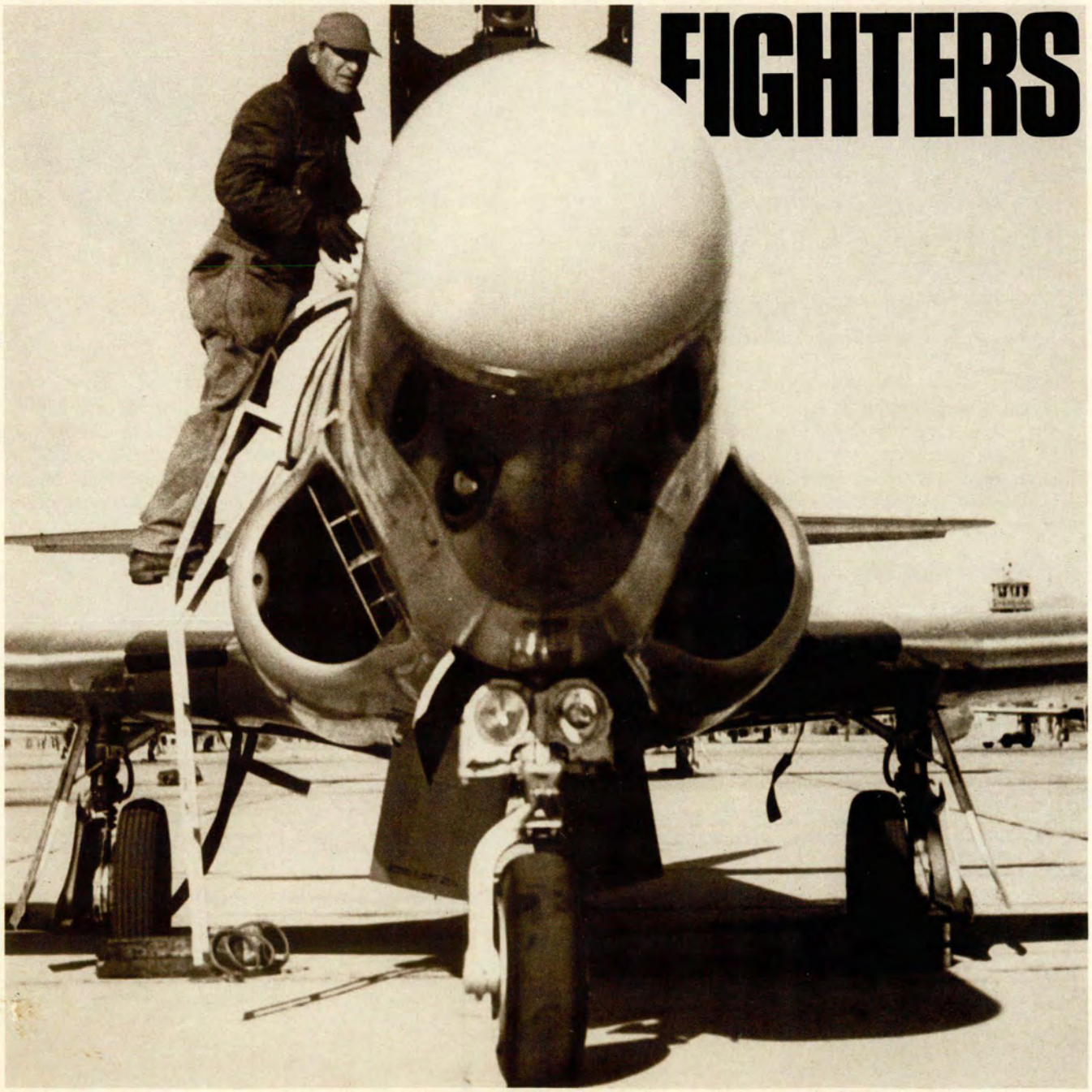
# flying

SAFETY

JANUARY 1989

## SPECIAL ISSUE
## Mishap Review and Forecast



# FIGHTERS

# We Have A Winner!!


. . . AND THE WINNER
FOR THE OCTOBER 1988
DUMB CAPTION CONTEST THING IS:

**MSgt Willie McGee**

**Sumter, South Carolina**

Once again, we learned many people were able to beat us in writing dumb captions. So many, in fact, that our panel of experts on dumb humor were dumbfounded. We experienced a severe case of caption gridlock. However, staff members from our new publication, *Road & Rec,* who are very experienced in handling difficult traffic situations, came to our rescue. They were able to get us moving again, and we finally chose a winner. Congratulations, Sergeant McGee. Your cheap little prize is in the mail.

