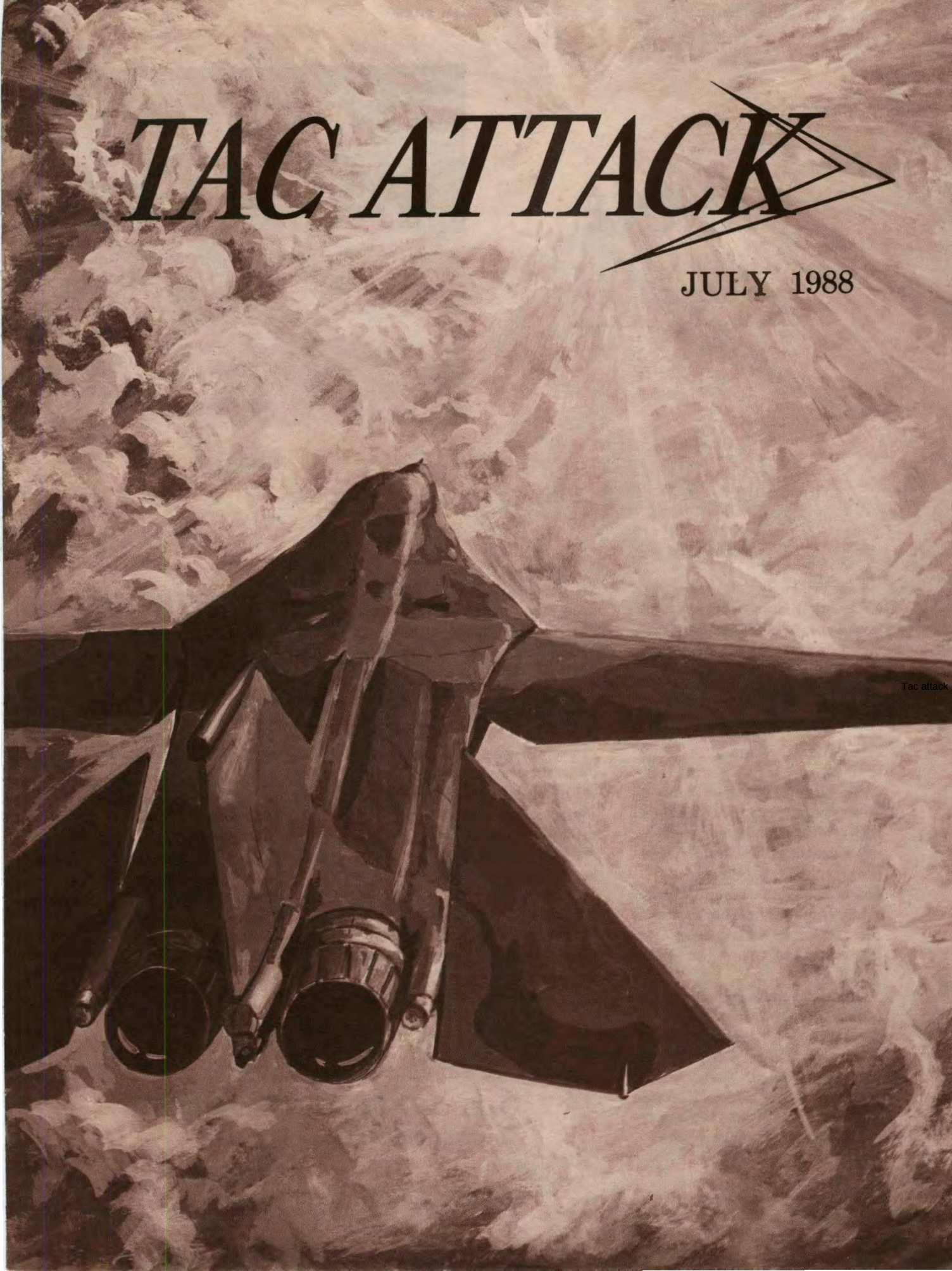
TAC ATTACK

JULY 1988



ANGLE OF ATTACK

July brings a lot of real summer weather for us to enjoy. I hope you're able to take advantage of it this year. *But* with the good weather, there are still a lot of potential hazards to be aware of around the flight line and in your flying area. Thunderstorms are everywhere this time of year with their associated heavy rains, hail and lightning. Give them plenty of leeway because you can experience hail, even in clear air, many miles downwind of a thunderstorm. On the ground, try to be aware of potential microbursts and storm-related high winds. They can cause a lot of unexpected damage due to unsecured intake covers and other AGE gear.

One of the main problems you'll be coping with for the next two or three months is the heat. Make a special effort to get plenty of water while you're outside – whether you're waiting to launch off on your sortie, working around the jets, or doing other important projects around base on the roads, supply area, munitions storage, POL and so forth. Heat-related problems are insidious so you need to maintain control of the situation and ensure you've got the water you need. One area to watch especially is when you're spending a lot of time sitting in a vehicle, such as security police on patrol around the flight line. With the air conditioning off, the temperature can soar rapidly and catch you unaware. *Supervisors*, don't leave it up to your people to keep a handle on the heat problem. This may be their first assignment into a hot part of the country and it's your responsibility to make sure they get sufficient water and salt (if necessary).

On a different note, how many times during a sortie have you been at or past the edge of the ejection envelope? For example, if you had to eject just prior to pullout from a 30° dive bomb pass, would you survive? Or, if you are starting down inverted from the apex of a low angle bomb pass in an F-16 and have to get out, would you make it? If those questions don't give you food for thought, they should.

Heads up – we're seeing a trend of people rushing emergency procedure completion at the expense of *maintaining aircraft control*. More on this in the next issue of *TAC Attack*.

Happy Independence Day, pardner!

Jack Gawelko

JACK GAWELKO, Colonel, USAF
Chief of Safety

TAC ATTACK

DEPARTMENT OF THE AIR FORCE

10

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features

departments

TACSP 127-1

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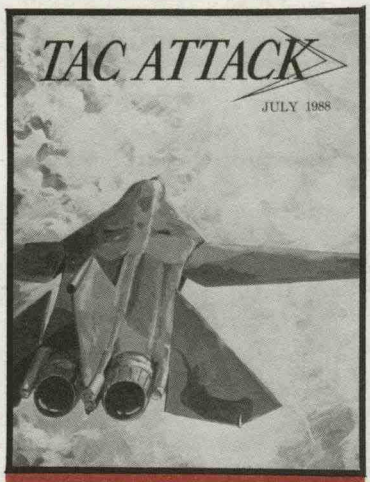

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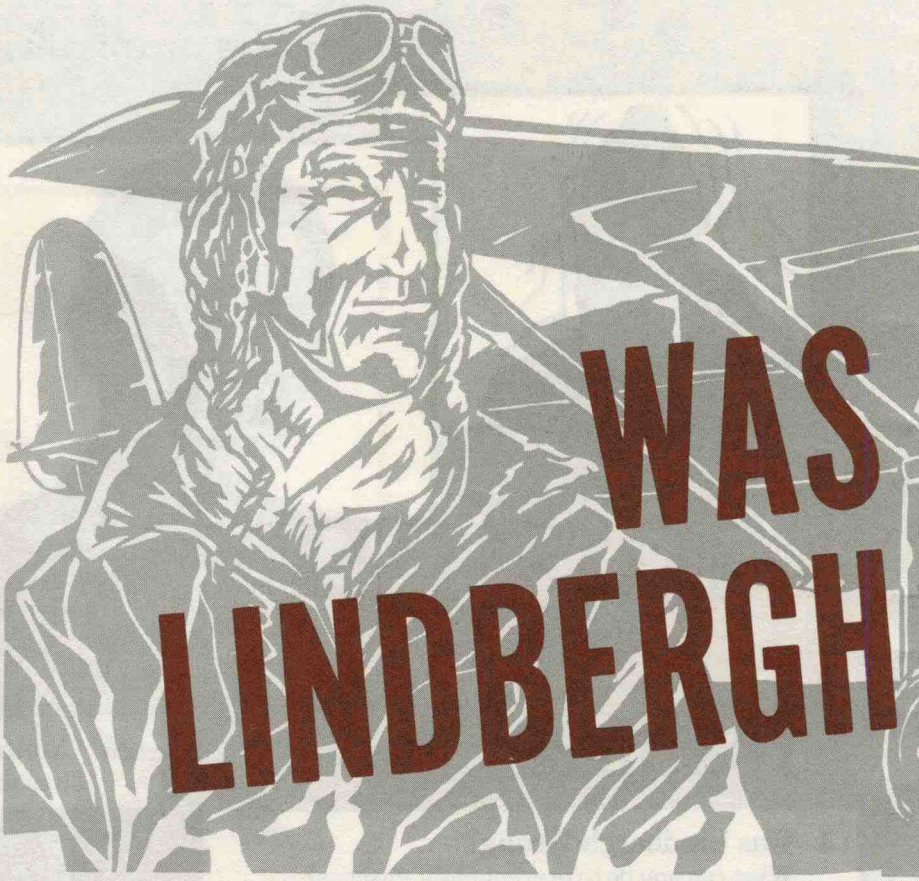
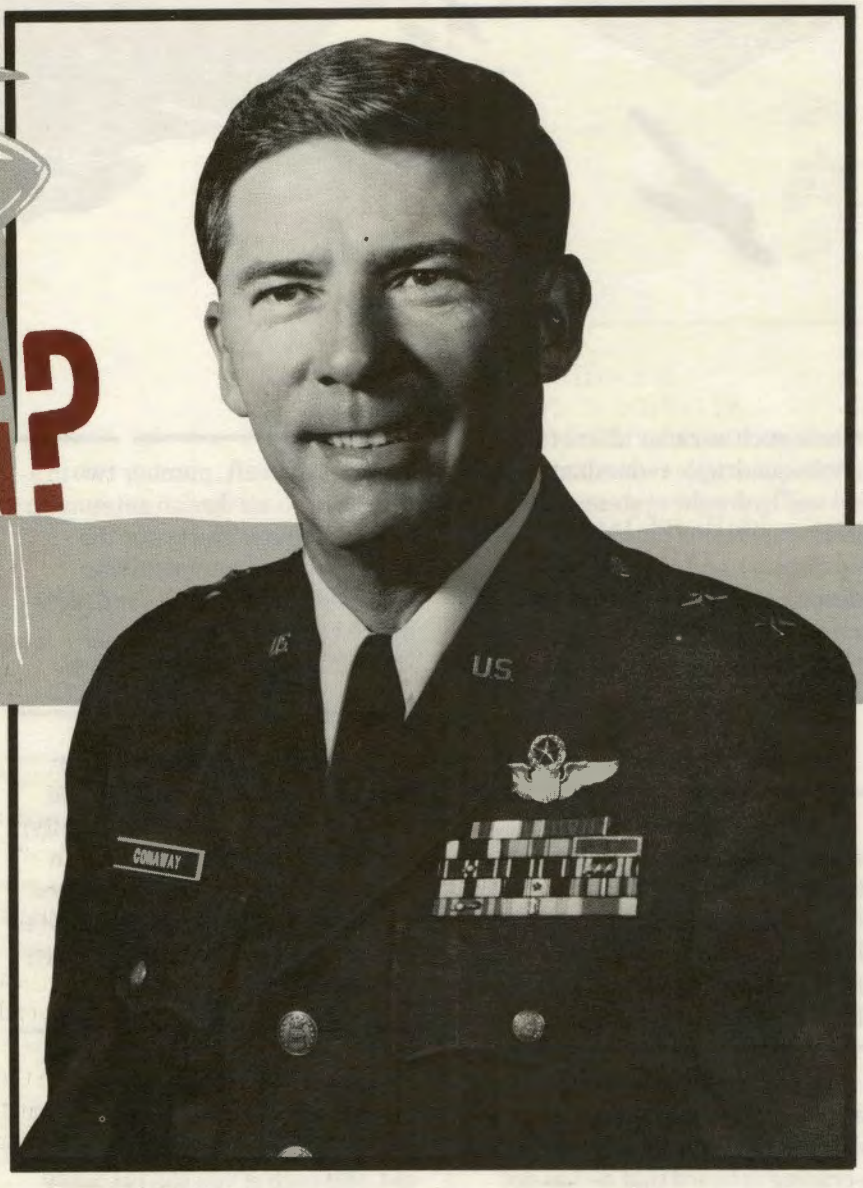


WAS LINDBERGH

"The readiness to blame a dead pilot for an accident is nauseating, but it has been the tendency ever since I can remember. What pilot has not been in positions where he has been in danger and where perfect judgement would have advised against going? But when a man is caught in such a position he is judged only by his error and seldom given credit for the times he has extracted himself from worse positions. Worst of all, blame is heaped upon him by other pilots, all of whom have been in parallel situations themselves, but without being caught in them. If one took no chances, one would not fly at all. Safety lies in the judgement of the chances one takes. That judgement, in turn, must rest upon one's outlook on life. Any coward can sit in his home and criticize a pilot for flying into a mountain in a fog. But I would rather, by far, die on a mountainside than in bed. Why should we look for his errors when a brave man dies? Unless we can learn from his experience, there is no need to look for weakness. Rather, we should admire the courage and spirit in his life. What kind of man would live where there is no daring? And is life so dear that we should blame men for dying in adventure? Is there a better way to die?"

