as a "reference point," it may appear that the target lights, not you, have moved. This is something akin to the autokinetic effect in which a stationary light will appear to move when gazed at; it can be somewhat confusing. Point sources of light provide no orientation information — either in relative attitude or in distance. Yet there is a common tendency to "go visual" too soon despite the lack of valid external orientation cues upon which to establish visual dominance. As a result, you become a set-up for the powerful vestibular illusions and can get into some unplanned attitudes.

If the runway lacks VASI's, the lack of ambient cues allows for another tendency: that is to fly a "banana" shaped approach, convexity downward. (The reason for this is that the eye, lacking other references, will attempt to maintain the same angle subtended by the visible runway — the near and far ends. In order to hold that same angle, you wind up flying the arc of a big circle, the chord of which is the visible portion of the runway, landing short or bending things shy of the runway.)

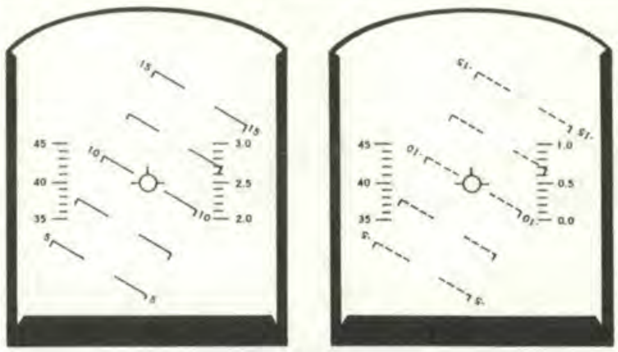


Figure 3

What's your attitude? How quickly could you interpret each of these HUD displays 1,000' AGL night IMC?

To cope effectively with SDO, you must establish visual dominance on valid, orientation cues. In other words, increase the ratio of "matching" cues to "mismatching" or conflicting cues. Under IMC, the only valid orientation cues are your instruments — primarily the attitude indicator. If single ship, reduce the disorienting mismatching visual inputs by turning down/off unnecessary light, inside and out, to reduce canopy glare and reflections; by lowering the seat; or by going heads-down. Then simultaneously expand the effectiveness of your valid orientation cues by leaning forward and concentrating on them — again primarily the attitude indicator. Make the attitude indicator indicate straight and level for at least 30-60 seconds (to allow the vestibular inputs time to subside).

Unfortunately, the most disorienting situation is formation flight in reduced visibility — IMC or at night. Though you may not be able to go heads-down (or sneak a peek) at the attitude indicator, tell lead you're disoriented and request flight parameters — primarily attitude. If possible, have him fly straight and level 30-60 seconds to settle your own gyros. If that doesn't help, try getting to VMC for reference to a horizon or the surface. Lead should also consider transferring lead to you — to let you get your ambient mode out of "Star Wars" and devote the full attention of your focal mode to the necessary gauges. (This should all be briefed ahead of time.)

Spatial disorientation is a common problem. It is to be expected under situations in which your visual system is either bombarded with disorienting cues or denied valid orienting cues — true horizon or surface — thus setting you up for the equally disorienting vestibular illusions. The best course is prevention by maintaining visual dominance (focal mode) on valid orientation cues (gauges). If SDO occurs, increase the ratio of matching to mismatching orientation cues by getting your head out of the Star Wars reflections and focusing on the appropriate gauges. In formation flying, have a plan and brief it. SDO is a killer. Don't take it lightly. ■

Thanks for their contributions to this article to: Dr. Herschel W. Leibowitz, Professor of Psychology, Pennsylvania State University, Dr. Robert B. Post, Dept of Ophthalmology, School of Medicine, University of California, Davis, and Professor Dr. Johannes Dichgans, Neurologic Clinic, Tubingen University, West Germany.

The fourth part of our AFISC project officer series continues in this issue with the A-37 and T-37 aircraft.

A-37 and T-37

MAJOR JOHN C. PLUTA

■ The USAF possesses 119 A-37s that have accumulated a total of 534,000 lifetime flying hours and a lifetime Class A mishap rate of 5.8. The numbers for 1982 are 24,633 hours with a Class A mishap rate of 4.6.

There was one Class A mishap during 1982. This accident involved an instructor pilot and an upgrading pilot on a low level and resulted in two successful ejections.

The AFISC Class A forecast for 1983 is the loss of one A-37 due to collision with the ground.

Instrument locations are being "standardized" on the right instrument panel. You should start seeing the new instrument layout for the attitude indicator, BDHI, and course indicator soon.

Blue fuel cell foam kits for deteriorating orange foam are in the field and are being installed on an attrition basis. ■

■ The USAF possesses 653 T-37s which have accumulated a total of 8,200,000 lifetime flying hours and a lifetime Class A mishap rate of 1.5. The numbers for 1982 are 319,664 flying hours with a Class A mishap rate of 0.63.

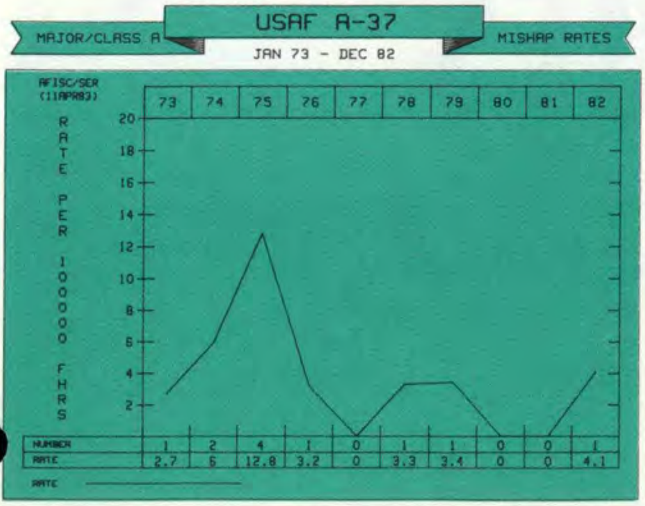
There were two Class A mishaps during 1982. One mishap involved an instructor pilot and student on a cross-country flight. During departure, the left fire light came on, and the IP shut down the affected engine in accordance with the checklist and set up for a single engine approach. The aircraft overshot final. The pilot started a go-around, reattempted landing, then reinitiated a go-around, and crashed. Two fatalities.

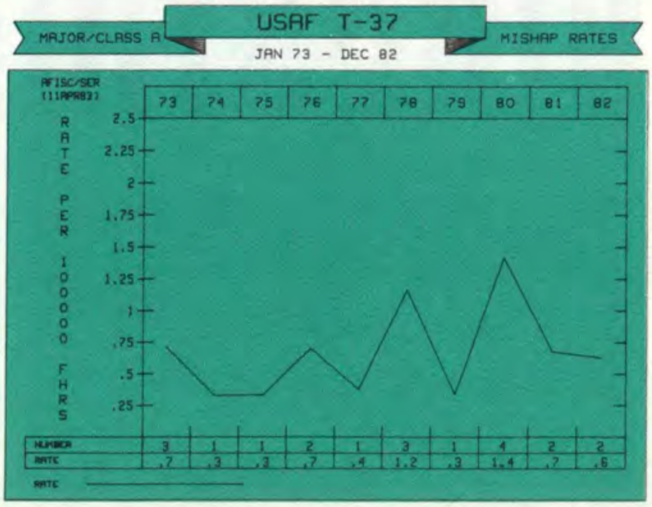
In another mishap a solo student completed a 180-degree turn to stay in the area and started a cloverleaf at an airspeed higher than planned. Normal stick movement produced G's higher than anticipated, and the pilot lost consciousness. Upon regaining consciousness he was disoriented, saw the ground rushing up, and made a successful ejection.

I strongly recommend everybody read the article "G-Induced Loss of Consciousness" in the April 1983 issue of *Flying Safety*.

The AFISC Class A forecast for 1983 is the loss of three T-37s — two due to control loss and one due to engines. Remember, this is a forecast, not a goal.

Inducer blade failure continues to be a problem even though mean time between failures has improved. Teledyne is accomplishing another analysis of failed blades and the recommended corrective action. Installation of DC powered standby attitude indicators (ARU-42/A-2) has been approved. Modification kits should be in the field in September 1983. The new indicator will be installed on the right instrument panel. ■





Something New For BIRDSTRIKES

CAPTAIN ROBERT C. KULL
BASH Team Ecologist

■ Although the airfield is considered the domain of aircraft, birds also find this environment very attractive. This makes the airfield the most hazardous area for birdstrikes to aircraft with 47 percent of all birdstrikes occuring within the airfield environment. Many of these birdstrikes have resulted in serious consequences.

▪ As a C-5 climbed IMC through 100-300 feet AGL on initial take off the aircraft encountered a large flock of snow geese and sustained at least 60 strikes including strikes in all four engines. Despite multiple failures and problems such as ceilings at 100 feet, the crew managed to return for a successful landing.

This potential for mishaps has led to the current emphasis on birdstrike prevention. Since 1976, the Air Force Bird/Aircraft Strike Hazard (BASH) Team operating out of the Civil Engineering and Services Center at Tyndall AFB, Florida, has been studying the problem worldwide and recommending ways to reduce the attractiveness of airfields to birds.