The next 10 most popular captions are listed below in the honorable mention category. It appears you are having as much fun with this contest as we are. Keep those cards and letters coming!

### Honorable Mention

1. **You said it's supposed to be a covert flight, didn't you?**
   MSgt Willie McGee, Sumter, SC*
2. **You ever fly one of these things? . . . Nope! . . . Me either, just keep smiling.**
   Joseph M. Mulhern, USAF Hospital, Bitburg
3. **Did they say this was a dumb *caption* or a dumb *captain* contest?**
   SSgt David Sandstrom, Oklahoma ANG, Oklahoma City, OK
4. **I never knew an interstate could look so much like a runway. . . . Just shaddup and smile. Maybe the colonel won't recognize us.**
   Capt Chuck Saint, AFEWC/IN, Kelly AFB, TX
5. **I told you it would work. We can hide *anything* from the IG now!**
   TSgt Roger Dawson and SrA Randy Patchett
6. **Gosh, Wally! Why are all those guys screaming, "Get out of the way?"**
   A1C Scott A. Layson, 152 TRG/CAM, Reno, NV
7. **Are you sure those guys are California Raisin scouts? . . . Yeah, shaddup, smile, and put on your shades!**
   Sgt Ron Cryderman, 388 EMS/CCQ, Hill AFB, UT
8. **You two do the worst Ray Charles impressions I've ever seen.**
   MSgt Larry J. Laatsch, 27 AGS, Cannon AFB, NM
9. **Yep, it took a year of intense studies, but we finally found a way to keep the dashboard from cracking.**
   Sgt S. Winnings, Avon Park, FL
10. **And we're gonna have a "baby on board" sign in the back, and a little dog with a head that bobs up and down, and some twinkling lights around the windows and a cat with suction cups on its feet . . . Oh yeah, and a chain steering wheel.**
    Jeri Rood, AFISC/SEPP, Norton AFB, CA

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* Yeah, we know. It's another entry by the guy who won, but the dumb humor experts who judged the contest didn't know who sent them so it was at least semi fair to pick him again. Besides, he'll still only get one cheap little prize. So big deal!

UNITED STATES AIR FORCE

# flying

SAFETY MAGAZINE

AIR FORCE SPECIAL PUBLICATION 127-2 | JANUARY 1989 | VOLUME 45, NUMBER 1



## SPECIAL ISSUE

1988 was another great year! We had 55 class A mishaps in FY88 and for the 5th year in a row, our class A mishap rate remained below 1.8. Our fighter/attack aircraft had a good year overall with 45 total class A mishaps. The A-10, F/RF-4, F-5, and F-15 all had an exceptionally good year.

In this issue, we take a look at how we did in FY88 in our fighter/attack aircraft. Next month, the magazine will be devoted to the heavies.

## SPECIAL FEATURES



## REGULAR FEATURES



### CONTRIBUTIONS

Contributions are welcome as are comments and criticism. No payments can be made for manuscripts submitted for publication. Address all correspondence to Editor, *Flying Safety* magazine, Air Force Inspection and Safety Center, Norton Air Force Base, California 92409-7001. The Editor reserves the right to make any editorial changes in manuscripts which he believes will improve the material without altering the intended meaning.

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, OSAF

**PURPOSE** — *Flying Safety* is published monthly to promote aircraft mishap prevention. Use of funds for printing the publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. Facts, testimony, and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in mishap stories are fictitious. The contents of this magazine are nondirective and should not be construed as regulations, technical orders, or directives unless so stated. **SUBSCRIPTIONS** — For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Changes in subscription mailings should be sent to the above address. No back copies of the magazine can be furnished. **REPRINTS** — Air Force organizations may reprint articles from *Flying Safety* without further authorization. Non-Air Force organizations must advise the Editor of the intended use of the material prior to reprinting. Such action will ensure complete accuracy of material amended in light of most recent developments. **DISTRIBUTION** — One copy for each six aircrew members. One copy for each 12 aircrew support and maintenance personnel. Air Force units must contact their base PDO to establish or change requirements. AFSP 127-2 is entered as a publication at the Second-Class rate (USPS No. 586-410) at San Bernardino Postal Service, 1331 South E Street, San Bernardino, CA 92403 and additional entries.

