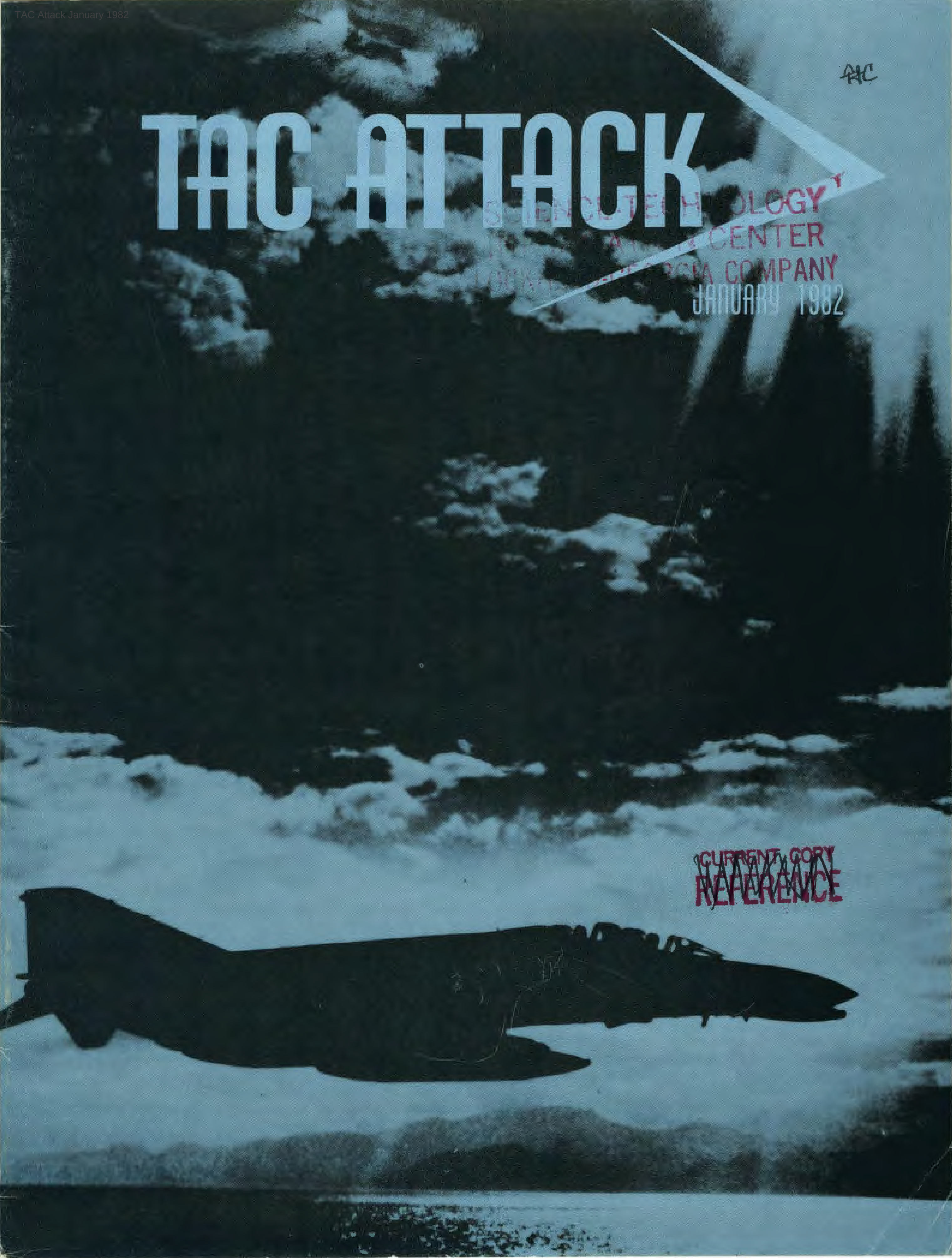
TAC ATTACK

JANUARY 1982



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READINESS IS OUR PROFESSION

Contents

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VOLUME 22 NUMBER 1

Angle of Attack

January—and we start all over again. But let's not forget the lessons of last year or all the years before. A new year is like a building block; it must be supported by the blocks underneath. If it isn't, we're back at ground level.

The examples we write about in "TAC Tips," "Chock Talk," "Down to Earth," and "Weapons Words" are building blocks when they become lessons learned and not repeated. That's why we print them. It's not to pick on the person who made the mistake, but to keep the rest of us from making the same mistake.

Some lessons are learned at a much better price during ground research and development. This month we feature an article from the Arnold Engineering Development Center called "Testing TAC's Hardware." The story gives us an idea of what kind of testing goes into our equipment. It also shows why we shouldn't be experimenting with untested loads. It's much better to let Arnold Center and the rest of the R&D community handle it.

We've also learned more this year about the F100 engine, which powers the F-15 and F-16. "F100 Engine Update" discusses engine problems and Air Force-industry programs for training pilots and maintainers. Again we have the opportunity to learn and improve.

Don't get me wrong, last year was not all bad, especially in view of our low command-controlled flight mishap rate. We can still improve; and if we aren't trying to do better, we'll do worse.

Instead, let's learn from 1981 and have an even better 1982.

Richard K. Ely

RICHARD K. ELY, Colonel, USAF
Chief of Safety

Testing TAC's Hardware

By Fred Leo, Arnold Engineering Development Center

Certain experiences aren't pleasant for TAC aircrews—losing a horizontal stabilizer section after releasing MK84 or GBU-15 air-to-ground munitions, seeing how far an aircraft can coast after an engine compressor stall, or having a large bird shatter a canopy. But aircrews face these potential incidents each time they take to the air. Thankfully, they're not everyday occurrences; however, they do happen, as many pilots who survived can tell you.

Inflight difficulties will never go away completely; Tactical Air Command, Air Force Logistics Command, and Air Force Systems Command folks are working together trying to reduce these and other potential problems. One location where such work is underway is the Arnold Engineering Development Center (AEDC) near Tullahoma, Tennessee. AEDC is a Systems Command unit that's not often heard of outside of the research and development (R&D) business. Yet, much of the R&D effort there ultimately affects flight procedures, safety, and the way TAC people do business.

The 380 Air Force employees, along with 3,150 contractor personnel, operate the free world's most comprehensive complex of what are called "ground environmental testing facilities." Wind tunnels, high-altitude engine and rocket test cells, impact ranges, and space simulation chambers are used to imitate on the ground the flight and atmospheric conditions that aircraft, engines, stores, and other hardware encounter.

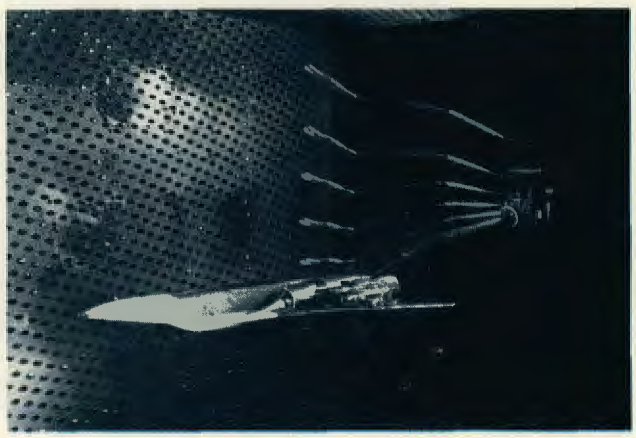
Information on performance characteristics is gathered in tests using either aerodynamic scale models or full-size systems. The engineering data that is acquired can be applied to many stages of a system's life, ranging from proof of concepts involved in new ideas, years before they might be seen in operation, through design and manufacture, to day-to-day maintenance and use. The information from AEDC and other non-TAC sources may not get to aircrews and maintenance folks directly, but eventually it will be there in the appearance and inner workings of a system, maintenance procedures, tech orders, and the like.

STORE SEPARATION TESTING. An F-16 store drop simulated in AEDC's 4-foot wind tunnel in 1978 resulted in a hit on the model's tail section. The photo sequence shows the store releasing (1, 2), reversing and impacting with the aircraft model (3), and breaking apart, with the nose section splitting into two parts (4).

AEDC visitors are usually fascinated by a short film clip showing a dropped iron bomb flying up into the empennage of an aircraft. An aircrew's reaction to seeing these stores crash into a fighter aircraft is, no doubt, somewhat different. That's why AEDC personnel continually study stores-separation phenomena. Most work in this area is done in a 4-foot transonic wind tunnel where either free-drop investigations are done or a computer-controlled captive trajectory system (CTS) is used. Both procedures use scale models of the parent aircraft and stores.

Freedrop is just what it says it is. With airflow over the parent craft at predetermined flight conditions, the store being studied is simply dropped from the weapons bay or fuselage mounting position while special cameras record how it separates from the aircraft.

The CTS approach uses a store mounted on a movable computer-controlled support arm positioned near the parent aircraft model. Small force- and pressure-measuring sensors placed inside the store are connected to a data acquisition system. With air flowing around the aircraft model, the store is moved away from the fuselage while the sensors report the aerodynamic forces acting on the store at given points. The resulting data give engineers a good look at how full-size stores would react, providing parameters of the compatibility of a particular store or combination of stores with an aircraft under the flight conditions being observed.



COMPUTER-CONTROLLED SYSTEM. This multiple-exposure photograph illustrates the use of the captive trajectory support (CTS) system in the 4-foot transonic wind tunnel where tests are conducted simulating separation of various stores from aircraft. The models are inverted in the test section for ease of installation.

Recent work with stores compatibility certification has been done on the F-15, F-16, A-10, A-7, and F-111. These wind tunnel tests have looked at the compatibility of aircraft with air-to-air and air-to-ground munitions, fuel tanks, pods, canisters, low-altitude dispensers and other such stores under a wide range of flight conditions. These results, alone with those from flight tests, eventually reach aircrews in the form of Dash 1 and Dash 34 procedures.

WING DAMAGE TEST. Tests to determine how long a damaged aircraft could remain in stable flight after the loss of wing-surface components help to determine combat survivability. Shown is a model of an F-111 wing with the leading- and trailing-edge flaps removed to simulate damage.

LAUNCH THE CHICKEN! In this special test an instrumented mannequin was used to study potential hazard to the aircrew of a high-performance aircraft subjected to a bird strike. The "X" above the mannequin's head marks the impact point in this pretest photograph. The test was sponsored by Air Force Flight Dynamics Laboratory.

Even with compatible stores, no one goes far without propulsion. The Systems Command folks are doing everything in their power to make the engines the best obtainable, including trying to improve performance characteristics, maintenance, and life cycle costs of our power plants.

For example, from time to time, unforeseen performance and maintenance deficiencies have been encountered with the A-7's TF41 engine, including such things as occasional stalls and overheating. Arnold Center looked at this engine under a variety of conditions—takeoff, dive stalls, bombing and strafing runs, as well as steady flight—all in relation to inflight stalls.

