flying

SAFETY

SEPTEMBER 1986

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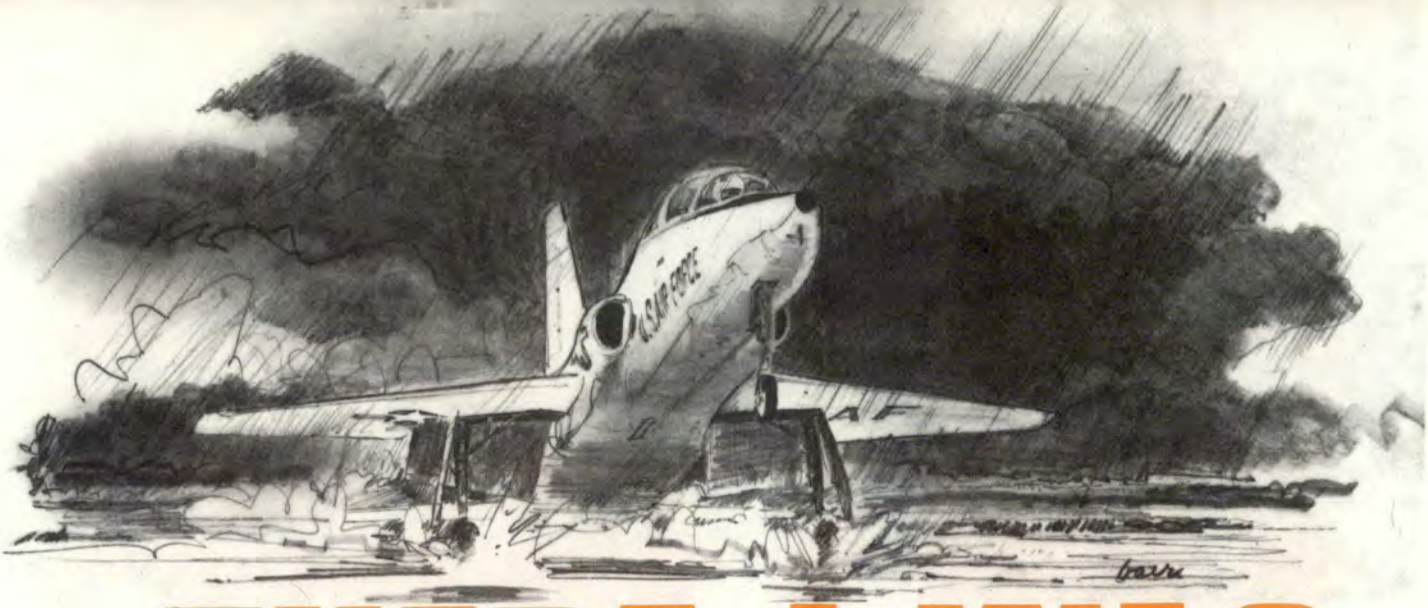
The Feathered Foe



THERE I WAS

One reason young aviators do not become old aviators is *complacency*. To avoid this problem, we need to plan every facet of every mission with worst-case scenarios in mind, i.e., when shooting an engine-out approach, it should be performed as if the engine won't respond when the throttle is pushed forward, and you will be forced to make a real engine-out landing.

Plan every mission, and accomplish every preflight as though you expect the worst conditions — *because* as described below, you just never know when you might encounter them.

■ I briefed the T-1 sortie early on a Monday morning. The sky was really overcast, and I hadn't flown in a week and a half. No problem. I have almost 2,000 hours in the jet and what could go wrong? I had flown well over 1,000 missions over northern Mississippi in some of the worst weather a then FAIP (First Assignment Instructor Pilot) could ever imagine.

When we got out to the airplane, I just knew it was going to rain and the tires were bald. No problem. I've done this before and never worried about it. Ground ops and takeoff were uneventful. We made it out to the area and were planning just a few maneuvers, but would leave with a lot of gas to concentrate on pattern work, if the pattern was open!

Heading back, we learned from the SOF that a weather recall was in progress because of heavy rainshowers. No problem. I was in the front seat and this Pilot Instructor Training student seemed very good, although it was the first time we had flown together.

I thought to myself, that runway isn't much over 8,000 feet, so I better burn off a little more gas by putting out the boards. We still showed up on final with about 1,600 pounds. No problem.

Boy, was it raining! I told the student I better make the landing and assumed control of the plane on ILS final. I guessed we were the last aircraft airborne since we were coming back from the farthest area from the base. The RSU called up and reminded us the runway was very wet and there was a slight tailwind. No problem.

I flew somewhat of a min roll approach and was sure to pull off the power early for the tailwind. Touchdown seemed to be in the first 1,000 feet, fairly nose-high and on-speed. I went into the aerobrake a little late, but not that late. No problem. I've always stopped the white rocket with plenty of runway left. The 5,000 remaining marker whizzed by. Boy, this runway sure is wet! The brakes didn't seem to be grabbing much at all. The 3,000 marker went by. When the 2,000 marker went by, I told myself we're going to hit the barrier. The airplane finally seemed to start slowing and just inside 1,000 feet remaining, it was down to taxi speed.

Thankful to survive, I thought about checking the status of my underwear. Just then, tower called up and asked, "How's the braking action?" ■

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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THE FEATHERED FOE

PEGGY E. HODGE
Assistant Editor

■ From mid-August to late December, our fine-feathered friends become "the feathered foe." They cause crewmembers great concern. Although some improvements in bird strike avoidance have been achieved, bird/aircraft collisions continue to be a problem. As crewmembers, we need to fully understand the situation to avoid it as much as possible.

To fully understand our problem, let's look at some highlights of the 1985 Bird Strike Report compiled by the Air Force's Bird-Aircraft Strike Hazard (BASH) Team. This report tells us *where* and *when* our problems may occur.

Although indepth information is not available to perform thorough statistical analysis for all reported Air Force bird strikes, the BASH Team reports the following trends and summary of the data gathered in 1985. Increased emphasis on strike reporting elevated the 1985 strike report to 2,722 over the 2,321 reported strikes in 1984. Bird strikes cost us $5,193,618 in 1985, substantially bettering the 1984 mark of $19,393,478. There was only one Class A bird strike in 1985; a downed T-38 from which both pilots escaped uninjured.

Aircraft Involved in Bird Strikes

Aircraft mission played a major role in which planes experienced the most bird strikes in 1985. Aircraft which flew high speed, low-level were much more susceptible than those which spent more time aloft. Additionally, aircraft size, configuration, type of engine, and geographic location played a role in aircraft susceptibility to strikes. Figure 1 shows fighter aircraft led the list in most bird strikes.

This fact is not surprising but can be misleading. The number of aircraft involved, hours flown, and emphasis on low-level flying made our fighters most susceptible to bird strikes, yet other aircraft such as the B-52 actually had higher strike rates per flying hour. Overall, the Air Force averaged 84.2 strike rates per 100,000 flying hours in 1985.

Bird Strikes by Phase of Flight

Assuming many of the bird strikes in the "unknown location" category occur on airfields, almost 50 percent of Air Force bird strikes occurred in the airfield environment. (See Figure 2.)

This proportion is because a great deal of time is spent in this environment. Also, high aircraft density, low altitude, and greater vulnerability to strikes during takeoff and landing contribute to this statistic. Fortunately, it is in this area we have the most control to reduce bird hazards.

Operational changes such as raising pattern altitude, changing pattern direction or ground tracks, flying during least hazardous periods, etc., should be considered.

A large number of bird strikes also occurred on our low-level routes. With the increasing emphasis on high-speed, low-level flying, this is to be expected, but control in this environment is much more difficult to achieve.

We can fly during that time of the day or season when birds are less prevalent. We should avoid known concentration areas for birds. The computerized Bird Avoidance Model (BAM) is helping make our low-level routes safer by allowing pilots and schedulers to select routes with lesser bird strike risks.

Figure 3 shows over 97 percent of our bird strikes occurred below 3,000 feet AGL, with the majority occurring on the airfield and on low-level routes.

Since bird strikes increase significantly as altitude decreases, the importance of remaining as high as possible in the pattern and on low-level routes is clear when the mission permits.

Times When Bird Strikes Occur

The Air Force does most of its flying during the day; so naturally, most of our bird strikes occur then. Figure 4 shows over 70 percent of our strikes occurred during daylight hours.

Many birds are most active at dawn and dusk as they fly to and from feeding or roosting areas. Strike numbers were low at this time in large part because little flying was done during these hours. However, a disproportionately large number of strikes seemed to occur here per flying hour, and extreme caution must be exercised during these times.

Many strikes occurred at night during migration periods. Most waterfowl and passerines (perching birds) migrate at night, and night flying in spring and fall can be particularly hazardous because of this.

Minimizing Risk

While many bird strikes are unavoidable, a reduction in the hazard is possible by a variety of means. What can we do to avoid "the feathered foe?"

■ One means we can actively pursue is *pilot response* to an imminent strike. When it is not possible to maneuver to avoid birds and the strike is inevitable due to the birds' proximity, it is best to remain level, possibly duck your head, and take the strike. Maneuvering within this region may only create additional problems such as pilot disorientation, unusual aircraft attitude, or increased damages following the bird strike.

In most cases, birds will tuck their wings and dive if they perceive the oncoming aircraft as a threat. From

continued

Figure 1
Bird Strikes By Type of Aircraft 1985

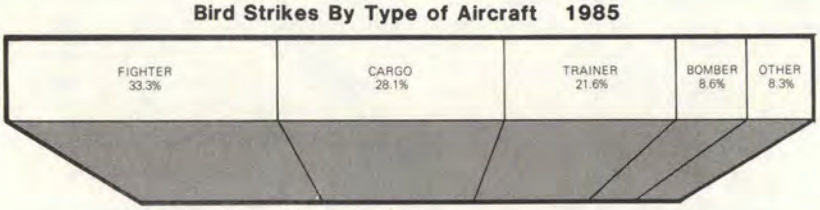
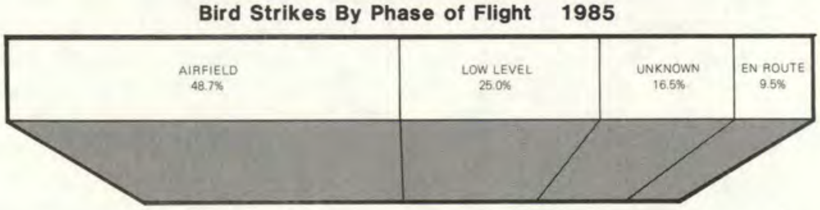


Figure 2
Bird Strikes By Phase of Flight 1985



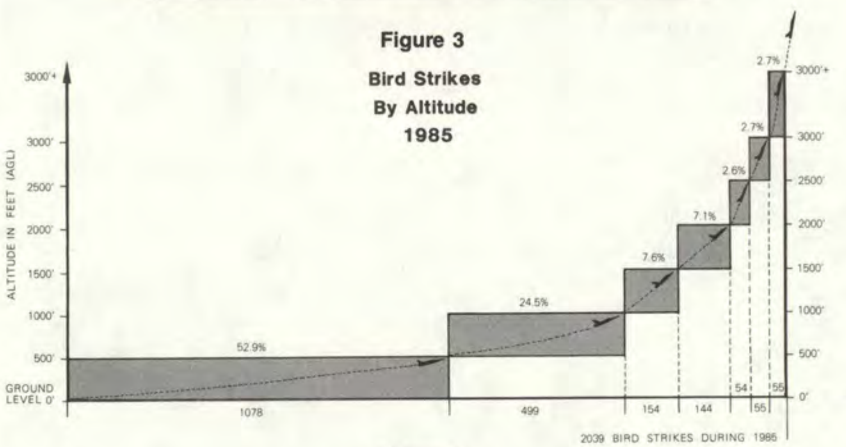
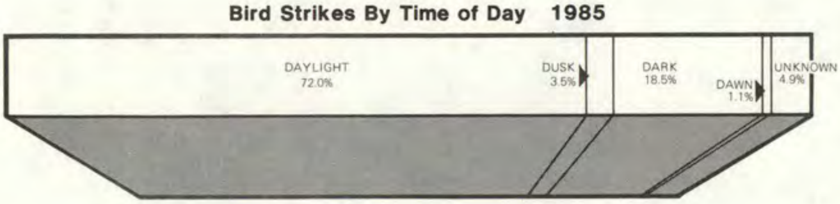
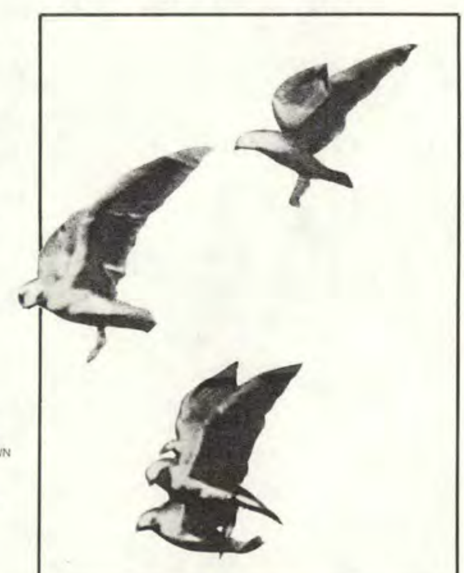


Figure 4
Bird Strikes By Time of Day 1985



97% of all bird strikes occur below 3,000 feet AGL.