# A-7

**MAJOR LINN VAN DER VEEN**
Directorate of Aerospace Safety

■ FY88 was *not* a good year for the A-7! While it's too early to say "The sky is falling!," it is safe to say the sky is broken to overcast, and the ceiling appears to be descending. After two exceptional years with only a single Class A mishap each, we lost two pilots and five airplanes, and suffered two tree strikes that were very near tragedies in FY88. There has been only 1 year with more fatalities or destroyed jets since 1979.

Since the A-7 is still one of the most accurate and reliable attack aircraft in the world, and is developing new capabilities each year, we need to protect this valuable combat resource. And it wouldn't be a bad idea to protect the operators and maintainers, while we're at it! So, to help you make it through another year, I'll update the recent mishap history and trends and then discuss some future developments.

## FY88 Mishaps

There are approximately 370 A-7D and K model aircraft in service, mainly with the Air National Guard. About 500 more jets are flying with the US Navy and the air forces of Greece and Portugal. The USAF fleet flew about 83,000 hours last year and has totaled just over 1.5 million lifetime hours. The A-7 has experienced 93 Class A mishaps since 1970, which yields a cumulative destroyed rate of just over six aircraft destroyed for each 100,000 hours flown.

The mishaps equate to 93 aircraft and 39 lives lost, and while this is a great deal of lost capability, the rate does compare favorably with other USAF fighter/attack aircraft. In fact, as figure 1 shows, the A-7 has one of the lowest lifetime destroyed rates of any USAF single-engine aircraft.

Pilot, maintainer, and aircraft performance had steadily decreased the number of yearly mishaps until FY88. The five FY88 Class A mishaps resulted in a rate of just over 6.0. Figure 2 gives a comparison of past A-7 mishap rates. The FY88 mishaps included three engine failures, a collision with the ground, and one case of probable pilot incapacitation.

- Early in FY88, an A-7 experienced a tragic engine failure that resulted in several civilian casualties. The engine flamed out when the compressor drive shaft failed on a cross-country mission, and the pilot's attempted flameout approach was unsuccessful. The pilot was able to eject, but the aircraft hit an airport hotel with disastrous results.
- The second Class A mishap also was an engine failure, this time due to a high pressure fuel pump failure. The pilot ejected successfully on short final.
- The next mishap was a fatal collision with the ground. The pilot, who was performing as a Bar-on during low altitude awareness training, dragged a wingtip on a small ridge while maneuvering for an intercept.
- Another pilot and aircraft were lost during an air combat training mission when the pilot became incapacitated, probably due to G-induced loss of consciousness.
- The fifth FY88 Class A mishap occurred when a throttle cable broke, allowing the throttle to be pulled back, but not advanced. The

pilot ended up with too little thrust to maintain flight and ejected successfully.

- There were two near mishaps that were very similar to the fatal collision with the ground in everything but the final toll. A-7s were put in the trees twice, once while maneuvering after a simulated bomb pass during a Maple Flag exercise, and a second time during a ridge crossing.

### Mishap History

Since the mission of the A-7 has remained relatively constant over the years, it's worthwhile to examine the historical mishap factors that repeat all too regularly. Through the end of 1988, there have been 54 Class A mishaps caused primarily by operator factors, and two types of mishaps have accounted for three-fourths of these ops-related mishaps.

**Collision With the Ground** As is expected given the low altitude attack mission of the A-7, collision with the ground is the largest single category, with tragic results: 21 destroyed aircraft and 20 fatalities. FY88 was no exception to this, with three instances of A-7 pilots hitting the ground, or something attached to it, all totally comfortable and confident.

**Loss of Control** The second most common operations mishap category is loss of control, which has accounted for 18 aircraft and 12 fatalities. The last mishap of this type was in 1981; however, automatic maneuvering flaps and advanced handling training have significantly reduced this problem. This is an example of how the community can attack a safety problem that once caused unacceptable losses of valuable combat resources.

Flying the airplane at its limits and aggressively accomplishing the mission it was designed for creates the potential for one of these statistics on every flight. There's no easy solution, of course, because that's the business we are in. But training the way we plan to fight, following the ROE, knowing the aircraft systems, and knowing individual limits can minimize exposure to these threats.