A six-month study was conducted on an engine with several "fixes"; most of the changes were designed to lengthen the TF41 high-pressure compressor's life. A redesigned fuel manifold, redesigned blades in the first rotor stage, and new and stiffer vanes in part of the compressor were examined. Procedures for restarting the engine after a stall were also investigated at Arnold Center. AFSC personnel felt that performance data acquired in AEDC tests would result in more accurate knowledge of the engine's performance characteristics.

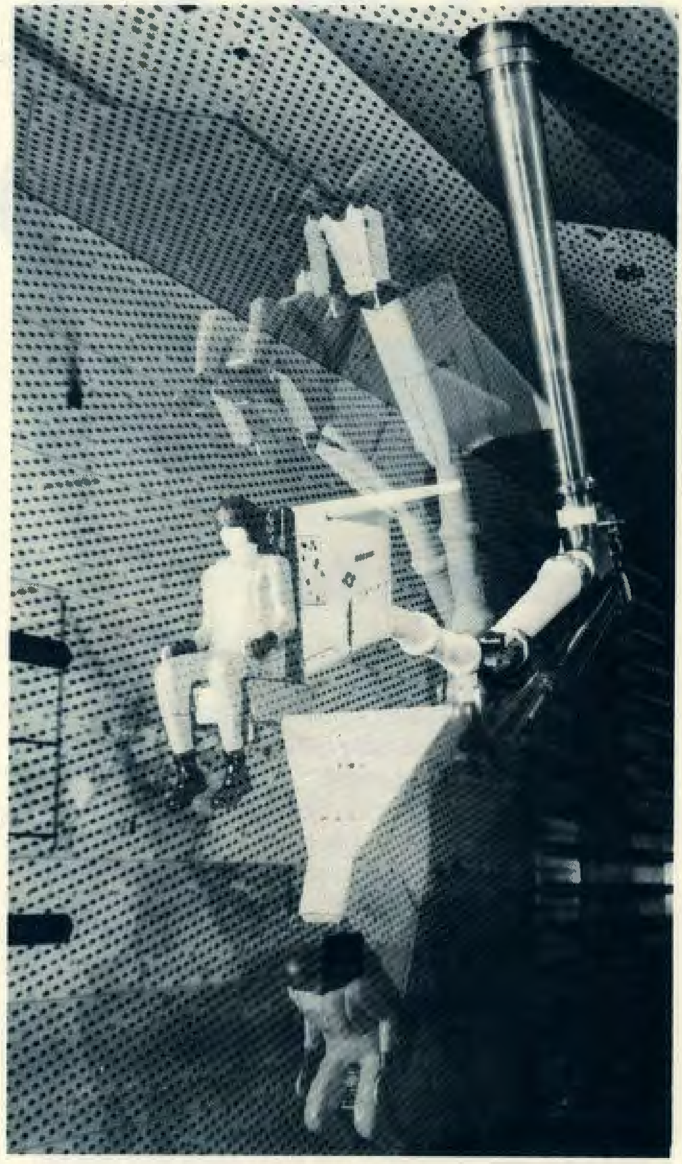
Tests run at AEDC also contributed significantly to the development of the Pratt & Whitney F100 afterburning turbofan engine for the F-15 and F-16 fighters. These tests, conducted over several years, covered all aspects of the engine's performance and made for the largest jet engine development program ever conducted at AEDC.

One of the more unusual wind tunnel test programs investigated how long a damaged F-111 could remain in flight after the loss of various wing surfaces and other components. Inflight damage to a scale model of the aircraft was simulated by removing the leading and trailing-edge flaps on one wing, or about half of the wing's surface area. Another of the 14 configurations tested featured a blunted nose, simulating the loss of an aircraft's radome.

AEDC tests are also helping manufacturers develop canopies which can better withstand high-speed collisions with birds. In these tests, a large air gun is used to launch chicken carcasses—at speeds from 200 to 700 mph—into real aircraft canopies at every possible angle. High-speed motion picture cameras record the impacts to show how different designs or materials hold up against bird strikes. Over the past eight years, hundreds of these tests have been conducted, most of them for the Air Force Flight Dynamics Laboratory. Canopies tested include those for the T-37, A-10, F-16, and F-111.

AEDC tests are also helping in the developing of improved aircraft ejection seat systems designed to protect the crew during bail out. A 5-percent scale model mannequin and ejection seat system were tested in the center's 16-foot transonic wind tunnel in conditions simulating environments where bailouts are most likely to occur. The ejection seat system, designed to provide wind blast protection, drag reduction, and improved stability, was tested at simulated flight speeds ranging from 456 to 1,126 mph and with the model positioned in a wide range of flight attitudes.

While nothing actually flies at AEDC, the research conducted at simulated flight conditions has an impact on what systems make it into production, how efficiently they perform, and how safely they operate. Not only does ground testing help determine which configuration will perform the best, but test conditions can be carefully controlled to ensure precise repeatability, something that is nearly impossible to achieve in flight-testing. Another big advantage in ground testing is that engines or other hardware can be pushed to their limits or tested in the worst conditions they will ever have to face. In all these cases, there is no risk to an aircrew or an expensive aircraft. If a catastrophic failure does occur, there is a battery of high-speed cameras and instrumentation, as well as the debris, to help tell what caused the failure.



EJECTION SEAT TEST. Wind tunnel tests conducted in the center's 16-foot transonic wind tunnel will aid in the development of an ejection seat system which will better protect pilots and crewmen if they are forced to bail out.

TAC aircrews will probably agree—if there's going to be a failure, better it happen in AEDC's facilities than in the air.

TAC TIPS

...interest items, mishaps with morals, for the TAC aircrewman

Everything happens to everybody sooner or later if there is time enough.

—B. G. Shaw

Overheated Hog

The A-10 pilot was practicing defending himself against air-to-air attacks by F-5s. His maneuvers included vertical rolling scissors at about 150 knots. The pilot was occasionally getting the chopped-tone stall warning in his headset.

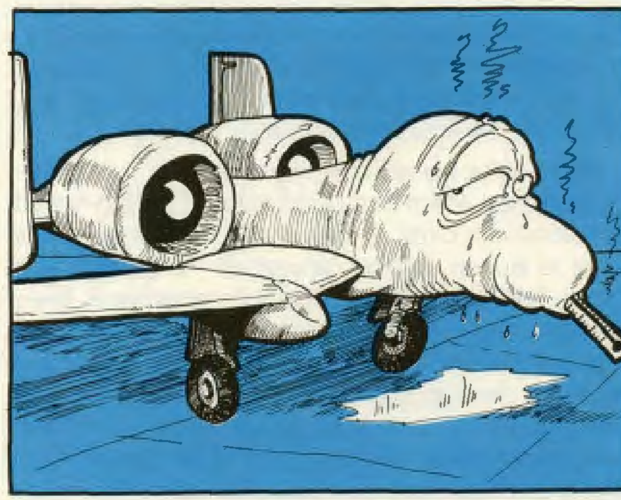
After a knock-it-off call had ended one engagement, the pilot looked back into the cockpit and noticed a master-caution light. The right-engine-hot light and right-generator light were also lit. The right-engine temperature was pegged at 1,200 degrees.

The pilot immediately pulled the right throttle to idle. He descended and increased the airspeed to 200 knots at about 9,500 feet. Shortly afterwards, he saw the engine-start-cycle light come on. The pilot didn't check the core rpm.

The engine temperature dropped to 700 degrees. The pilot tried resetting the right generator without success. As he headed home, he noticed the engine-start-cycle light come on and go off several times. He decided that wasn't good; so he referred in his checklist to "Engine Start Cycle Light On." It said to pull the L/R Eng Start circuit breaker; he did. A couple of minutes later, the right-engine-hot light again lit up. He looked at the temperature gage and saw it headed back up toward 1,200 degrees. He shut down the right engine.

The pilot made a single-engine landing without any more problems. Teardown of the engine showed the severe overtemp had caused heat damage to the first stage of the high-pressure turbine.

What can we learn from this? First, we can learn something about the engine-disturbance area of the operating envelope. According to the Dash One, the aircraft should stall before the engines are disrupted by high angle of attack, *assuming low sideslip.* But a vertical rolling scissors probably isn't a *low sideslip* maneuver (especially if the pilot used to fly a rudder-rolling aircraft). We may be flying in the area of engine disturbance much more often than we realize.



Second, we can learn to look at the rpm gage when we have an overheat. A rollback in rpm, together with rising temperature, usually indicates a nonrecoverable compressor stall. The only way it can be cleared is by shutting down, cooling, and restarting the engine (if we must).

Third, we can learn more about the starting system on our airplane. An A-10 with the automatic starting system will attempt to start itself anytime the throttle is put in idle and rpm is less than 54 percent. That's what set off the start-cycle light. The engine was trying to start. When the pilot pulled the starting circuit breaker, he cut off the bleed air to the engine, which was still stalled. So the engine overheated again. Then he finally shut it down—which is what he should have done in the first place.

Airspace Violations

A base belonging to one of our sister services is beginning to get annoyed with us. This naval air station is located near several TAC bases and Guard units, and it's just outside airspace we often use for exercises.

In one eight-day period lately, this base's airspace was penetrated twice by fighter-type aircraft. One was at night, and the aircraft couldn't be identified. But it came across the field at high speed with its afterburners cooking away. The Navy base had student flying in progress when the unknown airplane blundered through. The second incident took place in the daytime. The offender this time was identified as a camouflaged F-4. It came through the control zone at 1,500 feet above the ground, did an aileron roll, and exited, still at 1,500 feet. Again,

heavy student flying was taking place at the naval air station.

The first case may have been a mistake. Sometimes, especially on exercises, we get so wrapped up in the tactical mission, we overlook how to get there and back. We don't study the airspace restrictions, and we end up in the wrong place at the wrong time. The problem can be corrected by better planning.

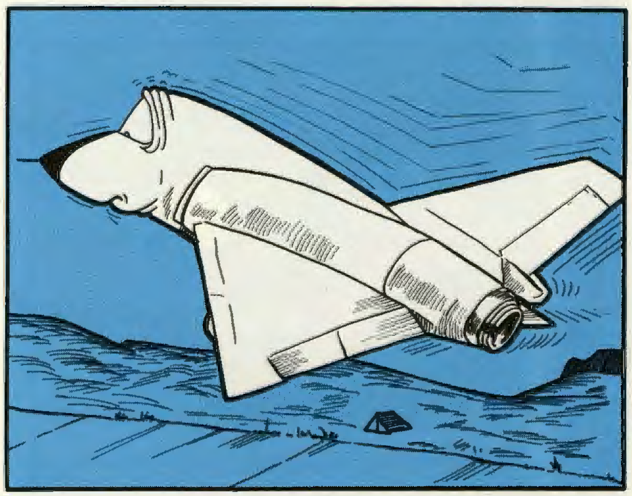
The other case isn't so easily corrected. The aileron roll indicates that the violation was intentional. The kind of fool who does something like that often keeps on until he either gets killed, gets smarter, or gets grounded. If you happen to fly with him, you may want to see what you can do about getting him smarter or getting him grounded. Because if he gets killed, you may be along for the ride.