Of course, not all birdstrikes occur within the airfield environment. Low level routes also garner their share and, even within the airdrome, complete bird elimination is not possible. So, we cannot expect to eliminate birdstrikes entirely. But we can design aircraft components to lessen risk of damage or even loss of aircraft and crews.

The Wright Aeronautical Laboratory at Wright-Patterson AFB, Ohio, is a leader in the effort to design aircraft more resistant to birds. Developments are encouraging. A new windscreen for the F-4 has been developed which will withstand a 4-pound bird impacting at 350 knots. Both the BASH Team and Wright Labs are continuing to work on new bird hazard programs. Three of the new ideas being worked are discussed in this article.

Radar Detection

For years, scientists have been detecting and tracking birds with radar. In fact, many current radar systems are sensitive enough to track large swarms of insects.

However, they all require skilled interpretation. The question then remains how can this information be quickly communicated to pilots so they can avoid bird hazards? And who will be tasked with the job of operating the radar and communicating this information?

The BASH Team recommended an automatic detection system. That is, a radar that would automatically identify a target as birds and display the information without the assistance of an operator. The Next Generation Weather Radar (NEXRAD) seems to "fill the bill." This weather radar, developed jointly by the Departments of Commerce, Transportation and Defense, has the ability to detect birds. Since NEXRAD is an automatic system, we do not need a trained ornithologist (bird person) sitting in front of a scope 24 hours a day. A system monitor can relay the weather or bird hazard to the control tower which, in turn, relays the hazard to the aircrew.

There is presently a problem in that the NEXRAD sometimes interprets bird targets as weather returns. However, if we can build a program to actually identify these living targets, we can provide bird warnings as well as improving NEXRAD's capability to distinguish weather targets.

NEXRAD systems will be placed near every Air Force airfield in the CONUS within the next few years. The BASH Team is working on establishing an equation that the computer can use to distinguish birds from other targets. In the future, pilots may be receiving advance notice of large flocks of birds on a collision course with their aircraft.

Low Level Routes

In the June 1982 issue of *Flying Safety* magazine Captain Jeffrey Short described the new Bird Avoidance Model (BAM) for military low level routes. BAM, based on 40 years of waterfowl migration data, is a computer-generated model that predicts the risk of birdstrikes on any low level route relative to time of year and time of day. Pilots, flight planners, or safety officers can compare routes or route segments to select the route with lowest risk for that particular time and mission.

By comparing BAM to actual waterfowl strikes on low level routes, the BASH Team determined that the graphs were about 70 to 75 percent effective in predicting birdstrikes. However, when comparing all birdstrikes to this model, the graph's effectiveness drops to 50 to 60 percent. Because of this drop, the Team decided to improve the model by including information on other types of birds.

The inclusion of hawks and vultures was a logical choice since biologists know a lot about their locations, habits, and population sizes. The BASH Team obtained a contract to gather this data for the BAM model and within 2 years this information should be incorporated. The effectiveness of the new model will help us decide which direction to go to continue improving the model.

Strobe Lights

Besides trying to predict where birds will be or actually detect their position on a real time basis, we can also attempt to clear birds from the

NEXRAD, BAMs and strobes. The BASH team is working on new ideas to help us share the air with our feathered friends.

paths of our aircraft. Many ideas regarding this concept have been discussed and some are being tested. Ideas range from sounding loud diesel horns while making the final approach, to large beacons similar to train beacons lighting the aircraft's path, or on-board radar systems emitting radar energy.

But try to imagine this problem from the bird's point of view. You are carefree, flying over the treetops when suddenly you hear a loud horn blast. Or, you're migrating south for the winter one night when a bright beacon shines in your eyes, blinding you. Or, how about this: You are a bird with the ability to sense low frequency energy (scientists know that some birds can sense magnetic radiation), and one day while soaring over the glide path of Eglin AFB you feel this twinge of energy hit you between the wings. If you were any of these birds, what would you do? Loud noises and radar energy don't pose a threat to you. On the other hand the blinding beacon scares you so much you freeze and can't avoid the danger.

Over the past several years, there have been several suggestions that flashing lights may, in fact, allow birds to see an aircraft, not be blinded by the light, and divert in order to avoid a collision. Most civilian aircraft have strobe lights, and these may be effective in avoiding strikes with our feathered friends. The Air Force has strobe lights mounted on T-37s and A-10s, but because of their varying missions and minimal data concerning the amount of flying hours with and without the strobe lights, the effectiveness of these lights for bird avoidance has not been determined.

The BASH Team is studying the question of how effective strobe lights are for repelling birds. If this study confirms the utility of strobe lights in reducing bird strikes, we have another argument for the installation of strobes on all aircraft.

By making aircraft more resistant to birdstrikes, reducing the numbers of birds around the airfield, warning pilots of immediate hazards of birds, predicting more hazardous routes, and clearing the aircraft's path of birds, the Air Force will reduce the loss of millions of dollars each year caused by aircraft/bird collisions. These new developments using NEXRAD, BAM graphs, and strobe lights are the next steps in reducing the number of strikes while creating a safer environment for flying. ■

It's Yours, I.P.

CAPTAIN PAUL J. RIBARICH
Directorate of Aerospace Safety

■ Come up with the wrong response to an unforeseen situation and you may find yourself in a dangerous predicament. Navigation errors caused by misplotted coordinates, incorrect time, distance, and headings, and improper formation positioning and tactics are all unanticipated discrepancies. They often provide that momentary distraction from your primary duty of ground avoidance with deadly and catastrophic results.

Faulty and incomplete mission planning and poor quality control of such planning are common causes of such distracting situations. But a conscientious instructor pilot can help reduce these planning errors considerably. The benefit of IP participation in mission planning cannot be overemphasized. The IP's guidance is important in shaping the thought and decision making processes of younger, less experienced aircrew members. Without this positive influence and guidance, the likelihood of catastrophic mishaps increases.

How many times has your instructor arrived midway through mission planning expecting to be spoon-fed with essential mission detail? Even if your instructor is in the squadron, if his attention is diverted from flight planning to other projects his presence could do more harm than good. After all, if you know you're going to have to count exclusively on yourself, you won't be caught short when the IP lets you down. Although his diversions and interruptions may be legitimate, inattention to mission planning jeopardizes the safety of the mission. If the IP misses the first half of the mission planning, he has missed out on most of the critical decisions concerning the conduct of the mission.

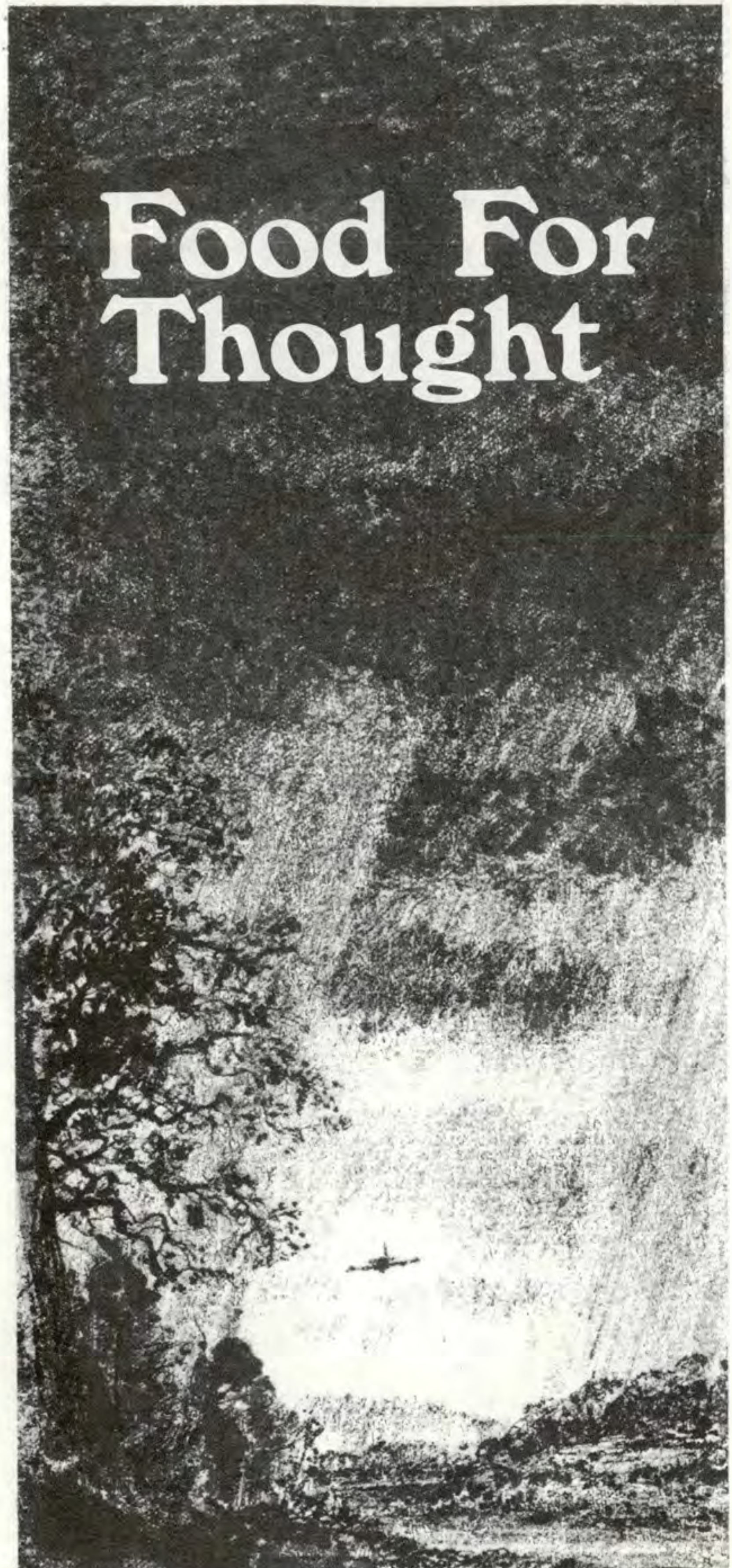
The IP's absence robs the other flight members of the benefits of his knowledge and decision making expertise. The usual constructive critique of mission planning (to extract the maximum training from each sortie) is lost in the rush to catch up. You are now being supervised by someone who does not understand the essential elements of a mission for which he is directly responsible.

