flying SAFETY

JULY 1985

Spin Avoidance In The F-5

Monday Morning Quarterbacks Are "Good Guys"

Flight Safety Crossfeed

THERE I WAS...

■ Have you ever noticed that during safety meetings when some clown stands up and briefs the latest accident or incident report; the typical cry that resounds through the masses is "you gotta be kidding me," or words to that effect? Inevitably, there's a story of some bozo who had done his ever-loving best to eliminate himself or some perfectly good airplane. He forgot something, did something inventive, or launched himself into some regime of flight heretofore untried in the annals of aviation history. How could a professional Air Force manage to hire so many incredibly stupid people?

Well, next time you reach into your bag of stones to drive one of your aviation fraternity brothers into exile, make damn sure you save a few for yourself. No, I'm not writing to encourage self-abuse or to lecture on the inevitability of all of us to screw up. This is to point out that even the many-houred jocks can secure a place among the infamous and to reassure a few A-10 experts that Uncle Fairchild has adequately provided for you.

This is where we do the "There I Was" part, but you may want to stick with me; it's a beauty! On the third FCF flight of an A-10 with continuous APU problems, I decided to try an APU-assisted air start of the Number Two engine at 15,000 feet to check out the airflow output on a new APU. In accordance with Dash 6 procedures, I fired up the APU, cooled the right engine, and shut it off. After the engine had then cooled to below 150 degrees, I was ready to go for the start process: Pull Number One to idle, lift Number Two over the detent to idle for start. Oops!

Whadda ya mean, Oops? You know it may sound strange, but as soon as I whipped that good engine from MAX to OFF, I knew I was in trouble. The sequence of events went into slow motion. My first reaction was to throw the throttle back up, say I'm sorry, and start all over. Sanity prevailed, however, and I realized I would be looking at a pretty bad overtemp on that engine if I did.

"Bold face" said the little man in the back of my head. Sure. What have you got to lose? You're not going home on the APU. THROTTLES — OFF: That's easy. We're already there. APU — START: Easier still. It's already going. FLIGHT CONTROLS — MAN REVERSION: Simple. I had checked that twice on the first FCF, so I knew I was in good shape. LEFT ENGINE — MOTOR: No thank you very much. I'm at 13,000 feet, and the terrain is 8,000 feet. Let the guys at Edwards practice low altitude, dead airplane tests. I need an engine now! Just prior to the big blunder, the right engine had already been cooled. That seemed a better choice for an easy start. Crossfeed was already on as a Dash 6 precaution, so now it's RIGHT ENGINE — START.

If ever there's a place where you don't want to FCF check an APU, it's while you're gliding helplessly towards the ground. As any FCF puke will tell you, there are two characteristics of the APU assisted start at 15,000 feet: (1) the Number Two engine has a tendency to produce warm or hot starts, and (2) the core rpm will periodically hang up at 56 percent. My right engine had cooled sufficiently to preclude the former, but it did opt for the latter. Help!

We'll note here that in the Dash 6, a note states that if the right engine fails to start at 15,000 feet, descend to 10,000 feet and reattempt. So, the key word is patience. Don't panic! Sure enough, at around 11,000 feet the rpm started to creep up to idle. I was out of the woods, literally, by a whole 3,000 feet.

So why do I bare my soul to the world for being such a bozo? Call it conscience or maybe just a desire to save some other poor fool from the same stupid mistake. Regardless, there are lessons to be learned:

1. Think before you do!

2. A lot of flying time is worth something only if you apply Lesson One.

3. Do the bold face. Also, think as you do the steps. There may be common sense items to do along with the bold face. For example: Use whatever residual hydraulic pressure you have left as the engines unwind to establish a 1-G level glide as you're performing Steps 1 and 2 of the dual engine loss procedures.

4. After you've done it all, think again to make sure you did it right.

If you have never done an FCF, go find someone who has, buy him a Scotch, and talk to him. Strange things happen to Warthogs when you shut off motors and other nice-to-have items. It may be worth your while to hear a few war stories. ■

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Spin Avoidance
In The F-5

This article was written shortly after the F-5 spin trials in 1976. It still applies today. You will note, however, that there is no discussion of the shark nose F5-F (F-2). It was not included in the tests since it hadn't been developed yet. While the F-2 model is more resistant to spinning than the conventional F, it can generate extremely high pitch rates and will stall and spin. The F model is more sensitive in pitch than the E, so pitch control is more critical. This article, as the authors state, is about preventing loss of control. For, if you are out of control in a fight, you are losing.

R.G. "DICK " THOMAS*
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and
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F-5 Aerodynamics

■ During 1976, a joint USAF/Northrop test team at Edwards AFB, California, completed an extensive spin avoidance program for the F-5E and F-5F. The test programs emphasized *spin avoidance* rather than *spin recovery*. The overall objective was to develop simple spin avoidance techniques based on the natural stall and out-of-control warning provided to the pilot in head-out-of-cockpit maneuvering. The primary effort in this type of testing involves placing the aircraft into poststall gyrations (PSG) of increasing duration and relying on the pilot's judgment to apply recovery controls based on the aircraft feel. This is much like walking around a hole in the ground and waiting until the edge breaks off before jumping to solid ground. Sooner or later the inevitable happens. To safeguard the airplane and pilot, provisions were made for recovery if aerodynamic controls failed to accomplish recovery. These provisions included a 24-foot ringslot parachute installed on the tail in the area normally occupied by the landing drag parachute.

As an indication of the scope of these tests, a few statistics are worth quoting. The F-5E test produced 70 flights with 430 erect and inverted maneuvers which resulted in five erect spins for the clean aircraft, two erect spins with external stores, and five inverted spins. The spin recovery chute was deployed on two occasions. The F-5F test produced 37 flights with 195 erect and inverted maneuvers which resulted in three erect spins for the clean aircraft, one erect spin with external stores, and one inverted spin. The recovery chute was deployed on three occasions. A comprehensive US Air Force movie entitled "F-5E/F Hig[h] Angle of Attack Characteristics" (Accession #40233) based on these programs is available through your local USAF representative and highly recommended for viewing by all user squadrons.

The test investigations covered two general areas: (1) Determining the erect (positive G) characteristics for all configurations, and (2) determining inverted (negative G) characteristics for the clean aircraft and for the centerline tank configurations.

The tactical maneuvers performed consisted of zooms to zero airspeed, high speed yo-yo's, aborted Immelmanns, and inertially coupled entries, which included rapid lateral and longitudinal stick movements after 360 degrees of a full aileron roll and wings-level from a trimmed condition.

Results

Now let's summarize some of the results obtained from these tests:

In the clean configuration, th[e] F-5E was found to be highly resis-

continued

*In the years since these tests, Mr. Thomas has left Northrop's Aircraft Division to work at Northrop's Advanced Systems Division.


G. WRIGHT

tant to departure from controlled flight and spin entry with an increased resistance when maneuvering flaps are used. Departures and spins could be generated, but required specific control and timing techniques in conjunction with a critical speed and cg range.

The resistance of the F-5F clean configuration to departure and spin entry was found to be dependent on the airplane cg and flap position. At a nominal cg, the airplane was resistant to departure and spin entry, and this resistance was decreased with flaps up. At an aft cg, the airplane was more susceptible to departure and spin entry, the susceptibility being reduced with maneuver flaps. As with the F-5E, the departures and spins generated required specific control and timing techniques in conjunction with a critical speed range. In addition, out-of-control flight could also be induced by abrupt full aft stick applications from AOAs below stall, regardless of flap position. When the AOA was allowed to progress above 35 degrees, there was a significant degradation in the flight characteristics. Due to this response, it was recommended that a 29-unit AOA restriction be applied to the F-5F in the clean configuration.

Both the F-5E and F-5F will provide many clues to warn you that you are on the verge of departure. The wing rock (roll and yaw) motions are of large amplitude and easily recognizable. If loss of control does occur, the best spin avoidance technique is a natural reaction; that is, for erect (positive G) conditions, push on the stick and get the flaps down. Inverted (negative G) conditions include the inverted pitch hangup (IPH) and the inverted spin. The IPH results from an unstable negative pitching motion which occurs anytime the aircraft approaches inverted stall angle of attack. In these inverted attitudes, the subsequent motions are too disorienting for you, the pilot, to be able to determine any direction of rotation. For this reason, don't try to apply any rudder or aileron, as they will only aggravate the motion. Just put the flaps up and keep pulling on the stick as necessary to pull the nose through.

Various external store configurations were also flight tested to determine their effects on departure and spin. These included centerline tanks (150 and 275 gallon), centerline SUU-20, and a heavy store configuration with four BLU-27's and a centerline 275-gallon tank. Asymmetric stores were flight tested, a single Mk-82 on the inboard station, and a single missile configuration. Completing the testing was the inflight refueling (IFR) probe configuration.

The large centerline stores had significant effects on both departure and spin for the F-5E and the F-5F. Both the 150- and 275-gallon tanks made the airplanes extremely susceptible to departure and susceptible to spin entry.

The SUU-20 configuration was susceptible to departure, but resistant to spin entry. Because of this overall degradation relative to the clean configuration, a maximum AOA limit of 20 units has been imposed when carrying any centerline store loading. This limit is also applicable when carrying any symmetric store/centerline tank configuration.

The single AIM-9 missile on both the F-5E and the F-5F did not produce any significant adverse effects, and flight characteristics were essentially unchanged from that of the basic airplanes. The single Mk-82 bomb mounted on the inboard pylon is the minimum attainable operational asymmetric wing-pylon store loading. This loading was extremely susceptible to departure on both the F-5E and the F-5F, susceptible to spin entry on the F-5E, and extremely susceptible to spin entry on the F-5F. The F-5E demonstrated that a recoverable oscillatory spin existed with this loading, whereas a recoverable spin is very unlikely for the F-5F with the same loading. Therefore, to preclude departure/spin entry with asymmetric pylon stores, do not exceed 20 units AOA.

The basic F-5E and F-5F airplanes with the IFR probe installed were evaluated with flaps in the maneuver position only. For the F-5E, this configuration behaved similarly to that of the basic airplane with flaps up. For this reason, when flying this configuration at AOAs above 20 units, place flaps in the maneuver position. The F-5E is resistant to both departure and spin in this configuration, while the F-5F is somewhat less resistant to departure and spin than the F-5E. As a result of this testing and a subsequent "High AOA" flight test program, the restriction on the F-5E with IFR probe is 20 units AOA for CG (center of gravity) aft of 12 percent MAC, and 24 units or stall AOA (whichever occurs first) for CG at or forward of 12 percent MAC.

Summary

It can be concluded that both the F-5E and F-5F in the clean configuration can be safely maneuvered to their maximum tactical capability without experiencing departures or spins. Departure will be experienced if configurations of external stores are subjected to maximum performance maneuvering exceeding 20 units AOA. The most important conclusion, however, is that all departures can be avoided if the pilot applies recovery controls when he observes the airplane's natural stall and out-of-control warnings.