Charles A. Lindbergh
Wartime Journals
August 26, 1938

WRONG?



Maj Gen John B. Conaway
Director, Air National Guard

Despite his genius, his daring and legendary accomplishments, Lindbergh was wrong – at least in this case. Our mishap rates would be atrocious if we didn't "look for his errors when a brave man dies." The sole aim of today's investigations is *mishap prevention*. We do learn from others' mistakes – sometimes.

Lindbergh's views notwithstanding, part of our peacetime mission is preservation of increasingly scarce combat resources. To do this we must safely fly the planes we do possess. The forty-wing tactical Air Force is still a distant goal, and the days of "the thousand plane raid" of World War II are receding fast from memory. The unit cost of today's front-line fighters dictates a different approach.

Our mishap rates would be atrocious if we didn't "look for his errors when a brave man dies."

The essence of flying today in the Total Force is a very careful analysis of risk vs. benefit. We train intensively, and fly the way we plan to fight. We no longer fly on just needle, ball and airspeed. Today's aircraft and leadership philosophy represent concerted effort to save us from ourselves with enhance-

WAS LINDBERGH WRONG?

ments such as radar altimeters, triple/quadruple redundant electrical and hydraulic systems, full instrumentation plus HUD (heads-up display), and so forth. However, despite an ever-declining accident rate, people still find ways to kill themselves or only narrowly escape doing so.

Consider the following:

A highly experienced pilot attempts an impromptu airshow in his A-10 to show off for some friends. He starts a loop from too low an altitude and impacts the terrain during the recovery, killing himself instantly.

An A-7 aircraft touches down after a normal mission and the pilot determines after some grinding and scraping is heard that he has not lowered his gear. Other aircraft doing approximately the same thing include F-4s, F-16s and an OA-37. Damages range from total destruction of the aircraft down to "only" Class C criteria. A variation on this theme is to raise the gear after a safe and uneventful landing. Such incidents continue despite the presence of presumably alert SOFs, RSOs, ROMs and tower controllers.

An F-4 aircraft, number two in a flight of two, strikes an antenna on a low-level route. The tower the antenna was mounted on was depicted in route charts and highlighted on unit low-level maps. Damage was limited to Class C.

A crewmember from "another service" got a little excited in the heat of battle (an exercise actually) and shot down an RF-4C with an AIM-9. Both recce crewmen were picked up unharmed and brought to the carrier that had launched their "opponent."

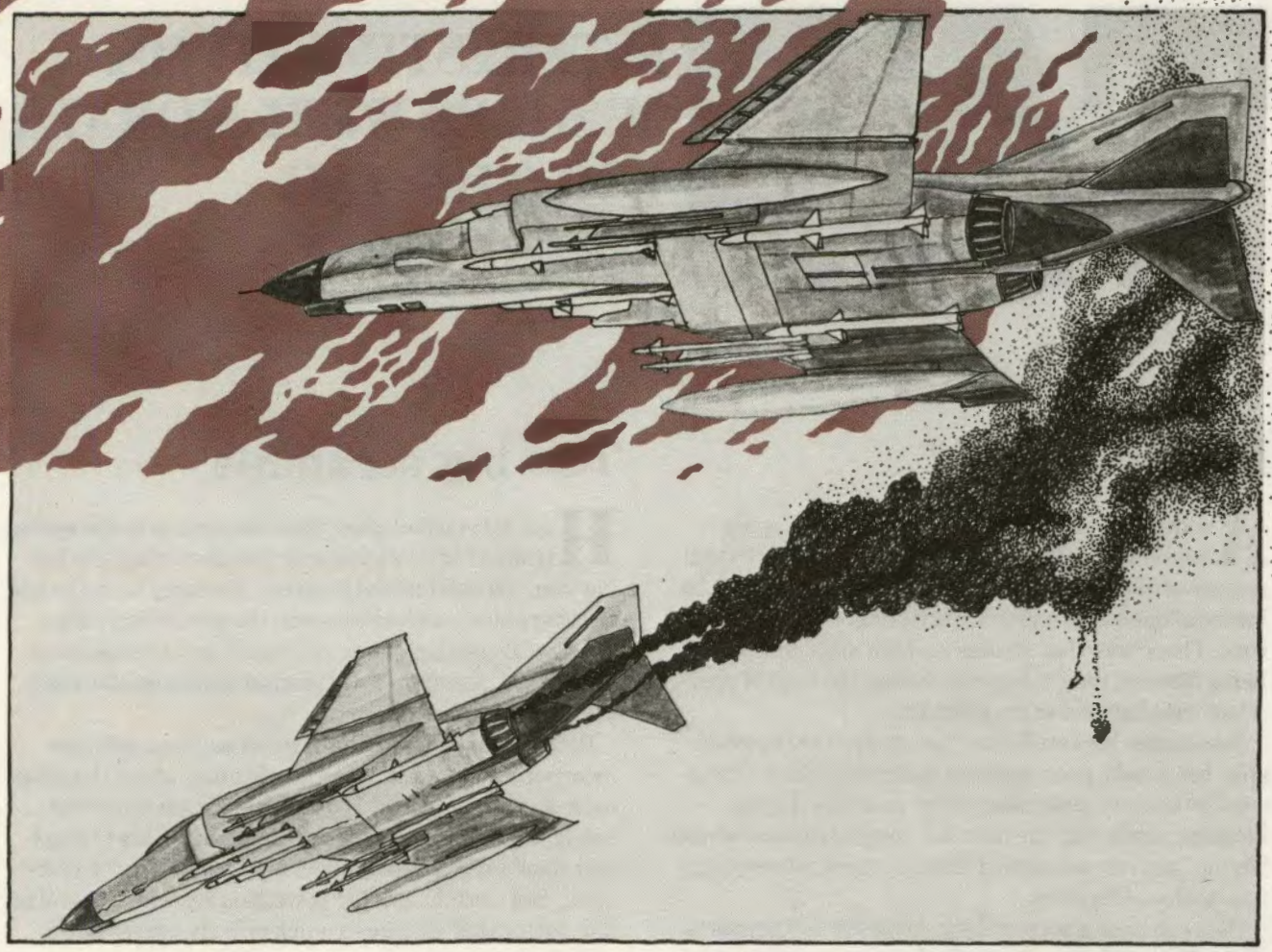
The above mishaps were all preventable. None of them should have ever happened. However, they did, and each of you can probably think of a number of others with equally egregious errors made by normally clear-minded individuals. Most of us have done something equally outrageous and gotten away with it. Or perhaps you were caught and escaped with only a slap on the wrist from your supervisor.

Human error will undoubtedly persist as long as men and women fly airplanes. What we are constantly (I hope) trying to do is reduce or eliminate those instances where people "screw up," causing injury or death to themselves or others. We know and accept the risk inherent in flying – there is no sense in adding to the risk on purpose or by willful neglect. Contrary to what Lindbergh wrote, most of us would probably rather die in a bed than on a mountainside. This is especially true if one dies in bed at age 80 vice the mountainside at age 25.

What we are constantly (I hope) trying to do is reduce or eliminate those instances where people "screw up," causing injury or death to themselves or others.

If only for the sake of your wife and kids, can *you* afford:

- not to "knock it off" when you
  – lose contact or visual in an intercept or a fight?
  – lose situational awareness?
  – lose sight of your wingman?



- not to take time for one more "gear down and locked" check?
- not to have a plan of escape or an awareness of where the high terrain is when you're in the weather (and possibly radio out, too)?

Contrary to what Lindbergh wrote, most of us would probably rather die in a bed than on a mountainside.

This is especially true if one dies in bed at age 80 vice the mountainside at age 25.

Despite the fact that the odds are probably with you, accidents do happen. If you take risks such as those above, they undoubtedly will. If they haven't yet, you've just been lucky, like Lindbergh.

Lindbergh was right about one thing – "safety lies in the judgement of the chances one takes." Despite talk about fate and "the golden BB," the things we do or fail to do often have logical and predictable consequences. However, luck sometimes plays a major part in human activities. Don't rely on luck or chance to provide your margin of safety.

When Lindbergh took off on his epic flight, his plane was overweight. It lacked any direct forward visibility and was poorly instrumented as well. Despite

Despite talk about fate and "the golden BB," the things we do or fail to do often have logical and predictable consequences.

spending parts of the mission "wave-hopping" to avoid the weather and falling asleep several times, he made it to Le Bourget, France.

They didn't call him "Lucky" for nothing. >

TAC tips

tac tips

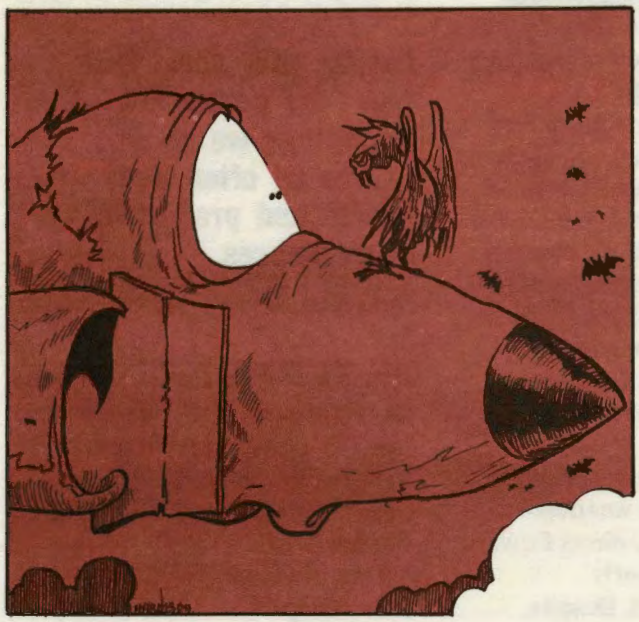
INTERESTING ITEMS, MISHAPS WITH MORALS, FOR THE TAC AIRCREWMAN

It was a what?

An aircrew was flying a night terrain following mission at 500 feet AGL when they experienced several strikes on the wing leading edge and down the intake of one of the engines. Bird strikes? Not this time. These were bat strikes, and the mission was being flown in the Philippines during the time of year when fruit bats are extra plentiful.

Sometimes bird strikes (or bat strikes) are unavoidable, but it pays to be aware of their most likely "hang-outs" so you can steer clear when possible. As this incident points out, the heaviest concentrations of such "flying" activity are a good thing to check when you go to a deployed location.