In the absence of an experienced IP, too much time will probably be spent planning simple, routine portions of a mission. An IP's supervision of mission planning ensures that all elements are adequately addressed and the most important phases of the mission receive a proportionate share of attention.

Although IP's are not to be held accountable for all aircraft mishaps, they can minimize the confusion considerably. An instructor who is absent for a major portion of the flight planning should not drop in and propose significant, last-minute changes to a flight scenario. Such changes may require major alterations to planning already accomplished and, in the process, a critical detail could easily be overlooked. It's bad enough that aircrew members are often required to plan missions under time constraints which are inadequate for complete and thorough mission preparation. But last-minute changes can lead to omissions and errors which could prove disastrous.

Finally, an instructor pilot who is not active in mission planning is often unaware of all the elements of a mission. He is also unprepared to check for errors that will surface later during the execution of the mission. The prevention of these errors, which should occur prior to the mission briefing, could prove to be the key factor preventing a Class A aircraft mishap. ■

Food For Thought



SQN LDR MARK A. LEWIS, RAAF
Directorate of Aerospace Safety

■ Our squadron commander was about to retire after many years in the business of hauling trash. There were formal farewells planned, but we squadron pilots had decided that a few drinks with the boss were appropriate, so we gathered in the warmth and friendliness of the club. We started drinking and remembering the good times we had all shared. He had been a good leader, and our feelings of loss were quite genuine. Many happy memories were reviewed and relived. This man was a superb pilot who had taught us many things and he would be missed.

In no time at all the old club was jumping. Eventually we arrived at the point where speeches were inevitable. Executives stood around and mumbled the platitudes which are always mumbled at this sort of gathering. Then the retiring CO spoke up.

"I would like to tell you a story about one of our pilots." Immediately a dozen guilty consciences had a moment of terror as their lives and careers flashed before their eyes.

My story begins early one Saturday morning, he continued. Some friends had decided to fly away for a weekend of gambling and fun at a casino. It was raining heavily as they drove to the airfield, and there was a low cloud base of solid, grey overcast. They decided

Flying war stories are not unusual, but one with the power to illustrate a major truth in flying is rare indeed.

to delay their departure and see how the weather developed. The passengers were happy to sit it out and put no pressure on our pilot. They were prepared to cancel rather than risk their lives in the weather. After waiting about 2 hours, the weather improved sufficiently to attempt the flight. They were airborne quickly, departing for the casino VFR.

The first half of the flight went smoothly, then the weather started to deteriorate again. They were still VFR, which was required by the category of the pilot's civil license and the lack of "aids" in the aircraft. He was not too concerned about losing visual reference to the ground. He was confident that his several thousand hours of military flying and hundreds of hours of instrument flying would pull him through. This encouraged him to "stretch" the VFR limits. He was determined to get to the casino.

He knew exactly where he was and where he wanted to go. The terrain ahead had some high ground, natural funnel features, river valleys, and a major rail route. He decided that he could successfully traverse this area by following the river and then the rail route. This ill-conceived plan was encouraged by the fact that the weather at destination was improving rapidly; it was already open to VFR traffic. Even though he would not be operating according to VFR, he pressed on.

As he flew into the deteriorating weather, he was forced lower and lower. He knew the success of his plan relied on maintaining visual contact with the ground. Eventually he was flying at approximately 50 feet above ground level with about one-quarter mile visibility, deteriorating in passing showers. The greyness of the weather seemed to promise VFR at any time, so he kept going.

While he was struggling with weather, destination center called and asked for a weather report. He knew if he told them the truth he would be in big trouble, but he didn't want to lie. A compromise transmission should save the situation.

He reported the weather as marginal VFR, with areas where the clouds went to ground level and main cloud base at an estimated 500 feet. He flew on for another 20 minutes before finally breaking visual. He was very relieved. (As the story unfolded, most of the guilty consciences relaxed and began to look forward to the coming exposé.) The story continued.

As our pilot entered the circuit area and prepared to land, he felt very guilty about the lives he had risked. Just then he heard another aircraft taxi VFR for the reciprocal of his route. You could not have paid him to attempt it himself. He had given himself a good fright. He spoke to the other aircraft pilot and tried to talk him out of his flight. The answer our pilot received was that since he had just come through VFR, what was all the fuss about? He departed as our pilot landed.

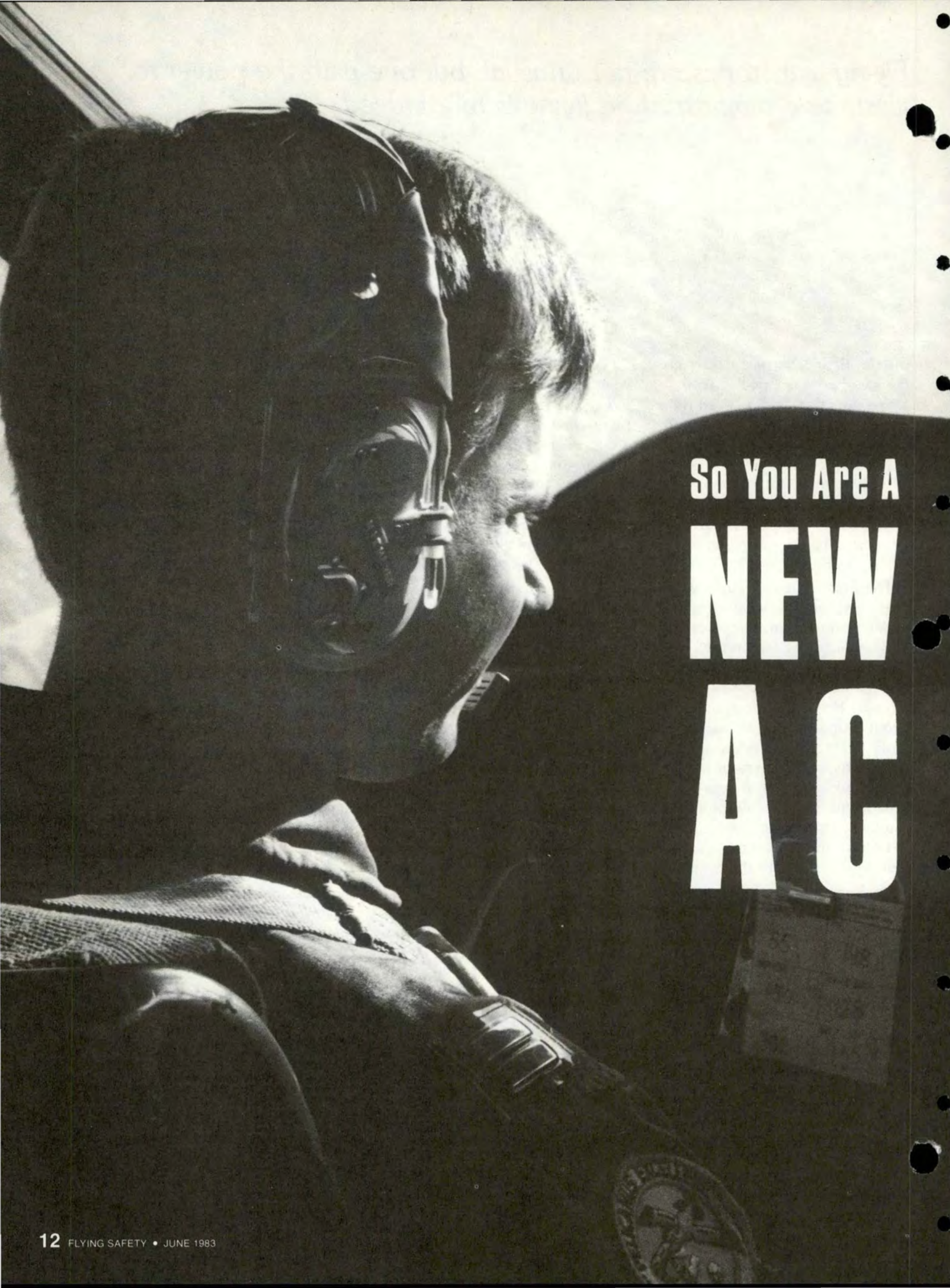
That evening, as our pilot was enjoying dinner in the casino, he overheard a discussion of a crash. It appeared that a light aircraft had crashed into the side of a mountain in poor visibility. The aircraft had been destroyed and three people had died.