Some Operational Considerations (View from the Cockpit)

No pilot ever intends to fly an airplane into a condition where he cannot recover. I hope all you pilots agree with that statement, because in the F-5E and F-5F spin programs, I was always trying to go into the worst possible condition but still recover using flight controls. We had the ultimate backup system during those maneuvers in case

In the 21 years that the F-5 has been in the Air Force inventory, 38% of the F-5 Class A mishaps have involved loss of control — mostly spins.

things got out-of-hand, a spin recovery chute. Operationally, you don't have a recovery chute, so take heed from what we learned spin-testing the F-5.

It has been almost nine years since the last test maneuver was flown, and there have been ten spin related accidents, nine in F-5Es and one F-5F. Most of these accidents have occurred in USAF Aggressor or US Navy TOPGUN aircraft, which fly the most stressful peacetime scenarios in use. There are probably two main reasons for the good results. First, you guys using the airplane know what you are doing, and second, the F-5 is very resistant to spin or even out-of-control departure. I am going to assume your question is, "Why write any more about the subject?" Being a little inclined toward philosophy, let me answer with a question, "Have you read the pilot's Flight Manual lately, particularly the bold print and the flight characteristics in Section VI?"

Bold print emergency items are those words we all learn and can repeat from memory every time the Stan Eval Team gives us a test. Yes, even test pilots get tested. So what! Well, I just read Section VI again and started thinking about all this memorizing of the bold print. Have you ever compared the bold print with the flight characteristics, Section VI, in an effort to see why you memorize the words?

The logic is there, but sometimes it is not obvious unless you have spent some hours reading the description and had some direct exposure to each type of condition described. Many times in this flying business you are prohibited from personal exploration past established limits, because tests have determined that if you exceed the limits, you may not be able to recover the airplane. Exceeding limits can be hazardous to your health! From these same tests, we determine the quickest and most positive method of recovering from each condition. The bold print is written in the shortest form with the idea of solving the worse condition expected. That's what started me thinking. In some cases where mild PSGs are encountered, full forward stick might drive you into an inverted departure. When we wrote the bold print emergency procedure, everyone was concerned about the results of too much recovery control for PSGs. So we took the attitude "fly the airplane — forward stick (as required)." That little phrase, "as required," means just that — keep going forward until you get results or until you hit the forward stop. If we had said "full forward stick" for every departure, a lot more of you would be seeing the inverted pitch PSG/spin, because that is one way of getting there. The bold print is correct the way it is written, but the element of judgment requires the pilot to apply the necessary amount dependent upon the response of the airplane.

I can hear somebody in the back of the room asking, "How long do I hold it?" The answer is *"until it recovers."* Sounds easy, but when you are wrapped up in one of these out-of-control conditions, you might have to sit there *holding recovery controls* and a few seconds may seem like a long, long time. Whatever you do, don't try to develop or invent recovery procedures just because the airplane is not recovering. At these slow speed conditions, airplane response is going to be slower than what you are accustomed to, and depending on your trim setting, it may take two hands to hold the stick forward.

In the test program, we observed some conditions which looked like a slow nose down spiral, until you looked at the airspeed. The airspeed was between 60 KIAS and 110 KIAS with oscillations. If you applied aileron to stop the roll, you were actually applying control which would promote a spin. Forward stick (as required) was the only control which did the job in the spin program for PSG recovery, but the bold print and Section VI are not intended to explain all the procedures that *did not work*. They give you the information based on a considerable engineering and flight test effort.

continued

One purpose for spin tests and the reason we study the results is to develop an understanding of why the bold print steps are written as they are.

SPIN AVOIDANCE in the F-5 continued

There is another advantage to holding forward stick, particularly when you realize how we intend the "as required" to work. If the airplane is not recovering from the PSG, it may be in the first stage of a spin. Don't relax the forward stick, since forward stick is the first bold print item for *spin recovery* too. Now all you need to do is determine the direction of the spin rotation. Easy, huh? No, because experience has shown us that some spins begin with a slow rotation rate, oscillating in pitch and roll so much that the direction of rotation is not obvious. DO NOT APPLY ANY ADDITIONAL RECOVERY CONTROLS UNTIL YOU KNOW WHICH WAY YOU ARE TURNING. I recovered the airplane from several oscillatory spins using only forward stick. The bold print procedure is for the most severe condition, but in mild conditions it may not be necessary. Don't get the wrong idea; the bold print is the best procedure. Your only concern is to apply the controls until you have the AOA and the airspeed back in the operating range. These two parameters are the primary indicators for recovery.

If you get into a condition in ACM where the airplane does not feel right, such as a continuing yaw after you have released rudder, you are probably in a PSG. Now is the time to get the stick forward and look for the AOA and airspeed gauges. If the airspeed is above 30 KIAS and the AOA is below stall, you have solved the problem. I've talked to some pilots who thought they were in spins when they were really in increasing airspeed, negative-G spirals. This happened because they held the controls in after the AOA and airspeed had recovered. They analyzed the problem when they looked in the cockpit and saw the AOA and airspeed. I think this is a reasonable approach: APPLY RECOVERY CONTROLS AND THEN CHECK THE GAUGES IF THERE IS ANY QUESTION ABOUT RECOVERY. If you look for the gauges first, you might miss your chance, and the longer you wait to apply controls, the less chance you have of recovery. If you hold them in after recovery, you will force the airplane into another gyration.

When you have finished reading all of Section VI and you are sitting in the airplane, check to see how much force it takes to hold full forward stick and full aileron. But remember, the aileron force will be higher with the gear up.

In ACM, the pilot who gets the most out of his airplane without losing control has the best chance of winning. If you lose control trying to out-maneuver your opponent, it can be just as bad as being shot down — you lose either way. The tests showed that the F-5 does not depart from controlled flight directly into an unrecoverable condition. The Section VI flight characteristics describe the conditions which are associated with the beginning of departures. After you enter these conditions, you have several seconds to apply recovery controls for PSG, so you can fly the airplane to its maximum performance without fear of losing aircraft control. This is another thing which is hard to put into words, and I must rely on the spin test data to clarify the subject. We flew the test maneuvers well past the area of PSG described in Section VI without spinning. Then we determined how much warning the operational pilot would have prior to a spin. In most cases, the conditions were held for 15 seconds or longer.

In ACM situations, if you hold the controls in one position for more than 15 seconds, you'll probably get your buns shot off. It only takes one second to accomplish a snapshot — two seconds if you use a long burst. During the tests, a few conditions were encountered where the airplane was in a strong departure (PSG) after five seconds, but the motion was so obvious that recovery controls could be applied well before a spin was encountered. In ACM, the PSG will be obvious because you can no longer track the target.

If you are trying to force an overshoot when somebody has accidentally entered your cone of vulnerability, use everything available, but you must be prepared to back off the controls if the airplane doesn't feel right. I see another question, "What do you mean by 'the airplane doesn't feel right'?" It doesn't feel right anytime the airplane is doing something you did not command.

During the spin test program, most of the pilots agreed that one of the warning signals was a very smooth rapid increase in yaw rate. This was preceded by abrupt oscillations in roll, pitch, and yaw, but just as the airplane transitioned from the random uncontrolled motion to the incipient spin phase, there was a very strong increase in yaw rate. Most of you will recognize this type of motion, because it is so different from the normal flight motion, seen in all flight areas. Roll and pitch are always there with G and acceleration, so we are accustomed to these, but when the airplane slides sideways, it gets your attention. The other part of the motion which always opened my eyes was the yaw angle, because it was different than yaw seen with wing rock. You can tell when you have something unusual because it gives you the feeling it is not going to reverse like wing rock — it looks like it is just going to keep yawing. Guess what? That's exactly what is happening.

If you don't stop the motion with recovery controls, you may have to walk home. I don't expect many of you to encounter this area because you should back off the controls long before you reach this point. What I have just described is the transition from a PSG to a spin as we saw it in the test program. The handbook intends for the pilot to stop at the beginning of a PSG, but sometimes in the whiteknuckle areas of ACM, you go further than you need to, so be ready with the recovery controls. Actually, the F-5 does very well in ACM without going out of control (or at least, so the ACM experts tell me). In fact, I have been told by these experts, if you are out of control, you are probably not winning the fight.

— Adapted from Northrup *F-5 Technical Digest*, May 1985. ■

Quench Your FATIGUE

■ One of the more common causes of fatigue is one that can be most easily treated. The cause — dehydration; the treatment — water. Let us consider a few points on dehydration.

■ We lose about a quart of water a day through normal excretion.

■ In very hot conditions, sweating can cause the loss of up to an unbelievable four quarts in an hour. (We won't lose that much in the cockpit, but we may lose quite a lot.)

■ At altitude, there is less nitrogen, less oxygen, and less water. The tendency is for the human body to try to share its water with the virtually water-free atmosphere.

■ Water loss from low humidity at altitude increases "insensible" perspiration — insensible because we do not notice it. We could just as easily call it evaporation. Our bodies are 75-80 percent water; like a wet sponge in the desert, we are continually losing water through evaporation. The rate of insensible perspiration increases when the body goes to altitude.

■ A lot of our dehydration is self-imposed because we probably do not drink enough water in the first place. When the body gets thirsty, it is already about a quart low; drinking sweetened drinks can sometimes be the last thing the body needs at this point.

■ How many of us ask for, and drink, water with a meal? Not many . . . why? Because we want something sweet, right? But when the body gets thirsty, sugar can complicate absorption of water. Alcohol and coffee actually can cause the body to lose more water than it gains.

Why haven't we dried up like a piece of seaweed by now? Fortunately, we get water in our foods and our body produces water as a by-product of cell respiration. Put those with the water we get the hard way through sweetened drinks, etc., and we manage to stay alive, but we are usually walking around in an almost freeze-dried state . . . there is no doubt that this dehydration makes us feel fatigued.

Even the early stages of dehydration can lead to emotional alterations and impaired judgment — not the sort of changes that go well with flying. Fatigue through dehydration should be realized by aircrew and treated — stop and take a couple of swallows of water. Water really does quench fatigue. — Adapted from *Cockpit*. ■

Monday Morning Quarterbacks Are "GOOD GUYS"

LCDR. PAUL MILES

■ The obvious sign was there for anyone to see: The Fresnel lens was tilted up at a crazy angle with the top cell and the cut lights missing. The windbreak forward of the lens had been chewed up too. But the thing that really caught my eye that morning — the morning after — as sailors worked to clean up the debris, was the F-14 mainmount lying in the port catwalk up near the end of the angle-deck. You could see a mark that ran for a hundred feet along the catwalk itself where the wheel had tried to penetrate the metal. Finally, it had been peeled off the airplane. And there it sat with everyone not quite sure whether to move it or leave it alone.

The CATCC watch had become something of a routine here in the Indian Ocean, in the summer of 1983. Visibility was rarely more than two miles, so we were doing Case III IFR recoveries day and night. That meant that those of us on our second tour were spending a lot of time down in CATCC, making sure our pals were kept out of trouble. In the daytime it wasn't so bad, although the deck was pitching and that caused a bolter or wave-off periodically. At night, though, it was showtime, and our F-14s were right up there in the limelight. With missiles, we were getting our first look at the deck with about 5.8 on the fuel (5,800 pounds), and it was averaging 60 percent that you'd get to land on the first pass. So as I walked into CATCC and took my spot on the sofa, I was mentally ready for an exciting night. Little did I know.

