flying

SAFETY

NOVEMBER 1982

Preparing For "War"—RED FLAG

No Respect

Spatial Disorientation
A NEW PERSPECTIVE

For Eagle Drivers Only
(But Other Types Should Read It, Too)

THERE I WAS

■ . . . 125 miles from Albuquerque in my T-37 with the fuel low level lights on. While this occurred many years ago, I still remember my student suggesting we land at a little civilian airport. I can no longer remember when this light comes on in the T-37, but back then, as a new ATC IP, I knew I was in big trouble.

The weekend had started on Friday as my student and I left Reese AFB, Texas, for a three-hop flight to Los Angeles. After an uneventful arrival at the NAS, we had gone our separate ways with relatives (really!). I had requested a three-hop return on Sunday, but wiser, older heads had said, "No, too tough for a newbie." Before leaving the NAS on Friday, the student and I agreed to meet at 1600 to mission plan the one-hop east on Saturday.

Well, 1600 Saturday, and no student. I started the mission planning. He had to come soon or our options would be few due to bases closing for the evening. He didn't, and they did. By the time he arrived, the only place within range and still open was Nellis AFB, so off we went, arriving there around 2300.

Much to our chagrin, there were no rooms at the Inn — and no rooms in town, either. A hotel was having its grand opening, and a golf tournament was in town. So, we changed in the men's room of one of the hotels and checked our gear, ate an early breakfast and did the only logical (?) thing — watched shows and gambled until 0500. Then back to Nellis for our two-hop (Kirtland to Reese) flight home. We both felt fine, and the Nellis forecaster said we might encounter cirrus at FL 21.5 (our VFR planned altitude) but 19.5 should be OK.

About 20 minutes out from Nellis, we hit the clouds and started a descent to approximately 11.5 to stay VFR. Now, I could not reach anyone to get an IFR clearance. Fuel was getting so far below that planned I decided to climb IFR on a VFR clearance — higher altitude = better range — both on the UHF and for fuel. I considered Williams AFB (just south of our route at Phoenix), but they did not open til noon. Finally got the IFR clearance, slowed to 125 KIAS (L/D max for Tweet) and landed downwind at Kirtland.

Saw the SOF (crusty major) and explained that I wanted to file an OHR on the Nellis weatherman, for he had blown it. Rain, turbulence, ice, St. Elmo's — you name it. When he asked why I didn't divert to Luke AFB, I walked away — glad that God watches out for his dumber animals. You can count up all my mistakes — my ego won't let me!

This could very easily have become one of our "dumb" mishaps. When things start to come unglued, take time to be sure you're not painting yourself into a corner. ■

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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PREPARING FOR "WAR" RED FLAG

MAJOR KENNETH P. WICKS
Chief of Safety
154th Composite Group

■ The 154th Composite Group was finally getting a chance to go to Red Flag. What were we to expect, and how were we to train for it? Ever since we received the F-4C in 1976, all our "cross country" training flights have been major over-water deployments. The unit transitioned, after 17 years in the F-102, to the F-4C. We were well experienced in fighters and ADC, but only a third of the crews had been to SEA — only three pilots and nine WSOs in the F-4, and a few additional WSOs had participated in Red Flag before joining the unit. Our original mission in the F-4 was strictly air defense. However, our F-4 experience since 1979 has been considerably better. We've flown in Cope Thunder three times, Combat Sage twice, and deployed to Guam and Japan once — for more than air defense!

At home, we'll fight anything that will stop in Hawaii long enough to allow us a face-to-face briefing — from Aussie F-111s and A-4Gs, to Navy F-14s off the carriers; local Navy/Marine A-4s and F-4s, as well as PACAF T-33s; not to mention F-16s, A-7s, F-105s, and F-4Ds from the mainland US ANG and TAC units that deploy to Hawaii for Exercise "Opportune Journey." F-4Es from Clark came in September — another DACT opportunity. We even had two F-106s stop by for some DACT a couple of years ago.

As of October 1982 we had 117 months without a Class A or B flight mishap, only three major over-Gs since 1976, and no FODs attributed to maintenance. We are presently the only Air Guard unit with an air superiority DOC as well as being tasked with an air defense commitment — probably the best thing going since "sliced bread." However, *all* our fighting has been over water with a 5,000 foot MSL floor. Our Red Flag/Green Flag in the spring of 1982 was to be another new experience. How were we to prepare for this "war?"

Preparation

Supervisory involvement was strong from the beginning. All our air technicians (full-time people) in operations either have been safety officers or at least have been to safety school. The material we received pulled no punches about the risks at Red Flag, and our job was to pass this information on and prepare the crews mentally for the trip.

Crew coordination is definitely enhanced by frequent flying of formed crews, but we find that very difficult to do in our unit because of scheduling and the availability of our drill status crew members. We stressed the crew concept for two months prior to the deployment because we expected the in-flight workload to be heavy and crew coordination to be extremely important. That gave us five or six rides. Considering our aircrew stability, we hoped that would be adequate. During the same period, we used the designated static callsigns and practiced fighting "high" (above a 10,000 foot floor) to get accustomed to a higher indicated altitude on the "clock." We normally fight all the way to 5,000 feet MSL — with a prudent

use of nose-low maneuvering below 10,000 feet.

We have been flying multibogie scenarios for over two years, but we've always had the luxury of clean radio frequencies. We have two AC&W squadrons attached to the Group which participate in all our exercises. The lack of discrete frequencies has not been a problem, so min-comm or comm-out ACM had not been practiced to any great extent. We knew it would be a player! We had to "re-learn" the importance of prefacing our calls with the call sign. (I lost a wingman that way in SEA, Number 4 called, ". . . SAM at 2 o'clock. We broke, and Number 3 hesitated. Three was hit, and the crew became guests at the "Hilton." The call sign was lost when the mike was keyed).

We also spent time reviewing past exercises — our experiences at "Thunder" and other people's experience at Red Flag. It gave us a little situational awareness (SA) from which to start.

Another "must" was that our

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PREPARING FOR "WAR" . . . RED FLAG

continued

operations officer took a trip to Nellis months before the planning conference to familiarize himself with Red Flag operations. He picked up as much material as was available on the patterns, procedures, missions, and exercise layout — this is extremely important if a unit has not been to Red Flag in its present mission. We also obtained plastic relief maps and local maps to help familiarize us with the area. Having some idea what the terrain would look like greatly reduced the tension over getting lost or "boxed" in.

Terrain avoidance in Hawaii is simple — watch the mountains north of Barber's Point NAS during an approach, don't run into the islands, and watch the altimeter setting during low altitude intercepts — not nearly the same kind of problem as in the desert!

We looked at the past Thunder and Red Flag mishaps and put them in perspective for the mission and for our crews — to increase their awareness of the hazard. $P_{k\,(Ground)} = 100\%$; and, ego kills!

Visual illusions had not been a factor in our normal missions, but we were sure they would be over the desert. We added that factor to the laundry list of high interest items:

- Realistic training atmosphere
- Inattention (loss of SA)
- Channelized attention
- Flight discipline — if in doubt "knock it off!"
- ROE
- Operate within capabilities (personal, crew, aircraft).
- Fly the aircraft, *first*
- Adhere to realistic, planned JOKER/BINGO fuels.

We've had a couple of other things in our favor during the past three years: We have both "lizard" and grey F-4s. This really makes the sorting easier and allows us to upgrade and add reality to our local training scenarios. On one occasion we had the lizard F-4s escort our C-7 on a "resupply" mission, to be attacked by the greys. Other missions involved escorting A-7s, T-33s, and A-4s as well as attacking Navy strike packages off the carriers.

Although these were not specifically planned to prepare us for Red Flag, we do feel that by making our home station training as varied and realistic as possible, the preparation for Red Flag could be taken as just another step in readiness. Unless things changed, we were to fly as adversary or "Red Air" both weeks. We hoped that this would give us some good DACT training in a different environment.

The way it sounds, only Ops was preparing — not true! Along with the "normal" deployment preparation, the key maintenance NCO's on the deployment team were briefed on mishap and FOD potential, ramp layout and congestion, what the work areas should be like, and what workload to expect. This was passed to all who were going. A Guard unit can have some difficulty maintaining continuity and getting the "word" to all since the drill status people are required to train only 39 days a year. They look to the air technicians for the continuity. It was very important that all training was up-to-date. Safety, FOD awareness, and the expected heavy schedule was stressed by the chief of maintenance up to the departure date. Our maintenance force consisted of an even mix of technicians and "part-timers."

The Exercise

Red Flag wasn't much different from what we expected. It was crowded — everywhere! There was definitely a "high activity level" both in operations and on the line. No, maybe it would be more appropriate to describe the first couple of days as controlled confusion. Many of the other units were working on local area maps and studying the aircrew aid just prior to the familiarization ride. I would definitely advise getting the maps and the "aids" prior to arrival at Nellis. This gave us time to concentrate on "last minute" items like finding the runway and on learning the "real" Nellis departures/recoveries prior to take off. Although we got our pubs early, there were the invitable changes.

We flew *all* our sorties as formed crews, and we tried to fly as formed elements or flights as much as possible. When a callsign is missed, a familiar voice can save the day. (That example I mentioned earlier, when we lost Number 3 over Hanoi, we broke on Number 4's voice and saw the SAM as we were pulling down into it. Three was relatively new to the squadron and wasn't familiar with everyone.)

Flying as much as possible with the other Red Flag crews prior to the deployment definitely helped our SA. We knew the strengths and weaknesses of our players and were able to count on them to produce. We were flexible enough and experienced enough to have backups for DNIFs, and we refused to put two inexperienced crewmembers in the same bird — that's with regard to the Red Flag

scenario, SEA experience, and proficiency.

We thought we would be mixing it up both with the top cover and with the strikers during their egress — at altitude! Not so! We ended up "roving our allotted area" and then pouncing on the strikers and the C-130s during their ingress and egress. The cover tried to tie us up and keep air superiority. None of us were "comfortable" with chasing the strikers in the weeds — I mean rocks. We set a 1,000 foot minimum altitude the first week and lowered it to 500, the second. We were still able to get shots without having to wince every time a "rock" went by.

This certainly wasn't what we expected to be doing and wasn't what we trained for! We found that the visual situation really did change with the different sun positions, weather, and ground cover (snow). It was also easy to get totally involved in the "fight," but we stressed the need to control the fangs — watch the ego involvement.