How's Your Bingo?

Here's a little story to motivate us all to be conservative when we estimate our fuel:

With 2,300 pounds of fuel remaining, the F-106 headed back to base. Bingo had been set at 2,500 pounds; so he was pretty much on schedule. The pilot contacted approach control, who vectored him around while they recovered a drone. He arrived at an 8-mile final approach with 1,200 pounds remaining. Just then the fuel-low-left and fuel-low-right lights came on.

The pilot continued to a straight-in landing. After



landing, he was delayed slightly in returning to the ramp. Once he was in the chocks, the pilot kept the engine running while maintenance workers extracted some data. All in all, the engine ran for some 20 minutes on the ground. Then it flamed out—with the fuel indicator showing 600 pounds remaining.

Actually, they found that the airplane had about 300 pounds remaining when it flamed out. It's not unusual for an F-106 with 300 pounds of fuel remaining to flame out on the ground. The nose-low attitude on the ground uncovers the aft fuel intakes when the fuel level is low.

But the gage error of nearly 300 pounds raised some eyebrows. That's a big portion of the reserve fuel that wasn't really there.

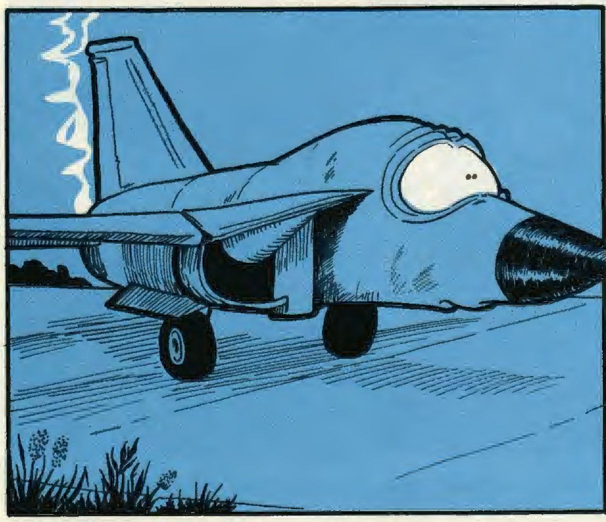
Think about that the next time you plan your bingo fuel.

TAC TIPS

More Surprises

Here's another case where an aircrew was surprised when the engine suddenly flamed out (again on the ground, fortunately). This time, it happened in an F-111; the lesson is a little more complicated.

After flying for 3 hours and 11 minutes, the aircrew landed with 2,200 pounds of fuel indicated on the totalizer. Instead of shutting down both engines, they kept the right one running while maintenance worked on a radar problem. With 1,300 pounds of fuel showing on the totalizer, the engine flamed out from fuel starvation.



But this time the gages were all within tolerances. The totalizer has a tolerance of plus or minus *1,250 pounds.* In addition to the high tolerance, the totalizer includes fuel that may not be useable. It depends on fuel management. For instance, normally the aircrew uses the fuel in the wing tanks first, turning the transfer switch off when the wings are dry. Then they use the fuel in the aft tank, switching to the forward tank when the aft tank is emptied. In both cases, the indication of when to switch is when the caution light for the respective fuel pump lights up and is confirmed by that respective fuel gage.

But it is very easy to trap some fuel in a tank by switching a little early—when the light is just beginning to flicker. That fuel, which was 450 pounds in this case, is shown on the totalizer, but is not useable when the selector is on the forward tank.

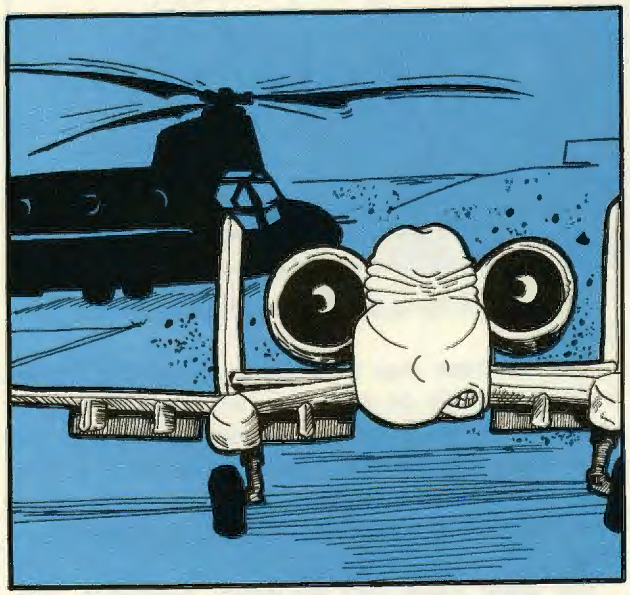
On the other hand, the individual pointer for the forward tank does not show the unuseable fuel in the other tanks and has a much lower tolerance, plus or minus 400 pounds. When the engine flamed out, it was feeding only off the forward tank; the forward pointer showed less than 300 pounds remained. The pointer was indicating that the engine was ready to flame out, but the aircrew had to read it to know.

The aircrew hadn't looked at the pointer since before descending into the landing pattern. After the descent, they flew a TACAN approach, two overhead patterns, and a closed pattern to a full stop. They were relying on the totalizer for their fuel readings; it showed 1,000 pounds more fuel than the forward pointer.

Well, no harm was done. And maybe it'll teach us to look at all the information available to us instead of relying on the most obvious. That's a lesson that even goes beyond flying airplanes.

The Helicopter Threat

Besides what we learned in J-CATCH, we've found another way that helicopters can be a threat to us. An A-10 overseas taxied within 50 feet of an operating CH-47 Chinook helicopter. Later, they found extensive foreign-object damage to the A-10's left engine. A single hard object, like a stone, had entered, damaged, and then exited the engine.

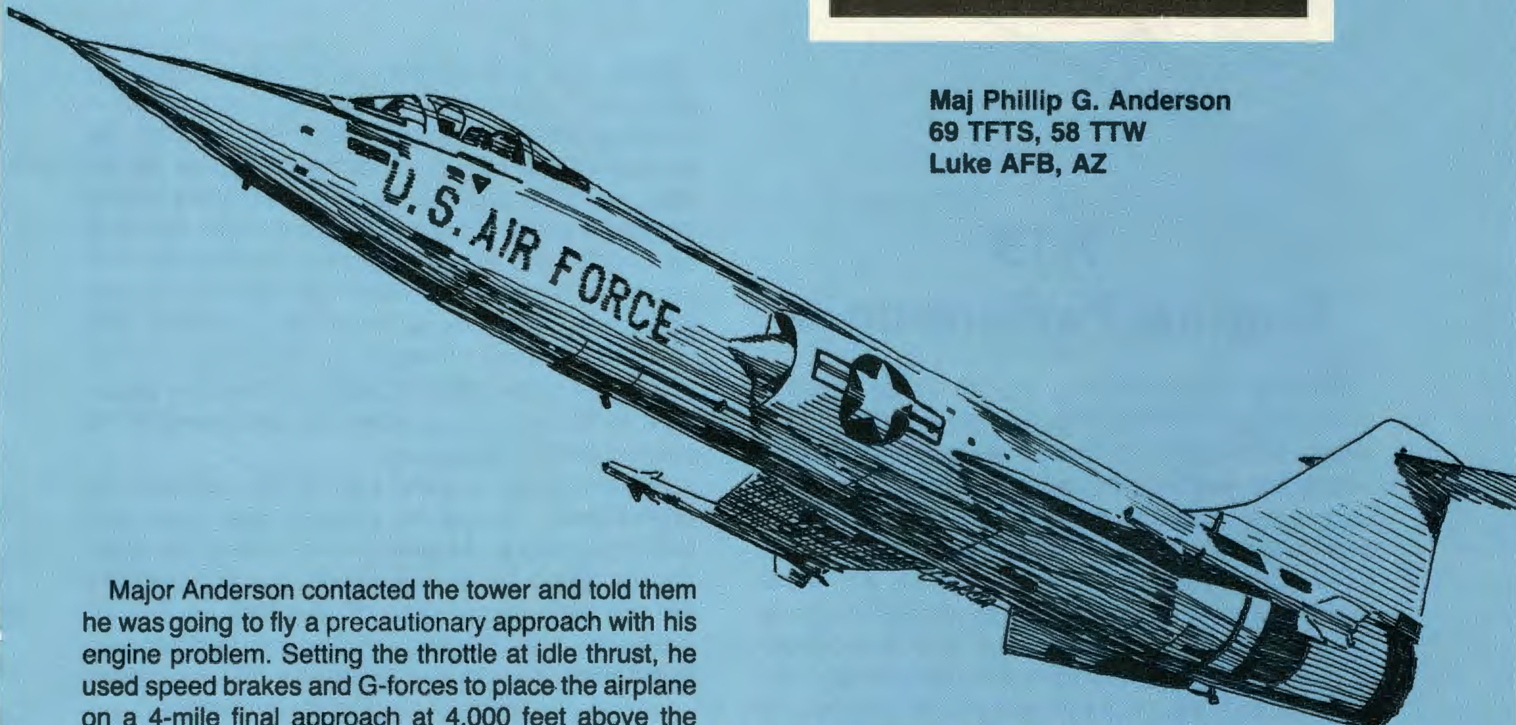


Now will you believe us when we say helicopters are a threat?

Aircrew of Distinction

On 6 July 1981, Maj Phillip G. Anderson was flying as wingman in a two-ship of F-104Gs on a navigation training flight. After cruising uneventfully at 28,000 feet for over an hour, he suddenly felt his engine decelerate and then accelerate. After that, the engine again rolled back to 88 percent rpm and this time stayed there. Major Anderson took over lead of the flight, engaged the start switches, and declared an emergency. He located a suitable emergency field and turned toward it; in the turn the engine flamed out. He restarted the engine; and it ran for about two minutes, but then flamed out again. As he set up a high key abeam the runway at 16,000 feet, he restarted the engine two more times and finally kept it running. He spotted the runway through the scattered clouds and haze. The TACAN at the field was out of service, and the poor visibility made the approach more difficult.