Bats can pose a potential for strikes in certain parts of the United States, particularly in the southwestern states. Check out your local flying area and low-level routes for such unusual hazards.



The big scramble

How did you feel after your last session in the egress trainer? If it left you with the uncomfortable feeling that you still needed practice, you could be in trouble. Getting out of a sick airplane on the ground isn't like a successful ejection where you have a lot of things working for you. An emergency ground egress involves only you, working alone.

Before you fly again, think about any new systems incorporated into your aircraft that may affect the snugness of your cockpit and your ability to get in and out safely. Being able to release leg restraints, lap fittings and shoulder harness connections is your ticket to survival. You can't let a radar or weapon system pedestal be the factor that changes a quick orderly egress into a desperate scramble to save your life.

The periodic training we receive is an excellent tool in preparing for this emergency. Consider also the actual setting in the aircraft which will decide the intensity of the situation complicating your egress. Take 30 seconds every now and then to hone your ground egress procedures while actually sitting in your aircraft. Face it – if your actions are not second nature in a ground emergency situation, you might be too far behind the power curve to negotiate an escape from a dark cockpit at night.

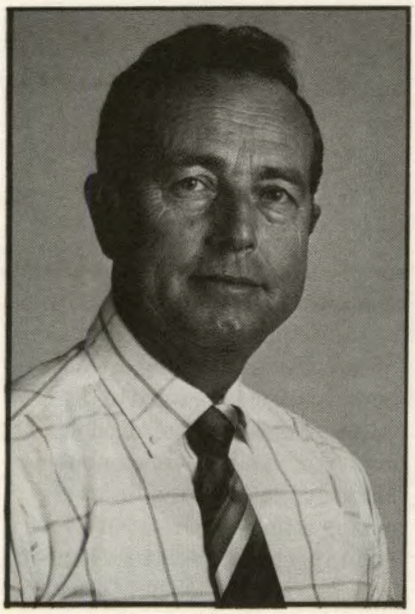
Know the conditions under which egress is pending and those when it's immediate. Being able to immediately assess the difference could save your life.

If you are caught in a moment of indecision, you lose seconds if it turns out that you should egress. Then, if you have to think about *how* to get out of the aircraft, you might not have time to do so.

Know your egress procedures. You're professional enough to get into the aircraft. Be professional enough to know how to get out in any situation.

– Adapted from an article by Lt K. M. Trombley, *U.S. Navy Weekly Summary of Aircraft Mishaps*

TAC OUTSTANDING ACHIEVEMENT IN SAFETY AWARD

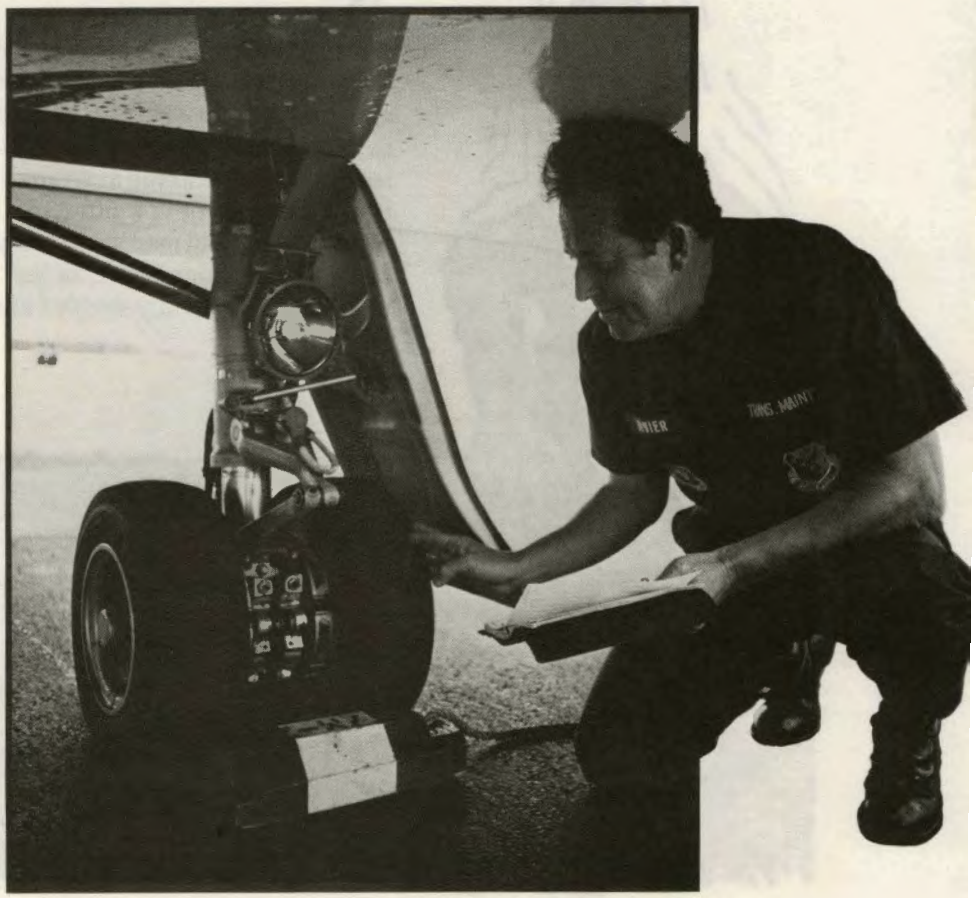


Mr. Guy Vivier
31 EMS, 31 TFW
Homestead AFB, FL

Mr. Guy Vivier, an aircraft worker in the 31st Tactical Fighter Wing's Transient Maintenance section, was inspecting a transient aircraft prior to its departure with a VIP on board when he noticed that one of the main gear tires had low pressure. Due to a rushed schedule, the aircrew was anxious to get moving; however, when Mr. Vivier insisted that the tire be serviced, the crew consented.

With his technical order in hand, Mr. Vivier began servicing the tire, but at approximately one-half the required pressure, the sidewall blew apart. Aircraft mechanics stated that the tire would have blown on the next landing if the aircraft had been allowed to take off.

Mr. Vivier's meticulous aircraft inspection and insistence that the tire problem be corrected, regardless of time schedule or passengers on board, prevented a potentially disastrous mishap. His actions have earned him the TAC Outstanding Achievement in Safety Award.



CONTINUATION TRAINING TRAPS: don't let one catch you

Lt Col Jon Foster
HQ TAC/DOT

A recent aircraft mishap brought to mind my time as a formal course instructor and how I viewed the difference between leading the standard student sorties as opposed to a continuation training sortie. It seems I always entered a continuation training sortie in a different frame of mind and may have set myself up for a continuation training trap. In fact, I actually stepped into one of those traps. Let's look at some circumstances that set up such pitfalls and could catch you, too.

First, there's a feeling of excitement as we look forward to the chance to enhance our mission employment skills while unburdened by the responsibilities of looking after a student. Next is a feeling of challenge at the chance to demonstrate proficiency to instruc-

tor peers. These feelings can cloud our judgment and prevent the attention to detail we normally apply in mission planning and execution. *Self-discipline is the key to avoiding this trap.*

In day-to-day student sortie planning, we are very careful to structure each sortie to achieve syllabus goals without exceeding student capabilities. Plenty of information is available on student performance and current proficiency levels (recent sorties with the same student and/or student gradebooks). The trap occurs when you assume that the rest of your continuation training flight members are as current and proficient as you are. Although such information is not as easy to find, some time spent here could help you avoid this trap. If all else fails, ask them how prepared they feel to accomplish each mission segment.

The trap occurs when you assume that the rest of your continuation training flight members are as current and proficient as you are.

Next is the continuation training sortie briefing. It is often shorter than the standard student sortie (and probably should be) with more standard items and fewer comments on techniques and potential problem areas. The "We're all instructors" attitude prevails. **Quality, not quantity,** is the key to avoiding this trap.

Our familiarity with the flying area (and each other) might lead us to omit some aspect of mission planning we see as unnecessary for continuation training but would never forget with a student onboard – another trap.

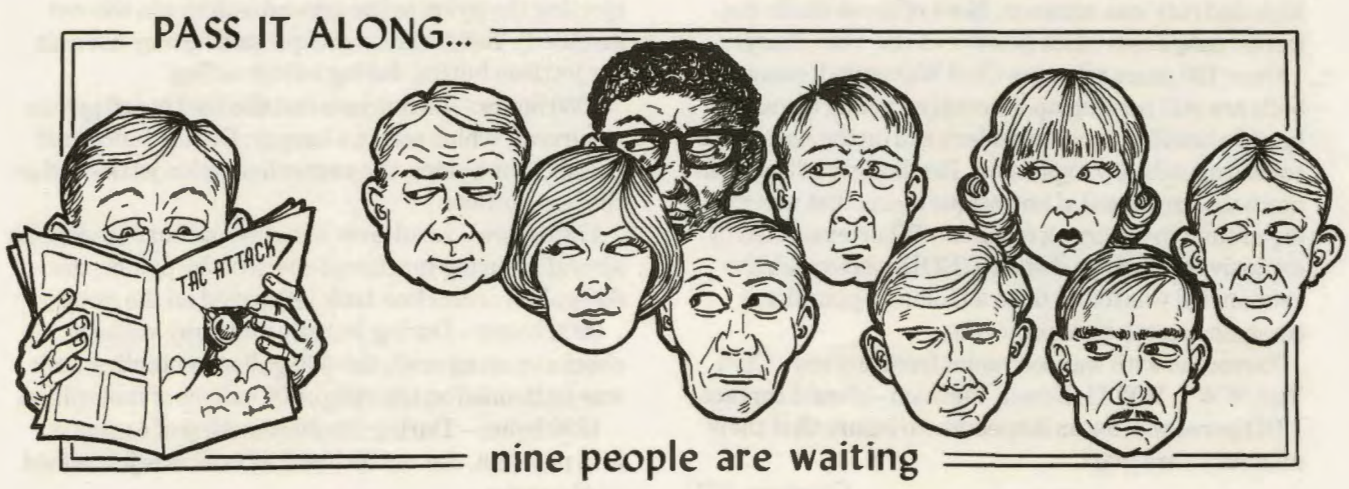
All of the things we would carefully consider for a student sortie are treated as routine for instructor flying.

A continuation training sortie might train to a wartime mission that differs from day-to-day student training or be out of phase with current student instruction. Once again, what we consider routine could be a trap.

What are the flying conditions for today's continuation training sortie: day, night, VFR, IFR, etc? All of the things we would carefully consider for a student sortie are treated as routine for instructor flying. Just another trap waiting to be stepped into.

Finally, we never fail to critique student performance inflight or give new directions when things are not going as planned. On an all-instructor continuation training flight, the "he knows what he's doing" attitude is a trap to be avoided. Don't blow off the mission critique with a simple "Nice flight, guys." Everyone benefits from an open discussion of the good, the bad, or even the ugly.

Don't be like me. I stepped in a trap I probably baited myself. I was very lucky; the resulting mid-air didn't cost any airplanes or lives. **Flight leaders, don't let it happen to you – keep those traps unbaited.**



WEAPONS WORDS

Souvenirs: Watch out for them

On June 9, 1863, Union troops manning Fort Lyons outside Washington, D.C., were busily inspecting artillery rounds in anticipation of a Confederate sneak attack. One round exploded outside the open door of a magazine which propagated to some more shells and finally blew up the entire magazine. Thirty men were killed with an equal number wounded.

An estimated 10,000,000 cannon balls and other artillery projectiles were fired by both sides during the Civil War. Such ordnance was hazardous then and even more so today. Due to imperfections in fusing, a high dud rate was common. Most of these shells contained dangerous black powder as the main charge.

Over 120 years after the Civil War ended, cannon balls are still turning up. Recently a young airman heard a briefing at commander's call on the hazards of collecting military explosives. He thought of that cannon ball, purchased at an antique store, that was rolling around in the trunk of his car. When examined by explosives ordnance disposal (EOD) personnel, the cannon ball was found to be a Union 12-pounder, a common smooth bore projectile.