I watched them launch 100 and 103 about an hour after sunset, and then I began concentrating on the recovery. In the middle of things, 100 called up on departure and asked to speak to a rep. That was me.

"One hundred, rep. This is Scotty. Go ahead."

"Yeah, Scott, we just lost our right generator, and it won't reset."

"OK . . . how does the bus-tie look?"

"It looks good. We have no other problems, and we intend to stay out for the full cycle. Just thought I'd let you know."

"OK, no big deal. See you on deck."

One hundred was being flown by "Skeet" Wilson and "J.R." Ewing. Skeet, the pilot, was first tour, but had a cruise and about 800 F-14 hours. He knew the airplane as well as any of us, and flew it better than most. He was a friend of mine. J.R., of course, was a nugget and a good one. No problem. I made a mental note to tell maintenance about the generator, but otherwise dismissed 100 from my mind.

I'd just caught our second jet (after a bolter) when the Air Ops officer got a call from Combat.

"Air Ops, Combat. One hundred has lost his left engine, and is returning as an emergency."

Holy Smoke! I could kick myself! I'd let him stay out! I could have told him to come on back! *Now he'll be doing a single-engine at night to a pitching deck. Thank God it's Skeet.* Those were my first thoughts. Then I realized I had some work to do. I called the ready room to have them inform the CO. Then I pulled out the NATOPS Manual, Pocket Checklist, and our own Pri-fly/CATCC Guide.

Finally, 100 was switched to a frequency on which I could talk to him. He was 100 miles out.

"Center, 100. We're up waiting for our rep."

"Roger 100, this is your rep. Tell me what you've got."

"OK . . . we just started losing rpm on the left motor. It went down through 40 percent, so I shut the throttle off and tried a restart. Nothing happened . . . no lightoff."

"Did you have fuel flow?"

"Negative. We also got a fuel pressure light as the rpm was winding down. I don't know if that has anything to do with it."

"Roger, you still have your right generator problem?"

That's affirm. We're on the emergency generator now. Bi-di pump is working, so combined pressure is 2,600 psi."

OK, what's your state?"

"Right now I've got 15.0. The drops are empty. My max trap is 5.8."

"OK, we're getting ready down here."

Meanwhile, Air Ops was in conference with the bridge. The captain wanted to know whether to try and divert 100 to a shore base. Diego Garcia was 1,600 miles away. Masirah, Oman might be available at 300 miles. That would require diplomatic clearance. My skipper arrived during that discussion. Our sister squadron had had a day single-engine two weeks ago, and it had been no sweat. Besides, Skeet was flying. We would take him.

"One hundred, rep."

"Go ahead."

"Yeah, we've decided to take you

continued

Safety officers have long been criticized for "Monday morning quarterbacking" over mishaps. Yet, when done right, such analysis is a key element in breaking the chain of events which can lead to future mishaps.

Here is an excellent example of the right kind of "Monday morning analysis" taken from *Approach* magazine.* Lcdr. Miles' comment regarding new, unforeseen problems applies just as much to our Air Force aircraft. How expert are you in your "systems knowledge?"

*"The Morning After," *Approach*, May 1985.

Monday Morning Quarterbacks Are "GOOD GUYS"

continued

aboard. I'd like you to go through the single-engine, combined hydraulic pressure low, and dual generator failure checklists for me, and report them complete."

"Roger, that. Oh . . . I'm getting a bit of fuel split here. The left tape is full, and the left wing has about 1,800 pounds. The right tape is at 5.9, and the right wing is empty."

"That's no problem. You can expect a fuel split while you're single-engine. You're only burning fuel out of the right side. You'll have to use the transfer switch to get that left-side fuel. When you decide to go for that fuel, just make sure you're in a level attitude, or it'll gravity-flow forward or aft on you."

"OK. I'll let this right side burn down some more before I do that. We're 88 miles out."

Aboard the ship we began getting our ducks in a row. We wanted a little more than minimum wind-over-deck, but not too much. Twenty-four knots was perfect. We told the controllers to set him up so he wouldn't need any big left turns (turns into the dead engine). We briefed the wing LSO — he was an A-7 guy, but had waved the single-engine two weeks ago — on the need for burner and rudder in the event of a bolter or waveoff, and that line-up would be a bear. The LSO went to a target two-wire and rolled the lens down to the single-engine setting (due to the fast approach speed, reduced angle-of-attack, and reduced hook-to-eye distance). We were ready.

"One hundred, rep. You have a ready deck."

"Roger, I'm down to 13.0 now, and something screwy is going on with the fuel."

Thirteen point zero! How could he burn that much fuel in . . . how long? Five minutes?

"What have you got again?"

"We've got 13.0, which seems to be excessive consumption. My left tape reads 6.4, left wing is . . . the left wing is now full with 2.0! Right tape is 4.6. Right wing is empty."

"You say the left wing has increased?"

"That's affirm. I checked it before we went single-engine, and it was down to about 1,400 pounds."

What the heck's going on here? "How far out are you now?" I said.

"We're at 52 miles."

"OK, you'd better try and get some of that fuel out of the left side. Go AFT on the transfer switch."

"OK. AFT selected."

The skipper was confused, and so was I. He'd never had a real single-engine himself. I'd had one at the field, but I'd landed immediately. Something wasn't right here. At least approach had radar contact now and started vectoring him to final. With luck, this would be over in 10 minutes.

"Rep 100. I'm not getting any fuel out of the left side. Right side continues to go down. Six point four on the left, 4.0 on the right. I'm going to start dumping now down to max trap."

I knew Skeet was doing the arithmetic with me. We had to get that fuel out of the left wing, or Skeet would only have 3.8 usable fuel for his landing. Also, what about lateral asymmetry? Two thousand pounds in the left wing was a lot, and it was on the same side as the failed engine. Dumping would make room for that wing fuel in the fuselage. It would also open the motive flow isolation valve if that had failed . . . was that the problem? It didn't make sense. What if he dumped and then still couldn't get the left-side fuel to the engine?

"One hundred, rep. Secure your dumps and read off your fuel gauge again."

"OK, dump's off. Left tape is 5,400. Left wings is 1,900. Right tape is 3,000. Total is 10.3."

"And you're still in AFT, correct?"

"That's affirm. Left wing is coming in, down to 1,800 now. Left tape is rising rapidly. Five point eight on it now. Right tape, 2.3. Something's not right here."

God, I thought, *he can't get the left side fuel to the engine. And he's only got 2,300 pounds usable!* I told Air Ops to send a tanker to 100 immediately. He agreed. I saw panic on the CO's face. Then I heard the panic on the radio.

"OK, Scott . . . the left tape's back up to 6,400, the left wing is full again, and I'm down to 1.8 on the right tape! It's going down fast! *What do I do?*

Fuel is going from right to left, I *thought. We've got to stop all paths it can take. He's got a windmilling engine. That's driving a motive flow pump, and it's pumping fuel out into the left wing and aft fuselage. But the left engine isn't burning it — so it just piles up. Also the crossfeed valve is taking boosted fuel from the right side and sending it to the dead left engine! With AFT selected, right side motive flow is going to the left side as well!*

"One hundred, rep. Pull your left fuel shutoff handle. Reselect normal transfer. Turn wing transfer off."

"Roger!"

Now, how to isolate the right fuel system?

"One hundred, pull the fuel feed and dump circuit breaker by your right knee, and tell me your right side state."

"Done. I have 1,200 pounds in the right feed and tape, and I have a right fuel low light."

"OK. The tankers coming your way with six to give. You have 1,200 pounds of usable fuel on board! Use fuselage only when you tank."

"Roger, a vector please."

Night tanking . . . single-engine. The minutes began to stretch toward eternity. *Their radar won't work on the emergency generator. Twenty miles apart. Ten miles. Clouds.*

"One hundred's Tally-ho."

"Tanker's no joy."

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Flight Safety Crossfeed

MAJOR JOHN E. RICHARDSON
Editor

■ Last November, I wrote an analysis of winter flying problems gathered from mishaps for a 10-year period. Now that summer is here, I have done another analysis of the summer flying months. Once again, we are looking at mishap categories and second level causes strictly for the ops related mishaps. The data for the analysis cover the months of May through September and the years 1974-1984.

For convenience, I have divided the mishaps by category. However, the emphasis is on the facts and not statistical categories. So let's look at problems with summer flying.

The first question might be: What's the difference between summer flying and winter flying problems? The answer, not too much. The numbers of mishaps and categories are relatively equal. Although there is an increase in the total number of mishaps in summer, this is matched by a corresponding increase in flying time (exposure). The first difference that appears is a shift in categories. During the winter, collision with the ground was the biggest problem. In the summer, the problem shifts to loss of control.

Loss of Control

The first thing apparent when looking at loss of control mishaps is that scheduled ACM/BFM missions account for less than half the mishaps.

The second level causes cover almost all categories: Fatigue, lack of proficiency, equipment malfunctions, and discipline breakdown. Here are some typical examples.

■ Three F-4s on a scheduled armed recce ground attack mission proceeded to the target area where lead called the target for No. 2 who, after picking it up, turned for the attack. At this point, lead, realizing that No. 2 was too close, called for No. 2 to "Take it through high and dry." Shortly thereafter, the third aircraft in the observation position saw the pitch and bank of the No. 2 aircraft increase rapidly. The aircraft departed controlled flight, and the crew ejected, but out of the ejection envelope.

■ A student pilot was scheduled for an aerobatics mission. The pilot was fatigued from a heavy flying and academic schedule. While attempting a barrel roll, the aircraft dished out at the bottom and entered a high speed dive. The student was unable to recover and ejected at high speed, sustaining fatal injuries.

■ Two F-15s were engaged in a 1 V 1 engagement during a BFM mis-

continued

Flight Safety Crossfeed continued

sion. As the F-15 attacker closed for a gun attack, the defender attempted a negative rudder roll to defeat the attack. The aircraft reacted properly but the pilot misinterpreted the resultant roll as an out-of-control condition. The pilot did not apply the correct recovery controls, and the aircraft entered an uncoordinated nose-low roll at low altitude. The pilot, disoriented from the continuous rolls, was unable to recover and ejected.

■ A transport aircraft was on a low level combat training mission. The aircraft reached the drop zone early and below briefed altitude so the crew did not drop the cargo. During the escape maneuver, the pilot turned in the direction of high terrain and focusing outside the cockpit, increased bank and pitch, allowing the airspeed to decay until the aircraft stalled, too low for recovery.

Collision with the Ground

Although hitting the ground is the proximate cause of almost all aircraft mishaps, this category is reserved for those mishaps where the aircraft was operating normally until impact. For the purposes of this article, I have combined the on-range and off-range mishaps into one category.