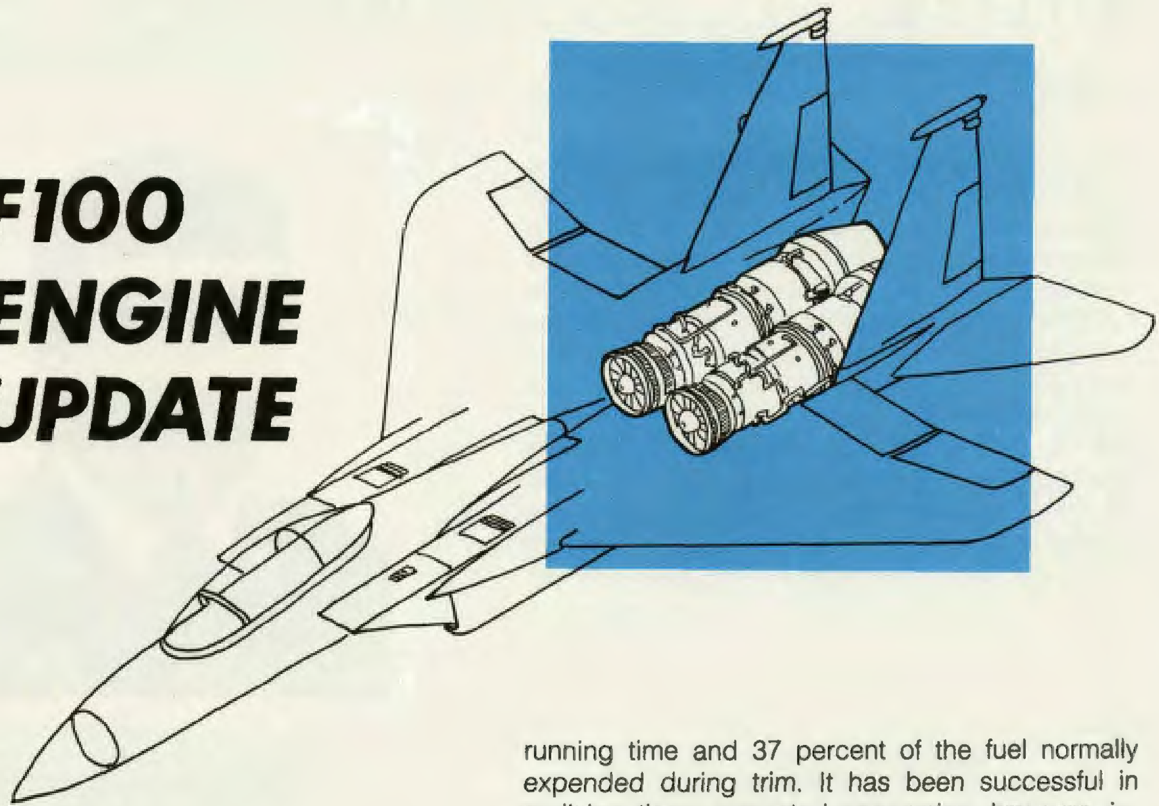
Maj Phillip G. Anderson
69 TFTS, 58 TTW
Luke AFB, AZ



Major Anderson contacted the tower and told them he was going to fly a precautionary approach with his engine problem. Setting the throttle at idle thrust, he used speed brakes and G-forces to place the airplane on a 4-mile final approach at 4,000 feet above the ground. During the turn to final, the engine again flamed out; again he restarted it. On final he made a series of G-loaded turns to slow the airplane enough to lower the landing gear. At 260 knots just prior to the overrun, he lowered the gear and began his landing flare. Once more the engine flamed out. This time Major Anderson ignored the engine and concentrated on landing the airplane. He touched down dead-stick at 200 knots. On the rollout he restarted the engine to get normal braking and steering. He then stopped the airplane on the non-barrier-equipped runway.

The superior airmanship shown by Major Anderson in executing this difficult recovery prevented probable loss of a valuable aircraft and possible loss of life. His actions qualify him as the Tactical Air Command Aircrew of Distinction. ➤

F100 ENGINE UPDATE



F-15 Engine Performance

During recent months, the Air Force noted a thrust decay in some of its F-15 engines and, as a result, conducted a thorough investigation. The investigation was headed up by the Air Force Systems Command, which is responsible for development and acquisition of the F-15, assisted by the user commands—Tactical Air Command, U.S. Air Forces Europe, and Pacific Air Forces. There are five operational wings of F-15s at present in the U.S. Air Force.

The investigation revealed that the primary reasons for this loss in thrust are (1) the engine trim procedures which were revised in 1979 and (2) a worn compressor part which causes thrust decay on older engines.

Jet engine trim procedures are used to calibrate an engine on the ground so that the fuel control will maintain a desired speed and temperature at full throttle. The engine trim procedure begun in 1979 was less complex and saved one-third of the engine running time and 37 percent of the fuel normally expended during trim. It has been successful in realizing these expected economies; however, investigation has revealed that the procedure did not adequately compensate for all the variables and so caused a wider variation in engine performance at full throttle. The investigation revealed that some 17 percent of the engines have thrust below the stipulated values—some by as much as 5 percent. This problem is being corrected by returning to a trim procedure more closely attuned to the earlier procedure to be sure the engines are performing at the desired performance level.

Regarding the second part of the problem, the phenomenon occurs on engines after they have been operated for several hundred hours. The investigation found that a subcomponent which positions the rear compressor variable vane (two per engine) is wearing over time and creating engine thrust loss. A program is underway to replace this subcomponent with one made of more durable material (stainless steel to replace titanium). This will be carried out as quickly as the new parts are available. The costs are yet to be fully determined but will be low, approximately $700 per engine. The wear pattern of the many components of a jet engine cannot be predicted in advance with absolute certainty; therefore, the need to switch to a more durable part is not unusual in the history of jet engines—and is not a large issue, but easily correctable.

Although the F-16 uses the same F100 engine, there have been no reports of low thrust in it. F-16 engines are newer and the rear compressor variable vane subcomponent has not reached the point when wear becomes an issue. Appropriate action will be taken on F-16 engines to be sure it does not become a problem.

—TAC/PA News Release

Air Force-Industry Training Programs

Air Force and industry cooperation has produced a new training program for pilots flying the F-15 and F-16. The program provides continuing education for mastering high technology jet engines and flight systems. The knowledge gained should improve safety records, extend the useful lives of jet engines, and be valuable in combat.

The training material is an up-to-date, practical supplement to the flight manual and was prepared from interviews with pilots, mechanics, product support troubleshooters, and aerospace industry sources. In plain English, Pratt & Whitney's engineers explain the workings of the F100 engine and its relationship to the F-15 and F-16. Engineers from General Dynamics and McDonnell Aircraft Company present material on aircraft performance and systems related to the F100 engine. The training program, now titled "Pilot Awareness," evolved over the past 4 years of day-to-day work with the Air Force.

Pratt & Whitney and General Dynamics worked closely with the Air Force to develop a "Know Your F100 Engine" presentation for F-16 pilots. Years of F-16 field experience were combined into a presentation that helps pilots to understand the capabilities and limitations of the F100 engine. The review also discusses information about emergency situations. This will give pilots more opportunity to combine flying skills with practical technical knowledge. Aircraft performance with the engine out is an important part of the discussion. The presentation was given at all F-16 bases by a joint Pratt & Whitney and General Dynamics team and is available as a pamphlet.

A presentation on the F100 engine in the F-15 began in July 1981. Pilots and engineers from both McDonnell Aircraft Company and Pratt & Whitney talked to pilots at all F-15 bases. Subjects discussed included F100 engine description, engine-to-airframe interfaces, engine ground operation, flight operations, inflight problems, airstarts, and maintenance debriefings. Air Force assistance in preparing

ENGINE UPDATE

the material came from HQ TAC, the F-15 Systems Program Office, the Propulsion Systems Program Office, and F-15 test pilots. Copies of the presentation "F100 Power for the Eagle" have been given to F-15 pilots.

The pilot awareness program had its beginning in late 1977 when Air Force and Pratt & Whitney representatives visited all F-15 bases to review and resolve differences between F-15 initial flight testing and operational use worldwide. Pilots provided more comprehensive details of situations described in their flight debriefings. Feedback concerning technical and operational characteristics desired by F-15 pilots resulted in engineering changes to the F100 engine. The 1977 visits established direct communications between Pratt & Whitney's engineers working on the F100 engine and pilots flying the F-15 aircraft.

These communications are now condensed into the major presentations.

The technical details presented to pilots relate to operational situations and explain how the turbofan engine operates. For example, since some air flows through the bypass duct in turbofan engines, the volume of air to airstart must be boosted by increasing airspeed. Procedures were developed to improve conditions for airstarting because the start times are slightly longer. Different airstarting characteristics are explained in the training and awareness program, which is particularly necessary for pilots transitioning from turbojet to turbofan powered aircraft. For instance, several years ago during an emergency, an Air Force pilot in an A-7 shut down and restarted his turbofan engine seven times. The engine was lighting off during each start attempt, but the pilot shut it back down before indications of a start could appear on his gages. When the pilot finally gave the last attempt a little more time, the engine started.

Several videotapes on flameouts and restarts have been produced for F-16 pilots and distribution to all F-16 bases. Early this year the F-16 airstart videotape was supplemented with 12 narrated scenarios. After a recent inflight incident, one pilot said he was grateful that he had studied the videotapes. He commented, "It looked just like the scene on the videotape. There were no surprises."

Mastering the high technology F100 engine and flight systems is also a challenge for maintenance crews. F100 engine technicians have been given an "Eagle Power Handbook" and presentation as part of an F-15/F100 maintenance awareness program.

An updated pilot and maintenance awareness presentation for the F-16/F100 should be available soon.

Safe maintenance and operation of the powerful F100 engine are more likely when pilots and maintenance technicians continue their direct communications with industry. Continuing educational programs provide answers directly to pilots and technicians. This approach is efficient in terms of lives and aircraft saved and improved operational readiness. Air Force and industry cooperation at all levels is the key factor in successful pilot awareness and maintenance awareness programs. ➢

If you have comments or ideas for the continuing programs, send them to the following address: Jim Williford (pilot awareness program) or Keith Griffith (maintenance awareness program), Government Products Division, P. O. Box 2691, West Palm Beach, FL 33402.

TAC Safety Awards

Amn Louis F. Jiran, Jr.