The Feathered Foe continued

this, we can conclude that in the vast majority of cases, a climb should be initiated to avoid bird strikes.

The BASH Team tells us ". . . there are times when a bird is too close to avoid. Remaining straight and level and protecting your face in this situation is best."*

■ Abort a takeoff or planned touch and go if a bird strike occurs and enough runway remains to stop. Bird strike damage cannot be accurately assessed in-flight and may result in a complex airborne emergency. Only maintenance people on the ground can make accurate damage assessments.

■ Aircrews experiencing en route bird strikes should also consider aborting the mission. While an engine ingestion or a canopy strike may be readily apparent from the cockpit, many fuselage, wing, tail, or radome strikes cannot be adequately assessed for damage. Continuing a mission may result in greater structural damage and an emergency situation later in the flight.

■ Checklist items should be accomplished in a way that will allow maximum eye contact outside of the cockpit. Briefing bird strikes is much like briefing a takeoff emergency where urgency dictates a preplanned course of action.

■ Limit night flights as much as possible during October and November. These are the peak migration months.

■ If numerous small bird impacts are experienced, curtail night flying for approximately one week to allow these small bird flocks to exit the local area. They transit an area quickly and quite often at night.

■ Flights below 10,000 feet AGL should be kept to a minimum because most migratory activity occurs between 1,500 feet and 5,000 feet AGL.

■ Airspeed below 10,000 feet AGL should be kept as low as practical. Each time the airspeed doubles, bird impact forces quadruple, and it is not uncommon for a mallard duck to create an impact force of 200,000 pounds.

■ If at all possible, landing lights should be displayed below 10,000 feet AGL to assist in bird avoidance. If birds are encountered, the aircraft should climb since bird distribution diminishes with altitude. Also, birds in flight that are startled or feel threatened, instinctively dive.

■ Use of low level routes should be scheduled between 0900 and 1500 because waterfowl activity is at a minimum during this time. Preference should also be given to routes with an East-West orientation to further reduce exposure. Route segments that pass over bodies of water should be avoided.

■ Visors should be worn by the pilots at all times during flight below 10,000 feet AGL, and, if in accordance with your aircraft's TO, the windshield may be heated to improve bird resistance.

■ Low-level mission briefings during September, October, and November should include bird encounters and actions to take in the event of a bird strike which may result in serious injury to the pilot or loss of cockpit communications.

■ Local state and federal wildlife officials are the best source of information on local bird movements. Flyway data have been published in various documents, and this information can be obtained from your regional offices of the US Fish and Wildlife Service at the US Department of the Interior.

Heads up! It's that time of year again! ■

*For more information on pilot response, see "Dodging Feathered Bullets," *Flying Safety*, May 1986.

Even at the low airspeeds flown by the T-37, bird strike damage can be severe. The pilots in this Tweet were lucky the bird hit the nose instead of the windscreen.

Don't relax your vigil as you begin the approach for landing — the airfield is the most dangerous area. Almost 50 percent of the bird strikes in 1985 occurred on or near airfields.

Since Maintenance magazine and the USAF Safety Journal are no longer being published, you'll see their subject matter gradually incorporated into Flying Safety magazine. "FSO's Corner" is the first of these articles which we hope to make regular features in the months to come.

FSO's CORNER

CAPTAIN DALE T. PIERCE
919th Special Operations Group/SEF
Eglin AFB Aux Fld 3, FL

■ I occasionally hear of flight safety meetings which seem to be square-filling exercises. (I'm sure I've had a couple.) Square fillers usually consist of boring lectures presented to disgruntled attendees. These square fillers can go a long way toward undermining more positive efforts in the flight safety area. One way to ensure your flight safety meetings don't fit the "ho-hum" mold is to increase the level of aircrew member participation in the meetings. The purpose of this article is to discuss one of the numerous ways you can increase aircrew member participation in your flight safety meetings.

At Detachment 11 (Det 11) of the 39th Aerospace Rescue and Recovery Wing (39 ARRW), a different aircrew member is selected each month to present a briefing at the Flight Safety Meeting. The selection is based on the selectee's experience with and knowledge of the suggested topic (provided to the selectee). The selectee receives a letter as a reminder, is given the option of either using the suggested topic or another topic of the selectee's choosing, and may select the method of presentation (guest speakers, etc).

The program is working well at Det 11, 39 ARRW. It has benefited both the flight safety meetings and the selectees. Interest in the meetings has been increased by the various styles of presentation used, and increased aircrew member participation has enhanced the feeling among aircrew members that the meetings are theirs (instead of briefings from "on high"). The selectees have been afforded the opportunity to polish their verbal skills, gain experience researching topics of interest, and obtain communication skill fodder for their OERs. I've used a similar, less formal approach off and on for several years and have had the same positive results.

US Coast Guard Lieutenant Stephen A. Scott, Detachment Safety Officer, Det 11, 39 ARRW, Myrtle Beach AFB, South Carolina, provided this month's FSO's Corner idea.

The FSO's Corner needs your ideas. What are you doing in your safety program that could help other FSOs if they knew about it? Call me (Captain Dale Pierce) at AUTOVON 872-8537, or send your name, AUTOVON number, and a brief description of your program idea to 919 SOG/SEF, Eglin AF Aux Fld 3, Florida 32542-6005. ■

If the safety meeting isn't interesting and pertinent, it's a waste of everyone's time. This month's suggestion is an excellent way to generate interest.

King of the Air

SQN LDR ALASTAIR G. BRIDGES, RAAF
Directorate of Aerospace Safety

■ This is the first of what I hope will be regular articles designed primarily to provide safety information to the overseas operators of C-12 aircraft. In my project officer position within AFISC, I have safety responsibility for seven different weapon systems, including the C-12. Some of these systems are widely dispersed throughout the world and to visit each unit is both impractical and impossible. I am concerned that the crosstell between the CONUS MAC units is not extended to all other operators, particularly those with only one aircraft, a couple of pilots, and thousands of miles of ocean between them and home. Therefore, in the interests of crosstell and acknowledging the similarities between the C-12A, D, and F, I am including all C-12 units. There are many lessons learned from the older C-12s that are very much applicable to the C-12F.

These articles will include any suitable safety topic applicable to C-12s. It will include brief summaries of both Army and Navy mishaps and any other pertinent information these services care to pass on. I'll also ask program managers and safety folks for information and will particularly welcome inputs from you in the field, even if it's a short note to say you don't like something I wrote.

There is some concern that raising the Class C threshold to $10,000 will result in valuable mishap data not being reported. Don't hesitate to write a HAP if you think something is a potential problem. By reporting potential problems, we can get responses from other operators who have had similar experiences, and we'll *all* know about it and can try a fix on it. An example from the F-model will help illustrate.

A failure mode in the C-12F's course deviation indicator (CDI) will cause the bar to center with no flags or warnings. This problem came to light after a HAP was submitted

This article is written primarily for C-12 crews. But, there are lessons here for all crewmembers.

and others then reported having the same problem. The program manager is working this issue with the contractor.

Both the Navy and Air Force have had instances that nearly resulted in gear-up landings and did result in prop damage. The similarities are striking, too — training flights, interrupted or missed checks due to other distractions, fatigue, and simulated single engine. The design of the gear warning system contributes to the problem. In the situation with one throttle retarded to simulate a shutdown engine and the flaps up or at approach, the gear warning horn can be silenced. Unless the flaps are lowered beyond approach, the horn will not activate even when the power throttle is retarded below 79-percent N1, as in the flare or on short final. Consequently, a very real potential exists for a gear-up landing in any C-12 aircraft. To illustrate, I'll briefly describe a Navy and an Air Force mishap.

▪ The Navy incident occurred at the end of a long instrument trainer flight in reduced visibility at an uncontrolled airfield. While preparing for the ILS, an engine failure was simulated by retarding one throttle and canceling the horn. Soon after, both pilots became engrossed in visually acquiring traffic and deviating to avoid this traffic. This placed the C-12B in a position where further maneuvering was needed to intercept the ILS. Another aircraft then commenced several radio exchanges with the C-12 until the C-12 was crossing the threshold. Final check showed no greens, and a go-around was initiated as one prop contacted the runway. After landing, damage was found on all three blade tips.

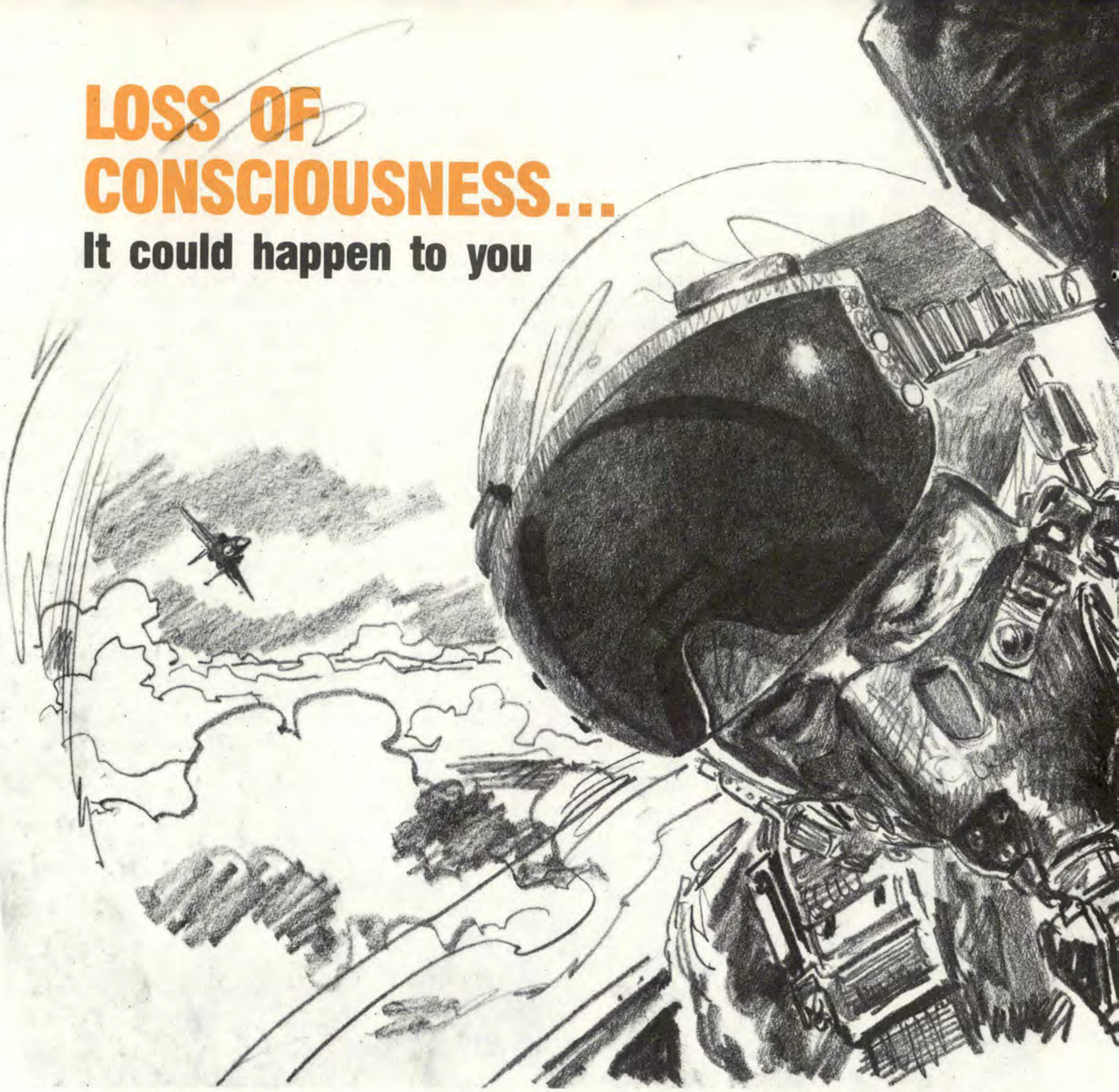
▪ The Air Force had a very similar C-12A mishap. This was again an instrument mission in VMC, and it was the final approach of the day — a VOR. This time, the gear was lowered and checks completed. After passing the final approach fix, a simulated engine problem and simulated feathering was conducted. Inside 3 miles, the gear was raised to maintain airspeed and height, and the horn was canceled. Tower then transmitted a bird advisory. The crew began a discussion of single engine procedures, and the bird problem and attention was now focused outside the aircraft with birds the primary concern. When the aircraft settled lower than normal in the flare, a go-around was initiated. On landing, all six prop blades were found damaged, as well as the lower strobe light and ADF antenna.