Personnel with war souvenirs from any era – Civil War, WW I, WW II, Korea, Vietnam – should contact EOD personnel for an inspection to insure that their mementos are inert.

– Courtesy ATC

They functioned as designed

One of the most often performed operations on the flight line is the functional check of weapons systems. The checks are performed hundreds of times a day; and when properly performed, no significant hazards are involved. The key phrase is "when properly performed." One or two missed steps in the checklist could lead to disastrous consequences. The steps "Check ejector carts are removed from all stations" or "Insure safety pins are installed in all loaded stations" were not performed in any of the following eight mishaps. The jettison systems worked perfectly each time; unfortunately, the ejector carts were installed and the aircraft was still on the ground. Damage was limited to the jettisoned items – this time. We could have lost an aircraft and came very close to losing a crew member. Take the time to perform all steps in your checklist and don't assume someone else has already done it. It's *your* responsibility.

0530 hours – Load crew performed functional check of external stores jettison system. Carts in both 370-gallon tank pylons fired.

1100 hours – During troubleshooting for a hung bomb problem on one station, CCU-44 carts were inadvertently fired on another station.

2100 hours – (same unit) During troubleshooting for a hung bomb problem on one station, CCU-44 carts were inadvertently fired on another station.

1900 hours – Technicians performed functional check of centerline pylon. Prior to shutting down aircraft power, one technician began installing ejector carts. As cart liners were tightened, the carts fired, ejecting the pylon to the ground (safety pin was not installed). Technician in cockpit said he may have hit the jettison button during switch safing.

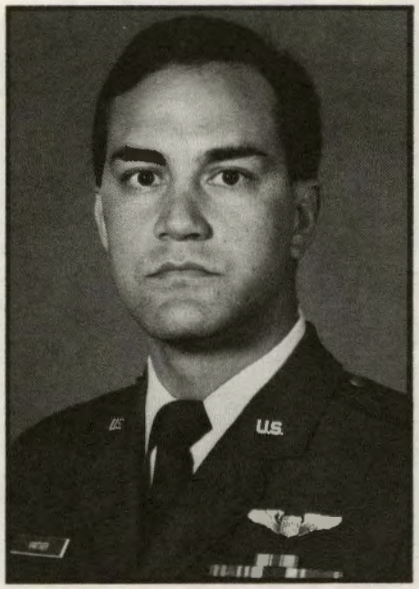
2030 hours – Technicians installed outboard pylons on aircraft which was in a hangar. During functional check of the pylons, the centerline pylon jettisoned on the hangar floor.

1730 hours – Load crew installed outboard pylons on aircraft. During functional check of the pylons, the 600-gallon centerline tank jettisoned on the ramp.

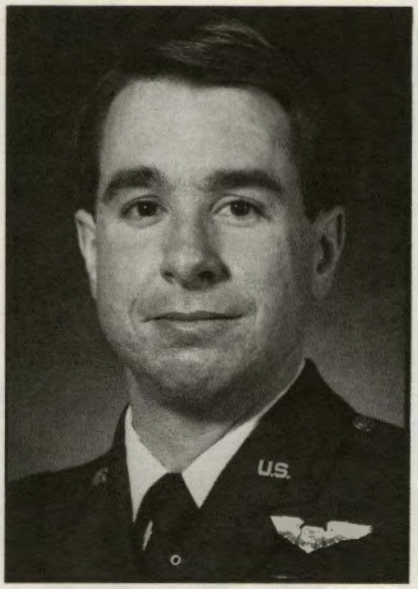
0900 hours – During jettison and stray voltage checks on an aircraft, the 600-gallon centerline tank was jettisoned on the ramp; 600 gallons of fuel spilled.

1330 hours – During troubleshooting of a missile arm problem, the centerline fuel tank was jettisoned on the ramp.

AIRCREW OF DISTINCTION



Capt Kenneth J. Vantiger



Capt Thomas E. Carlson

523 TFS, 27 TFW
Cannon AFB, NM

Captain Kenneth J. Vantiger, F-111D aircraft commander, and Capt Thomas E. Carlson, weapon systems officer, were entering initial at Eglin AFB, Florida, when Capt Vantiger felt a momentary glitch in the control stick. Within seconds, the stick moved full right and the aircraft rolled rapidly right. Both crewmembers applied full left stick force and stopped the roll at 80-90 degrees of bank. Since the stick would not move past the centered position, rudder was required to get the aircraft back to wings level. When they had regained control, the aircraft was pointed away from the airfield at 2000 feet AGL. While Capt Carlson kept full pressure on the stick, Capt Vantiger turned off the flight control dampers and placed the flight control disconnect switch to override, but the full right stick deflection persisted. Realizing he had only rudder control to turn the aircraft, Capt Vantiger selected full rudder authority to give additional steering control.

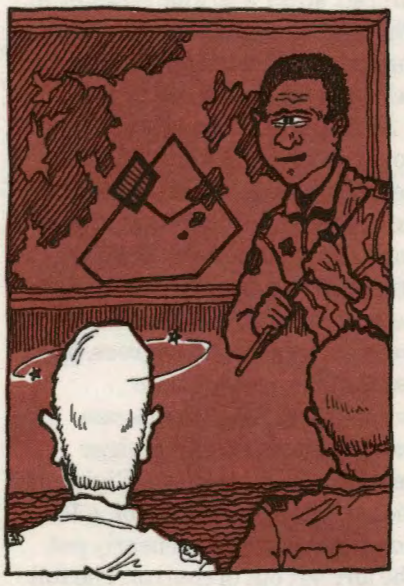
The aircrew declared an emergency and informed Eglin approach they would be unable to get back around to land on the active runway. The controller suggested a right turn to Pensacola NAS, but with the right stick forces, both crewmembers felt a right turn might place them in an out of control situation. A left 5 degree rudder turn was the most they could safely maintain. As the crew continued to turn to the south and started a slow climb to 6000 feet to prepare for a controllability check and the possibility of ejection, the stick made small back and forth glitching movements in pitch. Capt Vantiger continued his slow left turn to line up on runway 01, estimating that his turn rate would eventually line the aircraft up for a 20 mile straight-in. This put the approach over water, minimizing the danger for ground personnel if ejection occurred.

At 24 DME, the gear was placed down. Pitch oscillations of ± 4 degrees were felt, but the oscillations dampened out once the gear were down and locked, although the stick still required full left force by both crewmembers. As the flaps were extended to 15 degrees, pitch oscillations became more pronounced. After they again dampened out, Capt Vantiger selected 25 degree flaps. Eight to 10 violent pitch oscillations of ± 15 degrees occurred and nearly put the aircraft out of control. The full right stick deflection increased the difficulty of pitch control. The pitch finally stabilized and the aircrew left the flaps at 25 degrees, requiring a higher than normal approach speed. As they began final approach only rudder control was available for runway alignment. Minor pitch oscillations continued throughout the approach and made airspeed and glide slope control very difficult. Without the yaw damper the nose of the aircraft wandered 5-10 degrees left and right of course throughout the approach, requiring continuous left and right rudder inputs.

At 50 feet AGL over the runway threshold, the right wing made an uncommanded drop of 10-15 degrees and a quick rudder input brought it up, but the aircraft drifted to the left edge of the runway for landing. Capt Vantiger landed the aircraft and carefully brought it back to the runway centerline with directional braking. The landing rollout was uneventful and no damage occurred to the aircraft.

The time critical decision making and superb airmanship demonstrated by Capts Vantiger and Carlson prevented the loss of a valuable combat resource and earned them the TAC Aircrew of Distinction Award.

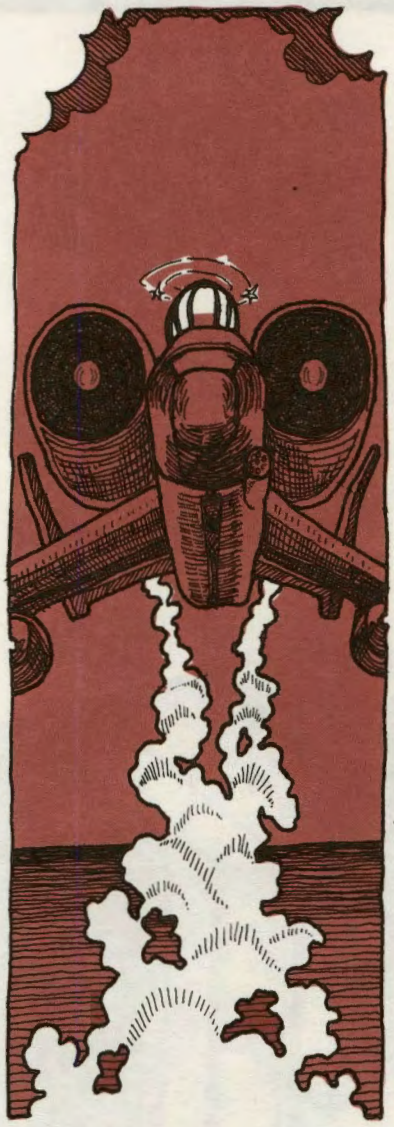
KNOW WHEN TO SAY "UNCLE"

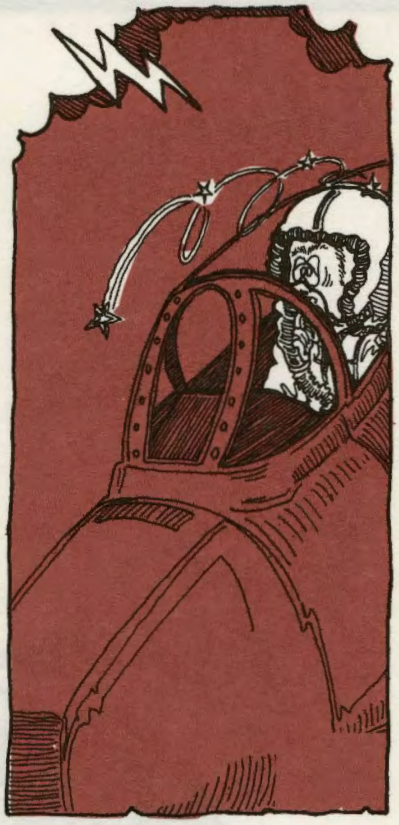


The weekend wasn't one of the best that I'd had lately. I had shown all the classic symptoms of a viral infection (diarrhea, nausea, fever, etc.), but felt much better at brief time on Monday mo ing. With that in mind and a few more squares to fill before the Christmas holidays, I decided to press on with the mission.

I can't say that I felt good, but I was sure I could "hack the mission."