By now our boss was talking to a very hushed group. Pilots do not like to hear of people dying in aircraft accidents. We pilots are all members of a nondefined club and are bonded by a love of what we do. The loss of a member is a very sad thing.

After a pause for reflection, our mentor continued. The pilot I have been talking about is me. I set a very poor example that day and someone followed it and died. He was not lucky enough to be able to recount this to you so I will do it for him.

Whenever you fly and whatever you are flying, be conscious of the example you set. Set examples you can be proud of. This way, you will help keep others safe. You are professionals; be professional.

I have always been impressed by this story and its message. It has affected my decisions at times in my career. I offer it to you as food for thought. ■



So You Are A NEW AC

Like a squadron commander, an aircraft commander must be a leader.

LT COL EDWARD GALLARDO
Directorate of Aerospace Safety

■ You have put in a few years in the right seat, you did your job well, and now it's time to consider upgrade training. Your flying skills have improved with experience, and you personally feel you're ready.

The upgrade checkout program was comprehensive and demanding. Sure, at times you felt that maybe you weren't ready, but through it all you succeeded, and the standardization pilot thought you did well enough to label you combat ready, mission capable, or plain checked out. You have conquered the world, now it's time to sit back and relax — *wrong!*

As aircraft commander you have, through the position, assumed a far greater number of responsibilities that now require time and thought. Don't worry about only yourself anymore, but also include all of those other crewmembers throughout the aircraft you command. What's to worry about, you might ask yourself? Have you considered their qualifications? Sure, their checkouts were just as thorough as yours, but now you are their commander. Are they still qualified? You went on leave, TDY, deployment, etc. Who is in a better position to know if these guys are still qualified to carry out the assigned missions? Have all of those training requirements, events, flights, simulators, etc., been completed?

Are you depending on the guys at scheduling or training to keep you out of trouble? If you are, don't. If you feel you need a training flight full of instructors, ask for it; that's good management. If you know you or one of your crewmembers has gone noncurrent don't hide your head in the sand and hope the problem will go away. Do something. Remember, *you* are the boss.

How about the crewmember who confides in you about a personal problem? What are you going to do with that information? Flying is a serious business, and you want your crew concentrating on the task at hand. Without having to violate a confidence, you might consider talking to the squadron commander, chaplain, or anyone else who can help. Remember the purpose of the Air Force Personnel Reliability Program. Take care of that personal problem before it affects the performance of the entire crew.

Don't overlook the books. You know what I'm talking about. Your troops should habitually review systems, procedures, and regulations. Sure you knew all of these things before, but sit down with your crew and discuss specific situations.

Make a practice of periodically reviewing emergency procedures. You knew all of your procedures when you were a copilot; now, as aircraft commander, things are a little different. Did that last no-notice emergency procedures exam sort of catch your boom operator, navigator, loadmaster, radar, or defensive systems operator by surprise? Tell the troops to get friendly with that Dash One. These people carry a lot of responsibility, and it's your responsibility to ensure that they're always ready, willing, and able. You are the boss. Don't leave any doubt in your mind that they can do their job in an emergency. Use your management skills to get results. Consider organizing extra E.P. sessions in the simulator or worksheets for E.P. review, as well as hangar sessions.

Keep in mind that this is not a one-way street. That crew of yours is looking for leadership. If you fail that no-notice check flight or that E.P. exam, then *you* have to make extra efforts to prove you are still in control. Crack down hard on those procedures and exams and get right back in the driver's seat. Lead by example.

One last point — listen to your people. Remember your checkout program? The instructors always had something to say after each flight and you listened to their advice. Well, you are now an aircraft commander, and learning never stops. Listen to the people who are there to help you. The wings, squadrons, detachments, etc., are full of people who have the experience and know-how to pass on information that will help you do your job better. Your crew members also have a lot to say about how you do your job.

Keep your chin up; you are doing a good job. Maybe day 2 as a new aircraft commander will be easier! ■

WELL KNOWN, But Easily Forgotten

LT COL HORST PONERT, GAF
Directorate of Aerospace Safety

Flying Safety's Mission:

To preserve the ability to fly and fight

■ For years we have struggled against worldwide recession. As always, money seems to be the key for success or disaster. The consequence is constant trimming of the defense budget which makes coping with all vital aspects of military strength and readiness that much more difficult. Since history leaves us little hope of significant breakthroughs at the ongoing peace talks, it is necessary to make the most of present Air Force resources.

The question is: What does this pessimistic picture have to do with flight safety? Unfortunately, quite a bit. Military aviators, supervisors at the different levels, technicians, and supply experts will have to work hand-in-hand to make flying safer with only the tools we have in the inventory now. We can't wait for more money or the magic weapon. We must accept that the times when we could draw on lavish resources are no more. In today's flight safety business, we must differentiate between desire and reality.

Let me reiterate a few key points regarding life-saving and conservation of valuable resources. The ideas are merely picked out of daily fighter/trainer mishap reports and are not unique or unusual.

The normal mission. No matter how easy or how complicated your mission may look, be prepared mentally and physically. Always stay one step ahead by diligent mission preparation and execution. Maintain positive control and do not allow the aircraft to fly you, whether under normal or emergency conditions. Know the procedures, stick to them, and use common sense.

Low-altitude flying. Distraction is not conducive to survival in our realistic low-altitude environment. Always maintain situational awareness. Know your own ability and your aircraft's maneuverability when close to the ground. Do not gamble with your energy level.

Air-to-ground/air-to-air tactics. Although as realistic as possible a scenario has been set up, rules of engagement must be obeyed. Do not press beyond limits while engaged. Do not airscore your bombs. The pride factor should not lead you into temptation. Confessing overcommitment is healthier — for your body and your ego — than a nylon let down.

Supervision. Training programs, directives, exercise criteria, etc., are worthy of review from time-to-time. Be careful not to saturate your aircrews or permit them to become complacent. Know your crews and be reasonable in your demands. Set an example worth imitating.

These suggestions are not just platitudes — remember — all possible efforts must be made on our side to succeed in ordinary daily flying. Thus, we have the power to move the ultimate goal of accident-free aviation within reasonable reach. A continuous effort toward progress must be our daily resolution. Stagnation means relapse. ■

NO SWEAT

Don't get TOO Comfortable

■ "Roger, ground, Boxcar 50 taxi to parking." The no-notice was over (we hope), and after minor maintenance we get to become airborne for 2+ hours in the pattern. Yahoo, some touch and go's — now the evaluator can become an IP, and we can get some good pattern work accomplished.

"Not so fast, guys," said our eval pilot. "New directives dictate that I can only evaluate a no-notice. No more changing from black hats to white hats. If you want an IP call scheduling, otherwise I'll go with you as an evaluator only."

"Two hours in the pattern with an EP is too much like practice bleeding for this kid," I think to myself.

The nav chimes in: "Scheduling says there are no IP's available."

The EP states, "You guys come see me tomorrow."

"Well, at least we are in unsupervised status," the pilot remarks. All the preflight goes normally, pressure is off, relax and enjoy some transition.

That's true. The pressure was off and crewmembers should be able to relax while performing their duties. The ol' adrenalin just wasn't there. I flew a lousy approach, and the pilot missed a couple of things on the check list — not important to safety of flight but highly critiquable.

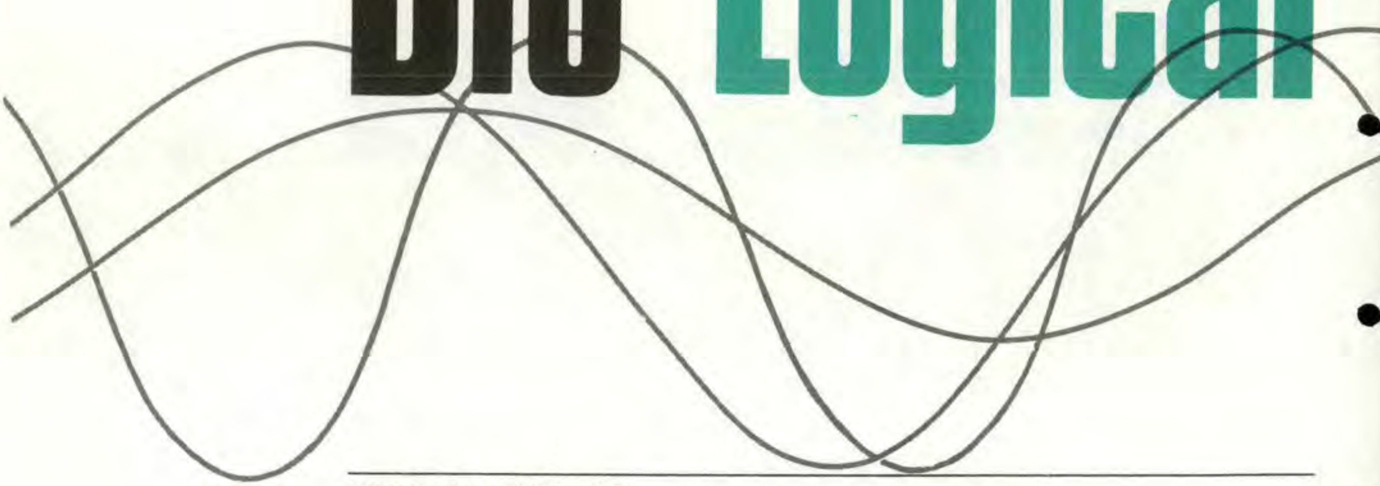
The AC flies one next and just waters my eyes. What's wrong with us? Nothing deadly, just sloppy flying. We just flew an exceptional mission with an evaluator and now we fly like our first ride at CCTS. That's it!