Warning horn modifications are being installed in all the older C-12 aircraft at this time and should help reduce the potential for a gear-up landing. We are working for similar modifications for the C-12F.

That's it for this inaugural article. Next time, we'll look at some older C-12 mishaps and some Army and Navy ones you may not have heard about. Hopefully, I'll also have some feedback from you which I can pass on to all. Keep up the good work, fly safely, and enjoy it. ■

Squadron Leader Bridges is the AFISC project officer for C-12s. It is impossible for him to visit all the widely scattered units, so let him know what problems you have. Also, let him know about your methods for solving or preventing problems.

LOSS OF CONSCIOUSNESS...
It could happen to you



The following article is the text of a briefing given by a USN exchange pilot who experienced loss of consciousness (LOC) during an ACM mission in a CF18. He is still around to talk about it, and we hope other pilots will gain from his experience.

LT JIM BRAUN
410 Sqn
CFB Cold Lake

■ On Monday, 19 Aug 85, I was scheduled for two ACM missions against F-15s. The first mission was a 1 v 1, early in the morning, the second was the last go, a 2 v 2. The incident occurred during the fifth and last ACM engagement of the afternoon mission. I was well rested and nourished.

Entering the merge with my wingman, we had a radar contact on only one bandit. Shortly thereafter, my wingman called for me to turn. I rolled into a 135° slice at approximately 425 knots. The next radio call I heard was from the ACMR Range Officer calling someone "dead" (they had been shot). Not clear as to who had been shot, I questioned the call. This distracted me from the work at hand. I was pulling 7.7 G in about 1.5 secs. Unknown to me, my G-suit had also come unplugged prior to the engagement. Just as I was questioning who had been shot, I lost consciousness. There was absolutely no warning that this was about to oc-

cur. I have previously experienced "greyout" and "blackout," but I never really expected that unconsciousness could occur to *me* so quickly, despite all the excellent lectures and training we've received on "G" awareness.

I remember coming to, not having any idea where I was. I remember seeing the inside of my eyelids and hearing my heart beating loudly, like it was between my ears. I felt very comfortable and relaxed, as if I had just woke up from a sound sleep. A radio transmission from my wingman jarred me into realizing I was flying. My vision had returned now. I could see that I was wings level, at 12,000 feet MSL, 480 KIAS. I had no idea what had happened or what maneuver I was in when I went out. I called a "knock it off" on the radio, as I began to sort things out. I was still groggy.

My first thought was that I had experienced some sort of seizure. I couldn't believe it. Then I started to think that I might have knocked myself out from rapid G onset. I still couldn't believe that it could happen to me, but did admit to myself that this is probably what had happened.

As I was regaining my consciousness, I had absolutely no fear of crashing. There was no thought of ejecting or keying the mike. Upon regaining my vision, had I been confronted with a windscreen full of green trees, I don't believe I would have been alert enough to eject. I was definitely along for the ride for another 10-15 secs.

After about 20 secs, I was alert again, and flying OK. I called a join-up and began to lead a four plane back into the break. I was reluctant to tell anyone what had happened and decided to keep quiet. It was a clear day, and I decided it was easier for me to keep the lead than to cross under and fly wing. As we returned, I discovered I was still not back to 100 percent. Break altitude at Cold Lake is 3,200 feet MSL. In a gradual descent from 14,000 feet MSL to 3,200 feet MSL, I descended to 2,800 feet before realizing I was low. By the time I reacted, I was level at 2,650 feet MSL, climbing back to 3,200 feet MSL. It also took a call from my wingman to get me to switch to tower frequency. We were already only 10 miles out — normally this call is made around 20 miles. The break and landing were uneventful.

On the ground, I still kept quiet. I almost felt embarrassed that this had happened to me. I have over 1,800 hours in fighters (1,000 in the F-14) and keep myself in good physical condition. Thinking about it that evening, I came to the conclusion that my feelings were ridiculous. If this could happen to me, it could happen to anyone — especially another F-18 driver. The F-18's pitch rate (G onset rate) is superior to any other fighter in the world.

Watching the playback on the ACMR was a spooky feeling. I watched my airplane fly for that 10-15 secs, during which time I knew I was out. Watching my HUD film the next morning was even more of an eye-opener. Because I recovered in a wings level attitude, I just assumed I was doing a level break when I lost consciousness. In reality, the aircraft attitude was 135° of bank, 45° nose down, at 450 KIAS. How the airplane recovered to wings level attitude is unknown. I must have maintained backstick while I was out.

Personally, this was a frightening but powerful learning experience — one which I will never repeat. I have gained a tremendous respect for the F-18's pitch rate and the hazards of G onset. The incident has not decreased my aggressiveness, but rather has made me smarter. I will never fight "greyed" out for even a few seconds. I will always relax the G if greyout is occurring. The loss of situational awareness during "grey out" is a tremendous disadvantage for the extra turn rate you're getting. Also, if you're going to turn, you must keep the speed manageable — around 400 knots or so. At 500 knots, a "flinch" can bring on 7.0 G. You must be concentrating hard on the M1 maneuver, and know how to do it properly. Although, *snapping* the stick back will never allow you time to prepare for the G onset.

Put yourself into a real combat scenario: You're blowing through at 500 knots plus. Suddenly, your wingman calls "BREAK!!!" Could you be the star of this incident? — Courtesy *Flight Comment*, No. 5, 1985. ■

This is an excellent reminder that even highly experienced pilots are susceptible to GLOC. Don't relax your guard at any time. Anticipate *the G onset,* lead *it with a* proper *straining maneuver, and continue straining while the aircraft is loaded up. Never assume it can't happen to you. Your first defense against physiological hazards is constant vigilance. — Editor,* Flying Safety.

Electronic Bulletin Board

LT COL JAMES I. MIHOLICK
Directorate of Aerospace Safety

The new Electronic Bulletin Board System is one more way of making safety data available for your use. You can also use it to send messages to any AFISC division.

■ The Air Force Inspection and Safety Center (AFISC) has opened the Electronic Bulletin Board System (BBS) data service. This bulletin board of safety statistics and mishap information, which is now managed by the Data Analysis Branch of the Reports and Analysis Division, resides on a Zenith Z-100 microcomputer which can be accessed directly by telephone through any 300/1200 baud modem.

The BBS is on-line 7 days per week, 24 hours per day, except during 0730-0800 Pacific daylight time on normal AFISC duty days. This time is used each morning to update information in the BBS to make it current as of that day. The rest of the time, including evenings, weekends, and holidays, our new computer telecommunications system is ready and waiting to give you information, or to receive your requests so we can process them as soon as we get to work.

The information currently available on the BBS includes 1985 and 1986 Class A/B flight mishap statistics (numbers/rates) in several formats including by MAJCOM and type aircraft; Class A and B flight one-liners; Class A ground, missile, and weapons statistics; and eight message boards. The message boards can be used to leave requests for data or technical assistance, messages for any of AFISC's divisions or people, or to browse through current messages or AFISC's staff directory.

The "main menu" option also provides for data file transfer in either direction between the BBS and a local mass storage device. The largest file currently available for transfer is 1.9 Kb (1985 flight statistics and one-liners). High on our priority list is an equipment upgrade to allow for electronic transfer of greater amounts of information directly to mishap investigation boards. We anticipate this may be possible within 1-2 months if all goes well.

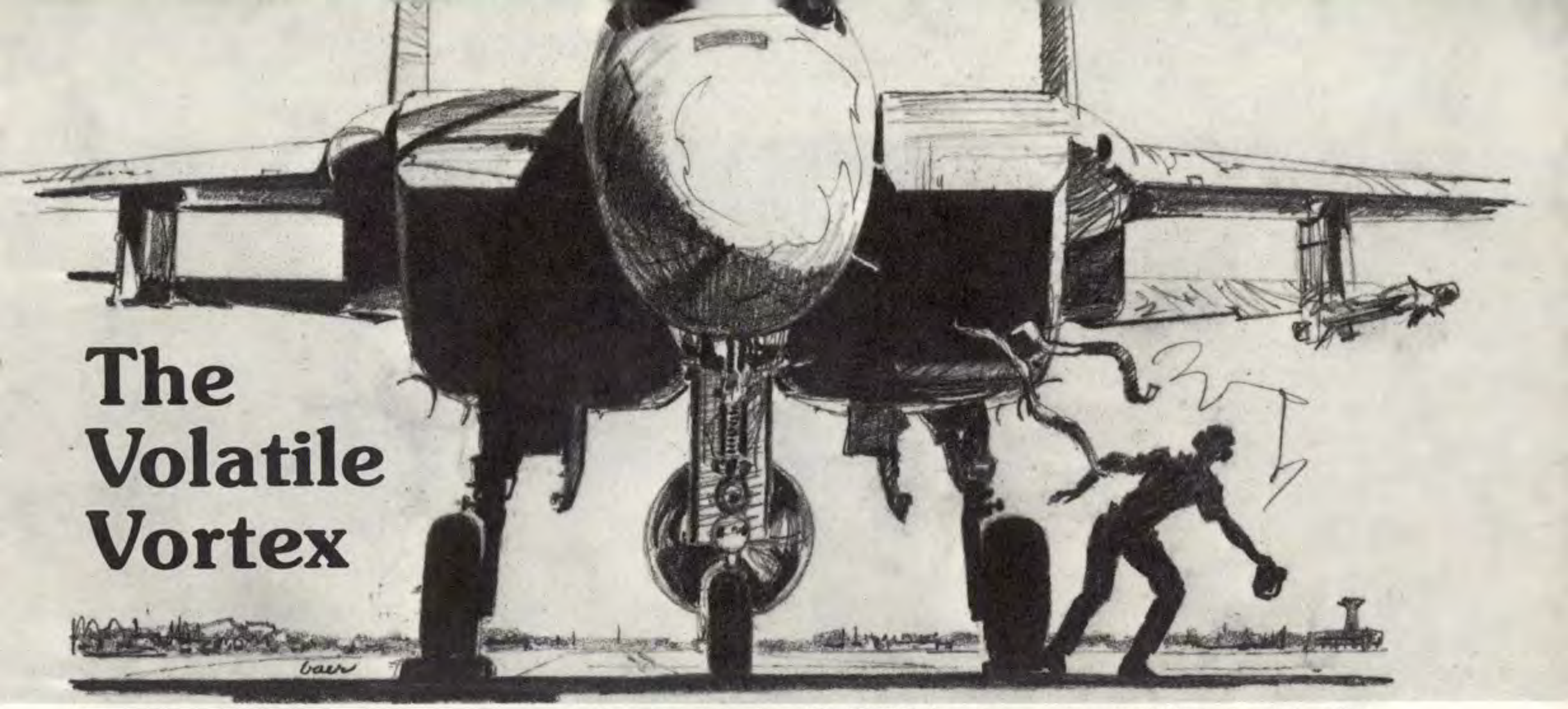
The current configuration allows only one data line into the BBS and therefore no true "multiple user" simultaneous access. If you try to make contact and the line is busy, wait a few minutes and then try again. If the BBS becomes too saturated, we will attempt to procure additional lines. For any MAJCOMs interested in providing a MAJCOM safety BBS service to their units, we can provide the necessary software to create a MAJCOM-based BBS emulating the one at AFISC. MAJCOMs with compatible, communications-capable microcomputer system can get the necessary details by contacting AFISC/SERD, AUTOVON 876-7577.