Brief, preflight and taxi out were uneventful. I can't say that I felt good, but I was sure I could "hack the mission." Just prior to takeoff, I developed a slight headache and nausea, but *still* felt that I could fly the sortie. During the takeoff roll, the nausea and headache went





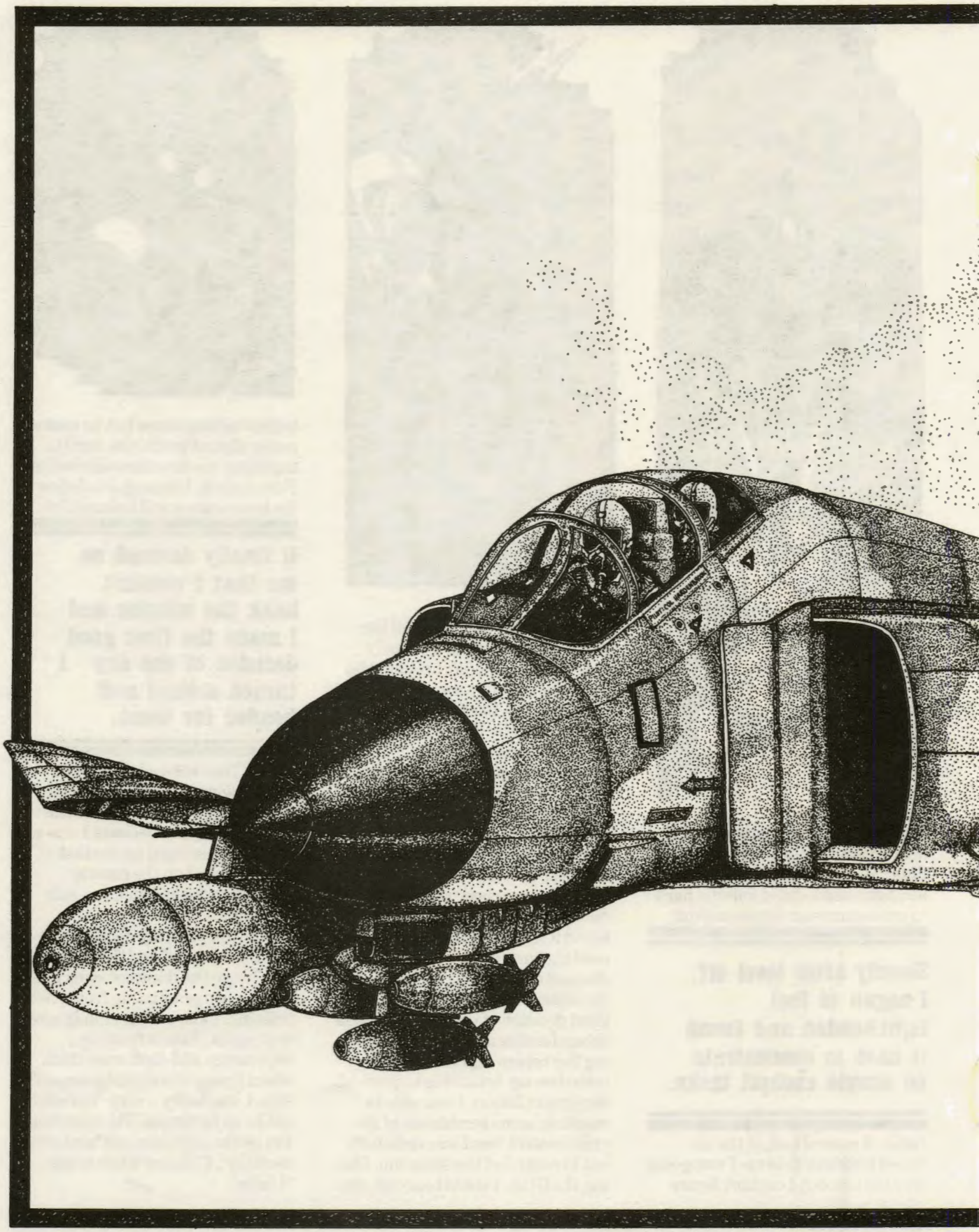
away as I made my departure and headed toward the working area. Shortly after level off, I began to feel light-headed and found it hard to concentrate on simple cockpit tasks. A second look at the airspeed indicator told me I was going way too fast but I couldn't figure out why. After staring at all the gauges for a long time, I finally realized that I hadn't brought the power below military after leveling off. About 8 – 10 minutes after takeoff, I really began to feel worse – increased light-headedness, slight stomach discomfort, and some dizziness. I made all the appropriate radio calls, gang loaded the oxygen regulator and continued to press toward the area.

Shortly after level off, I began to feel light-headed and found it hard to concentrate on simple cockpit tasks.

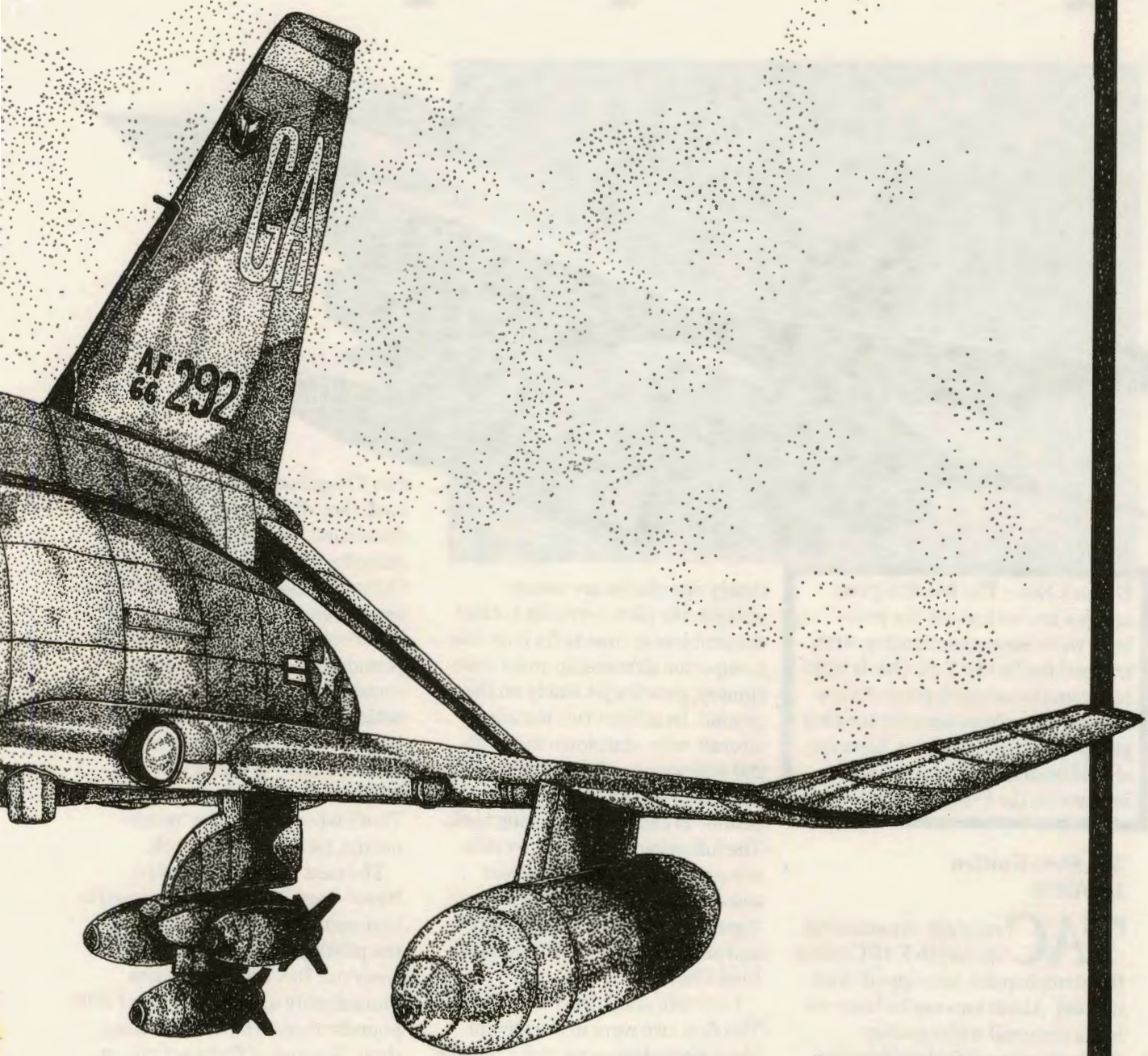
As I approached the area, I *really* began to feel worse and found it hard to think clearly or read the instruments. It finally dawned on me that I *couldn't* hack the mission and I made the first good decision of the day – I turned around and headed for home. During the return flight, I concentrated on my breathing to prevent hyperventilation. I was able to maintain some semblance of aircraft control, but I was definitely not in control of the situation. During the GCA, I could hear the controller talking to me but he seemed really distant and it was hard to translate his directions into action. Fortunately, I managed to follow his instructions and lowered the gear. I then noticed that I was sweating profusely and dropped my mask. I began to feel a little better (probably because I was concentrating so hard on the task at hand), picked up the runway visually and continued to a safe landing.

It finally dawned on me that I couldn't hack the mission and I made the first good decision of the day - I turned around and headed for home.

In retrospect, my decisions to "fill the squares" and "hack the mission" were the dumbest ones I've made since graduating from pilot training. I know I'll certainly never do it again. Take it from my experience and don't even think about flying when you know you're sick. I was lucky – very. You might not be as fortunate. The next time I'm on the schedule and "under the weather", I'll know when to say "Uncle." >



F-4 PHANTOM



F-16 TRAPPED FUEL operator's perspective

Editor's Note: The following two articles are both about the problems we've been experiencing with trapped fuel in the F-16. One is written from the aviator's point of view and the other from the maintenance perspective. Both articles, however, should be of interest to everyone involved in the F-16 business.

Maj Steve Kniffen
1 AF/SEF

TAC recently experienced its fourth F-16 Class A flight mishap due to trapped external fuel. About two weeks later, we had a close call with another trapped external fuel malfunction. This is not the only close call we've had recently. Trapped external fuel is a known problem in the F-16. If timely ops checks are accomplished, the pilot normally notices the problem in time to fix it or, due to superior airmanship and a close runway, gets the jet safely on the ground. In at least two instances, aircraft were shutdown with only 200-300 pounds of useable fuel in the reservoir tanks and 2000+ pounds in each external wing tank. The following paragraphs review some of these mishaps, discuss some things about the fuel system Viper drivers need to think about, and explain the current Trapped Fuel Checklist.

Let's talk about the Class A's first. The first two were in the days of black noses before we had a "needle, needle, totalizer, tank(s) feeding" fuel check. The first pilot forgot to close his air refueling door. With the two 370-gallon tanks unpressurized, they didn't feed and the engine flamed out. We lost an aircraft and gained a "Post Refueling Checklist Complete" radio call. (This call is no longer required.) The second mishap involved an A-model with 1200 pounds of fuel trapped in a lone centerline tank. The pilot didn't notice it because the automatic fuel transfer system took care of that and all we had to watch was the totalizer. So much for that idea! That's when we got the "needle, needle, totalizer" fuel check.

The next two mishaps were "three-bag" jets. Through missed or improper ops checks in both cases, the pilots got into situations where reservoir fuel was all that was immediately useable in spite of 4000 pounds trapped outside creating drag. Because of flight activity at the time, neither pilot remembered hearing the voice "CAUTION, CAUTION" when the Fuel Low

MALFUNCTIONS:

Lights came on. Neither aircraft had the "Bingo fuel warning based on fuselage fuel" mod and neither made it home.

Anyone with much experience in the jet can remember lots of times when the externals haven't fed, and it's usually not been a big deal. Usually checklist procedures such as cycling the air refueling door solved the problem. The latest Class A and a similar incident a few days later pointed out some things we didn't know about the F-16 fuel system and some misperceptions about the Trapped Fuel Checklist.

First of all, the key to changing a trapped fuel situation from a serious mishap into a minor inconvenience lies in **early recognition of the problem.** Most of these mishaps started with a breakdown of basic airmanship. Whether you call it complacency, channelized attention, lack of situational awareness, or whatever, it all boils down to *not properly flying the aircraft and not paying attention to what it takes to keep it in the air.* If you notice trapped fuel with 9500 pounds total, it's a lot easier to handle than with 4600 pounds total, 4000 of which is external. Your pucker factor and your priorities take radically different perspectives accordingly. Perhaps the biggest lesson learned from our most recent mishap is – if your engine flames out due to fuel starvation, any fuel trapped in the external tanks will stay right where it was trapped. **It will never feed.** There are several things which influence this. The first, most obvious one is that with the engine not running, there is no bleed air to pressurize the tanks. We learned years ago that without pressure, they won't feed. That's not surprising.