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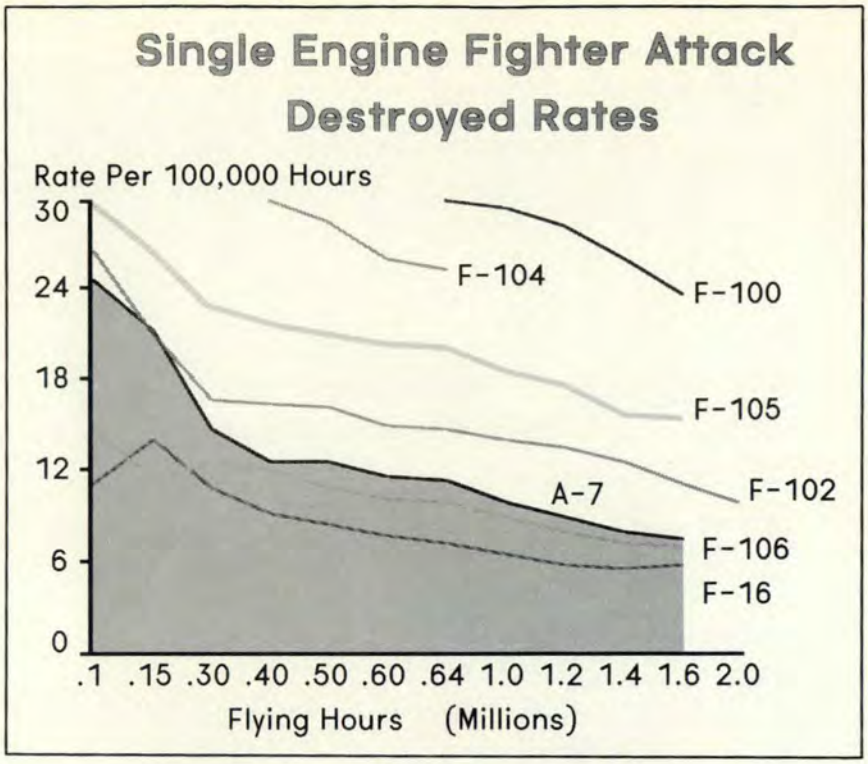



Figure 1

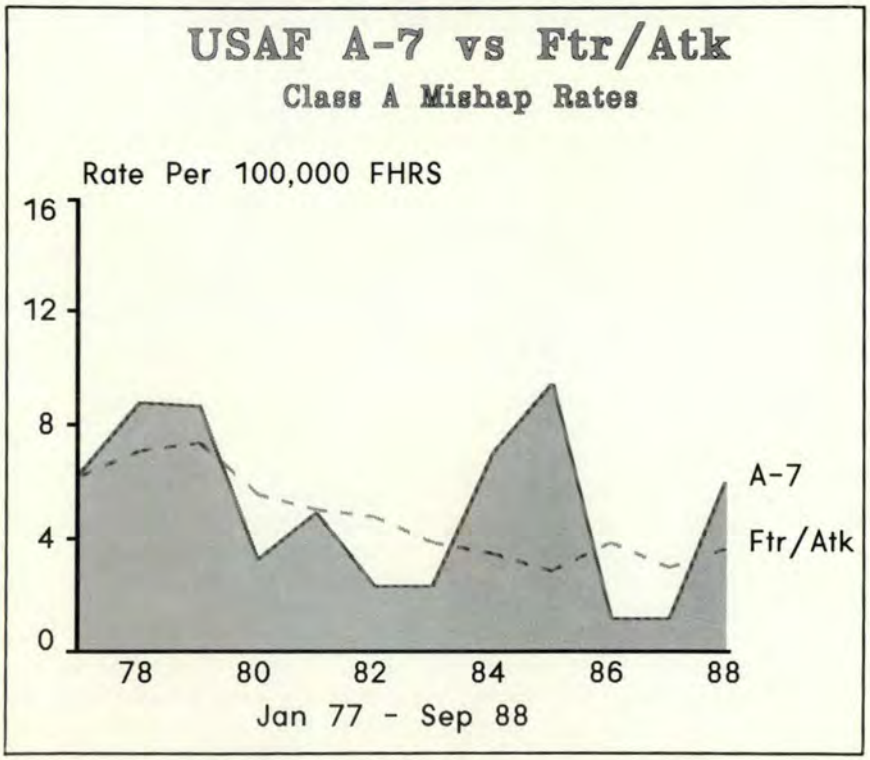



Figure 2


**Engine Failures** There have been an additional 39 Class A mishaps caused by material failures, maintenance problems, or design deficiencies. Leading the list of these logistics factors is TF41 engine failure, which has resulted in the loss of 24 aircraft and many other close calls. This year was one of the worst on record, with three losses in this category. Since each was from an unrelated cause, it's difficult to come up with a quick fix. But the experts are aggressively attempting to do just that, and there are already additional inspections, restrictions, and tech order changes in effect to prevent a repeat of these failures, or at least detect them before the jet gets airborne.