Units wishing to access the AFISC BBS should submit the name, rank, office symbol, and duty title of the individual desiring access to HQ AFISC through their MAJCOM safety office. To add these individuals to our access list, MAJCOMs should forward the above information to HQ AFISC/SER, ATTN: BBS SYSOP, Norton AFB, CA 92409-7001. We will respond by mail within 5 working days with the BBS telephone number, BBS system communications protocol, a user ID number, password information, and a comprehensive user's manual.

The AFISC BBS is designed to satisfy your needs. Communication involves simply dialing the BBS number, setting your modem to "originate" (if this isn't done automatically), and answering the prompts that appear on your screen. The BBS menus are designed to lead you through the system in a functional, user-friendly, plain English manner. Even if you are unfamiliar with electronic telecommunications protocol or syntax, you should have little trouble getting the information you need.

Communication with AFISC and the BBS System Operator (SYSOP) will help keep the BBS dynamic and provide the kind of service necessary to continue reducing mishaps. Contact the SYSOP by telephone anytime with any questions, problems, suggestions, or comments at AUTOVON 876-7577. ■

The Volatile Vortex



SERGEANT DARRYL BULLUCK
36th Aircraft Generation Squadron

■ Everyone who works on the F-15 is aware of the awesome power of the F100-PW-100 engines. Technical data identifies an area beyond 25 feet in front of the inlet as being the safe zone with engines running — common knowledge in the F-15 community. But what some people may not realize is that there is an area behind the inlet that presents a similar danger area. This is the area where I encountered the "dangerous volatile vortex." Sounds like the title of a science fiction story, doesn't it?

What follows is worse than an encounter with science fiction; it is true. It was a very cold December morning at Bitburg Air Base, Germany. I was tasked to evaluate a trainee on preflight and launch procedures. Very routine since the airman was well trained and extremely competent. After the airman was briefed concerning the procedures by the pilot and me, the pilot accomplished his walkaround and entered the aircraft to begin the launch sequence.

I was impressed at how well the trainee had mastered the lessons given to him in the previous days. He did everything as he had been taught — exactly as outlined in 1F-15C-6WC-1-1. After the launch sequence was well underway, the trainee started to accomplish local procedures to comply with 1F-15C-6 (end-of-runway steps necessary to ensure pylon pins are pulled after engine start) and stowed the pins in panel 154L prior to aircraft taxi.

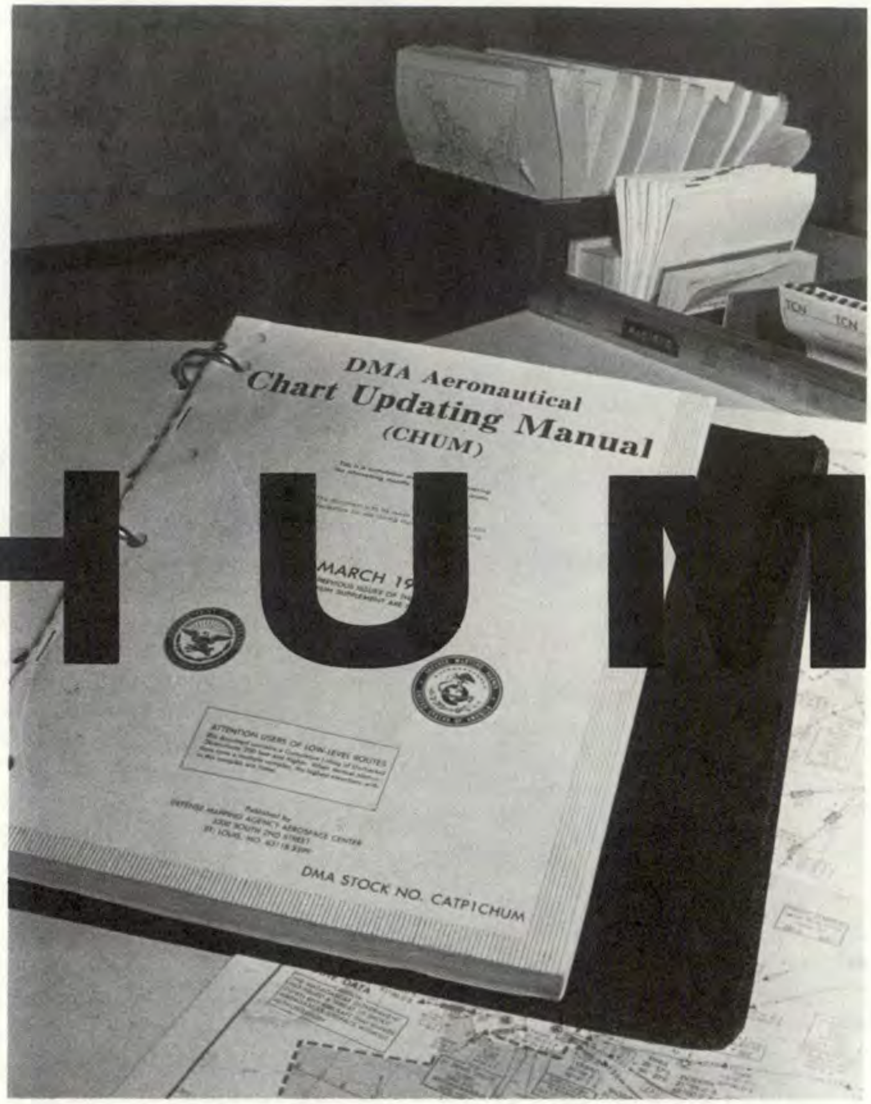
The airman pulled the two MAU12 pins and the LAU114 pin and wrapped them together with the streamers. He pulled the missile seeker head and fuse covers and placed the pins, rolled up in a tight bundle, in the seeker head cover as he had been taught. I closely observed him as he went to place the bundle in door 154L. As he bent down about 4 feet *behind* the intake of the No. 1 engine to place the bundle in door 154L, he lost his grip and dropped the bundle. When he picked up the bundle, the MAU12 pins were missing. Although I didn't realize immediately what happened, I noticed the trainee's astonishment and instructed the pilot to shutdown. After shutdown, it became obvious what had happened.

The pins were ingested by the engine. An analysis determined the pin's streamers, along with the pins, were picked up by the vortex that forms aft of the intake when the engine is running. Everyone has seen this phenomenon when the F-15 is taxiing out on a wet morning — a small vortex forms at certain times and runs into the engines. However, until the pins were sucked into the vortex, I didn't realize the FOD potential this vortex created. I was astounded that the vortex could pick up two MAU12 pins 4 feet behind the engine with the engine only at idle.

As the old saying goes, "hindsight is 20-20" — and we have learned from it. Since this incident, we have taken corrective actions to prevent a recurrence. The use of a pin bag to stow loose pins has been implemented, and we have changed the location for storage of larger items to the VTR door, which is farther to the rear of the inlet. The steps we have taken should greatly reduce the likelihood of another engine FOD during launch. The real lesson to be learned is that this volatile vortex makes it absolutely necessary to ensure our shelters, taxiways, and runways are FOD free . . . MAU12 pins are much larger than the small nuts, bolts, and pieces of safety wire that I occasionally find during FOD walks and after maintenance cleanup. So be forewarned, the wicked vortex is always present, ready to take another engine's life and zap us of precious resources. ■

Pilots, when you're stopping at a cross-country base, brief all crew chiefs and any other maintenance people who will be around the aircraft when the engines are running. They're all aware of the danger area in front of the intakes, but they're most likely not familiar with this danger area aft of the intakes. The short time spent briefing these people will pay great dividends in reducing the FOD threat to our F-15s. — Ed.

You can't find this CHUM in Webster's Dictionary, but it's an essential part of your mission planning.



THE CHUM

DAVE CALDWELL
Defense Mapping Agency
Aerospace Center
St. Louis, MO

■ "The job isn't finished till the paperwork is done." That very popular commentary is widely read and understood by all. It prompts us to attend to tasks that are required, but often approached with little enthusiasm.

Consider this expression: "Flight planning isn't finished till the CHUM* has been checked." This little reminder, though somewhat less popular, is significantly more relevant to military air crewmembers. The consequences of treating it lightly may be severe. The rewards for abiding by it could include the life of the pilot and the entire crew. Military aircrews routinely "bet their lives" on the currency and accuracy of Defense Mapping Agency (DMA) aeronautical charts.

To emphasize the significance of the quoted expression, here are some basic facts about the "CHUM."

DMA provides aeronautical charts to all military flying organizations. These charts are produced initially to satisfy a specific operational flying requirement and then they are updated periodically through publication of newer editions. Unfortunately, it is not possible to publish updated charts fast enough to keep pace with all the changes that occur worldwide. As aeronautical chart producers, we are constantly reviewing new source materials. Many changes to chart features are noted daily (new vertical obstructions, new powerlines, new airfield data, etc). A method of communicating these day-to-day changes to military aircrews is obviously required.

Enter the CHUM and its companion publication, the DMA Chart Updating Manual Supplement (CHUM Supplement). These publications provide military aeronautical chart users with corrections, data about hazardous conditions not previously known, and new currency information on a monthly basis, once the chart is published. The CHUM is published in March and September of each year and contains a complete listing of known aeronautical chart correction information. The CHUM Supplement is published monthly between editions of the complete CHUM and contains a cumulative listing of additional changes and corrections. These two publications, along with Flight Information Publication (FLIP) and Notices to Airmen (NOTAMs), must be reviewed by crewmembers prior to each flight in which aeronautical charts are used.

The CHUM/CHUM Supplement are divided into sections, and each

*Defense Mapping Agency Aeronautical Chart Updating Manual

The CHUM will tell you if the chart you're using is the most current one. It will also tell you if there have been any changes to the chart.

section serves a specific purpose. The cover contains three relevant dates. A publication date appears near the center of the page. Below it are the information currency dates; one for obstruction information and one for all other information in that publication. It is important to locate and reference the latest edition of CHUM/CHUM Supplement and to understand the currency of information published.

After a table of contents, each CHUM/CHUM Supplement contains one or more pages of general information under Section I. To make effective use of these publications, you must read and understand the information provided there. Section I provides instructions for reporting uncharted obstructions and describes the criteria used for including chart corrections in the publications.

A "Summary of Changes" paragraph keeps you informed on changes to the CHUM/CHUM Supplement itself, and the "General Notices" paragraph provides broad categorical information on aeronautical charts. A request for user response and a legend round out the section. The information in Section I may change from time to time reflecting changes in the data provided, format, or method of using the publications.

The next section, Section II, contains correction data for aeronautical charts. The listed charts are arranged by series or type, then in alphanumeric order by chart number. Corrections to each chart are listed by one-degree blocks of latitude and longitude beginning in the upper left corner of the chart and progressing left to right, from top to bottom. This arrangement is designed to assist you in locating and transferring the corrected information from publication to chart.