Once we get past that basic knowledge, things get a little sketchy. Any lieutenant just out of the B Course and *most* SEFEs know that the primary means of fuel transfer in the F-16 is by siphoning action. As fuel is used from the reservoirs, suction pulls additional fuel through standpipes from the upstream internal tanks. The only thing needed to keep the siphoning process going is a running engine and an absence of air in the tanks receiving fuel. If you are operating with fuel only in the reservoirs and suddenly introduce fuel into the internal wing tanks, siphoning through the fuselage tanks may be a slow process depending on the amount of air in the internal tanks. If you're almost out of reservoir fuel, you won't have enough time to get a useful siphon action going.

Oops, what now? Well, we have transfer pumps to scavenge the tanks. If the external tanks start transferring, the wing transfer pumps should pick up the fuel in the internal wings and pump it into the fuselage tanks. "Yeah, that's the ticket."

There are only two problems with the wing transfer pumps: 1) they only pump at a rate of 3000 pounds per hour each, and 2) they shut down when both reservoirs go dry. So, if your externals just started to feed as the engine quit, the fuel is still trapped because without pressure it won't transfer out of the external tanks and without the transfer pumps it won't move into the fuselage even if it would transfer into the internal wings.

What does this mean to you, the operator, who just flamed out a perfectly good airplane? You're not going to get a restart on that engine unless you can find some way to manually pump fuel into the reservoir tanks. The JFS (jet fuel starter) won't run and the EPU (emergency power unit) won't pressurize the tanks. Your decision tree has just had a limb cut off. Instead of reaching for the trapped fuel or airstart checklists, it's time to reach for the flameout landing checklist. As foolish as it may sound, it's time to jettison what was your only source of fuel, the external tanks, and practice being a glider pilot if there is a nearby airfield. If not, look for a place to park the jet out of harm's way.

Trapped fuel is a fact of life in the F-16. The engineers are working on ways to keep it from happening, but regardless of what actions they take to protect us from ourselves, it is still each pilot's responsibility to fly his aircraft. Knowing how much fuel is on board and where it's at is an essential part of combat readiness. We can't kill 'em if we can't get there and we can't get there if we don't have any jets left. Early detection is the key to preventing a trapped fuel mishap. Regular ops checks in the directed format are the way to detect it early.

What happens if you don't notice

F-16 TRAPPED FUEL MALFUNCTION:

your trapped fuel until you have 4600 pounds total fuel remaining? Let's walk through the Trapped Fuel Checklist to see what it does for you.

Your first natural reaction should be to turn toward the nearest field and zoom so you can get the jet on concrete if you are close enough and the engine runs long enough. Your wingman might fall into chase and dig out his checklist. He might also ignore (as has been the case in several recent near misses) the "Accomplish as many of the following steps as required:" notation on the top of the page and start reading:

STEP 1. FUEL FLOW REDUCE. That makes sense, you want to use what fuel you have as slowly as possible so you can get the most out of it. **(Warning 1: With trapped fuel, the totalizer does not indicate total usable fuel.)**

STEP 2. AIR REFUEL SWITCH – CLOSE. This is a "check and see" step, just to make sure you didn't come off the tanker and forget to accomplish your Post Refueling Check.

IF FUEL IS TRAPPED IN AN EXTERNAL TANK:

STEP 3. AIR SOURCE KNOB – NORM OR DUMP. This is another "check and see" step, since fuel doesn't feed in RAM or OFF.

STEP 4. AIR REFUEL SWITCH – OPEN (3 SECONDS) THEN CLOSE. This is a shock treatment. A power cycle on the air refuel circuit may cure a switch hangup on the external vent and pressurization valve or associated relay contacts. (Note 2: Open or close the AR door at or below 400 knots/.85 mach.)

STEP 5. EXT FUEL TRANS SWITCH – WING FIRST. This bypasses two electrical circuits which may be inhibiting transfer. One circuit involves the centerline tank float switch; the other circuit involves the vent tank float switch.

STEP 6. TANK INERTING SWITCH – TANK INERTING (1-2 MINUTES). This step lowers the pressure in the internal tanks while leaving the pressure in the external tanks at the normal level. The increased pressure differential between the internal and external tanks may unstick a valve and allow the external fuel to transfer.

STEP 7. AIR REFUEL SWITCH – OPEN (1-2 MINUTES) THEN CLOSE. This fully dumps the pressure in the external tanks and may unstick a valve once pressure is restored. (Note 3: If repositioning the switches does not

operator's perspective

correct the trapped external fuel condition, then internal fuel is the only usable fuel available.)

STEP 8. STORES – JETTISON (IF REQUIRED). This is a judgement call on whether or not it is "required." If none of the above steps have helped and you need the glide distance, consider it. If it appears fuel is starting to transfer, jettisoning will cut you off from 4000 pounds of useable JP-4 that will go a long way toward getting you home.

STEP 9. LAND AS SOON AS PRACTICAL. So you accomplished steps 1-7 and didn't get any results. You can't figure it out. You just went over this EP on your SEPT last month and you were impressed today with how fast you could zip through those checklist steps. You had them done about as quickly as your wingman read them to you. But what about that **"as many of the following as required:"** lead-in your wingman forgot to read you? That could have hurt you and your proficiency at switchology may have prevented you from ever getting fuel out of your tanks.

Go back to step 5. By going to WING FIRST, you bypass the centerline tank float switch circuit which has historically given us the most problems with trapped fuel. If the centerline never sends an "I'm empty" signal to the external wing tanks, they are never going to feed as long as the External Fuel Transfer switch is in NORM.

Selecting WING FIRST takes the centerline out of the loop and may start fuel moving. The kicker is, how fast will it move? With only reservoir fuel useable, the external fuel must travel through the internal wings, the forward and aft tanks, and finally to the reservoirs before it can go to the engine where it will do some good. When the externals start to feed, the fuel in the internal wings is picked up by the transfer pumps which move it into the fuselage at a rate of 3000 pounds per hour per wing. That sounds like a lot, but if you're burning 3000 pph, only half of what you transfer will be available to show on the gauge. The rest is going into the engine. Between the time you start transferring fuel from the external wing tanks and the time the fuel gauge shows an increase in the reservoir tanks, up to three minutes may have passed. That can be an eternity when you're looking at 300 pounds on the gauge. A check of external wing quantity will be your first and fastest indication of fuel transfer. As the external quantity drops, the fuel is going somewhere.

If you did race down the checklist through Step 7, what happened when you opened your Air Refueling door, seconds after going to WING FIRST? The pressure dropped and the fuel just sat there. With no pressure, it isn't going anywhere. You have just precluded any transfer to the internal wing tanks for the two minutes you have the door open. That could make it take five minutes to get an indication of fuel transfer in the reservoirs. How high is your pucker factor now?

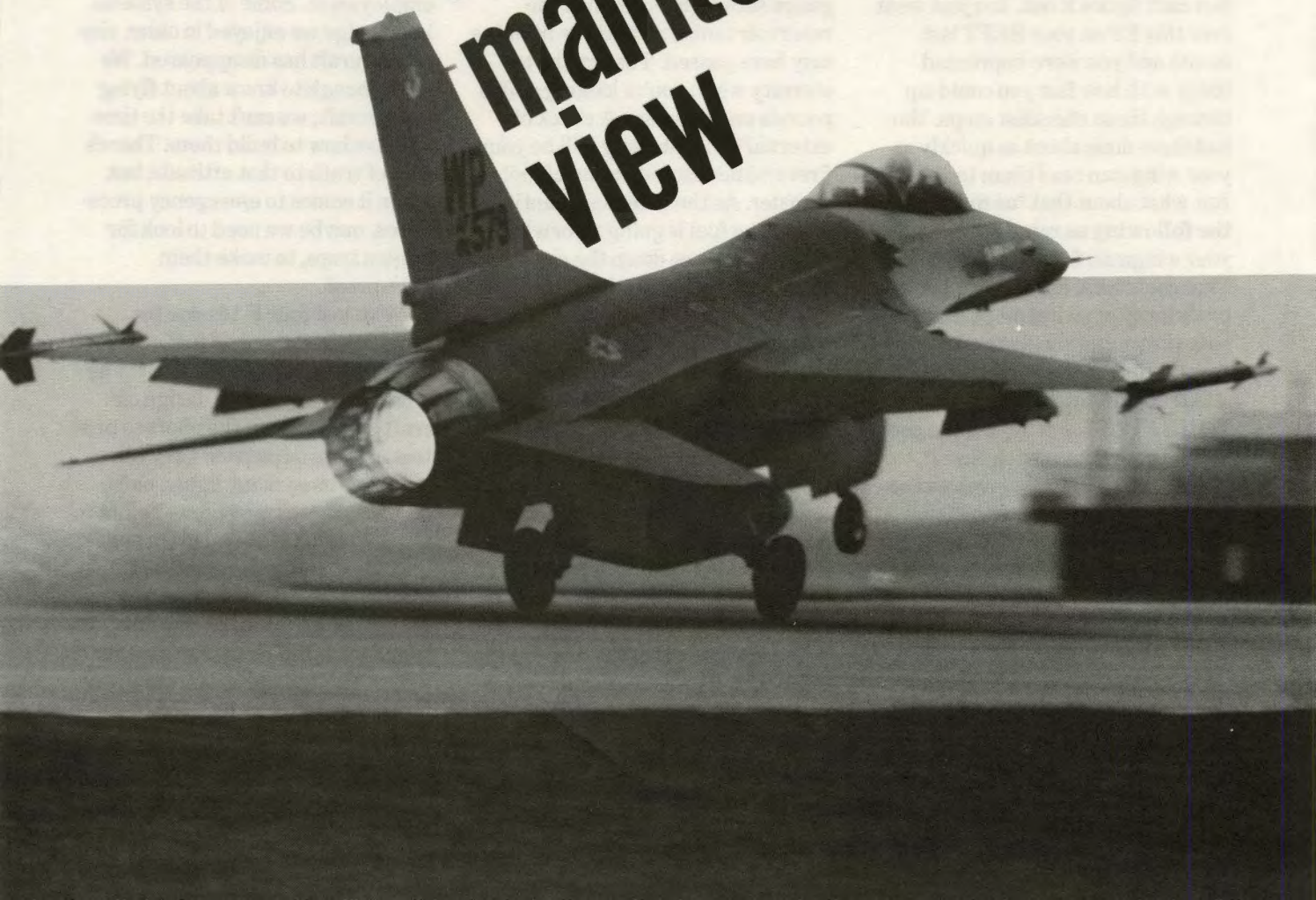
The key was in the "as many of the following steps as required:" which your wingman forgot to read you. If going to WING FIRST solves the problem, stop there. But you have to give it time to work first. Speed is not of the essence in this procedure. Slow down and let the system work. That's the way the engineer designed it and the publications author intended it. They thought a simple caveat at the beginning would suffice. They never expected the pilot to race through the checklist and maybe retrap fuel he had just freed.

As aircraft have become more complicated and Dash One's have grown to monumental proportions, it has become easier to learn only those things which you can directly affect from the cockpit, especially the ones involved in weapons employment. Some of the systems knowledge we enjoyed in older, simpler aircraft has disappeared. We have enough to know about flying the aircraft; we can't take the time to know how to build them. There's a lot of truth to that attitude, but when it comes to emergency procedures, maybe we need to look for hidden traps, to make them pilot-proof.

We've lost four F-16s due to unrecognized trapped fuel, a lack of attention to basic flying skills. The engineers continue to design aircraft smarter than the pilots to protect us from ourselves. They can only give us so many lights, bells, buzzers, Bettys, and horns before the jet begins to sound like a one-man band and his nagging wife. There is only so much that General Dynamics can save us from. It's time for each of us to take another look at basic piloting skills and systems knowledge as integral parts of combat readiness.