**Bird Strikes** The most common reportable A-7 mishaps in FY88 were bird strikes. While these were all minor, or Class C mishaps, they could have been worse; the pilot could have been wearing the feathers or flying a 15-ton glider.

Which brings up a point the guys flying night missions may not have considered — you may not see the birds at night, but lots of them, especially the big ones, are still flying. I don't know if they have "requirements" also, or just like the smooth air and reduced traffic, but they are there! Plan those night, or any low-level missions, to avoid bird concentrations and migratory routes. Pass sightings or strike info to the next guy or the SOF.

**Gear-Up Landings** Last year was the second in a row without a gear-up landing. Maybe we've seen the light, but it's still something that deserves plenty of attention. The hydraulic system design and the absence of any aural gear-up warning have set up many A-7 pilots, so disciplined checklist compliance and a personal habit of checking "gear, flaps, and hydraulics" on short final is a must for *every* approach.

### Future

That's a brief rundown of the A-7's FY88 history. Although it's been in the USAF inventory since 1968, the A-7 still has a bright future. The low altitude night attack (LANA) mod combines a FLIR pod, a new navigation/weapons computer, a wide-angle field-of-view HUD, and an automatic-terrain following (ATF) coupler to add night, below the weather attack to the A-7 mission. The bad news is that this new mission will increase the amount of night low-level flying, which means not only a higher threat environment, but potentially significant lifestyle changes for operators and maintainers.

Further, over the horizon is the "Strikefighter," or the A-7+. Officially designated the YA-7F, two prototypes are being built by LTV and will integrate a stretched A-7 airframe with the Pratt and Whitney F100-220 afterburning turbofan and an advanced technology digital avionics suite. The first flight is scheduled for April 1989, but this could be delayed due to funding difficulties.

### FY89 Forecast

As with all of our systems, there isn't much separating the mishaps from the close calls. The potential for disaster is inherent to the attack mission, and with even more LANA aircraft and missions coming in FY89, it will be even harder to have a mishap-free year. The AFISC computer has predicted the USAF will lose four A-7s this year, and low-level flight, range operations, engine failures, and landing mishaps are areas that deserve special attention if we are to prove this forecast incorrect. The goal, though, is to maintain the tactical edge without any losses, and the A-7 community has the experience, the people, and the motivation to turn last year's record around.

If you would like more details on mishaps or mods, contact your unit FSO, give us a call at AUTOVON 876-3886, or write HQ AFISC/SEFF, Norton AFB, CA 92409-7001. ■

# A-10

**MAJOR LINN VAN DER VEEN**
Directorate of Aerospace Safety

■ Think about how the loss of four A-10s and four pilots would affect your squadron. This would be a significant loss for any unit, and quite an investment at around $6 million per aircraft and years of training per pilot. Even one pilot — especially if he's in your wing, your squadron, maybe even your flight — is too much! But if history repeats, the A-10 fleet could experience four mishaps in FY89.

One of AFISC's many missions is to record historical mishap data, hopefully to use it to prevent future mishaps. Our prognosticators have a crystal ball that compares planned flying hours to the mishap history of the past several years, and then predicts the number of aircraft mishaps for the next year. This is the number of aircraft that will be lost if operations are conducted the same way as in the past.

The forecast predicts four collision-with-the-ground mishaps. This is consistent with past experience, so it's not just a theoretical problem — it's "up close and personal" for every Warthog pilot, and now is the time to think about how you are going to survive 1989. The purpose of this article is to help do that by defining the threat. First, I'll take a look at recent history and the mishap trends that developed the past few years, and then I will attack that forecast and see where we can make it wrong.