In looking at the second level causes, three things stand out. First, lack of experience or proficiency is a killer on the range. This is particularly true when the mission pressure gets high. For some reason, as the fangs grow, blood drains from the brain and pilots seem to forget the basics of flying. Finally, fatigue (chronic, acute, or both) was specifically identified as a factor in 20 percent of the mishaps. Long days and good flying weather make it hard to get enough rest.

Here are some examples.

■ An A-7 pilot was scheduled for a night mission to an unfamiliar range, despite his lack of recent experience. While making a radar attack on an uncontrolled overwater range, the pilot became disoriented and allowed the aircraft to descend into the water.

■ A multiengine aircraft was scheduled for a higher headquarters-directed mission. The crew experienced lengthy delays in getting the aircraft ready — extending their crew duty day. The combination of frustration and fatigue led to inadequate planning and as a result, the aircraft struck high terrain on departure.

■ A fighter pilot was No. 2 in a BFM mission. He had not flown a similar sortie in almost six months. Further, the pilot was not in very good shape to fly at all, much less a demanding mission. He was hung over, had very little sleep, and was apparently self-medicating for hay fever. The pilot did not inform squadron supervisors that he was not fit to fly. During the third engagement, the aircraft entered a wings-level descent from which the pilot did not recover.

■ An F-16 pilot was lead of a two-ship night surface attack mission. The mission was scheduled at the end of the pilot's maximum crew duty day. Prior to range entry, the pilot successfully flew seven intercepts. Setting up for the first target pass, the F-16 struck the ground while lining up on final.

Landings

Hitting the ground is not confined to ranges. Landing mishaps accounted for the third highest number of mishaps during our study period. Here is the area where IPs are most prominent. That is, in the majority of landing mishaps, an IP was on board and usually failed to take action to prevent the mishaps. The same factors, event proficiency or experience, fatigue, and mission pressure seem to be very common in landing mishaps, too. The discussion on takeoff and landing mishaps will be short since the subject is covered more thoroughly in another article in this issue.

Some examples follow.

■ A T-33 with a pilot and IP took off for a training mission. The first mission event was a simulated flameout pattern. It had been a long time since the IP had flown such a pattern, and the pilot trainee had never flown one. At high key, the pilot configured the aircraft according to Dash 1 procedures. As he turned final, the pilot selected full flaps. Several seconds later, the IP, seeing that the aircraft would not make the runway, told the pilot to go back to 50-percent flaps, then directed full throttle. The slow acceleration of the T-Bird engine did not provide timely response. So the pilot raised the flaps in an attempt to stretch the glide. The IP did not prevent this despite the fact that the aircraft exceeded the gross weight for a flaps-up approach. The aircraft entered a high sink rate and struck the ground more than 600 feet short of the runway threshold.

■ A transport aircraft was on an overwater mission with an inexperienced co-pilot and a recently upgraded AC. The copilot had not had adequate crew rest prior to the mission. During landing roll, the AC mistook a crest in the runway for the end of the runway and initiated a go-around. He overrotated the aircraft. Due to a combination of inexperience and fatigue, the copilot could offer no assistance. The aircraft became airborne in an extremely nose high attitude, then struck the runway left wing first, caught fire, and was destroyed.

Midair Collisions

During the period of this study, there were 18 midair collisions. Although some were the classic midair collisions between aircraft unknown to each other, the majority were either members of the same flight or tankers and receivers, all of whom knew the other aircraft were there. The cause factors are obvious in most cases so one or two examples should suffice.

■ Two F-5s were on a BFM mission. The IP initiated a high angle gun pass against the student's aircraft. The student negated the attack with a hard right defensive turn. The IP did not "knock it off" when the gun attack could not be pursued. The student then maneuvered into the vertical plane, which placed the two aircraft on a collision course. The IP did not anticipate the student's maneuver and lost sight of the other aircraft. Neither pilot made any attempt to avoid the collision and both aircraft were destroyed.

■ Two F-15s were positioning prior to a 2 V 2 engagement. The element lead initiated a cross turn to maintain VMC in an area with no discernible horizon. The wingman was confused about the maneuver, and while lead's attention was directed at guiding the wingman, he allowed his aircraft to transition from a descending to a climbing turn. The wingman, his attention diverted inside the cockpit, failed to see the collision developing. Lead attempted a last ditch avoidance maneuver but was unsuccessful.

Violations of Flight Discipline

There is one other area that is of concern. In reviewing the mishaps during the study period, an inordinate number involve violations of flight discipline. I am not referring to inadvertent errors in altitude or procedures, but deliberate flaunting of established rules. The risks should be obvious, but to reemphasize, here are some examples.

■ Two fighters were on a low level navigation mission. After the low level, the flight made a lead change and began a series of BFM and trail maneuvers in direct violation of command directives. During the maneuvering, the trailing aircraft departed controlled flight at an altitude too low for recovery and the pilot ejected.

continued

Flight Safety Crossfeed continued

■ A fighter pilot was known to be extremely aggressive and had a cavalier attitude toward flight restrictions and procedures. After completing a low level mission, a flight of two, with this pilot as wingman, made three passes over the termination checkpoint (a lake). Witnesses observed the aircraft at very low altitude with No. 2 below Lead on each pass. On the third pass, the aircraft performed individual rolls. Number 2 rolled inverted and held that attitude for several seconds before starting to roll upright. The aircraft then nosed over steeply and crashed.

■ A pilot habitually violated crew rest requirements as he had prior to the mishap flight. During extended trail maneuvering, the IP in the lead aircraft initiated a 2½ to 3-G left chandelle. He observed the wingman begin a crossover to the inside of the turn. When No. 2 did not reappear, the IP reversed his turn and observed the No. 2 aircraft about 2,000 feet below in a 40-to 50-degree wings level dive. Repeated calls by the IP — first to recover and then to bail out — went unheeded until just before impact when the pilot initiated first a rapid pull out, then ejection.

■ An OV-10 pilot was returning from a mission when he contacted Tower and requested a low approach followed by a full stop. This was approved, and the pilot made his low approach gear up at 50 to 75 feet and 200 to 220 kts. At the departure end of the runway, the pilot pulled up sharply to 800 to 1,000 feet downwind, angling in toward the runway. At the final turn point, the pilot abruptly rolled into 90 plus degrees of bank with the nose 30 to 35 degrees below the horizon. The aircraft remained in this attitude until it was about 100 feet AGL. At this point, the pilot attempted to roll out and arrest the descent, but the aircraft struck the ground 86 feet short of the runway and was destroyed.

■ An IP and student pilot were scheduled to fly the student's last sortie in UPT prior to graduation. Once in the operating area, the student pilot attempted an Immelmann but broke off the maneuver due to low airspeed and proximity to the floor of the area. He then maneuvered for a second attempt, selected afterburners, and at about 350 knots, began a high G pullup for the maneuver. The pullup overstressed the aircraft but the IP allowed the student to continue. At about 30 to 45 degrees of pitch and 300 knots, the student stated that he was going to lower 60 percent flaps to which the IP agreed. The student then mistakenly lowered full flaps, which the IP failed to correct. As the aircraft approached the vertical at about 150 knots, the IP took control but did not initiate an immediate recovery. The aircraft entered first a vertical stall, and then an inverted deep stall from which the IP was unable to recover.

■ A flight of four fighters was engaged in a 2 V 2 element tactics mission. The pilot of the No. 3 aircraft installed a personal movie camera in his aircraft. During the second attack, Nos. 3 and 4 intercepted the lead element as they egressed from the target. Number 4 began his attack and called FOX 1, then closed for a gun attack. Number 3 did not maintain proper position but flew a high angle-off tracking maneuver on No. 4 in order to film the attack. Concentrating on the camera, the pilot of No. 3 failed to maintain separation from No. 4 and the two aircraft collided.

■ A transport was on the second leg of a three-day airlift mission. The aircraft commander violated directives and allowed the copilot to make the approach and landing at an en route stop. On the first approach, the copilot flew a poor traffic pattern and executed a steep 50 percent-flap final at an airspeed which exceeded flight manual limits. The AC did not correct this error. The copilot was unable to land out of the approach and went around. The second approach was also steep and fast. The aircraft touched down with 3,400 feet of runway remaining, 40 knots above recommended touchdown speed. After touchdown, the AC took control of the aircraft, but rather than executing a go-around, attempted to stop it. He lost control of the aircraft, which departed the right side of the runway, did a 180-degree turn, slid across the runway, and came to rest on the left side of the overrun.

After looking at the mishap experience, we can see that the same old familiar problems are facing us. Fatigue, lack of proficiency, and violations of flight discipline are the big players in our study. All three are controllable. Yes, we fly longer days, and, yes, there are a lot of fun things to do during the summer, but with a little personal planning, we can keep the edge and still have fun. As for proficiency, the only cure is to fly. But the real answer is to start slowly. If you've had a layoff, don't jump right into the most demanding mission. Modern fighters require a lot from a pilot. You must work yourself up to peak condition. There is very little margin for error.

Any reduction of these categories can have a big effect on the overall mishap rate in 1985. Over the 10 years, summer mishaps account for about half the overall numbers. Let's try to beat the statistics and cut those numbers in 1985. Have a good, safe, fun-filled summer. ■

making SAFETY work

HENDRICK W. RUCK, Ph.D.
Directorate of Aerospace Safety

■ As a commander, safety is a vital part of your job. Your Flight Safety Officer (FSO) is a key adviser. He is most likely a recent graduate of the FSO Course and is brimming with new information and ideas. Practically speaking, though, one of your chief concerns should be what can you and he do that will *make a difference* in the safety performance of your unit? Let's discuss some very practical concepts that you can use as tools for enhancing safety.

This article is an introduction to some concepts that many of us are familiar with. The problem is that most of us have never thought of these concepts as being useful in the squadron. The concepts that we will discuss are derived from a theory of how people learn proposed by Dr. Albert Bandura of Stanford University. The theory is called Social Learning Theory. Social Learning Theory is more than *just* a theory, it works. And, it can work for you.

FSO's are specially trained. They've learned about safety policy, about aviation psychology, about human behavior; and on and on. . . . After learning all of this good stuff, it's time to consider how to put it to work. The job is not a simple one. It requires innovation and attention to detail. Safety deals with *mishaps*, which, by definition, are highly unlikely and, given good management, are relatively unpredictable. Your FSO is both an adviser and an educator. He educates his peers; he increases safety awareness by presenting briefings and writing articles, memos, and so on. He may sponsor special activities and serve as a safety inspector. What more can be done that would improve safety?

Well, safety education and awareness are important and effective. But, more can be done. The bottom line is that you have to provide information and ways of using such information that members of your unit can *use* to enhance safety. Such information, as we will see later, can be quite subtle; yet, it can have profound effects. After all, just "preventing" one mishap is a major accomplishment.

Briefings and presentations are important in promoting safety. All too often, however, they are much less effective than we would like. Why? Well, have you ever come out of a briefing saying, "So what?" Or, have you ever wondered what the bottom line was? How about those stories that have left you saying, "That would never happen to me?" This article will not tell you how to improve safety briefings. It will address how to supplement briefings with action — action oriented at "fine tuning" what may already be (as most are) a very good unit.