It is critical you match the chart in use with the one listed in the CHUM/CHUM Supplement. This match is not only by chart number, but by edition number and date as well. If all numbers do not match, the chart and the CHUM cannot be used together. It is also significant to note corrections listed represent those that are known to DMA. There is no intent to imply each chart is systematically examined to identify all discrepancies which may occur. Once a correction appears, it is carried in each subsequent CHUM and CHUM Supplement until the chart in question is obsolete or replaced by a new edition.

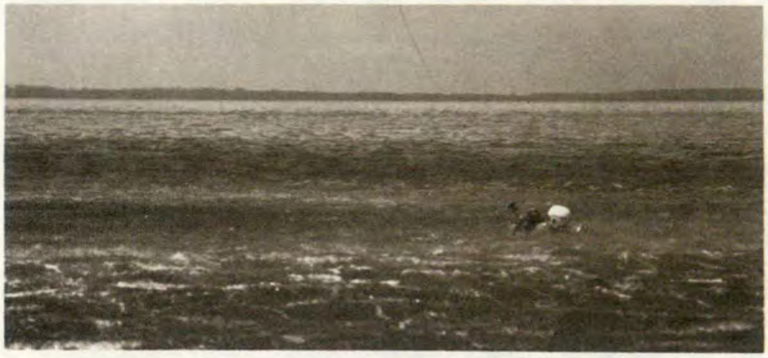
Beginning with the March 1986 CHUM, all charts published and available are listed even if no corrections are required. This listing provides military aircrews with a handy reference for confirming the chart they are planning to use is, in fact, the most current chart published by DMA.

Safety of flight is a main concern, and DMA is dedicated to providing aeronautical chart update information in the most timely and usable way. The CHUM/CHUM Supplement are regularly reviewed to determine if proposed changes will improve the publications' utility. If you have suggestions for improving the CHUM/CHUM Supplement or if you have a question regarding these publications, please contact the DMA Aerospace Center, Attn: PRN, 3200 South Second Street, St. Louis, Missouri 63118-3399.

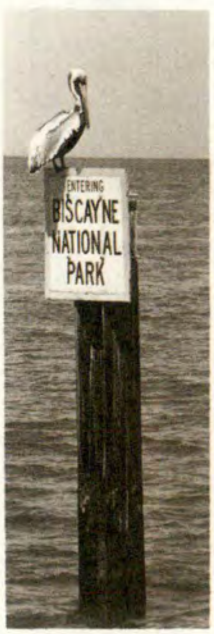
And remember — "Flight Planning isn't finished till the CHUM has been checked." ■

A person who does not signal rescue forces when lost at sea has less than a 5 percent possibility of surviving the ocean environment.

How Can You Improve Your ODDS?



Be prepared for over-water emergencies. Know your equipment — know what to expect — know your procedures — these are proven techniques for successful survival after a bailout over water.



The Air Force conducts its water survival training in Florida's Biscayne Bay. (It looks like the school has a mascot!)

Conventional demonstrations and classroom lectures provide crewmembers with necessary survival information including proper radio and parachuting procedures.

Outdoors, crewmembers get hands-on experience with their equipment. Flares must be used properly and not wasted. Also, proper parachuting techniques will build confidence and necessarily result in a more timely ejection.

Photos by
Sgt Michael R. Massey
31 CSG
Homestead AFB FL

I recently had the opportunity to attend the Water Survival Course at Homestead AFB, Florida. The stepping-stone approach used to instruct crewmembers in the proper use of equipment, procedures, and survival was excellent! "How Can You Improve Your Odds?" and "It is Possible" review some of the significant survival, signal, and communications portions of this course. We hope you never have a need for this knowledge, *but*, as you may one day find yourself in a survival situation, we offer this material for review.

PEGGY E. HODGE
Assistant Editor

■ In May 1984, an F-4 was on a routine training mission in a 2-ship formation 90 miles southeast of Homestead AFB, Florida. The sky was overcast, the winds were 18-20 knots, and the waves were 8-10 feet.

The aircraft stalled at 8,000 feet and went into a flat spin. After an unsuccessful attempt to control the aircraft, the pilot started the ejection sequence. Seconds later, both men were looking up and checking their parachute canopies. Both descent checklists were performed without any problems. There had been no time to radio a MAYDAY call.

The crewmembers landed approximately 650 feet apart and were unable to stay in sight of each other due to the rough seas. They did, however, maintain radio contact with each other. They attempted communication with other aircraft in the area but were unsuccessful.

The downed crewmembers were optimistic of immediate rescue. However, their optimism began to dwindle as an extensive cloud cover began to move in, and it became a possibility they would be spending the night in their life rafts.

However, the other F-4 had immediately alerted the control tower at Homestead and rescue aircraft were in the area an hour later. The crewmembers vectored in the helicopter. There were no problems donning the pickup device. They were flown to the base hospital for observation.

The preceding narrative describes a water survival success story. This crew was lucky! There was *another* aircrew to alert rescue. You may not be so lucky. *Your* signal could be the only chance you've got for rescue.

Successful survival after a bailout over water *is* possible, and the Air Force ensures all crewmembers are adequately educated in the area of water survival. By teaching proper procedures and familiarizing aircrews with their emergency equipment, the USAF Water Survival School at Homestead prepares flight personnel for over-water emergencies. This water survival program prepares aircrew members to use principles, techniques, and equipment to improve the probability of survival and recovery after over-water ejection.

Under controlled conditions in Florida's Biscayne Bay (near Homestead), students are placed in simulated situations similar to what they might encounter in a real emer-

continued

It Is Possible

SGT JEFFREY L. BROWN
3613 CCTS
Homestead AFB, FL

■ Four-fifths of the earth's surface is covered by open water. Although accounts of water survival incidents are often pessimistic, successful survival is possible.

Modern equipment for survival was designed to give all aircrew members the means to remain alive until rescue could be effected.

In general, shelter yourself from the elements, keep as dry as possible, keep striving for water and food, signal for help, observe strict water discipline, and above all, do not despair.

In this type of environment, many priorities must be set. Certain items go on a much higher platform than others. Some of these items might be difficult to accomplish or obtain whereas others might be quite simple.

Some of the items easier to obtain would come under the category of sustenance, or very simply put: Water and food.

As we know, if we had to place one ahead of the other in terms of importance, water would win. Contrary to popular belief, water is very easy to procure in this open water environment.

Now the questions come to mind: How much water do I need, and what water sources are available to me? The answer to the first question is easy: 1 quart minimum. The answer to the second question needs more explanation.

One of your first sources will be your emergency drinking water found in your accessory kit. This small can contains approximately 10 ounces of ready-to-drink water. The

continued on page 17

How Can You Improve Your ODDS?

continued

gency. With this knowledge and the confidence they gain from their training, aircrews are better equipped to survive a bailout at sea.

This course covers parachute procedures in open waters, survival living, survival in multiplace rafts, medical aspects of water survival, and signaling and communications for recovery.

A hands-on experience is emphasized, and a stepping-stone approach is employed to gradually bring the students up to proficiency in using their equipment and learning proper procedures so well, they will automatically "kick-in" when needed.

Chances for over-water emergencies are exceptionally high when one considers four-fifths of the earth's surface is covered by open water. It is, therefore, very important for us to learn these survival procedures well and — on occasion — review, review, review.

"It Is Possible" in this issue of *Flying Safety* magazine reminds us of what we need to know to survive from a food and water standpoint. But, as we already pointed out in this article, the fact is, if you *don't* signal, your chances for rescue are very slim. Let's review some key communication and signal areas that will be there when and if we need them.

Whenever an aircraft develops problems over water, it is imperative the pilot begin emergency radio procedures as soon as possible. Failure to announce the pilot's intention at the earliest possible moment may greatly reduce the chances of immediate recovery. So, if at all possible, *communicate prior to egress*!

Although the Dash-1 emergency communications procedures are different for various aircraft, the following steps generally outline the necessary actions.

A 300-foot wide canal is used as a safe, in-water training site. Instructors give students hands-on experience with their equipment including pick-up devices.

Hands-on and in-water experience is emphasized. Students receive training in both one-man and twenty-/twenty-five-man rafts.

Rafts and pickup devices are essential to survival. Rafts are designed to protect the survivor. If the survivor can get into the raft, it will prolong survival time.

■ If at low altitude and power is available, climb to a higher altitude.

■ If attempts to make contact on normal frequencies are unsuccessful, use (a) 243.0 MHz — the international distress frequency on the UHF, or (b) 121.5 MHz — the international distress frequency on the VHF.

■ Regardless of the frequency used, transmit the following information as long as time and circumstances permit: (a) Transmit "MAYDAY, MAYDAY, MAYDAY;" (b) identify the aircraft and the pilot; (c) give position or best estimate of position; (d) give course heading, speed, and altitude; (e) describe the nature of the aircraft emergency; (f) state your intentions; i.e., ejecting, attempting to correct problem; (g) at the end of the message, give two 10-second hold downs followed by an identification of the aircraft; and (h) prior to bailout, set radio for continuous emission — if possible.

■ The appropriate communication while still in the disabled aircraft can give search and rescue forces a very accurate position from which to begin the search. This gives them a head start and can help reduce the time required to effect a rescue.

A survivor awaiting rescue must keep all signaling and communications equipment readily available for quick use and attempt to make radio contact. It is important to transmit the number of survivors in your group and the physical condition of the group so rescue personnel may plan accordingly.

A major problem survivors have when communicating with rescue forces is failure to *maintain* contact. Keep talking to the rescue pilot, giving continuous direction updates and other pertinent information such as weather conditions, wind conditions, signaling equipment available, wave conditions, etc.

continued

Confidence in parachuting and proper use of the equipment is taught by use of the parachute descent tower.

After water entry, getting in your life raft will prolong survival. They provide a much more secure method of flotation as well as protection from the elements.

"A survivor awaiting rescue *must* keep all signaling and communications equipment readily available for quick use and attempt to make radio contact."

It Is Possible

continued from page 15

main reason this is your first and most important source is that by drinking this water now, you aid in the treatment of shock. You can also slow down, relax, and start thinking of other sources available to you.

When solar stills are available, read the instructions and set them up immediately. Use as many stills as possible, and make sure they are securely fastened to the raft. Rain, dew, and old sea ice (blue, rounded corners, splinters easily) are natural water sources which should not be overlooked. Water should be procured at every available opportunity.

Your last resort for water is the desalter kit. The reason for this is that you can only use the kit to produce 8 pints of water. The water should only be used if no other sources are available.

As a general rule, if you don't have the proper amount of water, don't worry about food. On the other hand, if you have water, then carbohydrates would be your best food source because they use a smaller amount of water in producing the nutrients the body requires.

The only real source of carbohydrates you might have on the open seas will be your general purpose rations. In this gold-colored can, you will find approximately 880 calories of almost pure carbohydrates. These "carbs" will come in the form of four cereal bars, sugar, soup, and gravy base. There is also coffee in the can but should be avoided if you are low on water because it can add to your dehydration. continued on page 19

How Can YOU Improve Your ODDS?

continued

As well as trying to communicate before egress, we must also be on top of the working essentials of our equipment.

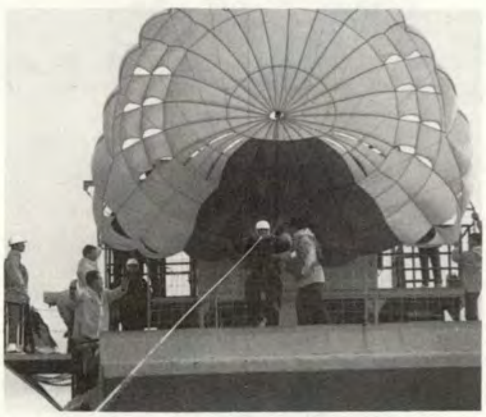
■ **Emergency Locator Beacons** Various models of personnel locator beacons (PLBs) are found in the Air Force inventory. All PLBs have similar characteristics and capabilities. Knowledge of your aircraft PLB is essential.

■ **Transceivers** Survival radios (or transceivers) have been the most commonly used of all communications devices available to the survivor. The transceiver and battery should be kept as *warm* and *dry* as possible. Operation of transceivers is essential to minimize time spent in the water. A basic knowledge of each radio will ensure the survivor a better chance of contacting rescue forces. Be familiar with the radio in your seat kit.