## A-10 Mishap History

Last year, the list of USAF A-10 wings grew to eight when two 81st Tactical Fighter Wing (TFW) squadrons moved to the 10 TFW at RAF Alconbury. The active A-10 wings, a test wing at Eglin, five Air National Guard units, and four Air Force Reserve units flew almost 220,000 hours and had three Class A mishaps in the 12 months ending 30 September 1988. This resulted in a Class A rate of 1.37 mishaps per 100,000 flying hours.

This number compares favorably to any other fighter/attack system, and it's the best fiscal year rate ever for the A-10 (1987 saw five Class As and a 2.23 rate). Yet, every one of the FY88 A-10 Class A mishaps were avoidable. Since the first A-10 flight in 1975, units have accumulated almost 2 million hours of flying time with a lifetime destroyed aircraft rate of 3.0, which is still the lowest of any fighter/attack aircraft in USAF history. See the figure for the annual A-10 mishap rates.

As good as the Class A rate appears, the 31 pilots and 59 jets we

continued

**"We've lost more than two squadrons of jets and almost a squadron of pilots, and that equates to a whole bunch of tanks that will never taste a 30MM API."**

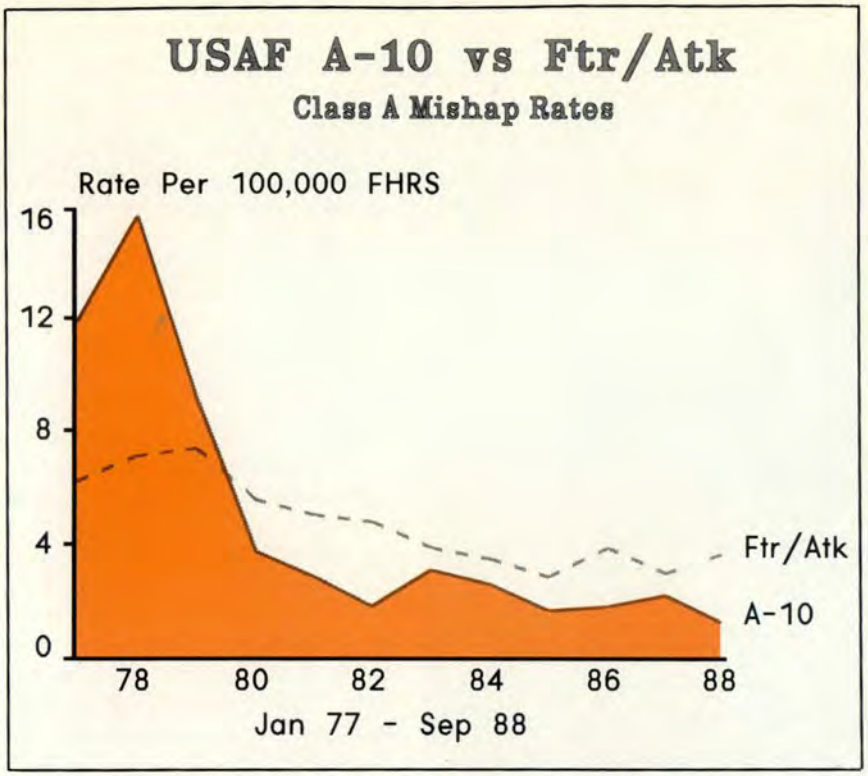
have lost represent both significant personal tragedies and lost combat capability. We've lost more than two squadrons of jets and almost a squadron of pilots, and that equates to a whole bunch of tanks that will never taste a 30MM API.

**Collision With the Ground** The three FY88 Class A mishaps were all the same type — collision with the ground. It is no surprise that these form a significant portion of the major mishaps for a ground attack weapon system. But it is alarming that, since 1983, over one-half of all A-10 Class A mishaps, and 80 percent of all fatalities, have resulted from flying into the ground. We can brag about the low lifetime destroyed rate, but the A-10 has the highest rate of any fighter for collision-with-the-ground mishaps.

- The year started with a true exception to the rule — a nonfatal collision with the ground. The mishap pilot clipped a small ridge with the wingtip while maneuvering in tactical formation. He was able to eject with only minor injuries, becoming the only survivor of 24 A-10 pilots experiencing a ground collision that destroyed the aircraft.
- In the second Class A mishap, the pilot was holding at low altitude when the aircraft descended into the ground. The pilot was probably looking inside the cockpit as he prepared for his next attack, and there was no attempt to eject.
- The third Class A was another low altitude mishap. The pilot was attempting to mark a potential Maverick target when the aircraft hit power cables at 60 feet AGL. The damage was so severe the pilot was forced to eject, fortunately, without injury.