I was impressed with the professional attitude of all the participants — on both Red and Blue forces. The crosstalk was extremely helpful. There were some close calls, but when the ROE was pressed the engagements were terminated and everyone went hunting for someone else. The mass debriefing by the Red Flag staff was excellent. We also debriefed our personal lessons-learned within the unit — open communication to keep someone else from making the same mistakes.

We kept maintenance up-to-speed on how the "war" was going and made sure they knew that we appreciated their work. During the two weeks we had one IFE, a generator failure, and lost only one sortie — the last day — to make sure a minor discrepancy didn't become a problem half-way across the Pacific. It's hard to put our feelings into words about how they took care of us and our birds. Outstanding isn't good enough.

Because of the close ramp conditions at Nellis, we were very concerned about jet blast and FOD. Our daily FOD walks paid off. It also helped to coordinate engine runs with the units parked on either side of us. The experience of our maintenance troops and the continuous supervisory presence both on the line and in the shops played a big part in keeping the birds OR.

Lessons Learned

The redeployment to Hawaii was uneventful and almost anti-climactic. After arriving home, we looked at the lessons learned and attempted to put them in perspective.

Formed Crews Although we practiced and flew as formed crews, more formed crew training was necessary. A Guard unit should probably start emphasizing formed crew flights six months prior to the exercise. Two months was not enough for us. It really takes a careful look at scheduling and aircrew availability to get it all to match up.

Min-Comm Training We also needed more training in a no-comm environment. As I stated earlier, our prior experience in this area was really lacking. The mission "game plan" must be kept simple. Complex plans can lead to a loss of SA and a possible midair or crash. The use of stable, static call signs is a must for maintaining unit/mission identification; but, during emergency or "break" situations the use of tactical call signs or names should be allowed (in line with AFM 3-1, para 1-2b). When flying

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in a no/min-comm situation use code words, brevity, and listen up! A long radio call in a multibogie, single-frequency arena can mask an emergency call. Changing call signs or unfamiliar call signs can cause just enough delay to prove fatal.

Knowing the Airspace. The small working area, a multibogie environment, and comm jamming all contribute to max heads-out flying. There is no time to "map read" in the target area. We found that it's important to study the arena on the biggest map available prior to the day of the mission. If a map is needed during the mission, make it small enough to fit on a knee board and large enough to cover the whole area — a "JN" worked great for me. It was there if I needed it, and it was annotated with all the necessary information. My "real" local area map was in my G suit pocket. Incidentally, low level route maps definitely don't fall into this category. The bottom line is know the *natural* features and the high ground. Manmade features change and snow or rain can hide the shape of dry lakes. Familiarity with the area before the mission contributes toward a feeling of confidence and allows more heads-out flying.

Realism and SA Pk(Ground) is 100%. One of our sister units (Blue Force) lost a bird three days after we left! Loss of SA, shadows, visual illusions, and very brief periods of task saturation can be fatal. Also, in ACM, belly checks do more than clear "six." They can prevent a midair in a multibogie environment — believe me! It's hard(er) for two birds to collide if *both* see each other. The low altitude ROE should be hard and fast. No hotdogging and no exceptions! Over confidence at low altitude is as deadly as Russian roulette. A healthy respect for the ground and strong crew coordination can go a long way.

Realistic JOKER/BINGO Fuel Plan the fuel to include a realistic JOKER for a good combat separation. If fuel becomes a factor, land at an alternate! If refueling, plan for the tanker rendezvous at the farthest part of the track. If you don't, you may find yourself short of gas. For "Red Air" the BINGO for refueling is higher than that necessary to get back to Nellis, so don't press in the target area just because a tanker is available. Running out of gas because of poor planning or long fangs is inexcusable — but done!

Jet Lag Just a note for the planner: Units that deploy a long distance, across the US or over water, should arrive a day early to get rested and situated to avoid the circadian rhythm problem and fatigue. We thought we did that by arriving on Saturday for a Monday familiarization flight. Not so! We arrived late Saturday afternoon, had a *full* day of "relaxing" briefings on Sunday, and then flew early Monday — a little too tight for my aging bones! Circadian rhythm was considered a factor on some of the F-111 losses during Linebacker II in late 1973. Why push it? Remember, this really isn't war.

We came to Red Flag to get some good over-land experience and to get some good DACT. We accomplished the former, but we didn't get much DACT above 12,000 feet MSL — that's 5,000 feet AGL around Nevada. However, being realistic, when was the last time a wave of "top cover" blew up a POL dump? Our crews needed to experience the "low show" at Red Flag to make the unit a more effective force and be able to fight and survive in either arena. That was accomplished. For our next Red Flag, we're pushing to get on the Blue Force. If I remember correctly, escorting birds into the target area over land is a little different than it is over water. Check Six! ■

NO RESPECT

MAJOR GARY L. STUDDARD
Directorate of Aerospace Safety

■ Recently I read a good article in the August 1982 *TAC Attack*. It was written by Major Jim Mackin and titled "Situation Awareness: Bah! Humbug!" The essence of the article is that we are blaming more and more of our operational factor mishaps on the aircrew's loss of situational awareness. Jim goes on to state that we can blame almost any mishap on the lack of awareness because, after all, if a pilot flies into the ground or runs into his leader either he/she was unaware that the event was about to occur or else the pilot was committing suicide. The bottom line is that the "loss of situation awareness" is too abstract and general. It's easy to use but almost useless for preventing future mishaps. I tend to agree with the author's comments and for the sake of this article would like to take the idea one step farther.

Maybe after flying umpteen dozen range rides, 9,284 traffic patterns, beaucoup low levels, and more formation airwork and air-to-air engagements than we care to remember, some of us may have just lost *respect* for the hazards associated with our business. The ole "I've done that a hundred times before" syndrome. But, because of the emphasis on "realistic training," our flight scenarios are becoming more and more complicated and complex. The days of flying purely a range ride or an ACT mission are long gone. Now we do a bit of everything on one or two sorties. As we cram more and

NO RESPECT continued

more into each mission, the *respect* factor must also be increased accordingly. But is it?

In the Safety Center, we keep close tabs on the type mishaps the Air Force experiences each year, and historically the two single leading causes of operator factor mishaps in the fighter/attack force have been loss of control and collision with the ground. Now with our realistic training, we are flying combat-like scenarios which expose our aircrews to both of these risks during a single mission, i.e., low altitude offensive/defensive maneuvering against an air-to-air threat. Maybe it's not surprising that we are seeing an increase in mishaps occurring during these types of missions.

For example, when considering the problems that a pilot has to cope with at low altitude — making a high-G turn while keeping the leader/wingman, the attacker, and the ground in sight all at basically the same time — it is understandable that a pilot may lose situational awareness. In fact, since 1977 there have been 13 low altitude loss-of-control or collision-with-the ground mishaps during offensive/defensive maneuvering against another aircraft. The average for this type mishap has been two per year during 1977-81; however, in the first 6 months of 1982, the figure has doubled to four Class As in this category. Thus the reason for this article.

Following this type mishap, the investigation board (in addition to citing loss of situational awareness by the aircrew) all too often identifies the lack of supervision, violation of rules of engagement, confusing guidance, quality of training, or a lack of understanding of training objectives as cause. All equate to the "lack of respect." So what can be done to prevent recurrence? Much has already been accomplished in the way of stepdown training programs and limiting offensive/defensive reactions during low altitude flight, but this is not enough as evidenced by the mishaps this year. We must do more.

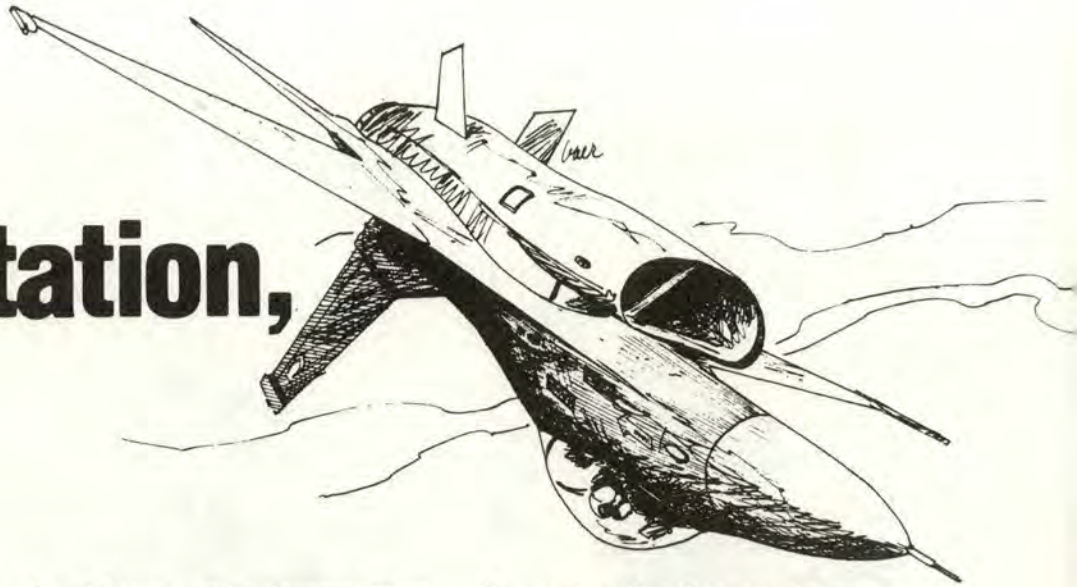
The solution is not simple, and the problem quickly becomes one of training realistically without exposing our crews to undue risk. Is it possible that "train like we plan to fight" has evolved into a tendency for our aircrews to exceed their own capabilities and our supervisors to demand too much, too soon from our aircrews? This is probably a question that could be discussed and cussed for many a day without ever reaching total agreement.

So, how much training is enough? As Jim said in his article, we certainly cannot suddenly throw a pilot into the deep water to see if he can swim and then chalk the loss up to a "lack of situation awareness" when he sinks. If the pilot isn't a "good swimmer" then the flight commander who let him into the water, the scheduler who put him there, the ops officer who concurred, and the squadron CC who approved it *also* lost their situational awareness and didn't respect the conditions they were imposing on the pilot.