Social Learning Theory

This fine tuning can be achieved through application of Social Learning Theory. What *is* this wonderful theory? And, how can a theory help

continued

Making **SAFETY** Work continued

me? Well, the theory explains behavior and the acquisition of new behavior in a complex, but certainly useful way. Most such theories do not explain or predict human behavior except under very well-defined circumstances. This is usually because most theories are too simple, and, therefore, they can only explain or predict behavior in limited situations.

What Social Learning Theory proposes is that there are three major components that affect our behavior. The figure shows the major components and their interrelationships. The components are:

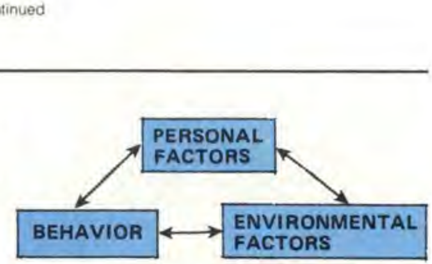
- Our behavior (what we do) itself,
- our own personal factors (our personality, mood, etc.) themselves, and
- our existing environmental factors (where we are, what's expected of us, etc).

What is new about this theory is that it suggests that all three are *interrelated.* That is, each component affects each of the other components. Let's quickly review some of the implications of the theory, discuss some actions that it suggests, and look at a possible "real-life" application.

What does this notion of behavior — person — environment interrelationship mean? Is the theory really new? Well, most of us view behavior (B) as simply a function (f) of the person (P) and his or her environment (E). In fact, that is what I learned in introductory psychology, and it is probably what you learned too. This is a much simpler view than that proposed by Social Learning Theory, and there are several reasons for questioning this more simple view. The biggest problem with the notion that $B = f(P,E)$ in actuality is that the person and the environment are not independent of one another. Rather, they are *reciprocally interdependent* (Dr. Bandura's term). For example, your behavior at a party is somewhat dependent on who else is there, how much you and they have had to drink, and so on. On the other hand, your presence can affect how well the party is going. You can see that your behavior is not only a function of how you feel and how the party is going, it is moderated by how you feel and how that affects the party and vice-versa!

The next step in understanding the basis of Social Learning Theory is to view behavior as more than the result of the interaction of the person and his/her environment. As you might expect, this too is an incomplete representation of behavior. Let's go back to the example of a party. If you are in a great mood and are comfortable with the other participants, you might become "the life of the party." This would enhance your mood, enliven the party, and, perhaps, spur you to new heights of animation. On the other hand, this behavior may be frowned on by some of the party goers, you may back off, and the party may become boring.

Dr. Bandura proposes that: "Behavior, other personal factors, and environmental factors all operate as interlocking determinants of each other. The relative influences exerted by these interdependent factors differ in various settings and for different behaviors. There are times when environmental factors exercise powerful constraints on behavior and other times when personal factors are the overriding regulators of the course of environmental events." The arrows in the figure



"Behavior, other personal factors, and environmental factors all operate as interlocking determinants of each other."

show the interdependence among behavior, the person, and the environment.

Given that Dr. Bandura is right; that our behavior affects our environment, our environment affects our behavior, and each of those affects our personality, while at the same time our personality affects them—what use is all of this theoretical posturing? Well, for our purposes, we'll take a look at what the theory says about how people learn, in particular, how they learn how to behave in an organization.

Learning

Most of us are familiar with the psychologists who are classified as "Behaviorists." The most famous of these behaviorists were Drs. I.P. Pavlov and B.F. Skinner. Through controlled experimentation with animals, they showed that behavior that is rewarded is likely to be repeated. There is no doubt that this finding is true. But, there is little use for this in complex organizations such as the Air Force. One big problem is that this approach to viewing human behavior ignores cognition. That is, it does not allow for the fact that people *think,* that different people may think differently, and that many people firmly believe that they have their own free will. Another complex problem that we'll look at in the behaviorist approach is more to the point — it does not explain how humans ac-

"The old adage 'Do what I say, not what I do' is much more important in real life than most of us suspect. That is because we all relate our own behavior to the behavior of others. . . ."

quire the capability to perform complex tasks, such as the task of piloting an airplane.

Using social learning theory, we can take the view that learning is not based purely on external forces that shape and reward appropriate behaviors. Dr. Bandura states that "Psychological functioning is explained in terms of a continuous reciprocal interaction of personal and environmental determinants. Within this approach, symbolic, vicarious, and self-regulatory processes assume a prominent role."

Complex behaviors are not learned through trial and error, with successful trials being rewarded. If that were the case, the Air Force would produce very few pilots, since the cost of a serious error in learning to fly is often a fatality. Rather, we train pilots by observational learning, vicarious learning, simulated performance, and, finally, actual performance. Observational and vicarious learning are synonymous with the simpler term of modeling. The key concept is *modeling.*

There is a lot of evidence that we learn by watching (modeling the behavior of) others. First, studies of how children learn and develop have repeatedly shown that imitation is an important factor in their acquisition of new behavior. Imitation is limited by the capabilities of the children and by the way that their models (for example, parents) respond to the children's behavior. For example, if the models give absolutely no feedback to children who are imitating them, or if they treat the children the same regardless of the quality of the imitation, the quality of the imitation deteriorates. Second, studies of modeling have shown that higher species of animals can learn complex behaviors by modeling. Even more important, they can delay the performance of the learned behaviors for a relatively long time. These findings tell us that symbolic processing is important in modeling, because the ability to model is abstract. We are all, to different degrees, "armchair philosophers." We are constantly observing and interpreting what goes on around us.

What does all of this mean? Fundamentally, what we are saying is that *learning goes on all the time.* Much of it occurs through observation of the behavior of those around us. Often, it turns out, behaviors that are not wanted are learned by modeling. The old adage "Do what I say, not what I do" is much more important in real life than most of us suspect. That is because we all relate our own behavior to the behavior of others, particularly those who are in positions of authority. Modeling is rarely perfect, and most of it is *not conscious;* nevertheless, it occurs.

Operations and Safety

Let's get practical. We reviewed the Class A flight mishaps for the years 1979 through 1983 with a particular focus on operations factor mishaps. After isolating all of the operations mishaps, we then looked at the conditions that existed that may have had an effect on the mishap sequence. Not surprisingly, more than 25 percent of the mishaps involved *discipline breakdown.* Roughly 10 percent were associated with *complacency,* over 10 percent with *fatigue,* more than 10 percent with *overconfidence,* and something less than 10 percent were associated with *pressing* beyond advisable limits. Nearly 40 percent were concerned with the more direct issues of command and control, which are seldom so subtle as the former issues. Yet these mishap factors (discipline breakdown, complacency, fatigue, overconfidence, and pressing) reflect the importance of attitude. This is where modeling comes in. Attitudes are formed and changed by vicarious learning.

Safety can be improved by techniques beyond the telling of anecdotes, the issuing of warnings, the writing of reports, and the analysis of statistics. An important point is that people often model their boss's behavior. People cannot "do what you say, not what you do," they will invariably do what you do, or do what they can to stay on the "good side" of the consequences of what you do. In future articles, we will discuss this further. ■

Monday Morning Quarterbacks Are "GOOD GUYS" continued from page 10

"I'm at your left nine. Come easy left."

"No tally."

"I'm joining."

"We don't see you."

He has no external lights on the emergency generator! What's his state? The CO's a basket case. So was I.

"I'm aboard! Put your basket out!"

"You've got no lights, 100."

"I'm aboard. My state is 500 pounds!"

"Cleared in."

"Give me a couple of percent."

I've never tanked single-engine. *Does he have enough power?*

Sure . . . the tanker's only doing 250 knots, the jet'll do that easy single-engine . . . but . . . not with the wings back!

"One hundred, rep. It may be easier if you leave the wings in AUTO."

I hoped that Skeet had tanked that way before. I imagined what must be going on in that cockpit. I heard Air Ops vector the helo in their direction.

"One hundred is plugged and receiving."

The CO turned away and sat down.

There was a moment of relief, but no real rest for me, because now I had to figure out how to get 100 aboard. The tanker would leave him with 5,000 pounds or so of fuel, all in the right side, because the left side was already full. But there was now 8,400 pounds trapped in the left, which was more fuel than 100 could legally land with on the ship. By the pocket checklist, 5,000 pounds was also not enough to go 300 miles single-engine to Masirah, diplomatic clearance or not, especially with 8,000 pounds of liquid ballast aboard. We would have to dump fuel again. We would also have to put a million dollars worth of missiles into the Indian Ocean.

Oh, well. But how to dump fuel? The fuel feed and dump circuit breaker, which was isolating the two halves of the fuel system, inhibited dump. How else to stop motive flow to the left side? Ah, yes! Select transfer FORWARD! Could we get rid of the missiles on the emergency generator? Yes, all but the Sidewinder. And I had to tell Paddles about the external lights — the only ones that would work were the approach light and the probe light.

We calculated that with no missiles aboard (except the Sidewinder), max trap fuel was now 7.3. Of that, 2,000 pounds would be stuck in the left wing, leaving 5.3 in the fuselage. If we could get the right side up to 5.0 or so, we could dump both the left and right side down to 600 pounds above max trap, leaving about 3.6 on the left and 2.3 on the right. Using about 600 pounds out of the right for the approach would put us at max trap, with enough for one look, and then the barricade. The CO talked to the captain, giving him my numbers, and they agreed, but decided they wanted 100 to be 200 pounds heavy at the ramp. No problem, I supposed. Max trap gross weight was 51,800 pounds, but the arresting gear guys always set 52,000 anyway. We had

plenty of wind. It wasn't "legal," but it should work. I briefed Skeet. Everything had to go right.

Skeet came off the tanker with 6.0 in the right. The tanker had given him a thousand pounds more than his calculated "give." Skeet would be buying him beer whenever we got into port. Now we had a little breathing room. Maybe he'd have 2.5 usable for his first pass. That would mean an extra look if needed.

Should we reconsider diverting him with the extra gas?

"One hundred is turning in at 12 miles, descending out of angels five and going dirty."

Too late.

Roger, 100. Final bearing 205. Fly heading 180. Descend and maintain angels 1.2."

"One hundred, roger."

"One hundred, Approach. Will you be able to reach 1.2 in approximately four nautical miles, or would you prefer a 360?"

"Ah yeah, Approach . . . we'll take a right 360 at this time. We lost our power there for a couple of seconds while dirtying up."

"One hundred, roger. Report steady, heading 180."

The hair began standing on the back of my neck. *A descending turn! A real naval aviation taboo!* But I was not on the radio any longer. It was up to Skeet and J.R. *What was that about a power loss?*

"One hundred, I show you at 13 DME, angels 1.2."

Silence.

"One hundred, I show you at angels point eight! Check your altitude!"

Panic.

"One hundred, Approach!"

Breathlessness.

"One hundred, Approach. Level off and climb!"

"Approach, 100 . . . We . . . got a little behind it there. . . ."

"One hundred, when comfortable, take heading 170."

Relief. For a while.