F-16 TRAPPED FUEL:

the maintenance view



Capt George Ireland
TAC/LG

The United States Air Force is in the best shape ever since its inception. Our people are dedicated, well-trained professionals and our aircraft are the best in the world, built to be maintainable and survivable in any hostile environment. We work hard at our peacetime mission which goes a long way towards pilot competency and keeping our fighting machines mission capable and war ready. However, the lessons we learn in the process of meeting our mission can be costly. We recently experienced our fourth F-16 trapped fuel Class A flight mishap in TAC. In this mishap, fuel became trapped in the external wing tanks but went unnoticed until it was too late. In an effort to learn from this mishap, let's review the external fuel tank transfer system on the F-16 and how we check this system once an aircraft is reconfigured for flight.

First, it is important to know the basics of exactly how the fuel tanks transfer fuel to the aircraft fuel system. Let's assume the aircraft is configured with only a 300-gallon external centerline tank. The process is simple. Air pressure provided by the Environmental Control System to the external tank provides the motive force to get the fuel to both of the internal wing tanks simultaneously. Now, with two 370-gallon external wing tanks (*no* centerline tank) the process is similar. Air pressure transfers the fuel from the external wing tanks to

First, it is important to know the basics of exactly how the fuel tanks transfer fuel to the aircraft fuel system.

their respective internal wing tanks. Finally, let's assume that the aircraft is configured with all three external tanks. This is where some changes take place. With the external fuel transfer switch in the NORM position, fuel is transferred first from the external centerline tank to the internal wing tanks as discussed above. After the centerline tank empties, the low fuel level float switch in the tank opens and removes electrical power from solenoid shutoff valves located in the external wing tanks. Until now, these valves have been keeping the external wing tanks from feeding. Once the valves are de-energized, fuel transfers from the external wing tanks to their respective internal wing tanks. With the EXT FUEL TRANS switch in the WING FIRST position (the aircraft is still configured with all external tanks), the solenoid shutoff valve located in the external centerline tank is energized via the low fuel level float switches located in the external wing tanks. As a result, the external wing tanks transfer first. When they are empty, the low-level float switches open and the valve in the centerline tank is de-energized allowing the centerline tank fuel to transfer. Now that you can see how the external fuel tank transfer system works, let's review how external tank checkout procedures have evolved.

Early in the F-16 program, the external tank checkout procedures were written to verify that the external fuel tanks would transfer into the internal wings at an acceptable rate, and that the tank and interconnect tubes would not leak. Although these procedures verified external fuel tank operation, they did not identify many of the failure modes that have been experienced with external fuel tank usage.

The incorporation of TCTO 1F-16-697 (Selective Fill of External Fuel Tanks) provided the capability to manually shut off fuel flow from each external tank. This, together with new checkout procedures, provided detection capability of all the major external fuel transfer discrepancies that have been encountered. Component/subsystem failures that now can be detected are:

a. External fuel transfer switch and associated wiring.
b. External tank float switch operation.
c. External tank shutoff valves.
d. Proper tank sequencing (NORM: centerline empties prior to wing tanks; or WINGS FIRST: wing tanks empty prior to centerline tank).

It is important to note that not all pylons have been modified with the manual shutoff capability incorporated in TCTO 1F-16-697, but all *new* pylons have this manual shutoff capability. (Shutoff valves are located in 370-gallon tank wing pylons and in the right wheel well for centerline tanks.)

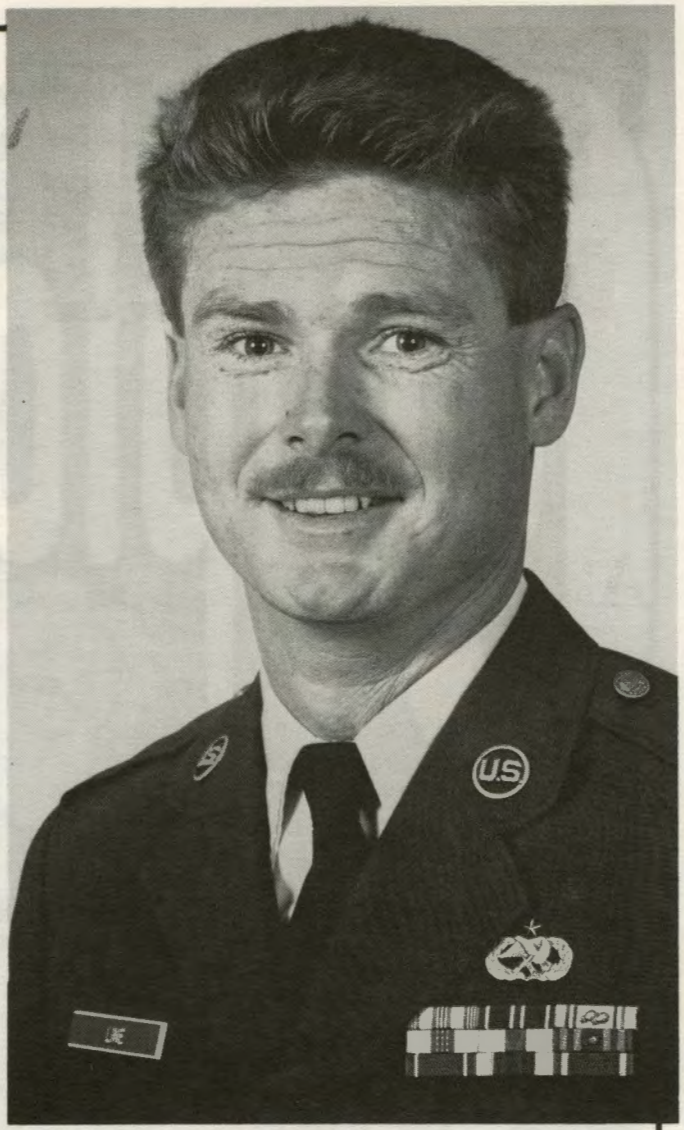
F-16 TRAPPED FUEL: THE MAINTENANCE VIEW

Successful completion of any mission is based on teamwork. As maintainers, our part of the mission is to know our aircraft and maintain them according to tech data.

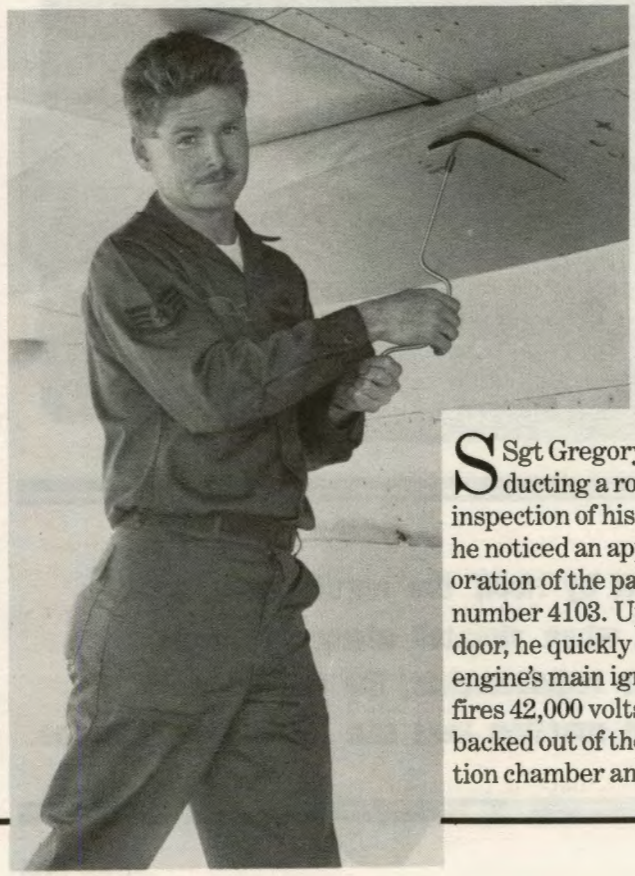
Successful completion of any mission is based on teamwork. As maintainers, our part of the mission is to know our aircraft and maintain them according to tech data. Previously, there was some confusion about what checkouts needed to be performed with varying configurations of external tanks. Now, C-model Job Guides very explicitly define that the checkout required is a result of the aircraft external tank configuration, not the tank just installed. For example, suppose an aircraft comes back from flight configured with a 300-gallon centerline tank and you add two 370-gallon tanks. You must now check all three tanks, not just the two newly installed ones. Bottom line: checkout is based on *latest configuration!* A/B-model Job Guides will soon clarify these new procedures.

As pilots and maintainers, we have learned many lessons from our experiences. Knowing our aircraft and following tech data are two important lessons we must not forget. We must continue to learn from our mistakes if we are to keep our Air Force the best in the world.

TAC CREW CHIEF SAFETY AWARD



SSgt Gregory K. Line
474 AGS, 474 TFW
Nellis AFB, NV



SSgt Gregory K. Line was conducting a routine thru-flight inspection of his F-16 aircraft when he noticed an apparent heat discoloration of the paint on aircraft door number 4103. Upon lowering the door, he quickly saw that the engine's main ignitor plug, which fires 42,000 volts of electricity, had backed out of the engine combustion chamber and was chafing against a fuel line. If this condition had gone unnoticed, the combination of fuel, high voltage and hot engine air could have been disastrous. SSgt Line's attention to detail prevented the potential loss of a valuable pilot and combat aircraft. His professionalism is commendable and has earned him the TAC Crew Chief Safety Award.

Complacency

Sgt Dennis W. Johnson
148 FIG/SEG
Griffiss AFB, NY

"It'll never happen! We've done it that way for years and have never had a mishap. It's just another stupid AFOSH requirement. Watch out, here comes the safety inspector (or QA)!"

It's possible that by itself the regulation may seem immaterial; but when violated along with other seemingly minor requirements, the ground work is laid for a chain reaction that can lead to catastrophe.

Have you ever been guilty of saying, or at least thinking, those thoughts? I know it's difficult to accept some safety requirements, especially if you've never personally been involved in a serious mishap that was caused by ignoring what you thought to be a meaningless regulation. But, we have to remember that the regulation is there for a reason – our safety! It's possible that by itself the regulation may seem immaterial; but when violated along with other seemingly minor requirements, the ground work is laid for a chain reaction that can lead to catastrophe.

"Yes, but I've done it a thousand times and haven't had a mishap." What about try # 1001? It only takes once! A recent ground aircraft mishap resulted in a fatality when a crew chief was ingested in the intake of an F-4D. It only took once!! Would you have thought it could actually happen? Well, it did!

Have you ever read a mishap investigation report? In most cases, there is more than one cause factor. Again, the small things build up until . . . "boom." How would you explain to an inspector or mishap investigator that you thought a certain regulation or tech order requirement wasn't important so you decided not to comply with it?

How would you explain to an inspector or mishap investigator that you thought a certain regulation or tech order requirement wasn't important so you decided not to comply with it?

If a mishap does occur in your unit or mine, let's make sure beforehand that we've done everything possible to have prevented it. That includes watching out for any complacency that may have crept in and paying attention to the "small things."

Maybe it's time for each of us to rethink our safety attitude. Remember, regulations are written for our protection. There is no place for complacency when it comes to safety.