Do we perform differently just because it is a check ride? How about the fact that "the pressure is off?" Everyone gets a little pumped up for a no-notice. That "razor's edge" is self-induced. Amazing feats of concentration and airmanship abound.

Concentration is a key factor on any flight. A high level of concentration is necessary whether flying cell, penetrating in poor weather, or just making a landing. The requirement for concentration in an emergency is even greater.

The fact that you just finished your check ride or had a no-notice just last week is no reason to "settle back and be comfortable." You still have to fly the airplane. ■

Bio Logical



ANCHARD F. ZELLER, PhD
Directorate of Aerospace Safety

■ Whereas biological rhythms and biorhythms are often thought to be one and the same, the concepts are diverse and only one is applicable to mishap prevention. Both the biorhythms and biological rhythms theories are built around the fact that the human body operates in time. Changes in time result in changes in the body. The most obvious cycle is the 24-hour sleep cycle. In conjunction with this time cycle are temperature, hormonal and activity changes, among others.

Biorhythms is the name of a specific system which attempts to postulate certain changes occurring in the body on a cyclic basis. These changes are purported to begin at birth, to be immutable and to be the same for everyone. Specifically, the biorhythms theory suggests that there are three fundamental cycles: a 23-, 28- and 33-day cycle. The 28-day cycle is associated with the lunar month (and frequently correlated to menstrual cycles). This is referred to as the emotional cycle. The original founder of the concept of biorhythms, a physician, thought he had also isolated a 23-day cycle, referred to as the physical cycle. Later it was postulated that a 33-day cycle, the mental cycle, existed. These cycles were originally studied in relation to health but later, attempts were made at correlating cyclic fluctuations to accident proneness.

The theory is that the critical days are the points at which the sine wave cyclically crosses the base line. Because these cycles are of varying length, they occasionally cross the base line at the same time. Supposedly, this compounds the problem.

The concept of biorhythms has a great deal of appeal because it is so simple. The only thing wrong with it is that it doesn't work.

About 5 years ago biorhythms reached its height of popularity. People were wondering why we weren't using this method for predicting accidents. We were deluged with such requests until l Col John H. Wolcott (then a major) at the Armed Forces Institute of Pathology did a sophisticated statistical study of more than 7,000 mishaps and found no correlation whatsoever between biorhythms and aircraft accidents.

Biorhythms is a fad which has come and gone. It will undoubtedly resurface. From our standpoint at the Safety Center, biorhythms offers no possibility for use in accident prevention. Having stated that quite flatly, I should hedge a bit. If people, for any reason, can be convinced to be extra careful 4 or 5 days a month, it is bound to have a good effect.

Having disposed of biorhythms, let's now discuss biological rhythms which do, in contrast, have an effect on performance. The introduction of shift work was one of the first systematic ways of disrupting the cycle — specifically when there is a rotating shift. I guess everyone knows if you stay awake too long or get too hungry, you don't function well. These are the obvious symptoms of upsetting the biological cycle.

Rhythms

Man is a 4 MPH vehicle traveling at Mach 2

Considering it takes anywhere between 2 days to a couple of weeks to reestablish biochemical balances after a major change in the sleep/wake cycle, this kind of approach to work can keep the individual upset continually. All it proves is you can be productive even when uncomfortable.

Because the human body is built to travel at about 4 mph, until the development of auxiliary means of locomotion, man couldn't move far enough in one day to affect his day and night cycle. But with aviation you can travel through enough time zones to seriously upset and even reverse your sleep/wakeful cycle.

As far as the body is concerned, the effect is the same as with rotating shift work. The result is discomfort and a reduction in efficiency. The combination of these symptoms results in increased errors and sometimes accidents.

A case in point would be the F-100 that made a steep right turn at low altitude following a bomb delivery. Repeated radio calls to "pull up" went unheeded and the F-100 continued its turn until ground impact. The pilot initiated ejection outside the envelope and was fatally injured. The pilot's lack of adequate crew rest was subsequently found to be a contributing factor.

Another example is the crash of a C-130 which had been flying a low level tactical exercise mission. One of the mishap investigation board's findings was that the crew's fly-night, sleep-day cycle was interrupted by a daytime mission the day prior to the mishap. Also, the pilot had not complied with crew rest regulations and was tired when he went to fly. The mishap mission was a night predawn flight when the crewmembers were at the low points in their circadian performance cycles.

A practical implication of circadian shifts is that the potential for accidents has increased in a very practical way, in contrast with the hypothetical cycles envisioned by the biorhythm proponents.

There have been numerous studies of circadian rhythms and the general conclusion is that while the individual may be uncomfortable and somewhat inefficient, that the demands of the situation are ordinarily such that accident-free performance can still be accomplished. This isn't always the case and while the accident is frequently attributed to something else, these disruptions are often the real culprit.

When the system is basically disrupted, the addition of toxic substances can be particularly deleterious to skilled behavior. One such substance is alcohol. When the body is already tired and worn, the depressant effect of this substance can be even more marked than it ordinarily would be in the same individual.

The general conclusion here is that whenever possible, a routine of waking and working should be established. When this is disrupted, the individual should be prepared for the probability of errors increasing and be duly cautious.

After all, we are still designed to go only 4 mph. ■

DYNAMIC ROLLOVER

The following article on dynamic rollover addresses primarily the UH-1 series helicopter, but the principles discussed apply to all helicopters used by the United States Air Force. Rotorheads-in-blue should read and heed.

■ Dynamic rollovers are always a result of pilot error. Knowledge and proper flying techniques can prevent these needless mishaps. They are not unique to the military, as 6 percent of civilian rotorcraft mishaps have also been attributed to rollover.

During normal or slope takeoffs and landings with some bank angle or side drift and with one skid on the ground, the bank angle or side drift can cause the helicopter to get into the situation where it is pivoting about a skid (or wheel). When this happens, lateral cyclic control response is more sluggish and less effective than for the free hovering helicopter. Consequently, if the bank angle (the angle between the helicopter and the horizon) is allowed to build up past 15 degrees, the helicopter will enter a rolling maneuver that cannot be corrected with full cyclic and will roll over on its side. In addition, as the roll rate and acceleration of the rolling motion increases, the angle at which recovery is still possible is significantly reduced. The critical rollover angle is also reduced for a right-skid-down condition, crosswinds, lateral center of gravity offset, and left pedal inputs. For cases where these items are all in their most critical condition, and for high gross weight at high altitude, hot day conditions, hovering on the right skid with thrust (left) approximately equal to the weight is probably uncontrollable for any bank angle.

Avoidance Procedures

When performing maneuvers with one skid on the ground, care must be taken to *keep the helicopter trimmed,* especially laterally. For example, if a slow takeoff is attempted and the tail rotor thrust contribution to rolling moment is not trimmed out with cyclic, the critical recovery angle will be exceeded in less than two seconds.

Control can be maintained if the pilot maintains trim, does not allow helicopter rates to become large, and keeps the bank angle from getting too large. The pilot must fly the helicopter into the air smoothly, keeping excursions in pitch, roll and yaw low, and not allowing any untrimmed moments.

When performing normal takeoffs and landings on *relatively level ground* with one skid on the ground and thrust (lift) approximately equal to the weight, carefully maintain the helicopter position relative to the ground with the flight controls. Perform maneuvers smoothly and keep the helicopter trimmed so that no rapid altitude changes build up, especially roll rate. If the bank angle starts to increase to a large angle (5 to 8 degrees) and full corrective cyclic does not reduce the angle, reduce collective to reduce the unstable rolling moment from the thrust (left) vector.

When performing *slope takeoff and landing maneuvers,* be careful to keep roll rates small. Slowly raise the downslope skid to bring the helicopter level and then lift off. (If landing, land on one skid and slowly lower the down slope skid.) If the helicopter rolls to the upslope side (5 to 8 degrees), reduce collective to correct the bank angle and return to level attitude and then start the takeoff procedure again.

Collective is much more effective in controlling the rolling motion than lateral cyclic because it reduces main rotor thrust (lift). A smooth, moderate collective reduction of less than approximately 40 percent (at a rate less than approximately full up to full down in two seconds) is adequate to stop the rolling motion with about 2 degrees bank angle over-shoot from where down collective is applied.