Aircrews can be trained the way they are going to fight, but to do so, every level of supervision must insure our aircrew training programs incorporate a building block approach. One which places more demands on abilities as greater proficiency levels are achieved and not before. Each aircrew and first line supervisor must have a healthy *respect* for the risks involved in each mission and must not allow any overcommitment. There is no substitute for attention to detail when it comes to training a new pilot or monitoring the progress of the ones who have reached operational level. Having all the squares filled does not necessarily equate to being able to "hack" every mission every day.

There is no doubt that our aircrews must train aggressively to be able to fight and win, but they must survive the training. Maybe if we put a little more *respect* into planning and flying our missions along with solid guidance, objectives, supervision, and individual discipline we'll prevent any more of our aircrews from "sinking." ■

Spatial Disorientation, A NEW PERSPECTIVE



CAPTAIN JAY A. WINZENRIED
Brooks AFB, TX

■ It was close to the end of the half. We both needed some night time and there was a squadron function on Sunday so we planned a late Saturday departure from MacDill on our cross country return to Hill. Everything went smoothly on our first leg, and we got a good turn at Bergstrom. They were calling the weather at home at 1000 and 3. It wasn't expected to deteriorate and Mountain Home was good as an alternate.

We launched as a two-ship of F-16s at 1730 Bergstrom time which, in December, was just after sunset and would give us enough night time to finish our requirements. Again, everything has gone smoothly enroute, and lead has just initiated an enroute descent with radar vectors to an ILS final. I can see the clouds coming up as we approach 10,000 feet. Now the work begins. I had better glue myself into position. There's no telling how thick this stuff is. This isn't that bad. I can see lead fairly well, and there's hardly any turbulence. I hope the whole approach is this easy. No sweat, we'll be on the ground in 10 minutes. We must be getting close to downwind; here's the turn now. He sure rolled out smoothly. I never felt it. A right turn? No, that must be the rollout. One turn and my head is already messed up. I wish I had time to sneak a peak at the HUD but I'm afraid I'll lose lead if I do. Now it feels like we're in a left turn and a descent. That can't be. There's the call for the base turn and the controller says to continue it to final.

My head feels like it's spinning. It feels like we are back in a left bank and like the nose is really low! I'm sure having a hard time seeing lead. More left bank? This doesn't feel right at all! Where's lead? "Two is going lost wingman." Let's make sure we get some separation. This still doesn't feel right; my head is spinning like crazy. Can't see anything out there but clouds. Check the HUD. Am I inverted? I can't see the attitude indicator. Where are those stupid light rheostats? They're all on. Hey, I've broken out. I am inverted! Burner. Roll. Pull. I'm not going to. . . .

How many of us have had a similar experience? Obviously, we haven't had the exact experience, but everyone who has flown a wing approach in the weather or at night has certainly experienced some form of spatial disorientation. And it doesn't just happen during formation approaches. It often happens on departure and sometimes during maneuvering. It also happens single ship and in multi-place as well as single seat aircraft.

Spatial disorientation is a problem to be reckoned with. It is important to remember that sensory illusions will occur regardless of the pilot's experience or proficiency. However, when these illusions are encountered, spatial disorientation may be avoided provided the pilot has a thorough understanding of the organs of equilibrium, the physiological mechanisms of various illusions, and the conditions of flight where these illusions may be expected. To refresh your memory on these topics, I suggest you consult AFM 51-37.

Of great importance in preventing spatial disorientation is an understanding of the concepts of visual dominance and vestibular suppression which are really two sides of the same coin. Visual dominance is a state that exists when a pilot receives essentially all of the information used to maintain correct orientation through his visual system (i.e., looking at outside or instrument references). This is the goal when flying at night or in IMC conditions. Vestibular suppression is a process by which erroneous information from the vestibular system (inner ear) is ignored by the pilot. Vestibular suppression comes with time, experience, and proficiency. In other words, you are going to experience sensory illusions but your goal is to ignore them through concentration on your flight instruments.

So what are some of the causes of spatial disorientation we need to be aware of? One obvious factor is experience. Considering that the

Spatial Disorientation, A NEW PERSPECTIVE

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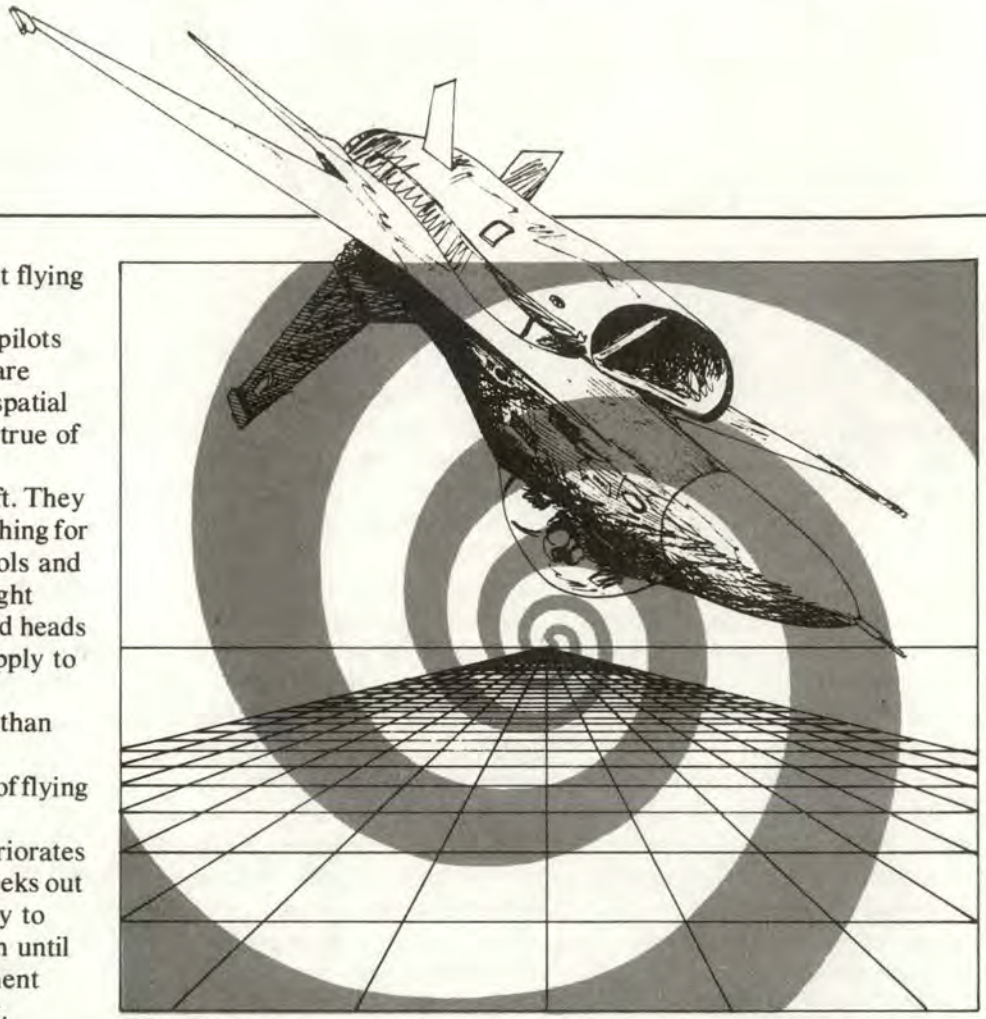

key to success in instrument flying is an efficient instrument crosscheck, inexperienced pilots with little instrument time are particularly susceptible to spatial disorientation. This is also true of more experienced pilots transitioning to a new aircraft. They must spend more time searching for switches, knobs, and controls and thus concentrate less on flight instruments. Now all you old heads are saying "This doesn't apply to me."

Not so. More important than total flying time is current proficiency and the number of flying hours in the past 30 days. Instrument proficiency deteriorates rapidly after three or four weeks out of the cockpit. Vulnerability to spatial disorientation is high until you get a couple of instrument flights to regain proficiency.

There are also factors related to the type or phase of flight. Remember what your instructor pilot always told you were the busiest parts of the flight? Departure and arrival. During these phases you may be passing in and out of IMC conditions, there may be confusing ground lights at night, there will be radio channel changes, squawk changes, clearances, and changes to clearances. All these serve to interrupt your crosscheck and render you susceptible to spatial disorientation.

Two critical phases of flight with high potential for spatial disorientation are ACM or air-to-ground ordnance delivery during periods of reduced visibility. Because of the nature of the mission, the pilot's attention is directed outside the cockpit. He spends less time on the gauges, especially during critical phases of weapons delivery and may be easily distracted. All this may lead to a lack of situational awareness in which the pilot inadvertently places the aircraft into a position from which recovery is impossible. Distraction, lack of situational awareness, and spatial disorientation are not the same but they are "kissing cousins." Failure to maintain an effective instrument crosscheck is the root cause of each. One may lead to the other, and any one of the three may result in a fatal mishap.

Now that we know a little more about spatial disorientation, let's look into the mishap of our ill-fated F-16 driver and see what might have been done to prevent it. First, we need to look into his physical status. Had he gotten a good night's sleep or was he up half the night drinking and telling war stories at the O Club? What about his nutritional status? Had he eaten anything during the day? How many times have you launched on a cross country with nothing but a cup of coffee and a doughnut in your stomach and then not had time at your stopover base for lunch? Were there any other predisposing physical or mental factors?

Once he began to experience

spatial disorientation, what could he have done to prevent buying the farm? At the first symptoms of disorientation, he should have told his leader. For all lead knew, his wingman was doing fine until he heard the lost wingman call. Had lead known his wingman was having problems, he could have told him to go lost wingman so he could get on his gauges, right? *Wrong!* Lost wingman procedures are designed to insure safe separation between aircraft in a flight when a wingman loses sight of lead and are not designed for the purpose of recovering a wingman with spatial disorientation. Instead, lead could have been of great assistance by simply telling his wingman the flight parameters. "We are level at 7,200 feet, 30° of left bank, and 280 knots." If this didn't help, lead could have brought the flight to straight and level and maintained it for 30 to 60 seconds. Again, he should advise his wingman of the parameters.