A1C Joseph P. Burke

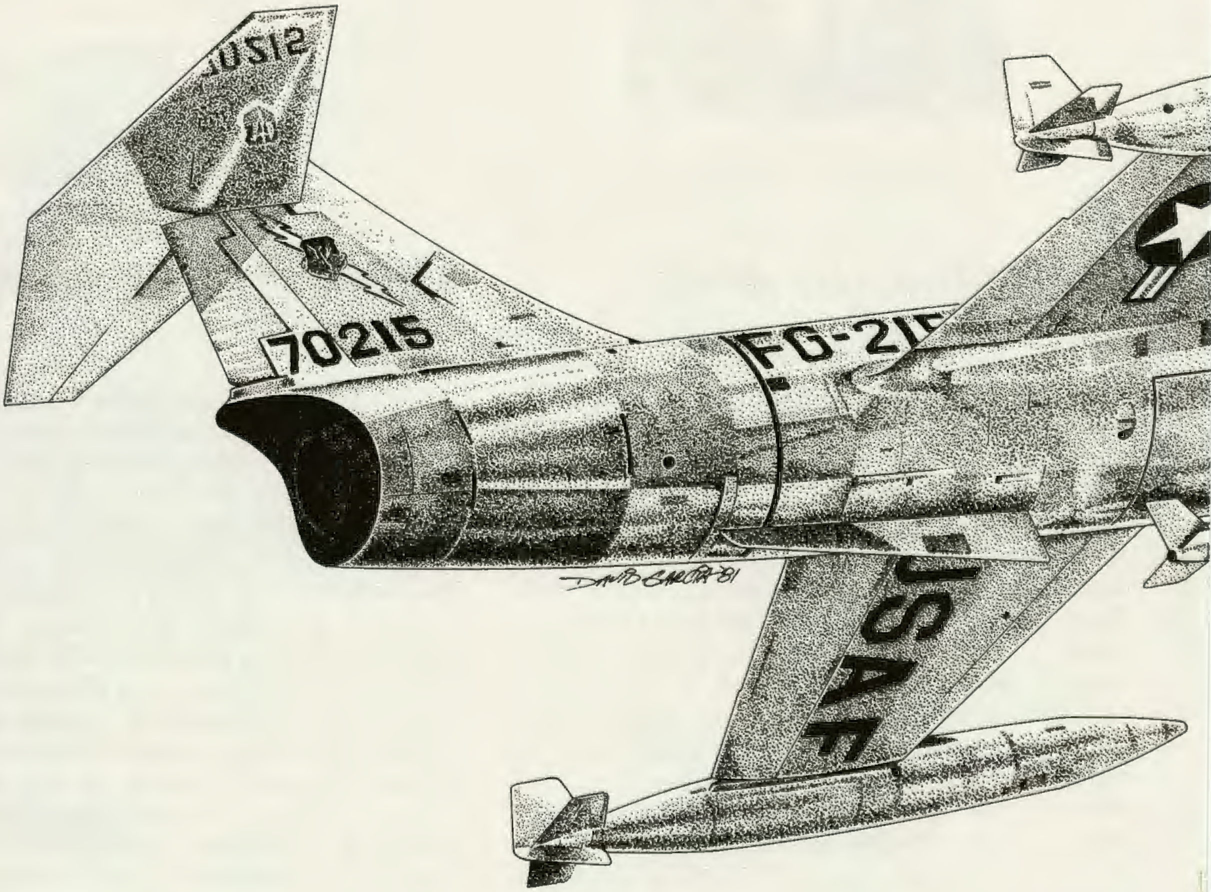
CREW CHIEF SAFETY AWARD

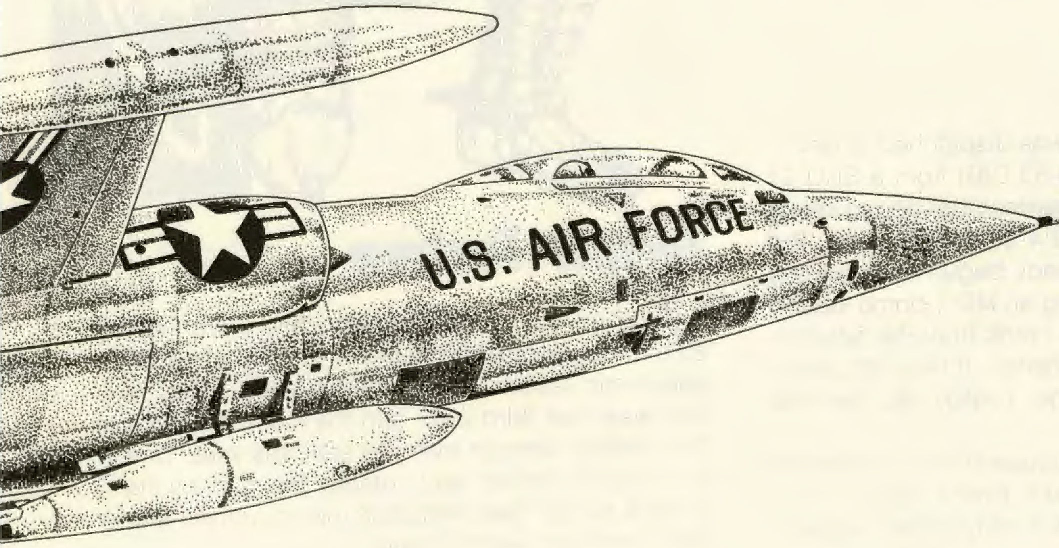
AMN LOUIS F. JIRAN, JR., is this month's winner of the Tactical Air Command Crew Chief Safety Award. Airman Jiran is assigned to the 125th Consolidated Aircraft Maintenance Squadron, Florida Air National Guard, Jacksonville, Florida. Airman Jiran's exceptional safety awareness is shown by two separate occasions when he prevented serious aircraft accidents. On one occasion he was doing end-of-runway checks on an EB-57B aircraft when he found a large crack in one of the main wheels of the aircraft. Although he wasn't an EB-57B crew chief, Airman Jiran's thorough inspection revealed the problem and prevented serious damage to or loss of the aircraft and its crew. Another time during end-of-runway checks he discovered a hot nosewheel-steering unit on an F-106 aircraft. If he hadn't found the hot unit, a loss of directional control during formation takeoff or an inflight hydraulic failure could have occurred. Airman Jiran's attention to detail, professional expertise, and dedication to safety while doing his job have earned him the Tactical Air Command Crew Chief Safety Award.

INDIVIDUAL SAFETY AWARD

A1C JOSEPH P. BURKE is this month's winner of the Tactical Air Command Individual Safety Award. While assigned to the 544th Civil Engineering Operations Squadron, Nellis Air Force Base, Nevada, Airman Burke reacted quickly and effectively to extinguish a fire on an F-16 aircraft. He was part of a barrier maintenance crew making a routine inspection of the arresting gear when an F-16 aircraft aborted its takeoff. During the abort the aircraft brakes overheated forcing the pilot to engage the arresting gear. After the arrestment was made, Airman Burke noticed smoke and flames coming from around the aircraft wheels. Despite the risk to his own safety, Airman Burke immediately found a fire extinguisher, began to extinguish the flames, and controlled the situation until the fire department arrived. His actions aided in preventing further damage to the aircraft and possible injury to the pilot. Airman Burke's courage, quick response, and unselfish attitude have earned him the Tactical Air Command Individual Safety Award.

F-104 Starfighter




U.S. AIR FORCE

WEAPONS WORDS

Out of Order

A munitions load crew was dispatched to download practice bombs (BDU-33 D/B) from a SUU-21 dispenser. The number 3 crewmember began safing the BDUs on stations 2 and 4 of the dispenser. But the number 2 man had already begun downloading the BDU from station 3, using an MD-1 bomb loader. While he was removing the bomb from the adaptor, the bomb slipped from his hands. It fell to the ramp and fired its signal cartridge. Luckily, no one was injured.

The order of events is supposed to be (1) safe the bomb and (2) then download it. Even if it's just a little practice bomb, it still packs enough of a charge to take an eye out.

Temper Tantrum

Two airmen in another command were loading 20-mm target-practice rounds into an F-4E, using a pneumatic loader. Things hadn't been going well. This was their third load, and the loader's shear pin had broken twice in trying to start this load. One of them got a rachet and rotated the gun by hand several times. They restarted the pneumatic loader and continued with the load.

Meanwhile, both the shift supervisor and the load crew chief stopped by. Seeing that the operation hadn't been going too smoothly, they pitched in and helped. Now the ammo coming out of the gun began to jam up in the chute. One of the airmen climbed onto the trailer and began raking the ammo down the chute. When the gun jammed, that was the last straw; the airman blew his top. In his anger, he began throwing the rounds down the chute.

The nose of one round struck another shell squarely in the primer. The round exploded. A large fragment from the shell struck the other airman in the face. Smaller fragments struck the shift supervisor, who was beneath the aircraft. He yelled for everyone to get down. There were no more explosions.

They took the airman to the hospital. His injury was fortunately limited to facial lacerations. No one else was badly injured.

They were fortunate, even though the airman with facial scars may not think so. But it could have been much worse. Around munitions when a temper blows, everything can blow. We have to learn to control it, despite the frustrations.

As supervisors, we also have to deal with the problem. When a worker's temper starts to cook off, pull him off the line. We can't afford to let him blow off steam at the expense of others.

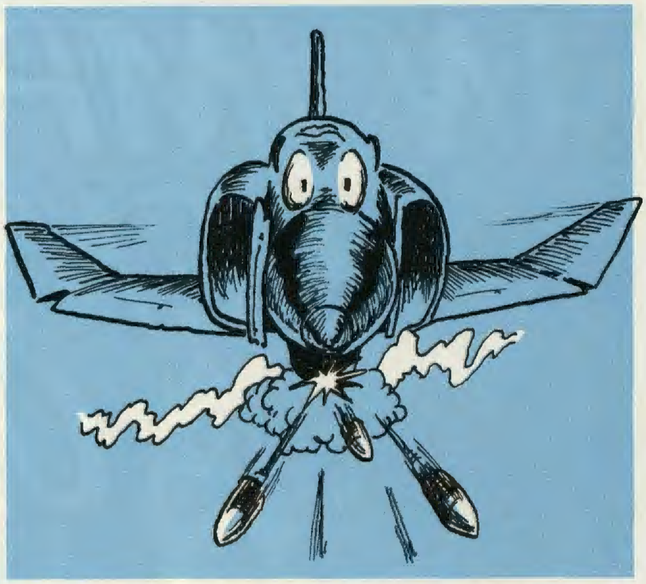
Handling: Bars or Barehand

The load crew only had to carry a weapon system evaluator missile (WSEM) about 10 feet from a van to the storage container. So they figured they didn't need to use a handling bar or frame. One crewmember prepared the storage container, while the other two got the missile. The two unstrapped the missile from the transport rack in the van and lifted it by hand. The crewmember at the nose of the missile stepped down out of the van with no problem. But when the crewmember holding the tail of the missile stepped out of the van, he rotated the missile about a quarter turn. The crewmember at the front end lost his grip as the nose cover came off in his hands. The nose struck the ground, cracking the radome.

The cost of not using a handling bar or frame was about $2,400. The time they might have saved wasn't worth anywhere near that.

Realistic Training?

As the F-4E pilot armed his 20-mm gun on the gunnery range, the gun began to fire before he pulled the trigger. The pilot immediately deselected the gun, but 65 rounds had already fired. Fortunately, they hit the ground harmlessly.



This wasn't the first time this airplane had a "hot gun" problem. A couple of weeks earlier, the gun had fired out on the range before the trigger was pulled. Maintenance had replaced the gun control box. It checked out OK on the ground; but a few days later, the gun rotated in flight on an air-to-air mission when the master-arm switch was moved to arm. The nose gun station hadn't even been selected. This time the gun control box and the clearing signal device were removed and replaced.