Because of weather, equipment, or other survival conditions, it may be necessary to use other signaling devices. Signaling devices can be divided into two categories: Improvised signaling devices and issued signaling devices.

■ **Improvised signaling devices** include white parachute material, pink side of 20-man raft canopy, white sea anchor raised up in the wind to create movement, splashing water, and any shiny metal object used as a signal mirror. Materials for improvising signals are limited in an open ocean survival situation.

■ **Issued signaling devices** should be used by survivors as



The goal of open-water training is for each student to assess problems and provide viable solutions.

Each student is given a "taste" of parasailing. This gives students a chance to reinforce their parachute descent checklist.

Also, using a parasail in the open-water environment, a student must . . .

Perform the post-egress checklist, assume and maintain proper body position for water entry, and finally . . .

Executive canopy/riser release after water entry.

much as possible. These include the signal mirror, sea dye marker, signal paulin, strobe light, whistle, flare, and gyrojet.

To ensure a timely and safe pick-up once rescue is in the area, there are a few things we need to remember about vectoring.

Vectoring is a means of attracting, guiding, and directing surface or airborne search and rescue forces to your position. Preparations for vectoring are:

- Inventory and secure signaling and electronics equipment to person or raft (flares, mirror, etc).
- Read and review all equipment operating procedures.
- Keep beacon and transceiver warm and dry.
- Maintain a constant lookout for aircraft or surface forces.
- Mentally review vectoring procedures.
- Be constantly aware of cardinal headings.

Survivors should feel confident they will be rescued. When search and rescue forces have been notified of the emergency, both national and international rescue systems will begin to operate.

Crewmembers flying over water may one day encounter a survival emergency. You must be equipped and must have confidence in yourselves and your equipment. The Commander of the Water Survival Training Program, Lt Col Clarence H. George, feels the school gives that. He says "the best thing the school does is give students confidence in themselves and their equipment." The only chance you have to "improve your odds" of survival in the ocean is through gaining *and* maintaining survival technique knowledge. ■

Just as they might be in a real emergency, students are on their own for the parasailing. Practicing parachuting in this manner helps to build confidence.

Successful survival is possible! Improve your odds by gaining *and* maintaining survival technique knowledge.

Are You a Survivor?

■ Do you have a survival story you would like to share? We are looking for people like you who have experienced a survival episode, either military or civilian, which could be used to enhance training and/or safety. We will use your valuable experience to let others know what might be expected and how they might feel.

Please submit your articles typed and doublespaced. While not mandatory, we would also appreciate photographic support for your articles and prefer 5" x 7" or 8" x 10" black-and-white glossy photos.

Examples of photos could be those taken during your experience either by you or the rescuing party, those taken immediately following the event, shots of the locale where it took place (preferably under similar weather conditions), and/or those showing the tools and equipment used during the actual survival situation (including staged recreations).

If you have any questions, please contact AFISC, Flying Safety Magazine/SEDF, Norton AFB CA 92409-7001, AUTOVON 876-2633; or the 3636 CCTW/DOV, Fairchild AFB, WA 99011-6024, AUTOVON 352-2371, or just mail your articles to the Norton address. ■

It Is Possible

continued from page 17

The ocean is a great big picnic basket just waiting to be opened. Especially in this environment, food should not be difficult to procure.

Your first source of protein will be the fish group. This is an excellent source; however, certain precautions must be taken. Here is a set of guidelines to follow when selecting an edible fish. Don't eat fish if:

- It doesn't look like a fish.
- It has a parrot-shaped beak.
- It has a large torpedo shaped body with a V on the tail.
- It is a puffer.
- It has a box-like body.
- It has skin instead of scales.
- It appears unhealthy.
- It has indented skin and a bad smell.

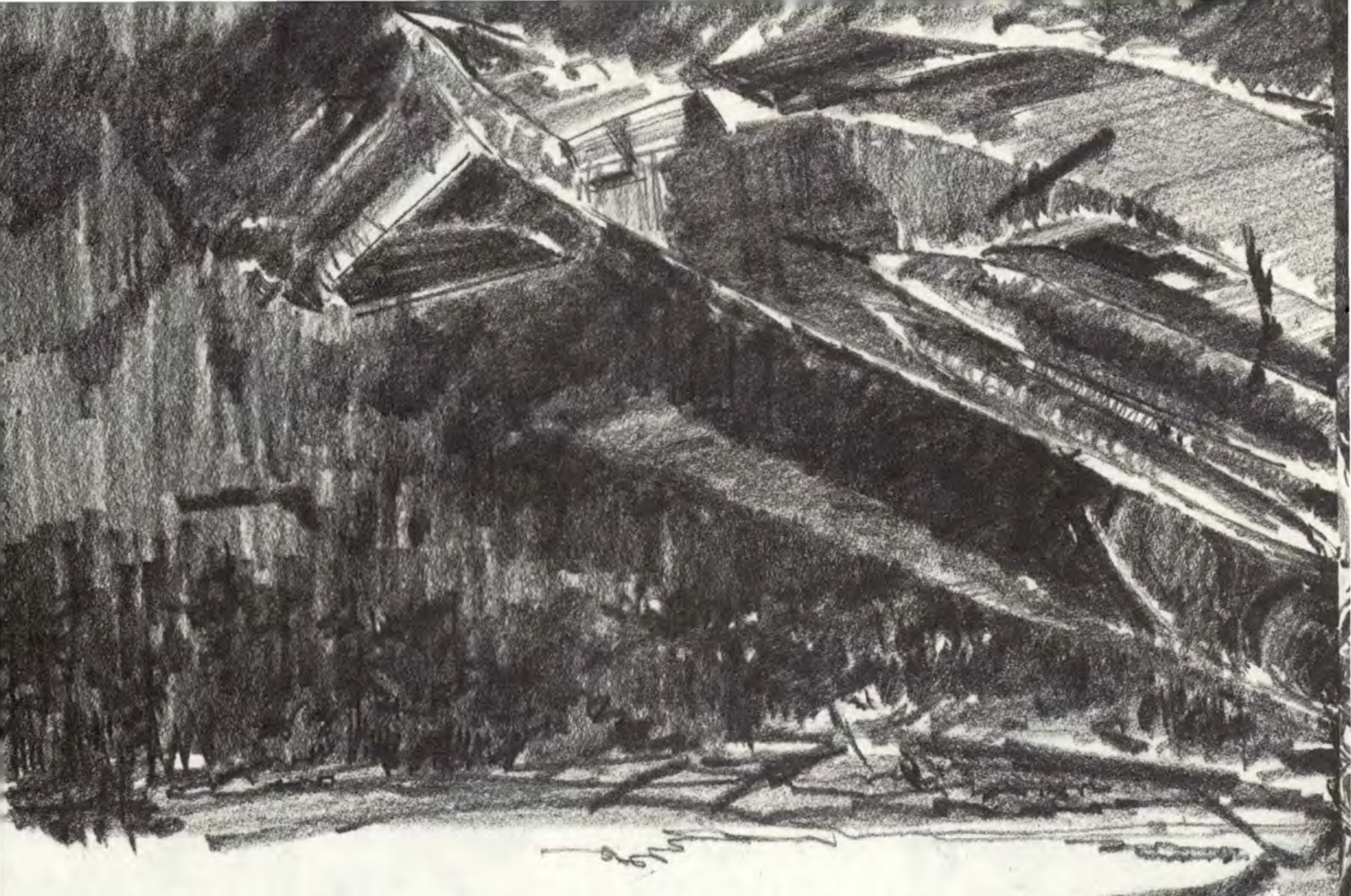
Keep in mind there are exceptions to every rule. These are merely the best guidelines to follow.

Another food source available on the ocean is birds. Birds have been seen several hundred miles out at sea. They can be captured by hand or caught with a baited hook when they land on your raft.

Last, but certainly not least, you have seaweed. This is a very high source of vitamins and minerals. Certain precautions should be taken. First, eat only seaweed that is red, green, or brown in color, and second, eat only the leafy-type varieties.

Just because you are placed in an unfamiliar situation doesn't mean that you have to go totally without the so called "comforts of home." Only now, these comforts become necessary for sustaining life. Remember your priorities; water then food. You can get along for weeks without food, but you can't live long without water. When you get that 1 quart or more of water, *then* worry about the food.

There are only two ways you can return from a survival situation — as a survivor, or a statistic. The choice is yours! ■



THE BROKEN CHAIN

MAJOR WILLIAM B. McGLOTHLIN
82d Flying Training Wing/MAT
Williams AFB, AZ

■ While I was working in the Flying Safety Office at Reese AFB, Texas, I learned mishaps are the result of many factors. Some of these factors are simply the sequence of events and have no real bearing on the mishap. Other factors are of such significance they are considered *cause* factors. This means if one of these "cause" factors were to be eliminated or changed, the mishap probably would have been avoided. In a sense, these cause factors "hang together" like links of a chain. The objective in mishap prevention is to break the chain of events leading to the mishap.

When flying CH-53s in Germany, I was the Aircraft Commander on a mission that nearly terminated in a catastrophic mishap. Before describing the chain of events that led to the mishap, some basics about helicopters must be understood.

A helicopter generates lift for flight by rotating its wings through the air at high speed. The lift vector produced by the main rotor is perpendicular to the rotating disc. Therefore, a pilot controls the direction of flight (stationary hover, rearward, sideward, or forward) by tilting the rotor disc in the desired direction. The force required to turn the main rotor applies an equal but opposite torque on the body of the helicopter causing it to try to rotate in the opposite direction from the main rotor.

Because of this, single-rotor helicopters must have an anti-torque rotor on the tail to keep the aircraft flying. As with any rotating mass, both these rotors must be precisely balanced and tracked. Out-of-balance conditions or flapping rotor blades can cause such extreme vibrations a helicopter can literally beat itself to death.

Harry Reasoner summarized it this way: "A helicopter does not want to fly. It is maintained in the air by a variety of forces and controls working in opposition to each other, and if there is any disturbance in this delicate balance, the helicopter stops flying, immediately and disastrously."* The links in the chain of events leading to my mishap were:

Link No. 1 — Crew Makeup. At the time of the mishap, my squadron

was involved in a base-wide exercise. We were manning the squadron for a 24-hour operation, and all crews were being tasked for 12-hour crew days. Also, to improve mission capability, each crew was manned with two flight mechanics instead of the required one flight mechanic. This, however, was not that unusual from our day-to-day operation. Nevertheless, if only one flight mechanic had been on board, the mishap would probably have been avoided. Having two flight mechanics resulted in a confusion of responsibility.

Link No. 2 — Night Sortie. Our mission for the day was to take spare parts and supplies to several remote locations in West Germany. Weather was not a factor but we got a late afternoon start. This meant we would have to fly the last leg at night. The reduced visibility at night was a definite cause factor in our impending mishap.

Link No. 3 — The Hasty Offload. We made our third stop shortly after sunset at a small, Army airfield. We were met by ground personnel who helped unload the aircraft. Because we wanted to minimize ground time, the copilot and I stayed in the cockpit with the engines running. During the unloading, one of the flippers (a hinged ramp for rolling cargo such as jeeps) was inadvertently knocked down and a tiedown strap was dragged partially out of the ramp. The flight mechanic who saw this disarray (Flight Mechanic No. 1) was helping the ground pounder carry out a heavy load and did not stop to "police up" the area.

Link No. 4 — The Cursory Walkaround. The other flight mechanic (Flight Mechanic No. 2) had carried a previous load to the truck and was unaware of the condition of the loading ramp. He returned to the aircraft and got into the jump seat so we could leave as soon as Flight Mechanic No. 1 got on board. Flight Mechanic No. 1 returned to the aircraft and either forgot about the condition of the ramp or assumed Flight Mechanic No. 2 had cleaned it up. Because of this, he did not walk completely around the aircraft but only checked the drain lines on each side of the aircraft. When he got on board, I checked to see if the walkaround was complete and shut the ramp.

continued

THE BROKEN CHAIN

Link No. 5 — The Trapped Strap. When the ramp closed, the flipper was trapped in the door and the tiedown strap was trapped between the flipper and the ramp door. Approximately 5 feet of the nylon strap and the 3-pound ratchet hook were hanging outside the helicopter.