Care must be taken to not lower collective at a rate so high that it causes fuselage-rotor blade contact. Additionally, if the helicopter is on a slope and the roll starts to the upslope side, reducing collective too fast creates a high roll rate in the opposite direction. When the downslope skid hits the ground, the dynamics of the motion can cause

continued

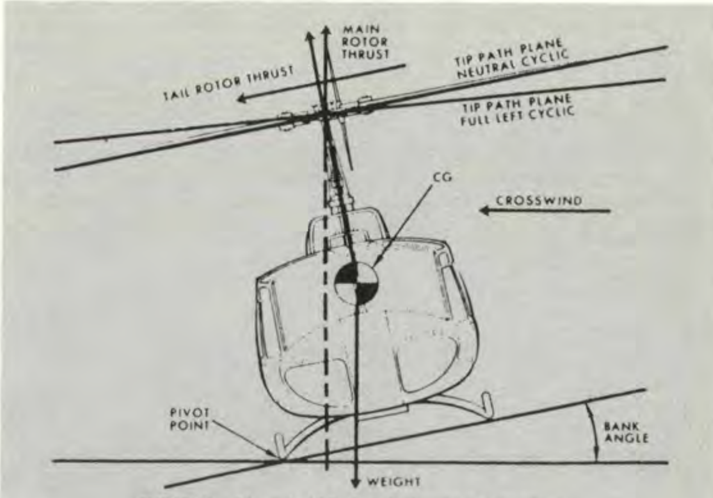


FIGURE 1. – Example of Forces Acting on a Helicopter With Right Skid on the Ground (Level Ground)

During normal takeoffs to a hover and landings from a hover, cross slope takeoffs and landings, and takeoffs from level ground with bank angle or side drift, a situation can exist where the helicopter will pivot about the skid/wheel which remains on the ground and enter a rolling motion that cannot be corrected with full lateral cyclic input.

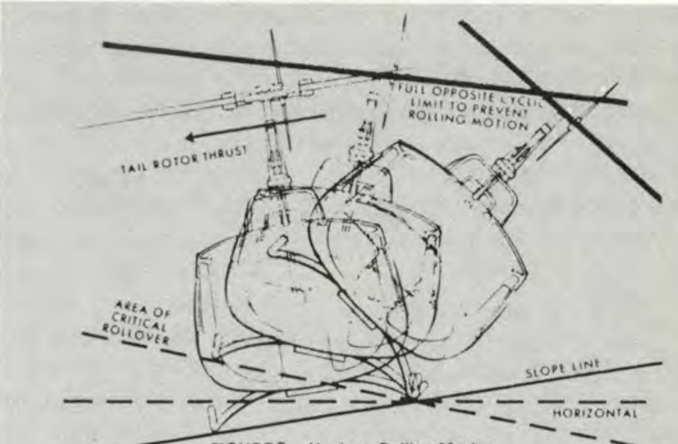


FIGURE 2. – Upslope Rolling Motion

Excessive application of cyclic into the slope, in coordination with collective pitch application. During landings or takeoffs, this condition results in the downslope skid rising sufficiently to exceed lateral cyclic control limits and an upslope rolling motion occurs.

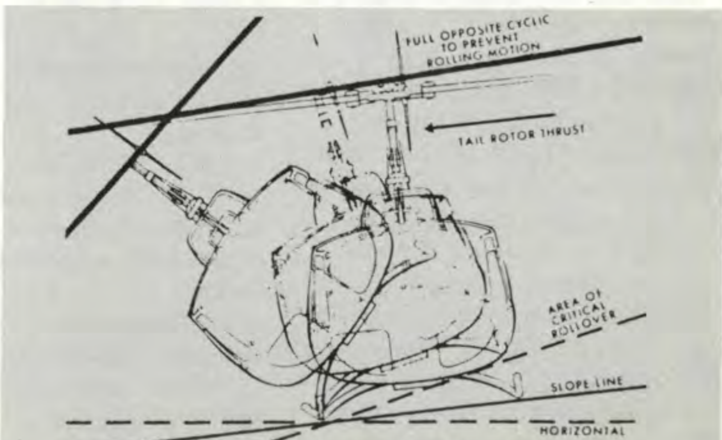


FIGURE 3. – Downslope Rolling Motion

Excessive application of collective pitch in coordination with cyclic application into the slope. When the downslope skid is on the slope, excessive application of collective may result in the upslope skid rising sufficiently to exceed lateral cyclic limits and induce a downslope rolling motion.

the helicopter to bounce off the upslope skid and the inertia can cause the helicopter to roll about the downslope skid and over on its side. Do not pull collective suddenly to get airborne as a large and abrupt rolling moment in the opposite direction will result. This moment may be uncontrollable.

Warning

If the helicopter develops a roll rate with one skid on the ground and thrust (lift) approximately equal to the weight, the helicopter can roll over on its side.

Caution

When landing or taking off, with thrust (lift) approximately equal to the weight and one skid on the ground, keep the helicopter trimmed and do not allow helicopter roll rates to build up. Fly the helicopter *smoothly* off (or onto) the ground, *carefully* maintaining trim.

The following information applies to UH-1 series helicopters and is basically the same for all single-rotor helicopters. However, the area of critical rollover will vary for other series helicopters depending on vertical and lateral c.g., landing gear configuration, tail rotor thrust moment, etc.

Slope Landing Techniques

Techniques for slope landings and takeoffs are similar for most helicopters. The following precautions must be considered during slope operations.

- Less lateral cyclic control will be available during crosswind operations with the wind coming from the upslope side.
- Slope operations should be avoided with tailwind conditions.
- Less lateral cyclic will be available for left gear into slope operations due to the translating tendency of the tail rotor.
- If passengers or additional crewmembers are picked up or offloaded after landing, the lateral cyclic requirement will change and must be reevaluated prior to pickup.
- In UH-1 series helicopters the interconnecting fuel line between tanks can cause unbalanced loading laterally due to fuel slosh or gravitational flow of fuel to the downslope tank. This shift of c.g. varies depending on fuel load, slope gradient and length of time the helicopter has been laterally inclined.

In Hueys a slope of 5 degrees to 8 degrees can be accommodated safely without encountering mast bumping or reaching lateral cyclic limits. During slope landing, consideration must be given to the combined effects of slope gradient, wind, load position, and soil stability.

If cyclic limits are reached during slope operations, further lowering of the collective may induce mast bumping. Therefore, if the cyclic control contacts the stop, before the downslope skid is resting firmly on the ground, return to a hover and select a position with a lesser degree of slope.

If, during takeoff from a slope, the upslope gear starts to leave the ground before the downslope, smoothly lower the collective and check to see if the downslope gear is "stuck" or "caught" on some object. Make the helicopter do what you want it to do before it becomes uncontrollable. Accept nothing less than a vertical ascent.

The dangers of dynamic rollover are not restricted to slope operations. Rollover mishaps have occurred on level surfaces. The fact that a skid gets caught on PSP or stuck in soft asphalt doesn't necessarily mean that helicopter rollover is inevitable. The end result depends on the person at the controls and how quickly and accurately he analyzes the problem and initiates corrective action. Improper control application can intensify the rolling motion and place the helicopter in an unrecoverable attitude. — Adapted from *Flightfax.* ■

There Are Real People

MAJOR JOHN E. RICHARDSON, Editor

■ An F-106 aircraft was returning from a night intercept mission. The RSO noted proper gear extension on final and a good touchdown and drag chute deployment. After about 1,000 feet of landing roll, the landing gear retracted, and the aircraft settled to the runway.

Investigators found the gear handle up and the idle thrust switch off. There were no problems with either the mechanical or electrical systems. As a result, the investigators considered the following sequence of events most likely. At touchdown, the pilot moved his hand from the throttle to the drag chute handle. He deployed the drag chute then moved his hand to the vicinity of the idle thrust switch. But he did not turn the switch on; instead, he raised the gear handle.

When they looked into reasons for this deviation by the pilot, investigators found only one factor of significance. The pilot had been without sleep for an extended period prior to the mishap, and by his own statement and other evidence was tired at the time of the mishap.

The pilot had not actually violated the crew rest requirements in that the day before the mishap he had the opportunity for sufficient rest and sleep. However, at the time of the mishap he had been awake for about 20 hours. There was evidence of fatigue in several of the pilot's actions. He did not sign the exceptional release in the 781 nor initial the last entry although his normal practice included a thorough review. During his approach, the pilot made errors in radio transmissions using wrong call signs and reading back incorrect altitude assignments. The final error was the actuation of the gear handle on landing roll.

Although the investigators found the pilot did not violate crew rest requirements, he did use poor judgment in that he did not rest during the day prior to extended night flying — the pilot flew two sorties between 2140 and 0406.

However, the investigators also felt that unit supervisors contributed to this situation because the pilot was scheduled for an emergency procedures simulator check at 1630 the afternoon before his flights. Concern for this check led the pilot to study until midnight the night before and then also study from 0900 until 1530 on the day of the check with only one break for lunch. At 1630 the pilot began a two-hour intense emergency procedures check, then was on duty continuously until 0406 the next morning when the mishap occurred. The pilot stated that he did not feel tired prior to the last sortie even though he was aware that he had been awake for a long time.

The pilot was named as a cause of this mishap because he did have the opportunity for crew rest. But, it should be obvious that by scheduling him for an emergency procedures check his supervisors put him in a difficult position. In order to do well he felt he had to study hard. Then, too, a two-hour check ride can be a tiring experience. It was definitely not the best planning to schedule the check ride and two night sorties as they did.

How about your unit? Do the schedulers look at more than just raw numbers and squares to be filled? In the crush of day-to-day operations it is easy to overlook the fact that those marks on the schedule board represent real people. But when that fact is overlooked the probability of a mishap is greatly increased. ■

Sometimes we can obey the letter of the regulation but violate its intent. Which is more important, the schedule or the people?