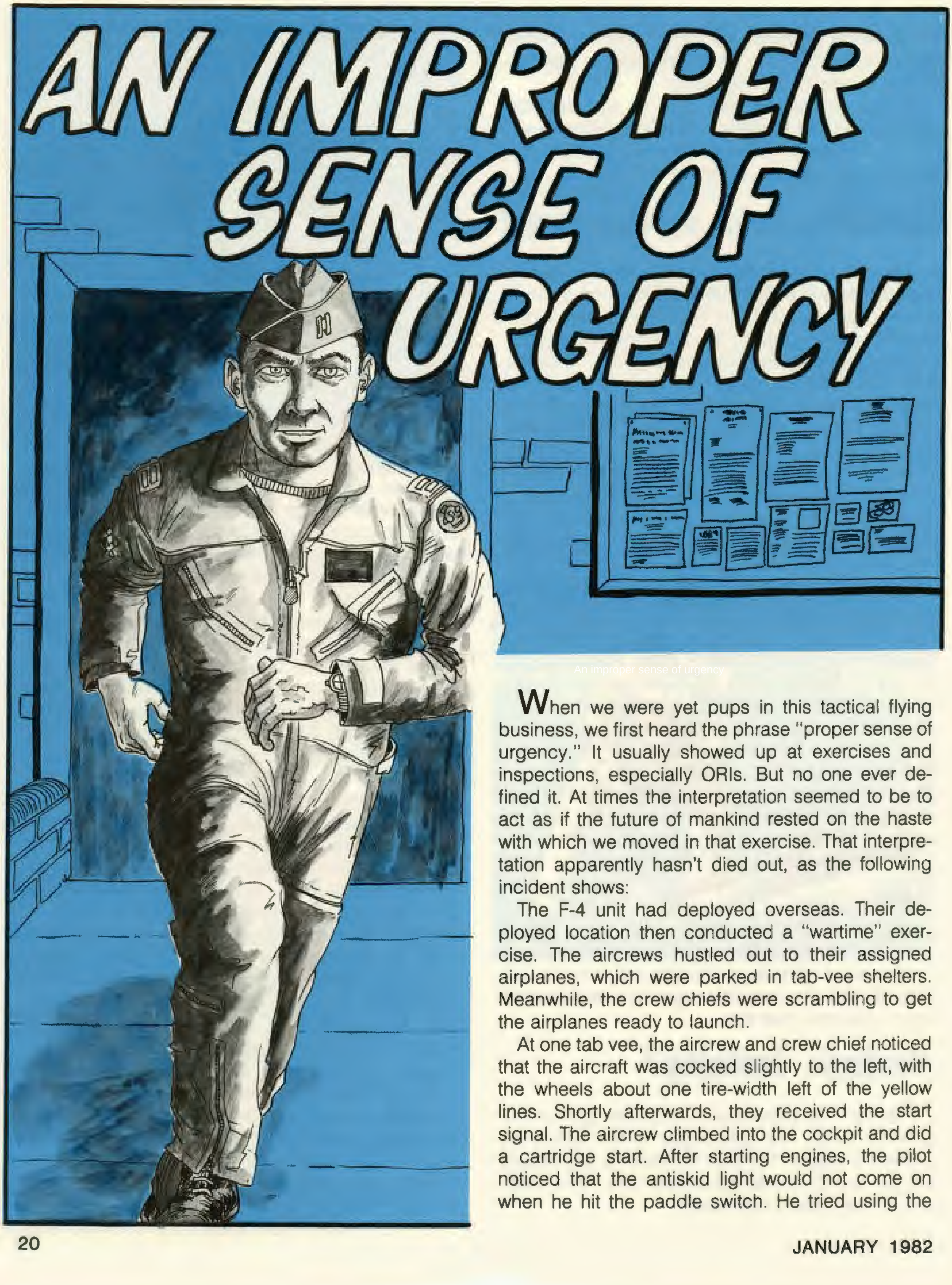
The aircraft then flew 10 sorties without a gun problem. But, in those 10 sorties, no one had armed the gun. The next time the gun was armed was this sortie on which it fired the 65 rounds inadvertently. So they impounded it and did some real troubleshooting.

They found it was all due to a do-all shorting plug. The do-all plug is intended for use with a different centerline rack (BRU-5). The AERO-27/A rack requires a centerline station arming plug. With the do-all plug installed, all trigger circuits are energized when the limit switch on the nose gear is closed.

Before the first incident, this airplane had been used for weapons load training. Apparently, a load crew had installed the do-all shorting plug on the AERO-27/A rack instead of using the correct arming unit. They probably didn't have the correct part available at the load pad; so they used what was handy. Then, of course, they forgot to remove it.

This incident gives a new insight into the phrase "realistic training." It sure isn't realistic to practice substituting parts which aren't meant to be interchanged. If we don't follow the tech data when we're training, then we're training ourselves not to follow the tech data.

AN IMPROPER SENSE OF URGENCY



When we were yet pups in this tactical flying business, we first heard the phrase "proper sense of urgency." It usually showed up at exercises and inspections, especially ORIs. But no one ever defined it. At times the interpretation seemed to be to act as if the future of mankind rested on the haste with which we moved in that exercise. That interpretation apparently hasn't died out, as the following incident shows:

The F-4 unit had deployed overseas. Their deployed location then conducted a "wartime" exercise. The aircrews hustled out to their assigned airplanes, which were parked in tab-vee shelters. Meanwhile, the crew chiefs were scrambling to get the airplanes ready to launch.

At one tab vee, the aircrew and crew chief noticed that the aircraft was cocked slightly to the left, with the wheels about one tire-width left of the yellow lines. Shortly afterwards, they received the start signal. The aircrew climbed into the cockpit and did a cartridge start. After starting engines, the pilot noticed that the antiskid light would not come on when he hit the paddle switch. He tried using the

antiskid switch, but the system wouldn't indicate that it disengaged. The light tested good; so the pilot called for "red ball" maintenance help. But as the red ball was arriving, the pilot changed his mind. Since the exercise only called for taxiing the airplanes, he decided to save time and taxi with the antiskid fault.

Another crew chief was now at the tab vee to help monitor the aircraft as it pulled out. The original crew chief was still in charge of marshaling the aircraft; he positioned himself and his helper on the right side of the aircraft. That way they wouldn't get hit by the jet blast as the F-4 turned right onto the taxiway after it left the shelter.

The pilot signaled he was ready to taxi. The crew chief began to direct the aircraft to taxi out of the tab vee. Then the crew chief noticed a maintenance truck parked on the left side of the taxi area in the aircraft's way; so he signaled the pilot to stop. As the airplane stopped, the crew chief got the truck to move. Then he motioned for the pilot to begin taxiing again. The crew chief concentrated his attention on the taxiway behind him as he waved the F-4 forward. With all the aircraft taxiing in the exercise, he wanted to make sure his aircraft could fit into the traffic flow on the taxiway.

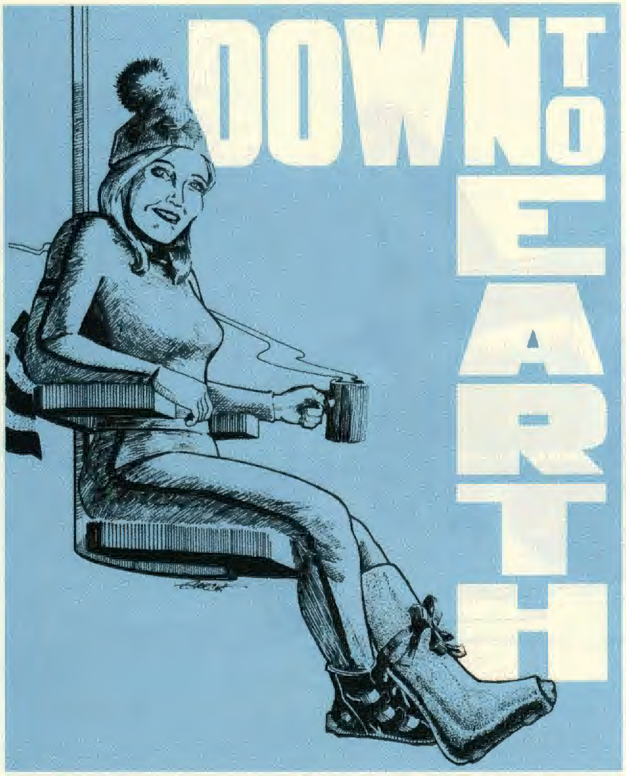
As he moved forward, the pilot noticed the airplane was drifting to the left. He tried steering to the right, but the aircraft didn't respond. He said "Nose-gear steering" on the intercom; he wanted the weapon-systems operator (WSO) in the back seat to check the circuit breaker. The WSO was looking at the right wingtip when he heard the pilot's call. Just then, they both felt a crunch as the left wingtip hit part of the tab-vee door.

That ended the exercise for this crew. They shut down the engines.

When a maintenance technician climbed into the cockpit to check on the nose-gear steering and antiskid problem, he found the landing gear handle in the *full up* position. After he lowered the handle, the steering and antiskid systems worked fine. The Dash One says that the gear handle must be in the down position for the nose-gear steering to operate.

Both aircrew members said afterwards that they felt things were moving at a rapid, but not hectic, pace. Yet the pilot didn't follow his preflight checklist, or he'd have known about the gear handle. He decided not to wait for red ball, or they might have found the problem. Then the pilot didn't stop when he felt the aircraft drifting left and the nose-gear steering didn't respond.

We still don't know what a "proper sense of urgency" is, but now we have a better idea what it's *not.*



Another Unnecessary Loss

The cyclist went over to a "friend's" house in the early afternoon and began drinking. No one knows exactly how much alcohol he drank. That evening, he left the house on his motorcycle and headed out to a truck stop to pick up another friend who worked there. This friend refused to ride with him—probably a life-saving decision.

The cyclist left the truck stop. He was drunk and probably mad. Speeding down the interstate, he lost control of the motorcycle. He slid 25 feet on the bike; then he was thown off. He tumbled head over heels another 75 feet. He died of head injuries. No, he wasn't wearing a helmet.

Driving Blind

You can't avoid the hazard you can't see. In winter, drivers are faced with special visibility prob-

Be Energy Conscious

Never have Americans been more energy-conscious than today. We are turning down thermostats, turning off lights, and generally cutting back on many creature comforts that use energy.

However, in their zeal to save watts and BTUs, many people may be creating more problems than they're solving. While certainly not all-inclusive, these situations should warn us to proceed with more caution.

Space heaters that should have been junked, or at least sent to an antique store, are being "recommissioned" for service. Many Americans today simply don't know how to use them as safely as their grandparents. They fail to vent them properly, place them too close to combustible woodwork, provide little or no insulation beneath them, and generally treat them too casually.

Space heaters and fireplaces are also doubling as clothes driers. Clothing draped on or too near such units can easily catch fire.

Chimneys, regardless of age, may be unsafe. Many are inadequate, deteriorated, or heavily encrusted with combustible soot and creosote, a common problem when wood is the fuel. Excessively hot fires can crack flue linings and bricks and set the soot and creosote on fire.

Before lighting gas fireplaces, be doubly sure the damper is open.

Harvesting firewood is hard work. Before challenging Paul Bunyan, be sure you are in good physical condition. Rest often. An exhausted lumberjack is a potential accident victim.