The most critical situation for developing spatial disorientation is the night or weather formation flight. The pilot flying wing cannot maintain visual dominance during his orientation/information processing. He has no reliable information concerning aircraft attitude, cannot see the true horizon, and has little or no time to scan his own instruments. Under such conditions, it becomes difficult to suppress information provided by unreliable sources such as the vestibular system. Illusions of various kinds are almost inevitable. A pilot's concentration on maintaining proper wing position may be diverted by what he "feels" the aircraft attitude to be. Lack of confidence in lead will increase tension and anxiety. An inexperienced, rough flight lead will most certainly aggravate the situation. Poor inflight communications and lack of specific procedures (properly briefed) to recover a disoriented wingman will increase the potential for an aircraft mishap.

Other variables which may contribute to spatial orientation are personal factors. A pilot who is mentally stressed, preoccupied with personal problems, fatigued, ill, or taking unprescribed medication may not be able to fully concentrate on the tasks related to flying duties and is at increased risk. Any of these factors may be detrimental to an effective instrument crosscheck and predispose a pilot to spatial disorientation. Illness, fatigue, and certain medications will adversely affect the pilot's ability to interpret and process information provided by aircraft instruments. Some medications may even interfere with the pilot's ability to see the instruments or produce vertigo as a side effect. And, yes, you knew it was coming: Alcohol is a factor, too! The effects of a hangover may last as long as 24 to 36 hours with a related decline in alertness.

At this point, if the wingman was still disoriented, lead could have initiated a climb to get out of the weather (it was clear only 2,700 feet up) and, while straight and level, transferred the flight lead position to the wingman. "Two, we are straight and level, 10,200 feet, you have the lead." The wingman should have been briefed to go straight to the attitude indicator and maintain straight and level flight for 60 seconds before intiating turns, climbs, or descents. The objective is to establish visual dominance as quickly as possible. A wingman who is severely disoriented should *not* elect or be directed to go lost wingman. If this does happen, though, lead should immediately request the wingman's flight parameters to be assured that the wingman is on the guages. All this should have been included in a thorough prelight briefing. A simple "be careful of spatial disorientation, and remember your lost wingman procedures" is not sufficient.

Even if these procedures were briefed properly, it won't do any good if the wingman never admits to lead that he is becoming disoriented. It might be a good idea for lead to take the initiative and ask if his wingman is getting disoriented.

Despite all the above, our fearless F-16 driver eventually became disoriented to the point that this, in conjunction with the weather conditions, left him unable to stay in formation. At that point, he still could have recovered by flying good basic instruments. His first mistake was looking at the HUD. It is not designed as an instrument reference to be used in place of the attitude indicator and

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SPATIAL DISORIEN-TATION

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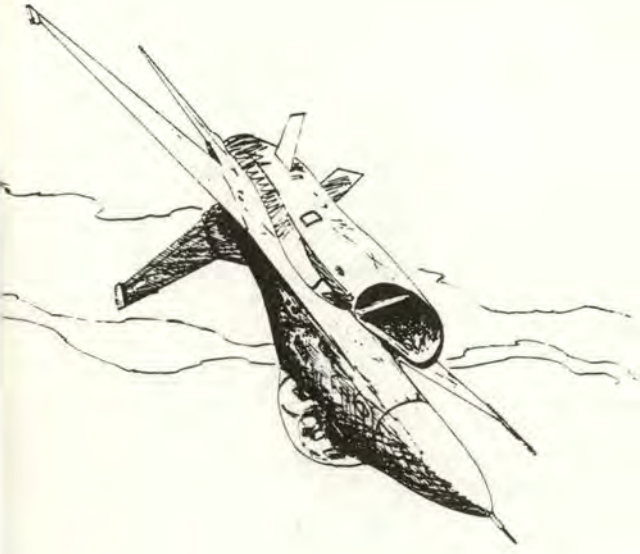


can be confusing, as it was in this case. Also, it is possible for spatial disorientation to progress to a point (a true state of "panic") where the pilot is unable to either see, interpret, or process information from the flight instruments. This may have been the case when the instruments were finally referenced — the pilot couldn't see them. He thought it may have been a lighting problem and probably induced greater disorientation through the coriolis effect as he moved his head in search of the light rheostats.

Improperly executed lost wingman procedures also contributed to the mishap. The wingman incorrectly felt that the flight had rolled out of his long right turn to final and had, in fact, entered a descending left steep banked turn. When lead did finally roll out of the turn, the wingman interpreted the rollout as entering even more left bank. In going lost wingman, Number 2 rolled right and pulled, all without reference to the attitude indicator. This maneuver, initiated from approximately 30° right bank and 2° nose low, placed the wingman in approximately 120° of bank and 30° nose low. At 2,500 feet AGL, this attitude gave the pilot only about eight seconds prior to ground impact. When he broke out of the weather at 1,000 feet AGL and interpreted his attitude, he did not have sufficient time to recover.

Additionally, pilots of single-seat fighters must recognize when spatial disorientation has progressed to the point where aircraft control is impossible and bail out.

Most of the procedures above apply to dual seat and multi-crewed aircraft as well. These aircraft have the advantage of having a second crewmember available to share the cockpit workload. This crewmember can assist the pilot by copying clearances, changing radio channels, and acquiring information from flight publications, etc. Division of workload between crewmembers should be clearly understood and covered in the prelight briefing. Also, if the pilot experiences spatial disorientation, then control of the aircraft can be transferred to the other crewmember if he is qualified. Although the potential for spatial disorientation is less in multi-crewed aircraft because of the difference in maneuverability, mishaps do occur in these systems and the cause is usually related to either distraction or poor crew coordination during an approach to a strange field.

The mishap described did not actually occur, but it does illustrate the chain of events through which spatial disorientation can lead to a mishap. In all of the mishaps in which spatial disorientation was a factor, there seems to be a recurring theme which is the failure of the pilot, at some point, to fly good basic instruments. When aircraft instruments are the sole source of accurate information, the pilot may become disoriented unless he primarily directs his attention to, sees, correctly interprets, believes, and processes the information provided by those instruments. And most important, he must make the instruments read correctly by controlling the aircraft. Until we learn to admit the onset of spatial disorientation, to seek help if it is available (from flight lead or another crewmember), and to fly good basic instruments, spatial disorientation will continue to account for a high percentage of aircraft accidents and fatalities. ■

About The Author

Captain Winzenried is a graduate of the Air Force Academy. He accumulated 1,500 hours in the T-38 as an instructor pilot at Undergraduate Pilot Training and Pilot Instructor Training prior to entering the University of Texas Health Science center at San Antonio where he is a sophomore medical student. He spent six weeks during the summer of 1982 in a clerkship with the Air Force Medical Service Center where he researched this article.

PILOT EGO

CAPTAIL JOHN B. BOND
Eastern Space and Missile Center
Patrick, AFB, FL

■ While reading a book *The Right Stuff,* I ran across several passages which describe what "The Right Stuff" is. While I was in the USAF Flight Safety Officer's Course we talked many times about pilot ego and how it can affect decisions. I wonder how many times it has affected decisions that turned out to be catastrophic. This also caused me to think back to times that I made decisions because I had "The Right Stuff." At least *I* thought so.

I believe that pilot ego has probably been more of a factor in accidents than we could imagine. How many times has a pilot delayed ejection thinking he has enough finesse to pull this one out? We read all the time: "Pilot ejected out of the envelope and was fatally injured." We also hear of pilots shooting approaches below minimums, or unauthorized maneuvers, thinking they're good enough to get away with it. And, when they do get away with it, it reinforces their ego, possibly causing them to do it again —and this time they may not be so lucky.

During my four years and 1,300 hours as an instructor pilot, many of my decisions were based on my ego and pride. When I look back on it, some may have been on the borderline of catastrophy, but luckily I had enough of "The Right Stuff" to pull me through. Or maybe it was luck! Whatever it was, I'm still here and still flying. I hope that my stunts to satisfy my ego and prove myself did not influence young pilots in the wrong way, but inevitably, I'm sure they did.

Night flying for an instructor in the back seat of a T-38 was an emergency procedure anyway. But, one night after totaling about 1,000 hours in the T-38, I was flying with a pretty good student. The weather was bad, but we had to get the ride off, and besides, there wasn't anything I couldn't handle in the T-38. Well, we were in the GCA pattern when the thunderstorms started moving in. But, "no sweat, kid, ya got me with ya." Anyway, we were at 4,000 going in between some thunderstorms with lightning in them.

I don't remember much except that I was trying to concentrate on flying instruments while lightning flashed around us. It felt like we were climbing so I steadied the stick, while I watched my ADI and heading. Then it felt like we were turning right. I put in some left aileron and HSI was turning left. The student told me we were descending, but I didn't feel like it even though my altimeter was telling me I was.

I had acquired the worst case of vertigo I had ever experienced. It seemed like 5 to 10 minutes, but I'm sure it was only a minute or so. I kept telling myself I could handle it. Finally, my better sense said, "Let the student fly it if he's all right." So I asked him, and he said he was. With my pride a little hurt, I gave up the stick. When I did this I was 60° off my assigned heading and 800' off my altitude. Turning it over to the student could've been one of the smartest things I've ever done in my life. I'll never know.

Every pilot must be aware of his limitations while flying. Some of the best pilots in the world are probably some with the worst hands because they fly alert and know when to be scared. Whenever I'm wrong or don't know something, I try to find out, because everybody can make mistakes. Even those of us who know we have "The Right Stuff." ■

FOR EAGLE DRIVERS ONLY

But Others Should Read It, Too

CAPTAIN PAUL Q.G. WOODFORD

"Back to the basics." How many times have you read, heard or said those words? We all recognize the concept but often the words are only lip service. The author goes beyond that in this article which we lifted from USAFE's *Airscoop*, August 1980.

Some Thoughts To Live By

■ You're entering the area at 5,000 feet above a solid cloud layer. Haven't called ready to play, but suddenly the controller is giving you urgent bullseye calls on two bogeys who sound pretty close. No contact. You lower the el and just like magic you get two hits, 20 right, 15 and 16 miles. Sampling the close target, you see a beam aspect, crossing right to left, level at 200 feet. That's low for certain, so you start a shallow descent as you break lock and sample the second bogey. Same aspect, right on the water. You're entering the cloud layer as you take a final lock on the close man, now just inside 10 miles. Cut to the left, push it up, and check your pitch attitude again — can't let your nose get buried when you're low and in the weather, and — just ain't your day, Buckwheat, the radar breaks lock. Beak! Okay, keep searching, you know where they were. Double beak! Just how long does a doppler update last anyway? All right then, you pinkos, auto guns. No contact. Slew it down. Still no contact.