These mishaps demonstrate how narrow the margin is between disaster and success. We were *extremely* fortunate to have lost only one pilot to these three incidents.

- In addition, another A-10 maneuvering for a simulated strafe attack clipped a tree and landed with spruce needles and wood chunks lodged in the left wingtip.




Don't count on being as lucky as these guys, because they used our entire allotment of luck for several years to come.

### Fighting the Forecast

As mentioned earlier, over one-half of all Class A mishaps since 1983 were the result of collision with the ground. We estimate a predictive ground collision avoidance system (GCAS) could have prevented at least 70 percent of all fighter/attack collision-with-the-ground mishaps. And the A-10 will be one of the first to receive a GCAS because of its ground collision rate. However, we won't see a modified aircraft in the field until FY90. GCAS will be part of a modification called Low Altitude Safety and Targeting Enhancement (LASTE), which will also increase combat capability with a constantly computing impact point (CCIP) and enhanced aircraft stabilization. Unfortunately, it's too far down the road to help this year.

**Collision With the Ground** Actually, the solution to collision-with-the-ground mishaps is in *your* hands. Two of the five 1987 fatalities occurred when the pilots attempted low-altitude maneuvers with insufficient altitude for completion. Two more happened with the pilots looking over their shoulder in a turn. All of last year's mishaps occurred when the pilot concentrated on something other than flightpath for too long.

All of these have one thing in common — the pilots were so comfortable, they were lulled into momentarily forgetting the number one priority at low altitude — ground avoidance. The only solution is to remember these two basics before any flight: First, no matter what the tactics or target, no matter what any other airplane is doing, nothing is more important than avoiding the ground. Second, the Hog has a bad habit of seeking the dirt, especially in a turn.

**Midair Collisions** After flight into the ground, the leading causes of destroyed A-10s during the 1980s are midair collisions and engine failures. In fact, these three categories have resulted in 80 percent of all Class A mishaps since 1983. Our midair collision problem is not just the stray civil aircraft, but also the guy sitting in the briefing room with you!

Collisions have historically occurred during cross-turns or other maneuvers when attention is focused on a target or another aircraft, and as aircraft roll out of tactical turns, concentrating on element flight lead. As with ground collisions, the cause is failure to clear the flightpath. Good communications discipline, strict adherence to ROE, and anticipation of flightpath conflicts that may result while maneuvering can keep your windscreen from filling with sheet metal.

**Engine Failures** The leading cause of A-10 Class A, Class B, and Class C logistics (maintenance, material, design deficiencies) mishaps has always been engine failure. The leading causes of engine failures and shutdowns in FY88 were FOD from ice, Tridair fasteners, and ladder latch crank solenoids; various oil system failures; and false fire warning lights. There were several overtemps and flameouts from "undetermined" causes, including one double-engine stall.

AFLC is doing quite a bit to keep

continued

# A-10 continued

TF34s running, although this does not, and will not, include new engines! Many major parts of the engine's hot section are being replaced during the Hot Section Life Improvement (HSLI) Program, which should significantly reduce the number of internal mechanical failures that in the past caused an overtemperature condition or flameout.

The Turbine Engine Monitoring System (TEMS), a computerized system that continuously monitors engine performance, is being added to engines as they undergo the HSLI modification. TEMS provides effective warning of many types of impending failures before the engine can fail in flight. These two mods are certain to improve engine reliability and should decrease the number of engine-related mishaps. An unhappy note is that these mods will not be completed until FY90, so you may still have plenty of opportunity to log some single-seat, single-engine time.

Any discussion of A-10 engine problems would be incomplete without a mention of the three occasions A-10 pilots have turned an engine failure into a Class A mishap. On two occasions, pilots proved the jet won't fly single engine with speed brakes extended, and in the other instance, the pilot shut down the wrong engine. Use those EP sims and EP-of-the-day discussions to prepare you to be the hero, not the unpleasant alternative.

**Other Aircraft System Failures** There are some other aircraft systems that regularly cause minor, or Class C, mishaps. These are the things that generally result in an air or ground abort, and while nothing else approaches the engine failure rate, there are some other systems to watch out for.

Landing gear, wheel, and tire failures have caused a number of problems this year and in the past. The resulting landing and takeoff surprises include main landing gear (MLG) tread separations, nosewheel bearing and steering failures, MLG wheel rim failures, and even an occasional gear collapse.