"One hundred, are you receiving the ILS?"

"That's affirm."

"Roger, fly the ILS until ACLS lock on. Hold you at 10 miles. Confirm dirty."

"One hundred's dirty."

"Roger."

In CATCC, all eyes were either on a radar scope or glued to the PLAT. All except the CO. His were closed.

"One hundred, ACLS lock on, 4½ miles. Say your mode II needles."

"Fly up, fly right."

"One hundred, concur, continue Mode II."

I don't see him yet. Of course he has only an approach light.

"One hundred, Paddles."

Not now, Paddles! I thought.

"One hundred, go ahead."

"OK, Skeeter *(He hates Skeeter!)*. We're gonna getcha. I want ya to be a little bit fast, but not too much or you'll hook skip."

"Roger."

"And I want ya to work a little low and flat so we keep lots of power on the jet. Don't get high on me."

What? You've gotta be kidding! My mind screamed. Low? *Never low!*

"And if we miss ya, go ahead and plug in that burner. Just give it lots of rudder, OK?"

"Yeah, sure."

Oh, Skeet! Don't pay any attention, buddy. Just fly it a half-a-ball high, as usual. There he is!

"One hundred, one mile. On course, slightly above glide path."

Good!

"One hundred, drifting slightly left, right two. Slightly above glide path. Three-quarters of a mile, call the ball."

"One hundred, Tomcat ball, 2.4, single-engine."

"Roja ball Tomcat. You're looking good."

God, he's looking great!

"Just keep it coming down for me."

Don't touch anything, Skeet. Damn, the deck's starting to cycle!

Skeet was settling. I could feel it . . . and drifting right. Lineup had to be a nightmare. Every power correction meant a rudder correction.

"OK, don't settle. A little power."

Oh, he's low and going farther right!

"Power and left for lineup."

And . . . his light's gone! He's gone — he just disappeared! No! Then I saw him. The low light camera on the PLAT had found his silhouette. Impossibly low and in about a 30-degree left angle-of-bank.

"Wave-off! Wave-off! Wave-off!"

I saw the burner igniter jet out of the right nozzle and the burner plume begin to build. *He's got to get the wings level!* He was coming across the ramp about now, and it looked like he might make it, but he was going to port due to that wild angle-of-bank! Sparks flew as his hook hit the round-down. His left mainmount was rolling now, his right still in the air. As he disappeared off the right side of the screen, the PLAT switched from the deck to the island camera.

"Right! Right!" The LSO screamed.

A flash from the fresnel lens as the jet went by. Confetti everywhere . . . *except it's metal confetti.* Pieces of flap and horizontal tail exploded behind 100. Now his burner had fully staged, and its brightness obscured all detail. But I'll never forget that sickening lurch as the port main landing gear fell into the port catwalk and tried to keep 100 from leaving the deck. I could not tell his attitude from the PLAT — whether he was upright or doing a slow roll into the water. I prayed for J.R. to eject himself and my friend.

J.R. will fly again. Eventually, so will Skeet, although it'll be a long, painful wait for him. Ejection trajectories, you know. They were lucky. And unlucky, of course. Why did it happen? Is there something I could have done?

You can Monday morning quarterback these things to death, and we (that means me) made several mistakes. You might look at everything that happened and at what our thinking was, and see how you would do it better.

Some major things deserve discussion, however, and you can bet they will be talked about in our ready room for a long time. There were essentially three things wrong with 100. Two were obvious, and one was hidden because it was a system we rarely use at sea: The left engine failed, the right generator was inop, and we think the feed tank interconnect valve failed to open upon command. Each of these by itself is not sufficient to cause loss of an aircraft. Together, however, they gave us three major prob-

continued

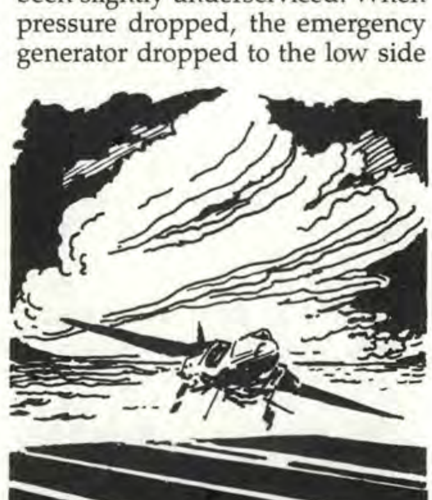
lems that caught us totally by surprise. One of them I solved, one of them Skeet managed to fly out of, and one of them cost us a jet.

First, the feed tank interconnect valve is *the* valve that allows crossfeed fuel transfer when single-engine. While a fuel split during single-engine operation is normal, especially if you let an engine windmill and leave the fuel shutoff handle in, if the feed tank interconnect valve fails to operate when it's supposed to, you will pump fuel from the good-engine side to the inop-engine side via the motive flow system at up to 300 pounds per minute and *never be able to get it back*. In the summer of 1983, nobody in our squadron knew anything about this problem. Fortunately, new NATOPS procedures have recently been issued to handle single-engine fuel migration. Not everything is known about the problem, especially the ramifications of a failure where landing cannot be accomplished immediately, and more discussion and procedural changes will likely occur. Someone in each F-14 squadron must become a real expert on this part of the fuel system.

Second, we underestimated the effects of weight and lateral asymmetry on single-engine flight. Skeet almost lost it when he tried to level off in a turn using only basic engine. As their airspeed fell below 150 knots, with J.R. *screaming* in the back seat, Skeet had to go to Zone 2 afterburner to stop his descent. And he got as low as 600 feet and 135 knots! Remember that he was over 52,000 pounds gross weight, had 2,000 pounds in his left wing, and had the combined drag of his turn and an inoperative engine working against him. Take a look at the single-engine rate-of-climb charts for MIL power and see how much gravy you have to get out of a hole. On a hot day in the IO, your climb angle may be less than one degree! Also, some day when you're flying downwind, note the fuel flow required for level flight, dirty at 150 knots. It's usually about 3,300 pounds per hour per engine. If you're single-engine, it'll take *6,600* pounds per hour plus some extra for the added drag. Next time you run-'em-up on deck, see how much rpm it takes to get 7,000 pounds per hour of fuel flow — that'll be your level flight power setting for single-engine. As Skeet said afterward: "It was nothing at all like practicing at the field with one at idle and light gross weight. I needed more power, more rudder . . . I felt like I had a drag chute on the jet . . . no similarity to the field at all." There's a new NATOPS procedures single-engine landing out now, too.

The thing that finally got us was the emergency generator, being powered by the combined hydraulic system, in turn being powered through the Bi-di pump by the flight hydraulic system. It should have hit me when Skeet "lost power" on his dirty-up. The high demands on the combined system were more than the Bi-di and the flight system could handle. We also think that the flight side may have been slightly underserviced. When pressure dropped, the emergency generator dropped to the low side and Skeet lost a lot of things:

- Stability augmentation systems
- Electrical control of spoilers
- VDI/HUD
- *All* external lights
- All cockpit lights except red floodlights
- The backseat (main) radio



We think what happened in-close is that Skeet made a large lineup correction and got the spoiler up on the left wing. Then, the control demands kicked the emergency generator into low, and Skeet lost everything. He couldn't even hear the LSO because that was on the back-seat radio. He was left with inboard spoilers partially extended on the *already heavy* left wing, and reduced tail power to pick the wing back up. So he smacked into the lens and the catwalk and ended up being saved by his RIO and Martin-Baker.

The moral is that although we have a mature 14-year-old airplane on our hands and lots of experience around, there are still new and unforeseen problems waiting to bite us, and we may not know all there is to know about some of our "common" emergencies. I suppose that's true of any aircraft in the fleet. The only solution to the unforeseen problem is total, thorough systems knowledge . . . to let knowledge, headwork, and analysis help you when experience by itself can't. Think about what happened to Skeet and J.R. and about what might happen to you. Brainstorm it in the ready room, and study for it in the books. Then maybe you'll be able to handle it on the night of, instead of the morning after. *Editor's note: Although fiction, this story is based on three actual F-14 mishaps which occurred recently.* ■

About The Author

Lcdr. Miles is an F-14A instructor pilot at VFD-101 with 2,500 flight hours (2,000 in the F-14A). When he wrote the article, he was deployed with VF-102 aboard USS America.

Needle, Ball and Airspeed

COLONEL PAUL M. DAVIS

■ Several things prompt this epistle: A recent conversation with an old friend, an 0-6 at a numbered AF who is still current in a reasonable facsimile of a fighter, an article in the *Air University Review* by Captain John L. Barry, and the number of accidents (mishaps if you prefer the current term) that come across my desk that show the crew's flying hours in the previous 30/60/90 days to be less than we all would like. The contents are meant primarily for the fighter types, but there is a message for all.

The 0-6 related with more concern than pride, how he had taken "all the marbles" during a recent fighter wing gunnery competition (bear in mind he was, and had been at the time, a headquarters type of some months). He had also recently talked to a wing commander who, at that time, had been top gun in his wing for three months running. I have been fortunate to work for many good-stick colonels over the years, but with the possible exception of one, presently a four star, I can't remember many who could consistently wax the rest of the troops in gunnery.

Captain Berry's message is that there is not enough fighter experience in the management level (flight commanders, Ops officers, and squadron commanders) in the fighter force. Some of you would say this problem is not unique to the fighter mission.

Now, if you've read this much — read on. In a roundabout way I'm going to tell you (1) how to knock most of the colonels off the gunnery charts, (2) up your insurance coverage with no increase in cost, and (3) get the maximum training from the minimum hours.

In the 1950-51 flying school era, instrument training was haphazard at best. Lots of hours, but much of it wasted on "buddy-rides." There was a lot we didn't know about weather. I quote the James Connolly AFB 1950 academic weather instructor: "You guys that go to jets will never have to worry about flying in weather above 20,000 feet. It doesn't go any higher."

Apparently, when it got below 20,000 feet, not many flew at all. Or

continued

Needle, Ball and Airspeed continued

so we thought. All in all, instrument training was a square to fill — not taken too seriously by the IPs — nor the students.

The 26 FIS on Okinawa was my first assignment. We arrived at Naha after several missed approaches via C-54 in February 1952 in a tropical rainstorm — in time to listen to two second lieutenant friends from flying school in two F-80s groping for the runway — via an antiquated GCA unit — with a ceiling of approximately 100 feet and, charitably, a visibility of about 200 yards. They found it eventually, but in his happiness to find the concrete, one landed downwind and stopped in the coral overrun — about 50 feet from the South China Sea. We were impressed! Really impressed!

During the next few weeks, we requalified in the F-80 and found we were considered an all-weather fighter squadron, weather existed far above our service ceiling and conversely well below our minimums, and that flying on Okinawa was some sort of different from Willy and Nellis. I also discovered after falling off the wing several times in the weather what my instructors had known all along — I wasn't too sterling at keeping the light on the star either — how can you when the star disappears in the murk?