YGBSM!

And you're just thinking about regrouping when you flush out of the bottom of the clouds at 300 feet, going like stink with the VVI pegged and the nose 12 degrees low. You don't even have time to say "Oh, sh. . . ."

Before you toss a nickle on the grass and say "It can't happen to me," consider a couple of things: It should be blindingly obvious to anyone brighter than a broomstick that pilots in the tactical community are busting their butts at a great rate. It's also clear that some of the recent fatal accidents are at least partly attributable to breakdowns in aircraft control while pilots are "peaking and tweaking" their systems during IMC flight at low altitude. Some of these breakdowns may result from poor instrument flying skills, but most appear to result from diverted or misdirected attention.

I don't believe our problems stem from a lack of instrument flying experience. We in USAFE probably have more instrument experience than anyone this side of the Hurricane Hunters. The problem, I think, is that we don't respect the absolutely critical importance of maintaining our basic

instrument skills. A lot of us think that basic instrument skills are second-nature, like riding a bike. Sadly, that's not true. I'm not saying that any of us can't flail through a TACAN approach once a year for Stan/Eval; I'm saying that really excellent flying requires plenty of practice and attention to basic instrument skills. Further, the combination of mission requirements and European weather that we live with demands excellent flying, all the time.

There are several areas where this combination of mission and IMC puts us on the spot: High to low conversions, as in our opening example; trail departures; night flying on the wing; even flying the base defense CAP in minimum acceptable VFR. You can surely think of more examples. The point is that we have to fly and fight (and don't you ever forget it), and we had doggone well better be able to hack the weather. To do this, we need three things: An effective crosscheck, a well-trimmed airplane, and a sense of priorities.

A crosscheck, according to AFM 51-37, " . . . is a proper division of attention and the interpretation of the flight instruments." Everything about the F-15's cockpit layout is designed to facilitate this essential task. The eye-level HUD repeats the information displayed by the central cluster of primary flight instruments, and these are backed up by the standby instruments. Everything the pilot needs to know to fly his jet is right in front, with only minimal vertical and horizontal scanning required. Our radar and weapons controls are optimized for "heads out" flying; they are, therefore, optimized for instrument flight as well. To be effective, however, a crosscheck has to be appropriate to the aircraft. How many of us are still using crosscheck techniques from other times and other planes? To become second-nature, a crosscheck has to be practiced over and over. How many of us consciously force ourselves to crosscheck as we work our weapon systems in VMC? It's a skill we must master before we enter IMC.

Once your crosscheck is cooking, you trim. Having the best crosscheck in USAFE is only of marginal use if you're fighting the controls; you should never settle for less than a "hands off" aircraft. A trimmed aircraft will hold a constant attitude, freeing you for other tasks; more importantly, it will help keep you from subconsciously overcorrecting an out of trim condition in IMC or at night when you're busy. Watch out, however, for the lag in the Eagle's automatic trim system: If you're hasty about trimming off pressures after attitude or speed changes, you'll end up fighting a system that's trying to work for you. Don't neglect the rudder trim either — apart from helping you avoid slow and insidious rolling inputs, a centered ball will get you more holes in the DART.

A good crosscheck and a trimmed jet aren't nearly enough, however. You have to prioritize. Cockpit task prioritization is an extension of the instrument crosscheck; it is made up of two parts systems knowledge, three parts tactical savvy, and ten parts self-preservation. When can you peak and tweak, when should

continued

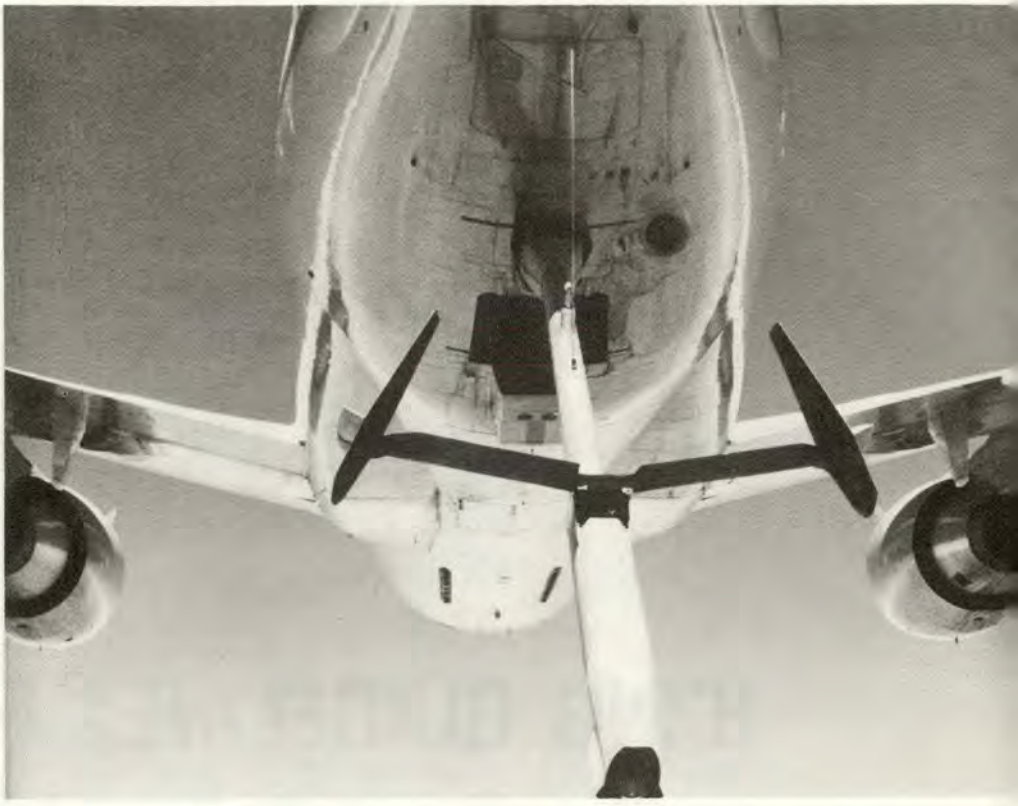
you let the auto modes do most of the work, and when should you forget the radar and fly the airplane? Every situation demands a different answer: During low altitude intercept work, for example, you might crank the frame store up more than normal and set the radar the way you want it before you enter the weather. Sometimes it may be appropriate to get on top of the weather and do your sorting where you can devote more attention to it. One thing's certain, though — a healthy fear of death ought to drive your sense of priorities. There is no operational requirement to lock up lead immediately after liftoff on a trail departure, and there's no reason on God's green earth to be doing anything but flying the gauges after falling off the wing at night.

These skills — crosschecking, trimming, and prioritizing — are as critical as having a blank check in your wallet and as basic as beer. When you're scrambled against a low-flying unknown in the BZ at three o'clock on a cruddy morning, you've got to have it together. Take every chance on every training sortie you fly to develop your basic skills. Don't let an opportunity to fly a TACAN approach go by, and consistent with ROE and flying safety, don't pass up a chance for low altitude work in marginal weather. When you've got to fly a trail departure, do it no-lock and learn from it. If you're a flight lead, try to brief and work some of these opportunities for basic skill practice into your flights. Times are tough, and if you're planning to wait until we get enough flying time to log collateral sorties for instrument practice, you'll probably be interested in some investment property I have in Arizona. . . .

We can never afford to be casual about the basics, and we can't ever assume they're second-nature in our wingmen or ourselves. Our mission and flying environment preclude this kind of thinking. We're here to fly and fight — and live to do it again. So practice, think, and practice some more. And instead of saying "It can't happen to me," say "I *won't* let it happen to me."

— Reprinted from *Aerospace Safety*. ■

WHERE'S THE GAS STATION?



MAJOR JOHN E. RICHARDSON, Editor

■ An F-16 was engaged in DACT against two F-5's. The F-16 pilot had briefed Joker and Bingo fuels, but did not enter the data into the fire control/navigation panel. This left the fuel remaining warning set for 2,500 pounds. The aggressors had briefed that the second would take over after Number 1 reached Bingo. This would allow the F-16 pilot maximum training time.

During the first four engagements, the F-16 pilot verified proper feeding and burn out of the centerline and internal wing tanks. The first aggressor reached Bingo and departed when the F-16 had 3,000 pounds remaining.

As the F-16 and second aggressor set up, the F-16 pilot reported 2,700 pounds remaining. During the engagement the VTR confirmed that the 2,500 pound Bingo fuel warning flashed and was reset by the pilot. While setting up for the last engagement, the F-16 pilot reported 2,000 pounds of fuel remaining. The engagement began from a neutral set-up and lasted two minutes with a majority of the maneuvering in the vertical with momentary use of afterburner during over the tops.

Seven seconds after the engagement began, the home fuel warning began flashing, but was unnoticed by the pilot. The warning indicated that if the pilot had begun an immediate recovery climbing to the home mode altitude and cruising at max range airspeed, he would arrive over home base with 700 pounds of fuel remaining. Five seconds prior to the "Knock-it-off" call the home mode indicated zero fuel remaining over base.

Immediately after terminating the engagement, the F-16 pilot saw the master caution, aft fuel low, and forward fuel low lights on. The totalizer indicated 400 pounds of fuel, and the aircraft was 42 NM from base at 375 knots and 10,500' MSL. The pilot immediately turned toward the base, began a climb and set the power at mid-range.

At the suggestion of the aggressor pilot, he also began to slow to endurance airspeed. He was, however, slow to reduce to max endurance airspeed and five minutes after starting toward home was at 15,000 feet/240 kts and 15 NMs out from base with 100 pounds remaining. The pilot began to maneuver for a base key, lowering the gear at seven miles. At 2½ miles, with the aircraft at 3,000' AGL and 200 knots, the engine flamed out. The EPU fired normally and the pilot was able to make a successful landing.