Wear close fitting clothing, work shoes or boots that protect your legs and have soles that provide good traction, light gloves, safety goggles or glasses with safety lenses, and ear plugs if using "noisy" equipment. Wearing a hard hat or bump cap is advisable.

lems that require some advance work before getting on the road. So plan ahead for the drive ahead, urges the National Safety Council.

Allow at least 10 to 15 minutes before every trip for snow removal and general cold weather conditioning of your car to meet prevailing weather conditions. For a systematic check, the council recommends these winter sight-saving tips:

1) Remove snow, frost, or ice glaze from the entire windshield and all windows.

2) Clean off headlights and taillights so that other drivers can see them clearly.

3) Turn on your heater for a minute or two before using the defroster so humidity won't fog the windshield when it hits the cold glass.

4) Use your wipers and washer as often as required to prevent road spatter buildup.

5) Stop and wipe outside lights and mirrors from time to time to control spatter, snow, or moisture buildup.

6) Keep lights on low beam when driving in fog or heavy snowfall.

Here are several safety tips for chain saw operators:

- When starting the saw, place it firmly on the ground with the bar and chain clear of branches, twigs, and other obstructions;
- Carry it with the bar and chain behind you;
- Never use a saw with a dull chain or one in need of repair or adjustment;
- Keep both hands on the saw when cutting.

—Courtesy National Safety Council

Keeping Score

By TSgt Cliff Bennett
1 TFW Safety Office

Well, another year, off and running.

You know, in the safety business the beginning of the year is almost depressing. The annual method of keeping accident statistics means we get to wipe off the board on 1 January. The depressing part is that we know we're going to start posting accidents all over again—starting with the folks who get drunk and hurt or kill themselves on New Year's Eve.

Sometimes it feels like you're putting in all the hours for nothing. You get to your office and feel like the scorekeeper at a losing home game. You hate posting every score by the other team, but they keep racking them up, again and again.

There are days and weeks when we're so busy investigating accidents that we don't have time to write a safety flash or pull a spot inspection. The saying about alligators and draining swamps was never as appropriate as in the safety business.

There was a wishful comment in the office recently that we ought to provide a safety troop for every worker in the wing. Wouldn't that make it so much better? Somebody who goes around with each person and keeps them out of trouble:

"Hey, don't forget to install that safety pin."

"You're going to cut yourself on that piece of metal, if you don't get some gloves."

"You better slow down, before you kill us both."

"Are you going to get a spotter before you back this thing into a hangar?"

"Stop throwing that ammo around like it was somebody's luggage."

Too bad most people don't care enough about their coworkers or themselves to play Safety Sam, once in a while. But we understand; it's too much to ask. Gee, somebody might think you're a "lifer." Or, maybe that you're—heaven forbid—afraid of getting hurt.

Oh well, we'll keep trying to educate people, eliminate hazards, and identify those we can't fix. And we'll keep keeping score.

Happy New Year.

Funny Fotos


OK, I'LL CATCH YOU.
NOW WILL YOU LET GO?


I CAN'T BELIEVE
IT'S A GIRDLE.


NEXT X-COUNTRY, I'LL
TAKE CARE OF BILLETING.
OH SHUT UP.


BUT HE SHOULD COME IN NOSE FIRST!!
LOOKS LIKE HE'S GOING TO MAKE IT.


WHATTA YA'SAY YOU AND THIS OLD FIGHTER JOCK GO SKINNY DIPPING?


SEZ HERE, BAKED POTATOES ARE 3 MIN, STEAKS AND CHOPS ARE 2 MIN.....


OK NAV, YOU'VE GOT IT.

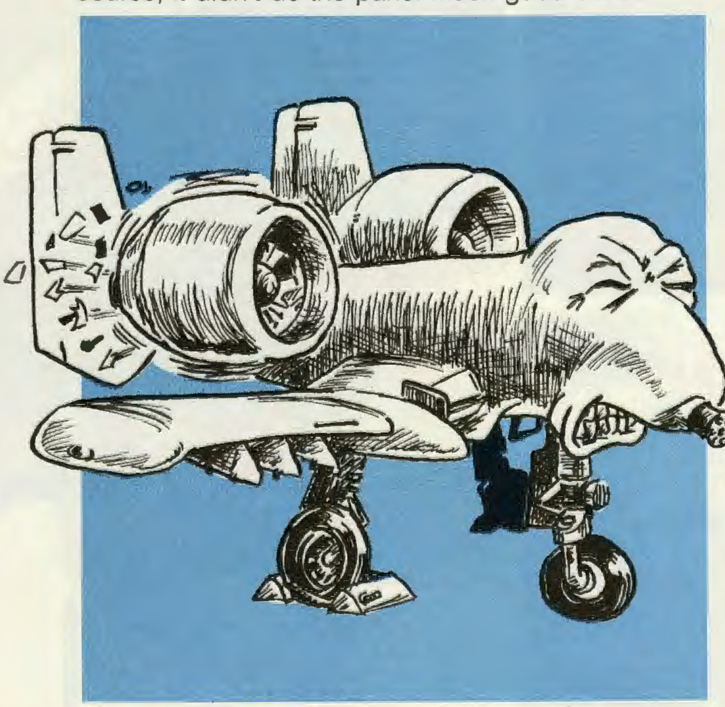

HOW DO YOU SPELL INCOMPETENT?
E-N-C-O-M.....

chock talk

...incidents and incidentals with a maintenance slant.

When to Inspect

During an engine run for maintenance, an A-10 swallowed a panel. The panel (N-1) came from the top of that engine nacelle. It damaged all the fan blades, the inlet extension ring and fan casing, the inlet guide vanes, and the engine bypass section. Of course, it didn't do the panel much good either.



The engine run took place after phase inspection. It was run once and checked for leaks. After shutdown, the phase-dock supervisor planned to run it again for a vibration test. The supervisor did a prerun inspection of the engine and noted it in the forms. Meanwhile, an engine specialist removed panel N-1 from the top of the engine nacelle in order to connect the tester's leads for the vibration test. He placed the panel on the engine nacelle.

When they ran the engine, the panel drifted close enough to the inlet to be sucked in and cause the damage.

This unit now says the inspection should be the last thing done before an engine run, and the engine run operator should be the last one on top of the aircraft as he or she checks for foreign objects. If someone else opens a panel, the inspection must be redone.

Radio Controlled Rudders

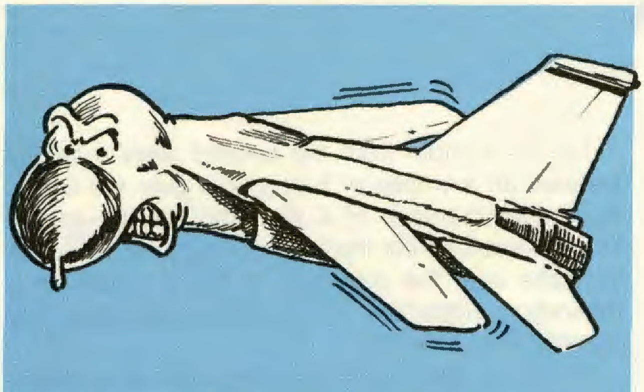
The F-16 was about to begin its low-level mission. When the pilot checked in on the UHF radio, the aircraft suddenly yawed to the left. The pilot figured he'd run into some turbulence. Then he made another radio call, and it happened again. So he aborted the mission, came back to the base, and landed, using only the VHF radio.

On the ground, with the aircraft engine running, investigators were able to duplicate the problem. When the UHF radio was keyed, the rudder moved six inches to the left. Both horizontal stabilizers also twitched and fluttered a half inch.

As they dug in to the problem, they found the coaxial cable for the UHF antenna was separated from the coaxial connector by 1/32 of an inch. Either the cable had not been swedged correctly to the connector, or it had been pulled apart during recent phase maintenance, when the UHF radio was removed.

Any defect in the shielding of the coaxial cable can allow large amounts of radiofrequency energy to leak to nearby cables and harnesses. Among the cables nearby are those to the flight control panel and the manual trim panel. Every time the pilot called on the UHF radio, a spike of electric energy was transmitted to the flight control computers, which commanded the rudder to deflect and the stabilizer to flutter.

What next, Murphy!



F-111 Wings Stuck

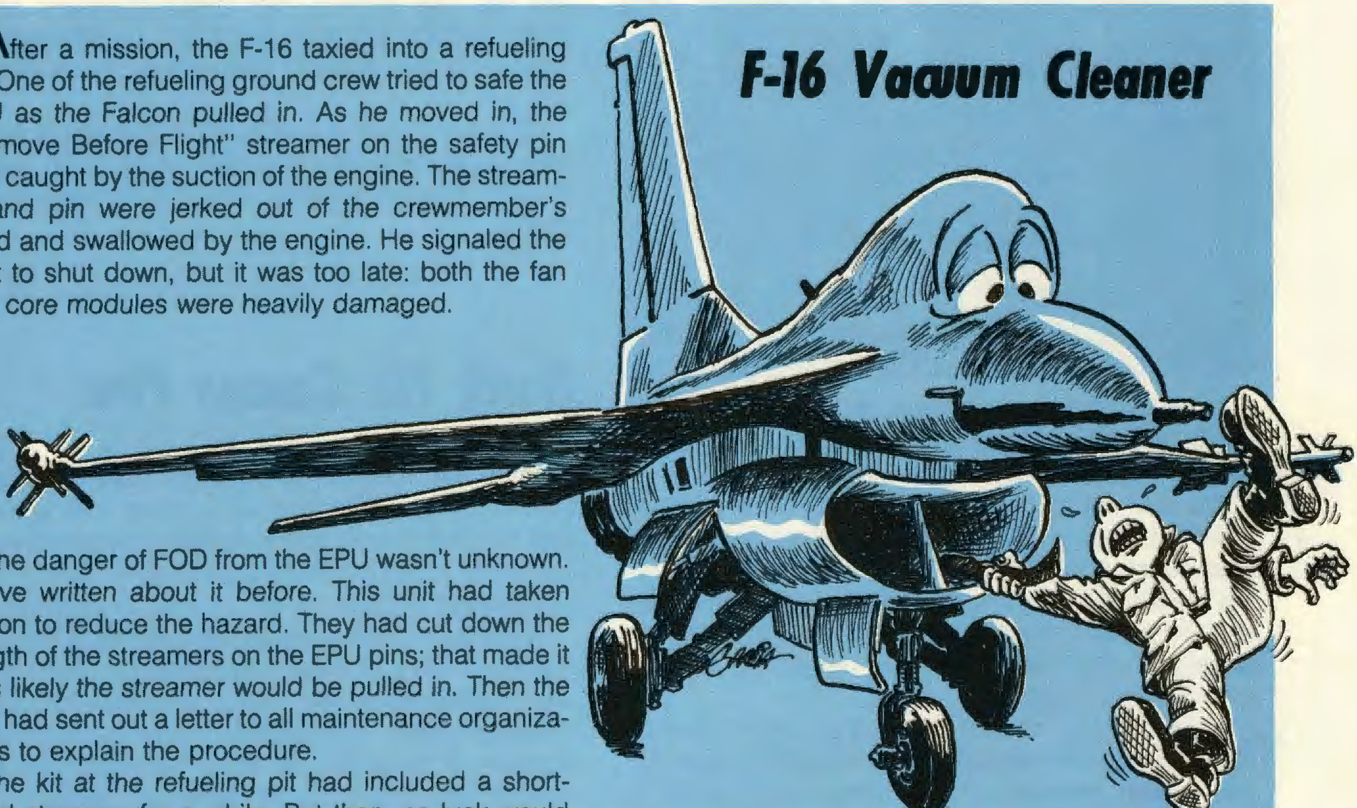
On an F-111 sortie the pilot swept the wings back as he did a zero-G maneuver. After the maneuver he tried to sweep the wings forward. As he began to move the wing-sweep handle forward, it became harder to move. At about 32 degrees of sweep, the handle wouldn't move. The aircrew returned home and entered the landing pattern. In the pattern the pilot gave one more push on the handle, using all his strength. It moved almost all the way forward, but not quite. The wings weren't far enough forward to allow the flaps and slats to extend. They made a successful no-flap, no-slat landing. Both brakes suffered some heat damage, and the fire department put out a small brake fire in the right wheel. But no other damage was done.