It quickly became apparent that if we planned to leave Okinawa as first lieutenants at end of tour, rather than in a pine box, we had to learn to fly the clocks. We rediscovered needle, ball, and airspeed and the vertical "S" maneuvers. Whenever the opportunity allowed, we practiced basic instrument flying religiously. The result for me was when I rotated home, I had acquired an excessive confidence in my ability to launch and recover in just about anything. Admittedly, my confidence wasn't necessarily shared by all, for when I suggested at the daily pilot briefing that we ought to practice acrobatics and unusual attitudes in the weather, as well as under the hood, the counter suggestion was made that I ought to see a shrink. I recalled this conversation with wry amusement several years later while trying to get rid of a T-63 shape via LABs in the soup during an ORI at Misawa. Therein lies another tale. We also discovered the better we got on the gauges, the better our formation flying and, more important to the fighter guy, our scores on the rag and air to ground improved all out of proportion to a probable learning curve based on increased experience. This, I believe, was why the 1952 Far East Air Force (FEAF) gunnery meet was won hands down by a major, a first lieutenant, and three second lieutenants from the 26th.

We discovered that the better we got on the gauges, the better we were at formation flying and also the better our air-to-air and air-to-ground scores.

Like many of you, I have had my share of lean flying for all the various reasons: No money, no gas, no parts, Pentagon, behind a desk, aircraft groundings, etc.; but whenever I got a flight, I always managed to get some instrument time. When I logged hood, I tried to work as hard as if I were landing at Naha in the rain or Misawa in the snow with GCA off the air and a green wingman with no radio and both of us on fumes. When it was actual weather, the incentive was built-in.

Several tours in fighters plus a four year stint at the Instrument Pilot Instructor School convinced me that the best instrument pilots are the best all-around pilots.

Tours in several fighter units over the years, plus a four-year stint at the Instrument Pilot Instructor School (IPIS), taught me a lot about flying in general; but one observation stands by itself. With few exceptions, the best instrument pilots I have known were the best all-around pilots. If my hypothesis is correct, the prime reason was that all of their flying was instrument flying and they worked at it constantly. They used *an* attitude indicator (AI) for every phase of flying. Notice I used the word "an" rather than "the."

To illustrate: The flight lead became an AI as did the rag, the panel or dart, the runway, the terrain, the horizon, or the tanker. Corrections to any of the above are like correcting to a desired instrument course, normally small, but certainly coordinated and smooth. All kinds of benefits accrue: Wingmen appreciate it; the boomer's blood pressure stays within limits as does your WSO's; you get there with more gas, and, I guarantee, your weapons scores will improve, particularly if you are not flying as much as you would like, and few are these days. One caveat: The finest instrument pilot in the world won't hit the target if you're out of range and/or the pipper isn't on target.

Over the years, ATC — to save money — has had to cut a big chunk of flying hours out of the program. Undoubtedly, instrument time was part of the cut. IPIS also bought the farm for budgetary reasons. Simulators took up some of the slack, but to what degree would be conjecture and open to debate. I predict that in the future we will be forced to increase the hours in the pilot training program and that some form of IPIS will be reinstated.* If we don't have the money to properly train *enough* pilots — maybe we need to train *fewer* pilots — *better.* We need to stop reinventing the wheel. In the long run it saves us so much money, the business goes bankrupt.

An hour or even ten minutes flying basic instruments, exact airspeeds, altitudes, and headings, or an extra GCA/ILS when fuel permits, may not be exciting but is a competitive challenge, and I always thought that the single word, competitive, best described the fighter pilot role. If you think I'm blowing smoke, ask the Edsalls, the Priesters, the Falls, the McPeaks, or their counterparts in your outfit.

As a final bonus for all, not just the fighter guys, the extra practice may make the difference between a normal IFR landing and a smoking hole — or in years to come — the opportunity to write about how it used to be. Try my theory. It isn't a cure-all, but it will work for those who work at it, *regardless* of age, rank, or experience. — Reprinted from *Flying Safety,* Feb 81. ■

**The Instrument Flight Center is again open and working on the very things Col Davis has discussed. There is also an initiative to provide about nine more hours of instrument time in UPT. — Ed.*

A Toast To Wing Wearers

LT JERRY M. LINENGER, MC
VRC-50

■ Our squadron's dining out was progressing rather well. To be sure, we had already endured the cocktail hour and its introductions ("What was her name again?"). We'd paraded into the grand ballroom, and had, for the most part, found our seats. The mess member and guests had gulped down massive amounts of smoked Lapu-Lapu, Blanc de Blanc, French onion soup, Caesar salad, Lemon sherbet "palate refresher," Vin de France, roast tenderloin of beef Wellington, Jardiniere of vegetables, Fondantes potatoes, and Mango Melba. Our box lunch training had undoubtedly paid dividends, and not a single Alka Seltzer bubble could be seen rising from the Harvey's Hunting Port before each of us. Everyone looked, and felt, fat and happy.

The evening to this point was not, however, without glitches. Rule No. 15, specifically prohibiting the "launching of projectiles," had been violated on numerous occasions. Sure, trips to the grog bowl were taken for other infractions such as inverted cummerbunds, haggling over date of rank, foul language, wearing eccentric earrings, and dining on floral arrangements; but in aggregate, these were minor when compared to projectile launching. Crescent rolls, slices of wholewheat bread, biscuits and, in desperation, even Fondantes potatoes, made up the aerial display. The general flow of air traffic appeared to be in the direction of the head table, with numerous rolls inscribed with the "X-RAY OSCAR" call sign. To observe this aerial display was almost as much fun as watching the Blue Angels perform.

Naval Aviators, you see, are fanatics for airshows and flying. Futile attempts to "control traffic" by Mr. President with fines and grog bowl trips did not dampen the activity. No, a Naval Aviator becomes so totally immersed in his joy that he won't allow himself to become distracted while executing a full-stop landing, two tables distant, into the XO's wine glass with a spin-

"Getting the job done, concentration on the task at hand, and the pure job of adventure are ingrained in the aviator. . . ."

ning croissant. Getting the job done, concentration on the task at hand, and the pure joy of adventure are ingrained in the aviator, with possible consequences and punishments compartmentalized away during critical "flying maneuvers."

Finally, the head waiter's quick assessment of the situation and call of "clear tables" accomplished what the president, immersed in the heat of the battle, could not. Ammunition soon dwindled, and the second Marianas' Turkey Shoot came to a close. An outside observer, looking at a situation from a different angle, can sometimes shed a new light on a difficult problem.

Harvey's Hunting Port replaced Vin de France as toasts began. The traditional toasts were completed, then modified as appropriate. "Our Missing Comrades" transformed into "Our Newly Fallen, Grog-Bowled-Out Squadronmates." Our "Comrades in the Other Services" toast specifically excluded the Air Force the second time around. (Naval Aviator pride — being the best in the world . . .) An informal toast to the Naval Academy predictably generated mixed reviews — calls of "squids" by some, and clanging rings to raised glasses by others.

But the most impressive toast of all was to the *"Wings of Gold."* The toast was presented with sincere pride and toasted by all with true, genuine conviction. An emotional intensity filled the room, chests swelled, and even the most frequent grog bowl attendees stood trim and tall. Naval Aviators, you understand, are proud of their accomplishments, of their struggles, of those who stood before them.

To me, this simple toast was the highlight of the evening. Squadronmates and friends looked around at each other for only a very important moment — and in that moment, I think, I realized how interdependent, how intertwined, we all are. "On the strength of each link in the cable, dependeth the might of the chain. . . ."

The subsequent toast generated a grog bowl trip for myself — as the *"Wings of Gold"* toast became more specific — "to pilot wings." I drank the toast, without taking exception. An NFO and an aircrew wing-wearing warrant officer, however, took exception to the toast and were predictably escorted to the grog bowl (the president of the mess being a pilot himself) with me following for not properly defending my flight surgeon wings.

In retrospect, I'd remain silent again and toast with the pilots. First of all, the grog was rather tasty, and though I looked a bit silly with the empty glass atop my head, it was a refreshing trip. Secondly, I'd never refuse a toast to *any* Naval Aviator. I respect them too much; respect their pride, their daily accomplishments, their professionalism. Of course, I'd still prefer a toast to flight surgeon wings. We all have our pride.

Closing remarks by our guest speaker began with the usual fighter pilot aerial-combat hand maneuvers. Madame Vice had firmly mounted the microphone to the podium, correctly anticipating that a fighter pilot would be unable to talk without his hands being in constant motion (similar to the "walk and still chew gum" syndrome).

The speaker, aviator that he was and well versed in the "be prepared" philosophy, came armed with a full-sized garbage bag full of "three-day old bread, hard as rocks," to ensure everyone would (1) enjoy his speech, (2) laugh at his jokes, and (3) applaud at the end.

Finally, with remarks completed and the coerced applause received, the long awaited three raps of the gavel sounded. Having just endured the grueling drink-ladened three hours without break, the grand ballroom looked like "NAS ANYWHERE" as pilots waddled from their seats to relieve their already overburdened bladders. Strained looks were replaced by relieved smiles; even tears of joy in some cases. Quite a display of aviator self-discipline, and that "never-give-in" attitude.

Strange as it may seem, amidst all the frolicking and frivolity, I remained rather solemn. True, my "preflight strategy" was to remain low-keyed, avoid becoming a "target" and, therefore, hopefully avoid over-indulgence at the grog bowl and an empty wallet. Be that as it may, my seriousness was beyond that of the preset strategy.

It stemmed, instead, from a spontaneous, overwhelming pride in being associated with the group, with Naval Aviation. Looking around, I saw nothing but genuine friends, dedicated people that I took for granted daily, but who, nonetheless support me, encourage me, and trust me daily. I was proud to be a part of their group.

My primary job as squadron flight surgeon, as I see it, is to care for Naval Aviators — keep them healthy, safely flying and, most importantly, alive. *I take my job seriously because at the next squadron dining out, I don't want to see an empty chair, propose a toast to a missing comrade, or get hit by one less flying biscuit.*

Keep looking after each other, communicate problems, and be safe. A toast, with pride, to wing wearers everywhere. SAFETY NOTE: No one was allowed to drive home following the dining out — all of us stayed in the hotel where the dinner was held. A good, safe idea.

— Courtesy of *Approach* magazine, October 1984. ■

One Commander's Safety Policy

Whether we belong to a tactical, airlift, or strategic unit, safety plays a necessary role in our daily operations. Each of us has our own ideas on what safety is — or should be. We offer the following as "food for thought" — and it just may include some information that will help you with your safety program.

Lieutenant Colonel Dennis J. McMahan, Commander of the 81st Tactical Fighter Squadron, USAFE, wrote this letter to his people in an effort to focus their attention on safety.

■ Noah Webster says *institutional* can mean "characterized by the blandness and uniformity attributed to large organizations that serve many people." In spite of Squadron Officer School's rhetoric of avoiding negatives, safety should *not* be institutionalized.

Safety is one of the many results of a solid, realistic training program and is not a separate, bisectional entity.

Conversely, a poor training program fails to prepare us for war, while producing the personal denominator of injury and death.