Although the pilot was aware of the restriction on use of afterburner with less than 2,000 pounds of fuel, in the heat of battle, he forgot. The pressure of the low fuel state and the suggestion of the aggressor pilot caused the F-16 pilot to select the incorrect option — endurance rather than max range cruise speed. Endurance airspeed gives max time aloft rather than maximum distance for a given fuel. Had the pilot immediately gone to the max range altitude and cruise airspeed for his conditions he would have made it to base before flameout. ■

ICING GUIDELINES FOR PILOTS

CHARLES R. TENNSTEDT

What to expect under varying conditions, how to handle icing when you can't avoid it and how to get rid of ice — here are valuable rule-of-thumb recommendations from a pilot's 35 years of airline operations and research.

■ Pilots should know as much as possible about icing and how to handle it in case they cannot avoid it. Perhaps I can assist you with observations and rule-of-thumb generalities from my years of airline piloting and research. The latter includes a study of temperature zones and freezing as related to airlines of the mid-1950s, when parameters approximate those of a broad spectrum of the general aviation fleet today. All described conditions in the observations which follow are based on the premise that the precipitation begins as snow in the upper levels, is completely or partially melted, transiting the warm air which exists at some intermediate levels, and subsequently modified by the cold air next to the surface. Any values assigned to the depth or thickness of the temperature zones must approximate the combination of these and other variables.

Condition A: Freezing Rain or Drizzle and a SubSurface Temperature of About 28 Degrees F

In order to have freezing rain, a layer of below-freezing air must exist next to the surface. Above this must be a stratum of warmer air. The surface layer of cold air may be from a few hundred feet to about 4,000 feet in depth. The warmer air zone might extend to approximately the 8,000-foot level.

Expect clear ice in the lower levels, carburetor or air inlet icing throughout until well into the colder and dryer upper air, and light rime ice in the clouds of the upper cold air.

You will encounter wet snow in the upper portion of the warm air. Flight plan 4,000 to 8,000 feet or higher. Climb through the freezing levels at a high power setting.

Condition B: Freezing Rain Mixed With Sleet

The warm air stratum in this case will be somewhat shallower and closer to freezing than the condition described above. It should be approximately 2,000 to 4,000 feet thick. About 4,000 to 6,000 feet should put you in the warm air, or go higher into the cold air. Clear ice can be expected in the lower levels and rime ice in the upper levels.

Condition C: Sleet

In this case the layer of lower cold air may be thicker and the layer of warm air may be thinner than the examples previously discussed. Expect icing to increase in intensity as you climb toward the warm air. Try 5,000 feet or above.

Condition D: Wet Snow and a Surface Temperature of About 34 Degrees F

The warm air is next to the surface in this case and is probably not more than 2,000 feet thick. Aircraft icing on climbout should be relatively minor.

Expect to have carburetor or air inlet icing well into the upper cold air. Cruise below the cloud base or get well into the cold air. Expect light rime in the clouds.

If there is rain mixed in with the wet snow the warm air will be about 3,000 feet thick.

Condition E: Wet Snow and Surface Temperature at or Below Freezing

In this case we can expect a shallow layer of cold air next to the surface, probably less than 1,000 feet thick. Above this there will be a relatively shallow (2,000- to 3,000-foot) layer of above-freezing air and colder air above. An altitude of 6,000 feet or higher would be recommended in this case. Expect light rime in the clouds.

Stay Out of Icing Condition Unless Your Aircraft is Properly Equipped

Keep the angle of attack at a low value. Maintain extra speed during climb, while holding or during periods when you would normally be at a minimum speed.

Use high power to leave the icing or to maintain a flat attitude in the icing. Don't wait until you're loaded with ice to apply power — at that point you'll just drag along with more exposed surface and all options will be gone.

Air friction causes a temperature rise as a function of airspeed. This rise may be about two degrees centrigrade at 130 knots and about six degrees centigrade at 250 knots, assuming an ambient temperature near zero. Changing the indicated airspeed can sometimes be used for control.

With deicing equipment, allow the ice to build to a thickness of about ¼ - ½ inch before actuating the boots. Once cleaned, turn off the boots and repeat the process again when necessary. (This prevents build-up of ice over inflated boot position.)

Ice is a great insulator. If equipped with anti-icing equipment, surfaces reach high temperatures much sooner and runback is reduced if a light coating of ice covers the surface when the heat is applied.

If it's a propeller airplane, keep the blades clean with heat or alcohol. Keep air inlets and inlet guide vanes clean if jet powered. Use pitot heat at all times including a period prior to takeoff sufficient to clear pitot and static heads of ice and water.

If you have a low performance airplane and you're flying in the warm air toward and over the warm front, stay above the frontal surface as long as possible. As the warmer air lifts along the frontal slope the strata of above-freezing air thins to the points where it reaches freezing or below as a result of the adiabatic process.

At that point, a descent of 4,000 to 5,000 feet should put you well into the cold air below. Maintain a high descent rate to minimize icing in the transition zone since you won't be able to get rid of the ice in the cold lower air except by sublimation (direct evaporation), which takes a long time. The procedure should be reversed if flying across a warm front from the cold air side. — Adapted from *Flight Crew,* Fall 1980.

Editor's note: *The bottom line for Air Force and aero club operations is avoid icing conditions. Air Force regulations spell out the acceptable limits for flying in icing – follow them. Weather briefings and preflight planning are important steps in avoiding icing problems. Finally, be prepared. If you suspect you may encounter icing, remember that anti-ice equipment should be turned on to* prevent *not remove ice.* ■

SEAT SAVVY

CECILIA PREBLE
Assistant Editor

■ The report read, "The WSO ejected and was recovered, having sustained no injuries. The pilot ejected after mistakenly pulling the emergency harness release handle and was not recovered."

In the past nine years, this error has been identified as a problem in three ejection fatalities. The aircrew member is going for the emergency harness release handle instead of the ejection handle. Primarily concerned are aircrews who have cross trained from aircraft configured with sidearm actuated ejection seats, to those with a face curtain or lower ejection handle.

Imagine yourself on the wing in a 3-ship of F-4s. You've got both throttles at maximum when you get a master caution light. Your right engine oil pressure is pegged at zero and you have a right generator out light. Immediately you shut down the right engine and call lead. Just as you've relayed your problem, the cockpit fills with smoke. Within a matter of seconds the aircraft yaws right about 45 degrees, followed by a roll to the right and a nose down attitude. You're trying to recover but nothing's working. Now you're past 75 degrees nose down and lead's yelling, "You're on fire! Punch out! Punch out!"

You reach over, get a firm grip on the handles, put your head back . . . and realize your mistake. You're gripping the emergency harness release handle and the drag chute handle.

As long as you haven't activated the release and are in the envelope, you can still reach back for your face curtain or lower ejection handle and eject.

The four Air Force aircraft equipped with a lower ejection handle are the F-4, F-16, A-7 and OV-10. In the F-4 the problem of selecting the wrong handle is particularly serious because the emergency harness release handle is almost identical to, and in the same place as the ejection initiation handle on sidearm equipped seats. The F-16 and A-7 also have emergency harness release handles on the right side of the seat, but they are a bit farther back and are shaped differently. The OV-10 does not have one.

Although the Air Force has shown a preference for the sidearm handgrip ejection seat, this is not true of the Navy, for which the F-4, A-7 and OV-10 were developed. The F-16 has a sidearm flight control system, precluding the use of a sidearm ejection seat.

The correction to the problem will not be a technological one; even the latest ejection seat, the ACES II, is being installed in modern combat aircraft with either side or center actuation. The Air Force has, however, intensified egress training for its aircrews in an effort to reduce ejection fatalities.

At the core of the problem is the phenomenon of training regression. In a moment of crisis (such as ejection) there is a tendency to revert to earlier training. Since most aircrews learned to fly in T-37s and T-38s, with side actuated ejection

seats, those ejection lessons are more prominent in their subconscious memories than the even more recent training which accompanies the transition to a different aircraft.

The significance of a thorough understanding of ejection procedures cannot be over emphasized. The Dash One for the F-4 is explicit in regard to the emergency harness release handle. This handle, found on the right front edge of the seat, provides immediate release of the lap belt and leg restraints for quick evacuation on the ground. Once you've pulled the emergency harness release handle, the sequence of events described by the Dash One is as follows: "The belt, shoulder harness restraints, and leg restraints are released and the guillotine unit fires to cut the parachute withdrawal line. The parachute restraint straps are also released to allow the personal parachute pack to separate from the seat."

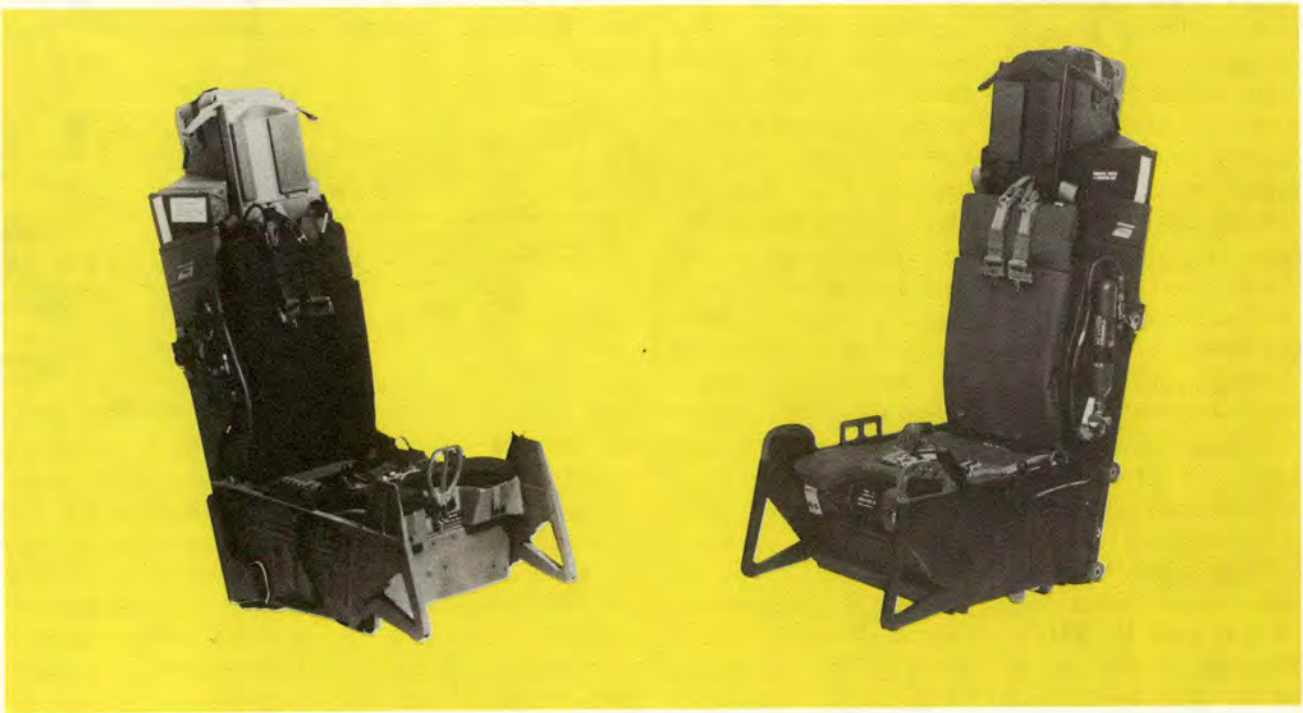
There is some additional information in the Dash One that could be misleading. It seems to infer that if you pull this handle everything will release simultaneously. One mishap investigation board found that these actions happen in sequence with the guillotine firing first. This means you can pull the handle part of the way, fire the guillotine, reset it and, since the other restraints have not released, you may be misled into thinking you haven't done yourself any harm. Then, if you eject, you may not realize that the automatic feature of the parachute has been negated and that now you must pull the manual parachute ripcord handle.