Link No. 6 — The Malfunctioning Light. The H-53 is equipped with an advisory panel and a caution panel. One function of the advisory light is to let the pilots know if the ramp is completely closed or not. Because the flipper was trapped in the door, the door was unable to close completely. Instead, it was held ajar about 3 inches. The left side uplock switch malfunctioned and indicated the door was completely closed. Oblivious now to any problems, we took off about 30 minutes after sunset en route for our mishap.

Link No. 7 — Noncommunication. Shortly after takeoff, Flight Mechanic No. 1 switched places with Flight Mechanic No. 2. As Flight Mechanic No. 2 sat in the back seat eating his supper, he noticed something flapping outside the ramp door window. Without saying a word to anyone, he unplugged his intercom cord and walked to the back to investigate. He noticed the flipper and tiedown strap trapped in the door. Flight Mechanic No. 1, in the jump seat, saw Flight Mechanic No. 2 looking at the ramp and saw the flipper was stuck outside. (Having the flipper stuck outside is not a particularly dangerous situation except there is an increased potential for a dropped object.) Without saying a word, Flight Mechanic No. 1 opened the ramp door so the flipper could be pulled in.

Link No. 8 — Contact. As soon as the door cracked open, the tiedown strap was free to go — and go it did, right through the tail rotor. The immediate indications in the cockpit were a ramp open advisory light and a heavy, high frequency vibration. When I asked what had happened, Flight Mechanic No. 1 told me the flippers were hanging and asked for permission to unplug and go help pull them in. I agreed — anything to get rid of that teeth-shattering vibration. I had never flown with the flippers hanging, but I had been told about the vibration they caused: A moderate, low frequency vibration. I also knew there was a potential for a dropped object so I began a left turn to avoid overflying a small town. It was at this time my copilot gave me some good advice as he lowered the landing gear and said, "Let's land!"

Night landings in an unlit, forested area aren't usually warranted, but because of the intensity and frequency of the vibration, I decided something else must be wrong and began looking for a landing area. As it happened, it was harvest time in the area, and there was just enough night light to make out a small, golden colored wheat field in the midst of the dark woods about a mile in front of us. I set up an approach to the far side of the field to be sure I cleared the trees on the near side.

The Missing Link. My copilot and I busied ourselves completing checklists and getting ready for the landing. When we were still about 100 feet in the air, we hit it! Large, high tension power lines are common in West Germany but the last thing we were expecting on this night emergency landing were power lines across an otherwise open field. Sparks flew as we hit the lines. I could no longer control the helicopter, and we flipped completely over and began falling to the ground inverted. Falling inverted in a helicopter at night is an experience that exceeds your wildest imagination. I don't remember the actual impact with the ground because as the main rotor blades began to flap, one sliced through the cockpit and took off my head.

The Real Thing. There really were highlines across the field, and I never saw them until daylight the next day. If we had hit them, I believe the result would have been pretty much as I described above. The highlines were on our approach path but when we were still about 200 feet in the air, my copilot gave me his next bit of sage advice, "Highline wires!" I immediately leveled off until we had safely passed the wires. We then continued to an uneventful landing.

The Broken Chain. This mishap shows how cause factors tend to link together until a mishap occurs. If our crew had broken the chain somewhere prior to Link No. 8, we could have avoided any damage to the aircraft and this story would simply have been a "There I Was" tale. We did break the chain prior to hitting the highlines, otherwise no one would ever have known what really happened.

I learned from this mishap I can *anticipate* problems when I fly. As Harry Reasoner put it, "This is why being a helicopter pilot is so different from being an airplane pilot, and why, in general, airplane pilots are open, clear-eyed, buoyant extroverts, and helicopter pilots are brooders, introspective, anticipators of trouble. They know if something bad has not happened, it is about to."* I now fly fixed-wing aircraft instead of fling-wing, but I still look for those links lining up. Some of them I have no control over, such as night flights, but where I can, my goal is to make as many links as possible "missing links." ■

*Reasoner, Harry, "Helicopter Pilots are Different," *The MAC Flyer*, July 1977.

PUZZLELAND

Kelly facility puts the pieces together

PERRY NELSON
San Antonio ALC Materiel Management
Kelly AFB, TX

■ The hand-painted sign with red letters at the entrance bears the name "Puzzleland." It's an appropriate label.

It's San Antonio Air Logistics Center's (ALC) Life Support Equipment Investigation Facility (LSEIF) at Kelly AFB, Texas, where the life support equipment and escape systems of aircraft involved in mishaps are painstakingly reconstructed.

Part of San Antonio ALC's Directorate of Materiel Management, the LSEIF is the only facility of its kind according to center officials. It was established in 1983 to assist safety investigation boards in determining if the use or non-use of life support equipment is a factor in a mishap. When a mishap results in crewmember injury or loss of life, the facility joins the investigation.

The two-room facility at this Air Force Logistics Command installation is crowded with ejection seats, flight helmets, and related odds and ends. Mike Grost, a representative of Martin-Baker Aircraft Co., Ltd., the British firm that manufactures F-4 ejection seats, conducts indepth studies at the facility. A native of Denham, England, he has more than 20 years experience as an escape systems field engineer.

"The work done here involves a close integration of medicine and engineering," Mr. Grost explained. "I work very closely with the findings of the Armed Forces Institute of Pathology in Washington, DC. There is an interface between the medical aspects of an injury and escape systems and equipment. You can't study one without the other."

Mr. Grost photographs, identifies, and documents each piece of evidence and uses x-ray equipment to examine injuries sustained by crewmembers. Other procedures include microscopic analysis, equipment reconstruction, and anthropometric/equipment correlation. In the latter, an individual with body measurements similar to those of an injured crewmember is used to study the location of injuries relative to the aircraft equipment.

Test flights are often conducted in

continued

Mike Grost, left, and Perry Nelson work with wreckage from an aircraft mishap to determine what went wrong. This painstaking task is crucial in preventing similar failures in the future.

PUZZLELAND continued

By uncovering the causes of failures, Puzzleland investigators seek to ensure all life support equipment works correctly.

Investigation of a malfunction sometimes involves recreating the sequence of events under controlled conditions.

an attempt to correlate a crewmember's body posture to flight attitude at impact.

Very often, all the available evidence is compacted into 20-30 pounds of molten material — all that remains of what used to be the cockpit and ejection seat. In such cases, Mr. Grost has to dig more deeply into the field of forensic medicine, studying medical reports and comparing autopsy findings against equipment damage to determine the cause of injuries.

"This is a tough business," he said. "There is no such thing as an easy accident."

But not all the life support equipment problems the LSEIF deals with are connected with mishaps. It also analyzes equipment malfunctions reported from the field and conducts studies designed to enhance the various systems.

Because the facility is one-of-a-kind, it also handles investigations on all ejection equipment in the Air Force inventory, as well as equipment from other military branches.

Mr. Grost has other duties in addition to his investigations. "There's a lot of teaching involved," he said. "I'm an instructor at the Life Support Officers' School at Randolph AFB, Texas, but we also train enlisted personnel and civilians. Our goal is to promote expertise — something which is hard to put a price on."

Turning people into first-rate investigators takes 2 years of training followed by 3 to 5 years of actual field experience, according to Mr. Grost.

"A person has to develop an instinct — know where to look," he said. "It might take days and days to search for something and be able to tell what you were searching for when you finally find it. The investigator also has to know what went on at a mishap site and whether there was any tampering with evidence."

Getting to the bottom of a mishap is something the Air Force does very well, he added.

"The Air Force system is the best in the world," Mr. Grost said. "The Air Force believes people's safety is the most important factor."

He pointed out that with each investigation performed at the LSEIF, additional knowledge is gained concerning a particular aircraft and its respective life support equipment.

"Results of the investigations can lead to new equipment designs and the development of improved technical procedures to safeguard crewmembers," he said.

Mr. Grost noted that to be of any value, mishap analysis and reconstruction need to be conclusive and precise. "Unless a specific cause is identified, the potential exists for repeated problems," he said. "And in this business, we have as much need to be inconclusive as a pilot has to practice spin recovery during landing." ■

Life Support System

MYTHS AND FACTS

LT COL ALFRED T. SCHNEIDER
Directorate of Aerospace Safety

This article was written by a dedicated career life support officer upon his retirement after 26 years in the Air Force.

■ The bell is beginning to toll, the watch is coming to an end. It happens to all of us, but I feel some of the myths and facts of the USAF life support system should be related to the new "advocates of the aircrews."

The history of the life support system is one of evolution from a supply function, oriented to procuring and accounting for aircrew personal equipment, to its present day aircrew training and survival enhancement concept. In the early 1960s, the Air Force saw the need to enhance aircrew escape/ejection training and the valid need to manage and conduct this training under Operations.

This concept led to rated life support officers (Who else has "been there" and is more qualified to discuss the ejection decision?) and the close and professional relationship between the aircrew and the life support technician. Nothing can replace that intangible confidence and morale-boosting experience by an aircrew member knowing the troop maintaining his personal equipment is totally dedicated to his mission accomplishment and flight safety.

Oh, "bean counters" and others will arise and say it's no big thing — it's not cost effective, etc. However, the life support system, especially the ejection system, is not cost effective. The myth — rated life support officers and dedicated life support technicians are not necessary for Air Force mission accomplishment. The truth — they are both necessary and paramount to ensure aircrew mission accomplishment and flight safety.

Let's look at another myth — that of NOMEX flight equipment. First, what is NOMEX? NOMEX is a trade name for an aramid flame retardant material. The main Air Force objective in developing this clothing was to protect the aircrew from flash fires in the air, during ejection, and emergency ground egress. This objective has been met and exceeded with overwhelming success.

Inherent in the design of our NOMEX flight clothing was the need to develop a material that would not burn immediately when exposed to flames and would remain intact. The other objective was to minimize the effect of radiant heating, thereby minimizing skin burns. These two concepts resulted in the present day "baggy NOMEX goat skin."

Recent flammability tests of NOMEX flight clothing by the US Navy Clothing and Textile Research Facility have once again confirmed the protective value of NOMEX. When exposed to a radiant heat flux of .5g CAL/CM²/sec, testing showed a time to burn injury (TBI) of 12.4 seconds when the NOMEX was against the calorimeter sensor. When the sensor was ¼ inch away from the NOMEX, TBI was 49.9 seconds. Simply stated, the ¼-inch of air between you and NOMEX provides a protection factor of 4. What this means is you have 4 times as much protection with ¼-inch of air between you and NOMEX than

continued

Let NOMEX work for you. Keep your sleeves down and your gloves on with no bare skin exposed between sleeve and glove.

if NOMEX is against the skin. Should our flight suits be baggy or tight fitting? It's your body — you decide. I already have.

Myth — NOMEX suits lose their fire retardance after a few washings and should be custom fit. Fact — the fire resistance of NOMEX is inherent to the fiber, and a ¼-inch air layer between the fabric and you gives you a protection factor of 4. Fact — being "macho man ala Rambo" and flying with a tight-fitting flight suit with sleeves rolled up and no NOMEX gloves or "holey" gloves will ensure a long hospital stay with second degree burns if you are unlucky enough to experience a flash fire while flying the jet.

In the aircrew life support training arena, many epistles have been written over the years, by others more eloquent and prolific than I. The bottom line is still the same. It's the cheapest flight insurance you can get. "Cutting class and pencil-whipping" this training will give you more time for other things, but "woe be you if lady luck looks at you with disdain one day." You will not only have let down the Air Force and your family, but also those troops dedicated to your safe escape and survival.

Your life support equipment won't win any style contests, but it will save your life. Don't alter it.

Myth — It can never happen to me. Fact — it has happened and will continue to happen as long as there are fliers and jets.