The squadron goal is to be the best in peace and war. Achievement is through intelligent training, which, in turn, will reflect in our safety program.

Why did I write "intelligent?" Well . . . on the ground, this means the spectrum from using checklists (plus flashlights if in the shelters) for preflights, to giving your car keys to those who don't drink. In the air, we need to remember the times we scared ourselves (or believed the survivor's war stories) and amend our habits. Translation for lieutenants: Learn from mistakes, including other peoples.

A Red Flag platitude: The PK of the ground is 1.

Nonplatitudes:

- Don't fly sick jets.
- If you don't feel well (illness or personal problems), go to your flight commander and get off the schedule.
- "Knock it off" can be done *between* front and back seaters when the little hairs on the back of your neck start talking (pompous, ignorant pride can kill).
- Shaving your bingos to the bare minimum is stupid (no one ever got hammered for diverting, so make your decision early).
- Don't be intimidated by NATO allied flyers who pressure you to fly below your low level category during joint exercises. Blame me if it makes you feel better. We have lost people in the 81st who tried to push this — think and fly at the same time.
- Most of our rules are to protect you. Our flying is among the best in the world — don't screw it up.

Safety's not a program. It's a logical, conscious decision to move out of the lower carnivorous order. Safety is ensuring your infant has a proper car seat, your car is driven by someone sober, and your jet is flown by the best you can be. If our training/safety is not smart, let's talk. We are always open for improvements. It's our safety shop, and the ideas will only be limited by our own initiative and imagination. ■

REX RILEY

■ Not long ago, a major command safety office sent out a message about takeoff and landing mishaps. The command was very concerned about an adverse trend in their numbers of such mishaps.

While the special concern and actions of this command are warranted, a review of the overall Air Force experience in the past year or so shows that other commands also need to be alert to the problem.

The best way to approach the situation is to look at recent takeoff and landing mishaps and try to identify those factors which led to the mishap and which are controllable. A check of the records at the Air Force Inspection and Safety Center (AFISC) show that since January 1983, there have been 26 Class A and B mishaps categorized as pilot-induced takeoff or landing mishaps. These mishaps are spread out through all aircraft types: Fighter, transport, bomber, trainer, and helicopter and include all the major flying commands.

Almost one-half of the mishaps (12) involved high sink rates resulting in short or hard landings. Nine of these occurred in VMC. In almost every case, the pilots failed to establish the normal glidepath for a visual descent.

For various reasons, inattention, inexperience, whatever, they often let airspeed bleed until the aircraft entered a high sink condition failing to recover to a normal approach or perhaps go around and try again. How is your landing technique? Have you gotten a bit sloppy about airspeed or AOA control?

The other problems in landings are about evenly divided between failure to lower the gear, "ducking under" on an instrument approach, and losing control after touchdown.

In both gear up landings, the aircraft had several crewmembers in a position to monitor the gear. None did so. An old friend of mine with many years of experience told me of his "last ditch" check. Stabilized on final and approaching the overrun, he made a last verbal and visual check of "Gear, Flaps, Slats, and Brakes." This might be a technique adaptable to your aircraft.

"Ducking under" has always been a serious problem for pilots. The advent of Head Up Displays has only complicated the problem. The only sure solution is to fly the approach as you were taught using the visual descent points, the VASI lights, and the precision glidepath indications. Going fully visual too quickly in marginal weather is asking for a short, hard landing at best and possibly an intimate association with some approach light stanchions.

Ask most pilots about hydroplaning, and they assure you that they've heard it all. Yet every year, one, two, or more aircraft end up as Class A mishap statistics as a result of hydroplaning. There have been volumes written on the subject, and every Dash 1 talks about slippery runways. Still, there are a lot of variables which make each case unique. The best preparation is to know your own aircraft very well and be very familiar with the recommended speeds for approach and touchdown on wet runways. Know the braking capabilities of your aircraft and the minimum hydroplaning speeds for the tires. Some preparation on the ground can pay big dividends once airborne.

In the takeoff mishap category, the only trend was in failed aborts. In a couple of cases, crews decided to abort, then failed to get the aircraft stopped through incorrect procedures. There is a lot more to a high speed abort than parroting the Bold Face. This is a procedure that must be carefully and thoroughly thought out until it is almost second nature. For example, can you, without looking, reach and actuate emergency brakes, tail hook, antiskid, and the other switches and controls important in your aircraft? When you are rolling down a runway at 100 plus knots, there is no time to be fumbling in the cockpit.

Perhaps the trouble with takeoffs and landings is our perception. We have been doing them ever since the first flight in pilot training. The sheer repetition makes them seem ordinary — easy. But anytime an aircraft gets close to the ground, there is potential for a mishap, and complacency or inattention increase this. As the safety office message discussed earlier says: "The idea that the traffic pattern is a simple portion of the mission or one that requires less attention is unfounded. It does not matter where an aircraft is destroyed, our wartime capability is still degraded." ■

UNITED STATES AIR FORCE

Well Done Award

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

CAPTAIN

Kenneth P. Radosevich

FIRST LIEUTENANT

Eric T. Stake

84th Fighter Interceptor Training Squadron
Castle Air Force Base, California

■ On 2 July 1984, Captain Radosevich and Lieutenant Stake were recovering their T-33 from a training mission as Number 2 in a four-ship formation. As the formation leveled at 3,800 feet AGL and approximately 240 KIAS, Lieutenant Stake, who was flying the aircraft from the front seat, noted erratic stick inputs followed immediately by an uncommanded slow roll to the right. He applied full left stick to counter the roll — with no effect. As the aircraft continued to roll right and the nose started to drop, Captain Radosevich assumed control of the aircraft and applied full left stick, also with no affect. Both aileron boost levers were moved to "off" but the stick still had no affect on aircraft roll. Captain Radosevich gave the order to prepare for ejection. As the aircraft approached 90 degrees of bank and 3,000 feet AGL, Captain Radosevich was able to reverse the roll using rudder. The aircraft was rolled back to wings level flight using rudder only, an immediate climb was initiated, and the aircrew visually confirmed that the ailerons did not respond to stick inputs. The aircrew continued to prepare for a possible ejection while evaluating aircraft control capability. During the climb, Captain Radosevich determined that the aircraft could be held wings level using a combination of aileron trim and rudder. Subsequent practice proved that the aircraft could be maneuvered using aileron trim and rudder to control roll. With supervisor of flying concurrence, the aircrew performed a controllability check and determined that the aircraft could be landed with the calm wind conditions existing at Castle AFB. With only enough fuel remaining for one approach, Lieutenant Stake reassumed control of the aircraft from the front seat and set the aircraft up for a straight-in approach to the nonduty runway to avoid overflying the city of Merced. Using coordinated aileron trim and smooth rudder inputs, Lieutenant Stake safely landed the aircraft. Investigation revealed that the linkage connecting both sticks to the ailerons had become disconnected. The exceptional airmanship of Captain Radosevich and Lieutenant Stake prevented possible serious injury or loss of life and loss of the aircraft. WELL DONE! ■

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UNITED STATES AIR FORCE

Well Done Award

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

CAPTAIN

James M. Corrigan

CAPTAIN

William K. Wells

50th Tactical Fighter Wing

■ On 31 July 1984, Captain Corrigan was leading a three-ship formation of F-16s when he felt what seemed to be a violent compressor stall. Engine instruments appeared normal, but Captain Corrigan noticed fumes in the cockpit. Captain Wells, the Number 2 wingman, visually inspected lead's aircraft for damage, informing him that the area around the right wheelwell was severely damaged, and that several hydraulic and electrical lines were hanging from the open wheelwell. Captain Corrigan declared an emergency. He accomplished alternate extension procedures when the gear would not extend normally. Captain Wells reported that the right main gear was shredded, hydraulic and electric lines were hanging free, and that hydraulic fluid was spraying from the broken lines. He also reported all three gear appeared to be fully extended. Captain Corrigan, however, observed a light in the gear handle, and both MLGs indicated unsafe. After he and Captain Wells analyzed the damage, reviewed systems operation and emergency procedures alternatives, Captain Corrigan flew a straight-in approach planning to use blown tire procedures for landing. He flew the approach slightly fast to allow for go-around in case the gear collapsed. On touchdown, the aircraft began settling to the right. Captain Corrigan executed a go-around, noting heavy buffet and less than normal thrust available. Conferring with Captain Wells, Captain Corrigan decided the best course of action would be an approach-end arrestment, which he accomplished successfully. Subsequent inspection revealed that the right main tire had exploded, partially collapsing the aircraft intake and severely damaging the engine. Captains Corrigan and Wells, through their outstanding flying skills, system knowledge, and intraflight coordination possibly prevented a loss of life and loss of an aircraft that experienced a failure mode never previously encountered in an F-16. WELL DONE! ■

SAFETY AWARDS

CHIEF OF STAFF INDIVIDUAL SAFETY AWARD FOR 1984

Presented to Air Force personnel who made significant contributions to safety during the previous calendar year.

LIEUTENANT COLONEL HENRY R. KRAMER
Tactical Air Command

As Chief of Safety for the 56th Tactical Training Wing, MacDill Air Force Base, Florida, Lt Col Kramer's observations and recommendations contributed significantly to flight safety in the F-16 aircraft in the areas of weather hazards, thrust losses, gun jams, and canopy jettison. His leadership in weapons safety resulted in no missile mishaps due to personnel error and the identification of a material deficiency in influence fuses. In ground safety mishaps were reduced 33 percent, and civilian injuries were reduced 25 percent through his safety initiatives.

LIEUTENANT COLONEL JOHN W. MYER
Air Training Command

As Chief of Flight Safety, Air Training Command, Randolph Air Force Base, Texas, Lt Col Myer's recommendations contributed to the establishment of a time change requirement for T-37 oxygen regulators, the expeditious design and development of a throttle gate for T-38 aircraft, and enhanced T-46 system safety in the areas of birdstrike protection and fail-safe contingency thrust. His leadership and dedication to safe mission accomplishment were instrumental in the Air Training Command equaling the lowest Class A aircraft mishap rate in command history during 1984.

FIRST LIEUTENANT HARVEY D. JOHNSON
United States Air Forces in Europe

While serving as Additional Duty Flying Safety Officer, 401st Tactical Fighter Wing, Torrejon Air Base, Spain, Lt Johnson's contributions to flight safety during his squadron's conversion from F-4 to F-16 aircraft represented the highest standard of professionalism. His safety program management reflected aggressive leadership, positive supervision, open communications, and an enlightened information program throughout the squadron. His efforts resulted in a perfect flying safety record and a combat readiness posture equal to the mission taskings.

TECHNICAL SERGEANT THOMAS L. CANFIELD
Air Force Communications Command

While serving as Safety Technician, 1839th Engineering Installation Group, Keesler Air Force Base, Mississippi, Sgt Canfield's outstanding professional skill, versatility, initiative, and leadership led to the adoption of a safety-first attitude throughout his organization. His expert analysis identified numerous previously undocumented deficiencies, and his ability to eliminate these hazards resulted in major contributions to the success of missions entrusted to the Air Force Communications Command.