The warning is specific: "Activation of the emergency harness results in loss of both parachute and survival kit automatic feature. A safe ejection is impossible because the occupant will separate from the seat during ejection and severe shock loads will be imposed on the body."

There are three basic methods for iniating ejection: The sidearm handgrips; the lower ejection handle, located between the legs; and the upper face curtain, located above and behind the aircrew member's head. The F-4 is the only aircraft equipped with both a face curtain and a lower ejection handle.

The key to avoiding this ejection error is regular egress training and concentration on every step of the ejection sequence. A retired Air Force general, who has ejected twice, both times safely, attributes his success to preplanning. Each time he slid into his cockpit, he made a habit of mentally going through his ejection procedures. It's a process that only takes seconds, but can make the difference between a survivor and a fatality.

The ejection decision must be made in advance of the crisis. Studies of successful ejections point undeniably to the importance of egress training. Drill by imagining yourself in an ejection situation and learn how you will and must react. Only continued repetition of the new ejection procedure will override the older and potentially lethal habits. ■



OPS topics

How High Are You?

■ An A-10 was part of a two-ship range sortie. The pilot had already completed three strafe passes and moved to another target for low angle bombs. As he pulled off from the first pass the pilot felt that he was lower than normal, so he reconfirmed the altimeter setting. On the second pass he felt extremely low as he started recovery. He called "Knock-it-off" and climbed for rejoin on lead. On both passes, release altitude indicated on the HUD was 600' AGL.

After rejoin at 2,000 feet MSL, all altimeters in both aircraft agreed, so the pilot made two more LAB passes releasing on sight picture rather than altitude from the HUD. The pilot encountered no further problems during LATN or recovery.

Then the pilot did a very smart thing. He wrote up his problem. Test of the altimeter showed a 200-foot altimeter lag on a simulated LAB pass. The gun camera film showed more than a 300-foot discrepancy between actual and HUD indicated release altitude with the HUD reading higher. The range officer reported that recovery on both passes was low (estimated to be 75-100 feet on the second pass) but called no fouls.

Inspection of the pitot tube and lines revealed contamination by some foreign substance. This contamination partially blocked the pitot tube and during rapid descents prevented the system from sensing the pressure changes.

That's What Gear Pins Are For

A T-39 crew performed the preflight and before starting engines checklists. They were then advised to delay starting engines because there was an emergency in progress. The crew then shut down the aircraft and departed for Base Operations after advising the maintenance crew. The ground crew then installed the nose gear pin.

Once the runway was clear, the aircrew returned and performed the thru flight items in the checklist and proceeded with the mission. No one noticed the gear pin. When the crew raised the gear handle they could not get a safe up and locked indication. After landing, the crew found the undamaged gear pin still in place.

Not Cleared

An F-106 was placed on practice runway alert during a night exercise. After cancellation of the exercise, the pilot taxied back to the alert barn. As he was taxiing back, maintenance began to open the doors. The pilot, upon turning toward the hangar, believed the door to be fully open and continued to taxi to his parking spot. The aircraft vertical stabilizer struck the partially open rear hangar door.

Phase-out — James Brake Decelerometer

The James brake decelerometer is being phased out by attrition due to nonavailability of replacements. HQ AF/XOORF has coordinated its replacement by the Tapley system. The Tapley meter, which works on the same principle as the James brake decelerometer, has been widely used in Japan and Europe. Technical Order 33-1-23, which has been revised to reflect the new Tapley system, will be in the field this fall. Both the James and Tapley systems will be authorized for use. The newer Tapley meters will be issued on request after the new tech order is distributed. The revised TO will also contain guidance on test vehicle tires.

Tapley meter readings will be converted to RCRs for use in aircraft tech data performance charts. Pilots should notice no difference in obtaining RCR values since the conversion to RCR will be done by the vehicle operator or weather personnel before it reaches the pilot. If direct Tapley meter readings are provided to crews for any reason, a rule of thumb is to disregard the decimal point and multiply by 3, i.e., a Tapley reading of .3 would convert to an RCR of 9, .6 to an RCR of 18, etc.

The Tapley system is a reliable system with the same constraints as any other RCR system. The currency of the reading, changing weather conditions, and locally variable RCRs on runways and taxiways still place the decision making burden on the shoulders of the pilot flying the aircraft.

Maj Arthur P. Meikel III, Directorate of Aerospace Safety.

Who's Got What?

Two IPs were on a cross-country in a T-38. At an enroute base they encountered several delays before being released for flight. When released, they elected to update their takeoff data while taxiing.

Once out of the chocks, they called ground control and asked for current weather for the takeoff data computations. When ground control called back with the information, the pilot in the front seat said "I've got it." The IP in the rear who had been in control of the aircraft assumed that the front seater now had control of the aircraft, leaving him free to copy the data.

Actually, the front seater meant that he would copy the data, so no one was controlling the aircraft. As a result, the aircraft did not make the turn onto the parallel taxi way and ran off into the grass.

continued

CORRECTION

Page 10, January 1981, *Flying Safety*.

■ The heading of the fourth column of Figure 1 "Spin Recoverable" should be changed to "Spin Resistant." The heading of the fifth column should be changed from "Spin Resistant Departure Recoverable" to "Spin Recoverable."

The seventh and eighth lines from the bottom of the first column should be changed to read: . . . " 'SPIN RECOVERABLE' line." Delete the words "RESISTANT/DEPARTURE." ■

OPS topics

Bumpy Ride

A flight of two F-4's was engaged in DACT with two Navy F-14's. During an engagement, the aircraft entered a daisy chain with one F-4 out in front followed by an F-14, then the mishap F-4 and, finally, the other F-14. The mishap WSO was watching the second Tomcat while the AC was maneuvering on the first one. During this maneuvering, the WSO decided to look over his left shoulder for a better view as the trailing F-14 switched sides.

As he was changing from right shoulder to left, the aircraft accidentally flew through the wake turbulence of the first F-14. The aircraft went from 4 Gs to .5 G and back to 4.5 Gs. The G transients forced the WSO's head down, and he hit the canopy breaker knife handle on the left canopy rail with his helmet visor. The impact was hard enough to damage the helmet and cause the WSO to become disoriented. He called "Knock-it-off," and the AC made an uneventful recovery. ■

A Big Misunderstanding

A C-141 crew was taking off from a conus base when at 125 KIAS with 4,000 feet remaining, the audible stall warning horn sounded. The master caution light came on but no accompanying annunciator lightm

None of the crew members recognized the horn. The copilot thought at first it was an improper take off configuration warning horn and quickly checked the position of his flaps and trim. He then realized that that horn was only on Boeing 727s and not C-141s, and decided it was safe to take off. Both the IP and jump seat pilot were current in the 727 and the pilot in the left seat had been current in the 727 about ten years ago.

All crewmembers said the warning horns were remarkably similar and only the IP had ever heard the C-141 stall warning horn before.

As the aircraft accelerated, the warning horn blared in the crewmembers headsets, and the last 3,000 feet of runway was quickly being eaten up, an unknown crewmember said, "reject."

After brief hesitation caused by the confusion of the horn and the seemingly unnecessary reject call, the pilot initiated reject procedures at 133 KIAS without resistance from the IP. The pilot had trouble getting thrust reversers 2 and 3 into reverse thrust (1 and 4 had been pinned before flight) and the IP helped him until they were finally in the reverse range. The pilot applied maximum braking. Due to preoccupation with trying to deploy the thrust reversers and blaring horn, the spoilers were not deployed. The aircraft was slowed down to 30 kts ground speed and came to a stop 300 feet short of the end of the overrun.

Maintenance later identified the problem as a shorted wire on the no. 1 stall prevention system. It had been a recurring and unresolved problem for some time.

Investigation also confirmed that the 727 improper takeoff configuration warning horn and the C-141 stall warning horn were so similar that they could be confused easily.

A survey of crewmembers was initiated to determine their reactions to the stall warning horn sounding 5 kts before go speed. The stall warning horn caused none of the eleven crews to reject the takeoff and most just ignored it.

In addition, of 105 crewmembers who were asked to identify the audible warning signals in the C-141, only 7 could correctly identify all the signals. The results of this test follow: Stall warning — 33%, Underspoiler speed warning — 69%, Engine fire warning — 95%, Landing gear warning — 95%, Aircraft overspeed warning — 60%, APU fire with door open warning — 39%, Emergency locator transmitter activation — 21%.

The test results show that warning signals seldom heard are seldom recognized. How well do you know the signals for your aircraft? ■

Target Siren-Song

MAJOR JOHN E. RICHARDSON, Editor

■ We've all heard of target fixation. Most probably many have thought "Yeah, it happens, but I never violate minimum altitudes so I can't get caught." Well, you can. Here is the story of a good, conscientious pilot who just tried a bit too hard.

An A-10 unit had deployed to an FOL as part of an exercise. On the day of the mishap the A-10 aircrews scheduled to fly briefed and completed their initial attacks without incident.