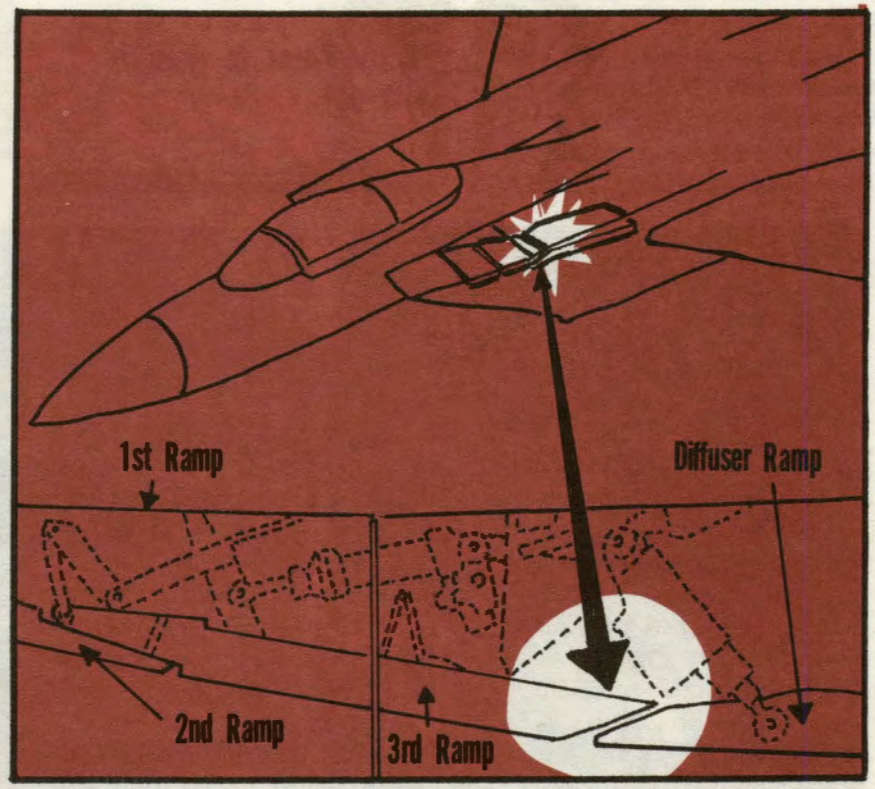
CHOCK TALK

INCIDENTS AND INCIDENTALS WITH A MAINTENANCE SLANT

A Hungry Eagle

The F-15 has jaws! At least there's one "Eagle keeper" who thinks so.

The crew chief and another technician were dispatched to the flight line to remove a foreign object under the diffuser and #3 ramps in an F-15 intake. Using a hydraulic test stand (TTU-228/E), they lowered the ramps and the crew chief climbed into the intake to retrieve the foreign object. Seems normal so far, right? However, the two individuals failed to follow tech data steps that would have closed the hydraulic loop between the aircraft and the hydraulic test stand. As a result, hydraulic fluid backflowed out of the aircraft into the test stand, causing the diffuser and #3 ramps to close slowly. The movement was so slow that the crew chief didn't notice it until he began to feel pressure on his back and chest – he was caught in the jaws of the two closing ramps! He screamed for help, and after a few moments of panic, a 2 x 4 was lodged between the ramps, stopping them from closing further. An hour later, after some minor aircraft damage in order to get the crew chief out, he was extracted with only a bruised ego and a renewed belief in the value of technical orders.



Area where body was caught

Murphy's Only Chances

1. The hydraulic "A" circuit breaker on the aircraft was not pulled and the ground safety interlock was not installed. This step, had it been complied with, would have prevented the incident.

2. The flow valve on the hydraulic test stand should have been turned off. This step, if completed, would also have prevented the incident.

If you haven't noticed, Murphy needed both openings to squeeze in; we gave them to him!

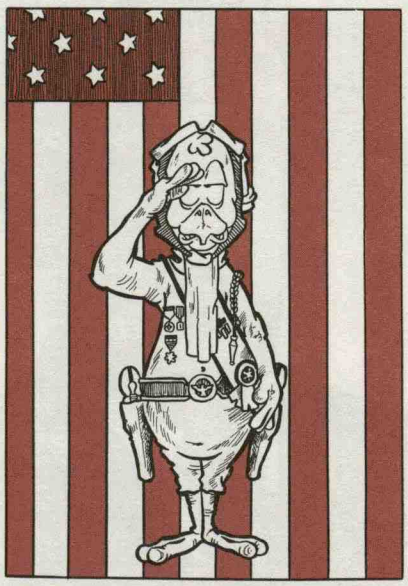
TAC OUTSTANDING ACHIEVEMENT IN SAFETY AWARD

TSgt Michael S. Wolfe
37 AGS, 37 TFW
George AFB, CA

Performing his additional duty as engine trim pad monitor, TSgt Michael S. Wolfe was performing a visual inspection of the aircraft holdback assembly on one trim pad in preparation for an engine run when he noticed a crack in the yoke assembly sufficient to render it unserviceable. If this problem had not been discovered the assembly could have broken during the scheduled afterburner run, allowing the aircraft to break free. TSgt Wolfe promptly notified maintenance operations of his discovery and closed the trim pad until the problem could be repaired.

When TSgt Wolfe checked further, he discovered that the damaged yoke and entire holdback assembly were due for a nondestructive inspection. He also found that three of the holdback assemblies in the war readiness spares kits required inspection and, after uncrating them, found that all three were unserviceable due to cracks. After necessary replacements or repairs were made, they were properly inspected and recrated.

Through his outstanding attention to detail and his professional standards, TSgt Wolfe prevented several potentially serious problems during engine runs conducted during both home station or deployed operations. His vigilance, persistence and safety consciousness have earned him a TAC Outstanding Achievement in Safety Award.



Capt Darrell P. Zelko, 355 TFS, 354 TFW, Myrtle Beach AFB, SC, was number four in a flight of A-10s en route to the working area for a surface attack tactics mission when his master caution and left generator warning lights came on. Capt Zelko verified that his engine instruments were normal and then began appropriate procedures to reset the generator. When the reset effort was unsuccessful, Capt Zelko noticed that the left engine oil pressure was dropping out of limits and pulled the power to idle on the left engine. As the pressure continued to drop to zero, he shut down the engine.

When his flight lead confirmed that the left engine was streaming oil, an immediate landing was called for. The weather at the nearest suitable emergency airfield was 800 feet overcast and two miles visibility. The heavyweight condition of the aircraft with fuel and a heavy training ordnance load further complicated the recovery. Despite having only the emergency system to extend the landing gear and emergency braking once on the ground, Capt Zelko safely landed his aircraft following an emergency single engine approach through instrument conditions. Capt Zelko's out standing airmanship has earned him a Fleagle Salute.

TSgt Donald R. Glasser, 58 AGS, 58 TTW, Luke AFB, Arizona, has prevented the loss of valuable Air Force equipment on several occasions while performing duties as an F-16 dedicated crew chief. On one occasion, he discovered a cracked vertical stabilizer cap on an aircraft just prior to its launch, preventing a potential dropped object and major structural damage to the jet. Another time he visually detected a slight binding of the nozzle on his aircraft during engine start. He immediately instructed the crew chief to have the aircraft shut down. Closer examination revealed extensive damage underneath the aircraft's "turkey feathers." TSgt Glasser's continual attention to detail and safety awareness have earned him a Fleagle Salute.

SSgt Allan Bouffard, 158th Tactical Fighter Group, Vermont Air National Guard, Burlington IAP, Vermont, was the number two man on the end-of-runway (EOR) team for a departing four-ship of F-16s. Although not required by the EOR workcards to check chip detector plugs, SSgt Bouffard had established a personal habit of looking at them on each aircraft and, on this day, found the number four plug missing in one F-16.

A missing chip detector could have had catastrophic consequences after takeoff by allowing the aircraft to pump its oil overboard, resulting in engine seizure and possible loss of the aircraft. This time it was only a sortie lost due to the ground abort. SSgt Bouffard's alertness and willingness to go beyond the minimum required have earned him a Fleagle Salute.

TAC TALLY

	Total			TAC			ANG			AFR		
	MAY	THRU MAY		MAY	THRU MAY		MAY	THRU MAY		MAY	THRU MAY	
		FY 88	FY 87		FY 88	FY 87		FY 88	FY 87		FY 88	FY 87
CLASS A MISHAPS	3	21	24	2	14	14	1	5	6	0	2	4
AIRCREW FATALITIES	2	12	19	2	9	12	0	2	3	0	1	4
* IN THE ENVELOPE EJECTIONS	1/0	13/0	19/1	1/0	9/0	11/1	0/0	4/0	7/0	0/0	0/0	1/0
* OUT OF ENVELOPE EJECTIONS	0/2	0/5	0/3	0/2	0/4	0/0	0/0	0/1	0/0	0/0	0/0	0/3

* (SUCCESSFUL/UNSUCCESSFUL)

TAC'S TOP 5 thru MAY 1988

1st AF	
CLASS A MISHAP-FREE MONTHS	
93	318 FIS
40	325 TTW
28	57 FIS
7	48 FIS

9th AF	
CLASS A MISHAP-FREE MONTHS	
63	33 TFW
36	507 TAIRCW
22	354 TFW
16	23 TFW
11	1 TFW

12th AF	
CLASS A MISHAP-FREE MONTHS	
39	58 TTW
32	35 TTW
26	474 TFW
24	388 TFW
22	602 TAIRCW

ANG	
CLASS A MISHAP-FREE MONTHS	
210	110 TASG
185	138 TFG
167	177 FIG
162	114 TFG
148	180 TFG

AFR	
CLASS A MISHAP-FREE MONTHS	
93	482 TFW
83	924 TFG
71	906 TFG
45	507 TFG
32	917 TFW

DRUs	
CLASS A MISHAP-FREE MONTHS	
140	28 AD
10	USAFTAWC
2	USAFTFWC

CLASS A MISHAP COMPARISON RATE

(CUMMULATIVE RATE BASED ON ACCIDENTS PER 100,000 HOURS FLYING TIME)

		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TAC	FY 88	6.4	3.4	3.0	2.7	2.6	3.3	3.0	3.1				
	FY 87	7.5	5.8	5.1	4.7	4.2	3.7	3.3	2.9	2.9	3.1	2.8	2.9
ANG	FY 88	0.0	0.0	0.0	0.0	0.9	2.2	2.5	2.8				
	FY 87	4.0	6.6	4.7	3.5	2.8	4.5	3.8	3.3	3.4	3.0	2.7	2.5
AFR	FY 88	0.0	10.6	7.7	5.9	9.5	7.9	6.7	5.9				
	FY 87	21.8	11.7	8.5	12.6	10.2	8.3	3.0	12.2	10.8	9.6	8.5	7.8
Total	FY 88	4.3	2.9	2.4	2.2	2.5	3.2	3.1	3.2				
	FY 87	7.3	6.3	5.2	4.8	4.1	4.1	3.6	3.4	3.4	3.4	3.1	3.0
MONTH		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP

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Fleagle
WHEN IN THE COURSE OF HUMAN EVENTS IT BECOMES NECESSARY FOR ONE PEOPLE TO DISSOLVE THE POLITICAL BANDS WHICH HAVE CONNECTED THEM WITH ANOTHER AND TO ASSUME AMONG THE POWERS OF THE EARTH, THE SEPARATE AND EQUAL STATION TO WHICH THE LAWS OF NATURE AND OF NATURE'S GOD ENTITLE THEM, A DECENT RESPECT TO THE OPINIONS OF MANKIND REQUIRES THAT THEY SHOULD DECLARE THE CAUSES WHICH IMPEL THEM TO THE SEPARATION——WE HOLD THESE TRUTHS TO BE SELFEVIDENT, THAT ALL MEN ARE CREATED EQUAL, THAT THEY ARE ENDOWED BY THEIR CREATOR WITH CERTAIN UNALIENABLE RIGHTS, THAT AMONG THESE ARE LIFE, LIBERTY AND THE PURSUIT OF HAPPINESS—— THAT TO SECURE THESE RIGHTS, GOVERNMENTS ARE INSTITUED AMONG MEN, DERIVING THEIR JUST POWERS FROM THE CONSENT OF THE GOVERNED,—
I NEVER TOOK TH'TIME TO READ THAT BEFORE.
©STAN HARRISON 1986
212 YEARS OLD AND IT WILL STILL WORK IF WE LET IT.
BUT ONE THING STILL PUZZLES ME.
HARRISON
I COULDN'T FIND WHERE IT SAYS YOU GOTTA SHOOT OFF ALL THEM LOUD AND SMELLY FIREWORKS.
WELL, THAT PROVES ONE THING, GRIFF
WHAT'S THAT, ROB?
YOU CAN EXIST WITH A BRAIN THAT'S 95% LARD.