ASRS CALL BACK

■ *"Callback" is the bulletin published by NASA for the Aviation Safety Reporting System. It often contains some lessons learned which are valid for military flyers as well as our civilian counterparts. So, for your information, here are some excerpts from the February issue.*

Report — And Listen

Although consequences of this incident were benign, it seems to be endemic to aviation: Inaccurate communication. I am motivated to report because of the multiplicity of occurrence, and confusion and potential hazard resulting. Call Tower over city; told to report "green tank" downwind 27R (tank on sectional chart — a common reporting point for this runway). *Directly* over tank at 1,000' I reported. Within 5 seconds another aircraft reported "over the green tank, downwind 27R." It was as if he didn't hear my broadcast. I immediately began searching by executing steep banks to locate other aircraft. About 45 seconds later I located him just entering downwind, about 0.5 miles *out* from the tank. That would put him 1.5 to 2 miles out from tank (at modest approach speed of 100 MPH) when he first reported. Note: Controllers always state, "Report *over* the green tank," not *"sighting"* the tank. He apparently did not hear my position report, though well within the ATA and its required frequency. I feel this particular situation causes two problems.

First, controller activity must be hampered by inaccurate statements, even in a radar environment (searching screen, credibility loss, etc.). Second, at a time when my primary duties should be landing preparation, I spend too much time searching the airspace. Why did it occur? Perhaps the pilot was unaware of consequences of his inaccurate report. Or perhaps he did not monitor other traffic/tower communications. Perhaps he didn't know where he was! Prevention: Stress importance of accuracy in all communications and the necessity of monitoring and taking cognizance of traffic communications — especially in ATA.

Good Grief — No. 13

. . . final with gear down and full flaps. I noticed a movement out of the corner of my eye. Another aircraft was turning final ahead and to our left. We took evasive action and went around. The aircraft took for-

ever to get off the runway and we thought we might have to go around again. We didn't, but on short final right before we landed the pilot of the other aircraft said, "Tower, were you trying to call me?" We decided that we ought to talk with this pilot about the close call. He must have known we'd be looking for him, because he disappeared. We stayed out of sight for a few minutes and sure enough he reappeared . . . He was apologetic. His excuse was he had his personal tape player headset on and couldn't hear the tower over the music. . . .

Altitude Bust — Habit Pattern Busted

. . . We were issued VFR traffic confirmed at 7,500 and told to level off at 8,000', altimeter 30.06. We leveled off at assigned altitude. The controller advised once again of VFR traffic at 7,500' at our one o'clock position. At this point we spotted traffic at that position, but it was above us. I advised Center I had traffic, but it was above us. The controller asked us to verify our indicated altitude and altimeter setting. Both pilots reported being at assigned or suggested altitude on correct altimeter settings. At ATC's suggestion an altimeter static system check was later made on the other aircraft. A leak was found in the plastic lines, which caused the pilot of the aircraft to fly higher in order to get the proper altitude readout. It is estimated that he was at 8,200' instead of 7,500. Although traffic information is an extra workload for the controller, it can be extremely important to pilots to alert us to potential problems.

Altitude Bust — Alerter Busted

. . . I believe the reason we descended through the assigned 12,000' was that someone had put black tape over the altitude alert light to keep it from shining in their eyes at night and we were distracted by the radio listening to Center, ATIS, etc., and did not hear the aural warning of the altitude alert.

Altitude Bust — Habit Pattern Busted

. . . Controller issued a speed restriction. Shortly thereafter we were issued a lower altitude . . . I noticed that the first officer, who was flying, had already vacated our assigned altitude . . . The controller had issued the speed restriction at the point where the lower altitude assignment normally comes and I think the first officer, anticipating the altitude change, left our assigned altitude prematurely. I don't see any procedure change that could protect against this situation. However, someone reading this report might be reminded not to let habit patterns become so ingrained that a minor change in procedure results in a crew error.

Altitude Bust — Concentration Busted

. . . crossing restriction — 10,000 feet fifteen miles southwest of the fix . . . I began my descent on schedule and was exactly on the desired profile at 18,000 feet. During descent, an ear-splitting transmission from a light plane pilot caused us to turn our receiver too low and we lost contact with Approach Control for a time. The discussion of this problem took my mind off of the crossing restriction and we crossed the fix at 15,000 feet instead of the required 10,000. To my dying day I will always wonder how I missed it so far. I had never missed a crossing restriction in over 20 years of flying. I guess the rush to get in before the tower closed, fatigue, and the radio problem distraction all took their toll. But I don't believe I will ever miss another restriction. Extra attention is required when one is tired.

Watching For Strike Three

Strike one! Changed the oil, installed new oil filter, got ready to perform check ritual: Run engine, shut down and check for leaks, take off and land and check for leaks. But — looked at watch. Late for dinner with company coming! Head home, fast. Three days later — fly 15 miles for lunch. Check oil before return flight — no oil on dip stick! Check again — and again — no oil! Notice oil coated engine! Mechanic check — no damage. *Survived strike one, strike two!* Preflight for 200-mile round trip — one hour of fuel below full tanks. No problem — I'll gas up on way back. Drop passenger off, fly to refuel point. Surprise! Airport covered with dust and reporting closed due to high wind. Flight Service Station assists by phoning next airport — 20 miles ahead — for me. Good news! Only 12 knots there. Flew the 20 miles. Easy landing, no problem. Taxi to gas pump and say, "Top 'em off, please." My bird has 37.5 gallons usable capacity. I almost had a stroke watching the pump show 35-36-37! *Survived strike two* — and I'm really watching out for *three.* ■

MAIL CALL

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Hydroplaning

Super article on hydroplaning in your December '82 issue! One question on dynamic hydroplaning: How do I calculate $9\sqrt{P}$ or $7.7\sqrt{P}$ when my F-4 has 165 psi in the two nosegear tires and 265 psi in each main? Since I am not a math major I don't know whether to add $9\sqrt{P_n+P_m}$ or $7.7\sqrt{P_n}+\sqrt{P_m}$ (both are obviously wrong) or go around! Can you help me?

On further thought, I would presume that the speed at which dynamic hydroplaning takes place is unique for each tire, i.e., $H_{d\text{-}n}=7.7\sqrt{P_n}$, $H_{d\text{-}m}=7.7\sqrt{P_m}$, and the speed at which my aircraft would dynamically hydroplane ($H_{d\text{-}n} = 7.7\sqrt{165} = 99$ knots, $H_{d\text{-}m} = 7.7\sqrt{265} = 125$ kts) is somewhere between those values — for the F-4 99 to 125 knots. How am I doing?

Captain Jim Tietjen
TAWC/CCA
Eglin AFB, FL

You're exactly right! Press on.

Regarding your article, "Hydroplaning. . . A Slippery Subject" in the December '82 edition of *Flying Safety,* I had trouble with your statement that depth of water and tread wear can decrease the minimum speed for dynamic hydroplaning. It is my understanding that tread depth, runway groove depth, and water depth only affect the probability of dynamic hydroplaning. If this combination of factors adds up to dynamic hydroplaning, then the formulae $7.7\sqrt{P}$ or $9.0\sqrt{P}$ (non-spinning and spinning tires respectively) define the minimum speeds for it. Adding water or taking away tire tread won't make it happen faster or slower because it's the relationship between dynamic water pressure and tire pressure that causes the tire to leave the runway surface. . . .

Bryan D. O'Connor
NASA Astronaut
Lyndon B. Johnson Space Center
Houston, TX

I enjoyed reading your article in the December 1982 issue and there is a lot of good information in it. However, there are a few statements which I feel are not entirely correct.

To my understanding, minimum dynamic hydroplaning speed does not change with tire wear. However, as the tire tread depth lessens, the critical water depth needed for dynamic hydroplaning becomes shallower. Furthermore, the pavement texture has a much greater effect on the critical water depth for dynamic hydroplaning than tire tread depth except in cases where the pavement is very smooth.

Your statement that a concrete runway reduces the likelihood of viscous hydroplaning is erroneous. If anything, the opposite is true. Asphalt runways, generally, exhibit slightly higher average traction numbers than concrete runways. However, the only definite statement that can be said about either asphalt or concrete, old or new, is there are no generalities. Some concrete pavements produce more traction than asphalt and some asphalts are better than concrete. The same thing can be said about old and new pavements. . . .

Captain Norm Hannah
Chief, Pavement Surface
Effects Team
Tyndall AFB, FL

As you all pointed out, the minimum speed for hydroplaning does not change with tread wear, but the minimum depth of water for hydroplaning to occur does. Thanks for keeping us straight.

"Down in Flames Through IFFC"

As I read your article "Down in Flames Through IFFC" in your February 1983 issue by Gene Hollingsworth, I was met by some obvious discrepancies in the first paragraph. Being an F-15 pilot, I know that the F-15C is a single seat fighter, and I take great pride in being a single seat fighter pilot. I was amused to read how "the F-15C crew searched the sky for their target while they listened . . . on the radio." The second paragraph wasn't any better as "the bogie was confirmed as their target and they received clearance. . . ."

OK, OK, maybe it was an F-15D and not an F-15C doing the firing. I'd just like to let you know that, yes, we boys in the field do read your magazine.

Captain Jack Casey
33d Tactical Fighter Wing
Eglin AFB, FL

Good call! Of course it was a "D" Model. My apologies to you single seat Eagle drivers. — Ed.

"Preparing for War — RED FLAG"

Thank you *Flying Safety* folks for the letter, advance copies, and the pen and pencil set.