The second target planned was a helicopter on the ground with "troops" in the open. The troops were maintenance and operations enlisted personnel from the A-10 unit.

The mishap flight made contact with another two-ship of A-10s, and the two flights proceeded to the target. Lead acquired the target at about 2 NM. He then made a successful pass on the target. Number 2 followed lead with 15-second spacing but was unable to acquire the target on the first pass.

After egress, the flight lead talked the No. 2 pilot's eyes onto the target. Then, after the second two-ship completed their attacks, the first flight set up for reattacks. The mishap pilot followed lead this time concentrating his simulated strafe pass on the troops in the open.

During the recovery from the second pass the A-10 struck some trees 67 feet above the ground. The pilot, thinking he had cleared the trees, continued the mission and made three patterns and a spot landing.

On clearing the runway the pilot discovered some binding in the nose wheel steering and elected not to take off again. Maintenance subsequently discovered damage to the fuselage skin, antennae, and rudder bell crank from the tree contact.

The first set of targets assigned the mishap flight were standard exercise targets. The second one was squadron generated to provide motivation for the squadron's deployed support personnel by letting them see the A-10's work. The flight briefing was complete with one exception.

No one discussed the temptation for increased aggressiveness or compromise of ROE for the second target. Although the flight commander had discussed the problem a few days previously, the point was not adequately emphasized. The mishap pilot perceived the mission to be "show the maintenance people how the A-10 works."

On the pass in which the A-10 struck the trees, the cockpit VTR recorded that the pilot initiated the attack as a 6-degree dive from about 6,100 feet slant range and 550 feet above the target elevation. He called guns on the target between 4,500 and 3,000 feet slant range and continued to hold the gun cross on the target until 1,100 feet slant range. At this point, the flight path shallowed to slightly less than 2 degrees dive angle. The pilot continued across the target then began a pull-up, but too late to prevent striking the trees.

An investigator, flying a few days later in the same area, could find nothing which would contribute to a visual illusion. However, witnesses did state that three of the four pilots who made the attack descended below the 500 foot minimum altitude.

It was the opinion of the investigators that a combination of the nature of the target, the lack of specific guidance regarding the target ROE, and the overall will to succeed contributed to the situation where the pilot pressed beyond good tactical parameters. ■

COULD IT HAPPEN

MAJOR JOHN E. RICHARDSON, Editor

■ For all but a small, lucky percentage of Air Force flyers, operating in winter weather is a yearly fact of life. For some, particularly in the northern tier, winter is a long-term proposition. Perhaps, because it is familiar, we sometimes overlook the potential for mishaps. Not too long ago, an aircrew was set up for what could have been a serious problem simply because some priorities got misarranged.

A command/control C-135 took off from a northern base for an exercise mission. Everything was fine through the descent for recovery. The arrival weather was reported as 9,000' scattered, 20,000' broken, 7 miles visibility, runway dry. The flight continued inbound, and at 7 miles on final RAPCON advised the crew to "expect reduced braking action due to freezing rain." The pilot decided to attempt a landing, check braking conditions, and if they were not good, go around. On landing braking was good, so the pilot completed the landing, braked to a slower than normal taxi speed, and made a 90° turn onto the taxiway.

Once on the taxiway the aircraft lost all steering and braking effectiveness. The pilot was able to continue down the taxiway and shut down all engines to kill the residual thrust available at idle. The aircraft finally came to rest with one gear on the asphalt taxiway apron. The final stopping point was 1,850 feet from the start of the skid. After the aircraft had stopped, a check of the taxiway braking action yielded an RCR of 01.

Like so many mishaps a lot of "little" things combined to cause this one. On the morning of this

HERE?

flight the Base Ops vehicle was taken to the Motor Pool for maintenance. The SOF was charged by base regulations to take RCR readings if the Base Ops vehicle was not available. However, through improper communication between the airfield management personnel and the command post, the SOF was not advised. Early in the day this wasn't a problem since the field was dry. Then the IG team arrived and kicked off an ORI at about 1045. At that point, the airfield manager and NCOIC left Base Ops for ORI duties elsewhere.

At about 1500 the NCO from airfield management called the command post and asked "Can the SOF do RCR's?" The controller replied "Yes." After that phone call Base Ops was sure the SOF was doing RCR's while the command post was sure that the SOF's ability to do RCRs had been confirmed. No one told the SOF to take RCRs.

A little over an hour later the airfield manager returned to Base Ops. Seeing that rain was imminent he asked who was taking RCRs. The NCOIC replied no one because the James brake instrument was still in Base Ops. The instrument was delivered to the SOF at about 1630. Light rain had been falling for about 15 minutes when the SOF began making RCR checks.

As he prepared to leave the ramp for the taxiway the SOF was surprised to see a 135 completing its landing rollout. As the aircraft was turning off the runway the SOF radioed that the RCR was 02. Unfortunately, by this time the aircraft had already lost all traction.

Further investigation into why the rain was so unexpected revealed that the weather radar was inoperative. This made accurate prediction difficult. A weather warning for freezing rain had been issued, but the rain started earlier than expected. The other problems of SOF duties and coordination were the result of infrequent use of the SOF, a nonexistent training program for the SOFs, and a reordering of priorities in the command post to cope with the ORI message traffic. Since the SOF was not told about the airborne aircraft, he reported the slick ramp first to maintenance to preclude aircraft taxiing. It was as he was preparing to notify the command post that he saw the 135.

The 135 AC was unaware of the icy taxiways. Because of its composition, the runway did not freeze as fast as the taxiways, therefore, the landing aircrew believed that the runway was merely wet, not icy.

The mishap report summarized this event's cause as follows: "The system was in place, but with a combination of weather, HHQ high load tasking, maintenance, lack of training, and human error, the airplane landed in deteriorating and potentially dangerous conditions." This unit has corrected their problems, but this winter all the factors listed as causes will again be present somewhere, very probably at your base. The key to preventing a mishap is to take a critical look at operations now. The question is: Could it happen here? ■

COLONEL
Richard C. Wheeler
366th Tactical Fighter Wing

CAPTAIN
Emmet R. Beeker III
289th Tactical Fighter Training Squadron

Mountain Home Air Force Base, Idaho

■ On 14 December 1981, Colonel Wheeler and Captain Beeker were flying an F-111A on a local surface attack training sortie. Shortly after roll out on the ingress heading at approximately 500 feet AGL, 540 knots ground speed, the crew saw four birds at 12 o'clock. A hard pull up was made in an attempt to avoid the birds, but at least one of them struck the nose of the aircraft. The impact buckled the radome, and as the aircrew continued the pull up to gain altitude for possible ejection, the entire radome shredded and peeled back over the nose of the aircraft. The stall warning horn activated, the left engine rolled back to idle, and both engine spike lights illuminated. Colonel Wheeler moved the wings forward as Captain Beeker selected override on both spike controls to insure proper spike positioning. The flight lead was informed of the situation and directed to rejoin on the disabled aircraft. Because all pitot static instruments were unreliable, flight parameters were estimated for rejoin. After the rejoin, a visual inspection was completed and fiber glass strands from the shredded radome were reported streaming down the right side of the aircraft. An immediate landing was considered essential, and a direct course was set for home base. Approach Control and the supervisor of flying were advised of the aircraft problems and the crew's intentions. The crew reviewed single-engine landing procedures and discussed the possibility of a yawing motion when the slats were lowered due to unreliable information from a damaged Beta Probe. The single engine checklist was completed for configuration and the aircraft did yaw 8-10 degrees left when the slats were extended. Colonel Wheeler positioned the flight control disconnect switch to override, eliminating the yaw input. At 300 feet AGL, the escort aircraft reported airspeed of 180 KIAS and started his go-around. Captain Beeker crosschecked the INS ground speed which was the crew's only operational source of aircraft speed. At 300 feet AGL, a portion of the shredded radome suddenly obstructed Colonel Wheeler's view of the runway. He transferred control of the aircraft to Captain Beeker who completed the landing. The quick reactions, systems knowledge, and excellent crew coordination displayed by Colonel Wheeler and Captain Beeker prevented loss of the aircraft and possibly their lives. WELL DONE! ■

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UNITED STATES AIR FORCE

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LIEUTENANT COLONEL
Robert J. Vorgetts

MAJOR
Walter Guthrie

58th Tactical Training Wing
Luke Air Force Base, Arizona

■ On 16 December 1981, Colonel Vorgetts and Major Guthrie were scheduled for a surface attack sortie in an F-4C. Immediately after takeoff, as the aircraft accelerated through 300 kts, the master caution light and check hydraulic gauges light illuminated. Utility pressure was noted decreasing through 1,000 psi and went to zero. Approximately 7 to 10 seconds later, the crew heard a loud bang and felt a hard thump on the right side of the aircraft. Colonel Vorgetts noted right EGT rising rapidly through 850°C, and he momentarily went to IDLE position. The stall did not clear, so he shut down the engine. After climbing to an altitude of 7,000 feet MSL and maneuvering the aircraft to a clear area, the aircrew jettisoned external fuel tanks and dumped internal wing fuel to reduce gross weight. They set up a left orbit 12 to 15 NM southwest of Luke and continued reducing gross weight. Colonel Vorgetts requested removal of the approach end BAK-12 on the inside runway. With aircraft fuel below 7,000 pounds, the aircrew established a long straight-in and accomplished the emergency gear lowering checklist. After confirming that the approach end arrestment cable had been removed, Colonel Vorgetts lowered the tail hook. A 250 kt final was flown to 3 miles out where the airspeed was decreased to 240 kts. After landing was assured, the aircraft was slowed to 210 kts for a single engine touchdown. The dragchute was a streamer, so Colonel Vorgetts applied light directional braking, and the departure end arrestment cable was engaged at approximately 130 kts. Post flight inspection revealed evidence of severe heat damage in the form of burned wire bundles and paint in the right ramp and intake area. The fire was caused by hydraulic fluid released from a failed vari ramp servo which was ignited in the forward engine bay. The fire light did not illuminate due to the location of the fire loops. Colonel Vorgetts' and Major Guthrie's prompt, decisive reactions, superb in-flight analysis, and exemplary crew coordination not only averted injury or loss of life, but saved an aircraft. WELL DONE! ■

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