Well, I have philosophized long enough — the bell is tolling, the watch has ended. The challenge to continue to support the aircrew member and enhance mission accomplishment remains the life support system goal. The new and young troops are ready and eager for this challenge, and I wish them Godspeed. ■

CHANGE IS COMING

■ Beginning next month, *Maintenance* magazine and the *USAF Safety Journal* will be incorporated into *Flying Safety* magazine. Our budget will not allow us to print more copies of *Flying Safety,* so we will have to change our readership ratio. The ratio will be changed from one magazine for every 3 people to one magazine for every 12 people.

Organizations that formerly received *Maintenance* or the *USAF Safety Journal* and do not already receive *Flying Safety* magazine must request AFRP 127-2 from their PDO. During the transition period, some units may not get the magazine right away. Those of you who are already getting it, please share with those who are not. ■

OPS TOPICS

Buckle Up and Stay There

■ A C-141B was en route at FL 390 with 129 passengers on board. After approximately 1.5 hours of flight, the aircraft suddenly pitched down to 4 degrees nose low and lost 300 feet. Several passengers who were not in their seats were thrown in the air — three of them reached the ceiling before falling to the floor. Two of the passengers received minor injuries. The third one suffered two fractured vertebrae and spent 10 days in the hospital.

A word to the wise — whether crewmember or passenger, remain in your seat with your seat belt fastened unless it is necessary to get up for short periods. Crewmembers who brief passengers should tell them to follow this advice.

Stuck Throttle

An F-16B pilot had just completed an afterburner (AB) takeoff and discovered the throttle stuck in AB when he tried to retard it. The pilot pulled the nose up to keep the airspeed under control while he tried several times to move the throttle. He was finally able to free the throttle by pushing forward on it and then jerking it backward with 50 to 75 pounds of force. The throttle worked normally below AB, and the pilot made an uneventful landing.

An after landing check found the seat safing pin in the unoccupied rear cockpit seat had not been removed and stowed before flight as required by the checklist. Also, the pin in the ejection safety lever was an EPU pin, not the correct pin. On takeoff, this pin had vibrated behind the rear cockpit throttle and blocked it in the AB position.

Two errors — using the wrong pin and not using the checklist — caused this mishap. The result was not serious, but it could have been disastrous. Use the checklist, and know what the pin should look like. This same philosophy also applies to all other aircraft operations.

Altimeter Mismatch

A flight of two A-10s were level at 14,000 feet after one hour of flight. The wingman noticed his altimeter was reading 18,000 feet in either the electric or pneumatic mode. The wingman made an uneventful wing ILS approach and landed. After landing, the altimeter read 4,000 feet above field elevation.

The problem was traced to an impedence mismatch between the Kollsman Altimeter and the digital central air data computer (CADC) used in A-10s with an INS. The Bendix Altimeter is compatible with this CADC.

The use of the Kollsman Altimeter in INS-equipped A-10s creates a definite flight safety problem. This is complicated by the fact that both altimeters carry the same stock number. Units with all INS-equipped A-10s should stock only the Bendix Altimeters. Those with a mixed fleet must be careful to get the correct altimeter installed.

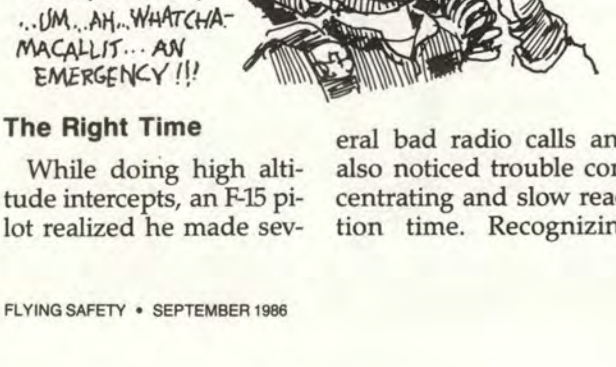
continued

OPS TOPICS

ALERT SOF

An FB-111 was being flown on a pilot proficiency sortie. All operations had been normal up to returning to the traffic pattern for approaches and landings. As the pilot was completing his first touch-and-go landing, the SOF noticed fluid streaming out of the No. 1 engine bay. The SOF made an immediate call to the pilot who aborted the touch and go and completed a full stop landing. After taxiing clear of the runway, the crew shut down the engines and evacuated the aircraft.

When maintenance crews inspected the aircraft, they found the No. 1 engine hydraulically driven fuel pump housing had cracked and was leaking large amounts of fuel into the engine bay. This presented a serious fire hazard. The watchful eye and quick response of the SOF possibly prevented a serious aircraft fire.



The Right Time

While doing high altitude intercepts, an F-15 pilot realized he made several bad radio calls and also noticed trouble concentrating and slow reaction time. Recognizing these as symptoms of hypoxia, he gangloaded the oxygen regulator and requested a descent. The Center told him to wait, so he declared an emergency, squawked 7700, and descended to FL100. After dumping fuel, he made an uneventful, straight-in landing.

The pilot was met at the aircraft by a flight surgeon and maintenance. Maintenance discovered a bad oxygen regulator had caused the problems.

We could have lost a jet! There really is a time and place to declare an emergency. Had the pilot accepted the delay at altitude and not declared an emergency, the outcome could have been entirely different.

Who's on First?

During a planned spin recovery in a T-37, the student pilot (SP) applied too much forward stick and caused a negative G condition. The SP then overcorrected by aggressively pulling back on the stick, and the aircraft entered a second spin. The IP then said "I have the aircraft," and started to apply spin prevent procedures.

However, the SP didn't relinquish control of the Tweet. While the IP was checking the throttles in idle, the SP pushed forward on the stick and once again put the aircraft into negative Gs. The unexpected pitch change caused the IP to inadvertently shutdown both engines.

The IP finally got complete control of the aircraft, recovered from the spin, and restarted the engines. The return to base and landing were uneventful.

Once again, we see the necessity for a complete and positive change of control in two-pilot aircraft. Two pilots on the controls at the same time can quickly result in disaster. Conversely, *no* pilots on the controls is also hazardous to your health and welfare. ■

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UNITED STATES AIR FORCE

Well Done Award

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

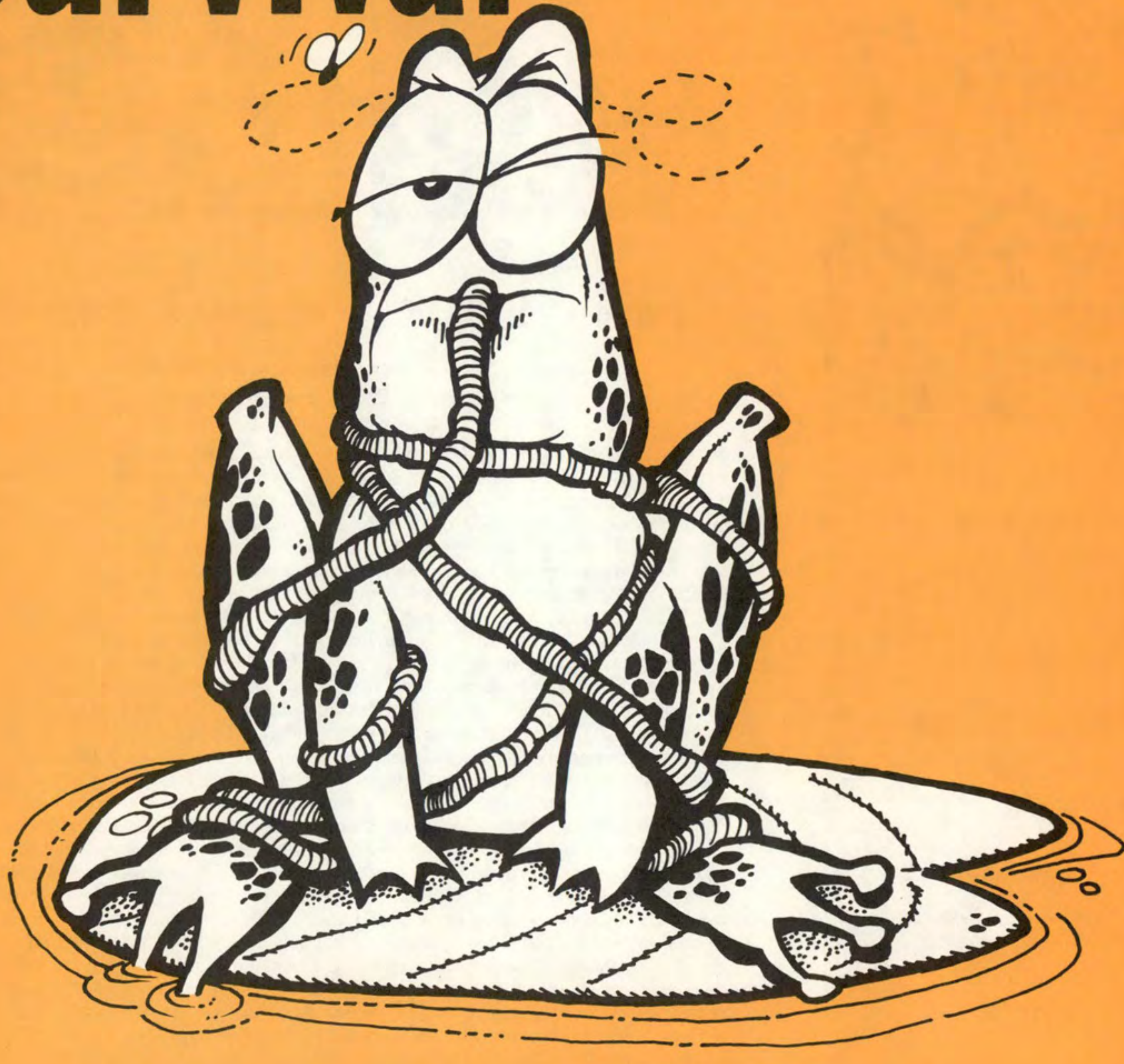
CAPTAIN
Byron C. Dodgen

FIRST LIEUTENANT
Michael K. Parker

16th Tactical Reconnaissance Squadron
Shaw Air Force Base, South Carolina

■ On 20 November 1985, Captain Dodgen, Aircraft Commander, and Lieutenant Parker, Weapon Systems Officer, were flying an RF-4C aircraft on a night reconnaissance training mission. While flying in IMC, the aircraft experienced abrupt uncommanded pitching and yawing transients. Simultaneously, Lieutenant Parker observed a fire in a rear cockpit circuit breaker panel. Captain Dodgen immediately depressed the emergency quick release lever to stop the pitching and yawing. Lieutenant Parker initiated checklist emergency procedures for "Electrical Fire" and "Smoke and Fumes." Both crewmembers selected 100 percent oxygen, and Captain Dodgen turned off both generators in accordance with checklist procedures. Less than a minute later, the battery failed, and all electrical power to the aircraft was lost. The ram air turbine (RAT) was selected, but failed to provide electrical power. Using the emergency attitude indicator, Captain Dodgen started an immediate climb to VFR conditions on top. Flames from the electrical fire persisted approximately 10 minutes after the generators were turned off, causing damage to two circuit breaker panels and numerous wire bundles. Due to intercom failure, Captain Dodgen and Lieutenant Parker were forced to communicate their plan of action by passing notes. Once in the clear, they unsuccessfully attempted to restore electrical power. With an unknown and depleting fuel state, no electrical power, surrounded on all sides by weather, and unsure of the reliability of the RCP ejection system, Captain Dodgen decided to attempt a landing at a small civilian airfield visible through the only small opening in the surrounding clouds. Because of the short runway with no arresting system; inability to lower the gear or flaps by the normal method; the possibility of rupturing the utility hydraulic system by using the emergency gear or flap system; and the lack of positive gear-lock indications, antiskid protection, or nosewheel steering, he elected to make a gear-up landing. He flew a shallow straight-in approach to touch down 350 feet from the approach end of the runway. The aircraft skidded 2,800 feet on the external tanks before coming to a stop 1,850 feet from the end of the runway. The crew performed an emergency ground egress as a small fire erupted from residual fuel in the external tanks. Captain Dodgen's superb flying skill and Lieutenant Parker's exceptional crew coordination saved a valuable aircraft. WELL DONE! ■

Water Survival



IMPROPER USE OF EQUIPMENT IS DEADLY