The cause of the jam was a turnlock fastener, which had wedged itself between the wing-sweep handle and the wing-sweep position track. The turnlock fastener came from the console cover directly under the wing-sweep handle.

This is just another example why those little fasteners in the cockpit are important. It can get worse—jammed throttles, jammed flight controls. Let's make sure the little troublemakers can't get loose.

F-16 Vacuum Cleaner

After a mission, the F-16 taxied into a refueling pit. One of the refueling ground crew tried to safe the EPU as the Falcon pulled in. As he moved in, the "Remove Before Flight" streamer on the safety pin was caught by the suction of the engine. The streamer and pin were jerked out of the crewmember's hand and swallowed by the engine. He signaled the pilot to shut down, but it was too late: both the fan and core modules were heavily damaged.



The danger of FOD from the EPU wasn't unknown. We've written about it before. This unit had taken action to reduce the hazard. They had cut down the length of the streamers on the EPU pins; that made it less likely the streamer would be pulled in. Then the unit had sent out a letter to all maintenance organizations to explain the procedure.

The kit at the refueling pit had included a shortened streamer for a while. But then, as luck would have it, the short streamer disappeared and was replaced with a long one. The ground crew had noticed the change in the length of the streamer about two weeks earlier, but they had forgotten why the length was important.

So the inevitable happened. Given the opportunity, the F-16 is the most effective vacuum cleaner around—powerful suction and low to the ground. The problem is, as a vacuum cleaner, it can only be used once.

CHOCK TALK

Soap Opera

The F-15 was flying from a deployed location overseas. Fifteen minutes after takeoff, the engine stagnated. The pilot shut down the engine to clear the stall and then restarted it. It ran within limits at idle, but stagnated again when the throttle was advanced. The pilot shut it down again, restarted it, and left it running at idle. Then the pilot felt vibrations; the engine seized as he was shutting it down. He brought the airplane back and landed single-engine without any more problems.

Investigators began looking at the engine's prior SOAP (spectrometric oil analysis program) samples. The story grew curiouser and curiouser.

The host unit at the deployed location provided the SOAP laboratory. The lab had taken oil samples after each flight, analyzed them, and recorded them on the correct form. A few days earlier, the oil sample showed an increase in iron content. In contained 10 parts per million (ppm) iron, an increase of 4 ppm over previous flights.

According to the tech data, the engine should have been placed under surveillance for iron wear of that amount. However, the oil sample was coded *A* (routine) by the lab.

The next day the aircraft flew three times. After the first flight, the oil sample again was high in iron—11 ppm. By the tech data, this should have caused a teardown inspection of the engine. But the sample was coded *A* and filed.

The oil sample from the second flight that day showed an increase of 5 ppm iron over the earlier flights. An increase of 5 ppm requires an engine teardown to find out the cause. In addition, the total increase over the previous 10 hours called for a mandatory inspection of the number 4 bearing. The sample was coded *A*.

The oil sample after the third flight had an additional increase of 10 ppm. Finally, the lab did something: they coded it *B*, meaning another oil sample was required immediately. But it was late Friday; the request didn't get to the deployed unit until Monday morning.

No one told the deployed unit why the additional sample was required, but they took it at about 0730 Monday morning. The lab analysis confirmed the high iron. It was coded *T*, grounding the airplane. Too late. The airplane had taxied and taken off at 0820; the information on the SOAP sample was still making its way through channels to the deployed unit.

Oil analysis has saved a lot of engines. It could have saved this one if it had been given half a chance. This SOAP opera should have had a better ending.

Quick Fix Causes Fire

After the T-38 from another command landed, a hole was found in its boattail. A closer look showed that the hole began in the number 2 afterburner. A spray bar in the afterburner had broken, and a hole had burned through the afterburner and boattail.

Inspection of the spray bar showed signs of bending. Apparently, at some time the bar had been bent; and then someone had tried to straighten the bar by bending it back. The bending caused a thin crack in the base of the spray bar. When the afterburner was used in flight, the spray bar separated. The spray bar missing resulted in a defective spray pattern. At the temperatures reached in the afterburner, the correct spray pattern is critical. A bad pattern, as in this case, can easily burn through the afterburner.

Quick fixes, such as bending a spray bar, aren't fixes at all. They're invitations to disaster.

Letters to the editor

Dear Editor,

Environmental specialists at Dobbins AFB, Georgia, have identified a potentially dangerous situation on the F-105 aircraft that could apply to a number of different weapon systems. The problem concerns the proper installation of a hot-air-line clamp, such as part number R40C60 or D40C60. The improper installation of this clamp is definitely a fire hazard. In many instances, the clamp is installed and torqued without properly seating the clamp on the duct flanges. The attached photos show both proper and improper installations. When the clamp is initially installed on the duct, it should be seated during torquing by tapping with a mallet until both the proper torque is obtained and the clamp's locking tangs are engaged. The tangs are an added safety feature to prevent the clamp from coming loose in the event of clamp bolt failure. Also, on future inspections, properly engaged tangs are a good indication that the clamp was properly seated during initial installation.

Personnel that are responsible for the maintenance of hot-air-line systems requiring the use of these clamps are encouraged to follow proper procedures during installation and to check existing in-use clamps for proper installation.

Emilio J. Rola, TSgt, Georgia ANG
Environmental Systems Supervisor

Dear Sergeant Rola,

Thank you for bringing the problem to our attention. Our worst catastrophes can often be traced back to something as minor as improperly seated fasteners.
ED

IMPROPERLY INSTALLED CLAMP

CLAMP TANGS PROPERLY ENGAGED

letters

Dear Editor,

This letter is in regards to the Individual Safety Award for the month of October given to SrA Pierre Fournier at the 49th Equipment Maintenance Squadron, Holloman AFB, NM. The severe electrical voltage hazard that is associated with the MD-1A motor generator set is true. It is also true that the tech data does not describe how to discharge the large filter capacitors. However, the procedure was taught to me 15 years ago and still is taught at the Aerospace Ground Equipment Technical School at Chanute AFB, IL. In tech school, if the procedure is not correctly done, the individual fails that portion of the block on the MC-1A generator set and retakes that portion of the block. This is repeated until the individual has done it correctly.

I would like to commend SrA Pierre Fournier for his initiative in submitting an AFTO Form 22 on this hazard that has been ignored and tolerated for so many years. I do believe it is time that all of us take a look around for those safety hazards we have tolerated and ignored over the years.

Dale R. Harting, TSgt, USAF
Asst NCOIC, AGE
607th Tactical Control Training Squadron
Luke AFB, AZ

Dear Sergeant Harting,

Amen. The most insidious hazards may be the ones we've learned to work around. "Everyone knows" is never true. A procedure that's important enough to be a pass/fail item in tech school certainly is important enough to be included in the tech order.
ED

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TAC TALLY

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CLASS A MISHAPS	1	30	28	0	6	12	0	1	3
AIRCREW FATALITIES	1	18	18	0	3	10	0	1	1
TOTAL EJECTIONS	0	25	28	0	2	11	0	1	3
SUCCESSFUL EJECTIONS	0	22	23	0	1	7	0	0	2

TAC'S TOP 5 thru NOVEMBER '81

TAC FTR/RECCE class A mishap free months	
38	1 TFW
37	31 TTW
25	49 TFW
24	355 TTW
20	363 TFW

TAC AIR DEFENSE class A mishap free months	
106	57 FIS
59	5 FIS
56	48 FIS
15	318 FIS
6	87 FIS

TAC GAINED FTR/RECCE class A mishap free months		
115	188 TFG	(ANG)
107	138 TFG	(ANG)
106	917 TFG	(AFR)
103	116 TFW	(ANG)
93	434 TFW	(AFR)

TAC GAINED AIR DEFENSE class A mishap free months	
93	102 FIW
89	177 FIG
55	125 FIG
38	119 FIG & 142 FIG
28	144 FIW

TAC/GAINED Other Units class A mishap free months		
148	182 TASG	(ANG)
141	193 ECG	(ANG)
136	26 ADS & 4787 ABGp	
132	110 TASG	(ANG)
128	USAFTAWC	

CLASS A MISHAP COMPARISON RATE 81/80

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

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAC	1981	4.0	3.0	3.2	5.6	6.0	5.9	6.3	6.2	6.0	5.3	5.0	
	1980	2.0	4.0	5.2	4.4	4.7	5.2	5.3	5.2	4.8	5.1	5.0	
ANG	1981	9.3	4.8	4.6	3.3	2.6	2.2	1.8	1.6	2.4	2.6	2.3	
	1980	5.0	7.6	6.6	7.1	6.5	6.1	5.8	5.1	5.0	5.0	5.0	
AFR	1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	3.4	3.0	2.8	
	1980	0.0	0.0	0.0	0.0	0.0	4.3	3.7	6.5	8.9	7.9	7.3	

☆ US GOVERNMENT PRINTING OFFICE: 1981—735—019/8


FLEAGLE
Blink! Blink!
HARDISON
HAPPY NEW YEAR
OH ME !! OH ME ! OH ME ! OH ME !! OH ME !
MUSTA BEEN SOME PARTY. WISH I COULD REMEMBER IT... GOTTA GET SOME WATER ON MY FACE.
AFTER DRINKING THE WAY HE DID LAST NIGHT HE SHOULD LIKE THIS HOME COOKED MEAL.
COME AND GET IT WHILE IT'S HOT, FLEAGLE. I BROUGHT YOU SOME FRESH LIVER, GREEN BEANS AND YAMS.
MYEPPH!
?
© STAN HARDISON 1961
BRRAAACCK!