It was enjoyable seeing the article in print *(Flying Safety,* November 1982), and after all the exclamations and "atta boys," I sat down and reread it as a reader. Oops! I noticed a typo that had gotten through all the drafts and the final printing — on the last page I mentioned Linebacker II, which occurred in latter 1973. It was latter 1972, not 1973!

My apologies to you and especially to the troops who flew in Linebacker II in 1972! Thanks, I hope that one "Ah . . ." didn't cancel out the "atta boys," and I hope the article brought across the importance of preparing to fight.

Major Kenneth P. Wicks
154th Composite Group
Hickam AFB, HI

Crash Survival

Major Meikel's comments on proper body positioning for crash survival ("Surviving an Aircraft Crash," February 1983) are correct for forward facing seats. However, for seats facing aft, like those in the C-141 and C-5, the seat should be in the full upright position and the passenger should sit erect rather than bent over.

While we were researching this subject we found that the C-5 Dash One has no guidance on crash positioning. We have submitted paperwork to correct this. Our thanks to Major Meikel for bringing the subject to our attention.

TSgt Ernest B. Jones Jr, NCOIC Safety
Sgt Michael D. Zondlo, Loadmaster
22 MAS
Travis AFB, CA

OPS

Hail Damage

■ A tanker made a rendezvous with a flight of fighter receivers at 12,000 feet MSL. The first contacts were made in IMC but then altitude was changed to 9,500' MSL to reach VMC. Refueling at this altitude (9,500') was not attempted due to turbulence. Shortly after the refueling was aborted, the tanker ran into hail for about five seconds. The tanker radar showed thunderstorms 10 to 15 NMs away.

That's What The Check Is For

During aircrew preflight of a large aircraft an instructor pilot occupying the copilot's seat performed the stabilizer trim check. The ground crew reported the stabilizer leading edge moving down first then moving up. This is just the opposite of the checklist procedure. However, neither the pilot nor IP commented on this discrepancy. The IP thought that he had merely performed the check in reverse, so he accepted the ground crew report as confirmation that the trim worked properly. Neither pilot noticed that the trim indicator was moving in the direction opposite to the trim switch. The aircraft took off without difficulty, and the reversed trim was discovered during air refueling.

After landing, investigators found that the copilot's trim switch had been installed upside down.

Collision With the (Power Cart) Ground

A C-130 crew was preparing their aircraft for a night mission. The copilot turned on the aux hydraulic pump and the hydraulic boost pumps but failed to select emergency brakes. Neither pilot monitored the emergency brake pressure gauge for a pressure drop as the pedals were depressed for setting the parking brake.

Maintenance personnel arrived after the loadmaster had removed the chocks but prior to starting the No. 3 engine. After No. 3 was started, the loadmaster cleared No. 4 for start without confirming that external equipment — in this case the power cart — had been removed.

The No. 4 engine was brought to ground idle while the maintenance crew was still coiling the power cable. The loadmaster came forward to the nose of the aircraft to help pick up the last few feet of power cord.

The C-130, which was parked on a slight hill, began to roll forward. The pilot noticed movement in his peripheral vision but thought it was the ground crew moving the power cart. This impression was enhanced by poor ramp lighting.

The loadmaster's attention was diverted to the power cord and he did not detect the movement until the nose of the aircraft struck him.

The pilot, upon realizing that the aircraft was rolling forward and drifting left toward the power cart, reached across the console, slapping the brake switch to emergency and applying the brakes. These actions were too late.

The aircraft traveled 25 feet forward and 12 feet left, brushing the maintenance ground crew and loadmaster aside and striking the MD-3 and upsetting it.

TOPICS

Don't Wait

An F-4 was maneuvering against an aggressor when it entered an accelerated stall and departed controlled flight. The pilot attempted to recover the aircraft and then ejected 19 seconds after the departure at about 3,200 feet AGL.

The back seater made it with minor injury. The pilot was fatally injured when his chute failed as he passed through the fireball from the aircraft explosion on ground impact. When the aircraft departed, it was already outside the successful recovery envelope.

Lightning Strike

A B-52 was scheduled to fly a night mission in the Strategic Training Range Complex (STRC). No significant weather was briefed for the STRC either during the pre-flight briefing or the airborne update. There had been isolated showers forecast, and during the first two hours of the low level route this forecast held true. Then the aircraft entered IMC.

The crew searched for hazardous weather but observed only radar returns for rainshowers. They continued the mission and the weather watch while IMC. The computed true OAT was plus 6° centigrade.

Ten minutes after entering IMC, the aircraft was struck by lightning on top of the nose at the base of the window. Both pilots saw a very bright flash which blinded them for about five seconds. The whole crew felt a momentary violent shaking of the aircraft.

The copilot, who was flying, was able to maintain aircraft control, initiate a climb, and as the flash-blindness wore off, he and the pilot were able to abort the route and make a successful, safe recovery. There had been no indication of hazardous weather prior to the strike.

How Close is Close?

An F-111 pilot was flying a low level route in a European country when he heard a loud noise and felt some vibration. Looking up, he saw a Jaguar directly overhead — only about 20 feet away. The Jaguar had apparently approached from eight o'clock and passed without ever seeing the F-111.

Smoking Flare in the RSU

The runway supervisory officer was notified of a change of active runway and drove the RSU unit (a metal cab mounted on the back of a 1-1/2 ton truck), to a new location. Since he was concerned mainly with getting to the new runway quickly, the RSO merely turned off the radios and pulled the circuit breakers. He left the flare gun loaded and installed, believing that it would not fall from the port.

After parking at the new location, the RSO walked back to the cab. When he opened the car door he found the RSU full of smoke and had to put out a small fire. Then he discovered the discharged flare pistol lying on the desk where it had fallen.

continued

Who's Clear?

It was a typical day at this southwestern base. An RF-4 was holding short for take off on Runway 25 while a flight of two AT-38s was holding for the intersecting Runway 34, and six AT-38s were taxiing back on a taxiway which is an extension of Runway 25.

Since the primary control tower was out of service, tower controllers were operating from a temporary facility. The trainee controller on duty intended to clear the flight of two AT-38s for take off but got the runways mixed up.

The RF-4 pilot heard a transmission "cleared for take off, Runway 25." The pilot queried the tower regarding the clearance, and when he received no response assumed that he had been cleared. As the RF-4 became airborne, the pilot saw the AT-38s but was able to continue his climb and cleared them safely.

The RF-4 pilot later admitted that he was unsure of his clearance but took off anyway.

Air Force Tests Dual Mode Missile Warning System

A C-130 Hercules cargo aircraft hardly resembles the fabled Firefox of Hollywood film fame, but one assigned to Aeronautical Systems Division's 4950th Test Wing has at least one thing in common with it. Both planes can detect missiles being fired at them, enabling their pilots to take evasive action.

The C-130 has been outfitted with a new Dual Mode Missile Warning System (DMMWS) for flight testing at the US Army's White Sands Missile Range, near Alamagordo, NM.

The system has been under development in the laboratory since 1978. Now in advanced development, it incorporates a relatively simple scanning infrared warning receiver and a pulse-doppler radar.

Flying Safety Does Pay Off!

A major national insurance company has announced they will no longer charge a military aviation premium on life insurance policies. According to the company, this change was a direct result of "the effectiveness of military safety and training programs in safeguarding the lives of military aircrews." ■

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UNITED STATES AIR FORCE

Well Done Award

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

CAPTAIN
William J. McNelis

MAJOR
Patrick S. Bench

527th Tactical Fighter Training Aggressor Squadron

■ On 10 August 1982, Captain McNelis and Major Bench were returning to base from a training sortie in F-5E aircraft. As Captain McNelis lowered the landing gear handle he noted the master caution light was illuminated. The telelight panel had the Left Gen Out and Utility Hydraulic lights illuminated, the Utility Hydraulic pressure read zero, and the left main landing gear indicated unsafe. Captain McNelis had 800 pounds of fuel remaining at this time so he declared an emergency and initiated the Landing Gear Alternate Extension procedures. Major Bench rejoined to a chase position and told Captain McNelis that his aircraft nose gear and right main gear were extended, but the left main gear remained retracted. The alternate gear extension procedure failed to extend the left main gear. Captain McNelis then attempted to extend the gear by yawing the aircraft, rocking the wings, and pulling up to 4 Gs while holding the alternate release handle extended. This procedure also failed. He then shut down the left engine and used rapid lateral stick movements to dissipate any hydraulic pressure which might be trapped in the utility system holding the gear doors and uplocks in the gear up position. The alternate release procedure was reattempted, again with no results. Captain McNelis restarted the left engine and shut off the battery and generators to bypass any possible landing gear control circuit malfunction. The alternate gear extension was attempted — again with no success. The battery and generators were turned on. Captain McNelis now had approximately 300 pounds of fuel remaining. Major Bench advised Captain McNelis to disregard landing gear airspeed restrictions and accelerate to the F-5E corner velocity to attempt one more alternate gear release with the maximum G available. Captain McNelis accelerated the aircraft to 340 KIAS and pulled approximately 5½ Gs while holding the alternate gear release handle extended. The left main gear extended during the maneuver and an uneventful landing was made. The calm and professional teamwork exhibited by Captain McNelis and Major Bench solved a difficult problem in a minimum amount of time. WELL DONE! ■

BIRDSTRIKE

They don't ALL hit the wings

Keep Your VISOR DOWN!