There have been a large number of main landing gear strut cracks (apparently caused by fatigue) uncovered in the past 2 years that must be blended out and monitored, and in the worst cases, the strut must be replaced. Check the forms and local procedures for limitations to formation landings or other procedures. These problems are being worked, but solutions are slow to find their way into the field. Be ready for that perfect landing to turn into an exciting ride.

**Modifications** The jets are constantly undergoing modifications, and many of these are the result of lessons we learned the hard way — broken airplanes. For example, this year the A-10 is getting high flow G-suit valves, formation strip lighting, and a two-action emergency canopy jettison handle. (This will prevent inadvertent actuation while reaching for the emergency brake handle.)

Starting in FY90, the fleet will get a new version of fuel tank foam to prevent the electrostatically caused fuel foam fires that have plagued units operating in cold climates, and an aural warning when the speed brake is extended while single engine (part of the LASTE system mentioned earlier).

**The FY89 Challenge** For the most part, though, we lose Hogs and Hog drivers due to pilot actions. This is compounded by the unforgiving low altitude environment. The good news is that you're in control; the jet is not going to put you in very many unrecoverable situations. History shows that if we avoid major "pilot errors," we avoid A-10 mishaps. That computer forecast for four mishaps in FY89 is a cold, impersonal, numerical analysis, and it doesn't recognize your desire to make this a mishap-free year. Think about that before your next brief, flight, or sim - *you* can make every flight end safely.

This discussion has just skimmed the surface of the FY88 A-10 safety record and upcoming safety modifications. If you want more details, contact your unit FSO, give us a call at AUTOVON 876-3886, or write HQ AFISC/SEFF, Norton AFB, CA 92409-7001. ■

# F/RF-4

**MAJOR JEROME L. JOHNSON**
Directorate of Aerospace Safety

■ FY88 proved to be another good year for USAF aviation with the fourth lowest Class A mishap rate of 1.62 mishaps per 100,000 flying hours!

FY88 was the *best year ever* for the F/RF-4 fleet with seven Class A mishaps for a rate of 2.80 mishaps per 100,000 flying hours. Congratulations to all of you on your *great* flying and maintaining.

With 25 years of service in the USAF and over 9.75 million flying hours, the F/RF-4 Phantom II still had approximately 1,205 airframes remaining in the USAF inventory at the close of FY88. The F/RF-4s accounted for 2.6 percent of the total USAF FY88 flying hours and 20.7 percent of the total fighter/attack FY88 flying hours.

The F-4s had the *best year ever* with only two Class A mishaps and two Class B mishaps; however, the Class A mishaps did cost two aircrew and one crew chief their lives. The F-4s set a record by going for over a year (9 Oct 87 to 9 Oct 88 plus) without an aircraft loss. This is truly a feat never before accomplished by operational F-4 Phantom Phlyers. CONGRATULATIONS!!

The RF-4 community was not as fortunate in FY88. Five Class A mishaps and two Class B mishaps reflect the sixth worst Class A mishap rate (7.32) in the 23 years of flying the RF-4s. Operational (ops) factors were labeled as causal in four of the five Class A mishaps. Loss of control was the primary problem area.

## Lucky!!

The F/RF-4s had a *very* lucky year. One F-4 crew tied the all-time low altitude record when they shot a PAR to minimums and inadvertently touched down somewhere during the missed approach. Oh, I forgot to mention the altimeter was in standby because at EOR with SPC on, it was out of tolerance. The previous approach had been flown to TACAN minimums without breaking out of the weather, and the crew did not hear part of the reported weather (visibility zero).

Another F-4 crew tried for the low altitude record but got only a tree during the recovery from a bombing pass. Several flight control problems also resulted in close calls (for example, uneven flap retraction during a formation takeoff, with a roll into lead). One F-4 had the left engine and PC-2 fail, leaving only the PC-1 from windmilling RPM to actuate the stabilator.

## Lives Lost

Five F/RF-4 crewmembers and one crew chief were lost in FY88. The two ejections ouside the envelope were unsuccessful. Two crewmembers did not attempt an ejection as they were unaware of impending ground impact. Seven of eight ejection attempts within the envelope were successful. The in-the-envelope fatality had a successful ejection but was never found and presumed drowned. A water activated LPU-9P most probably

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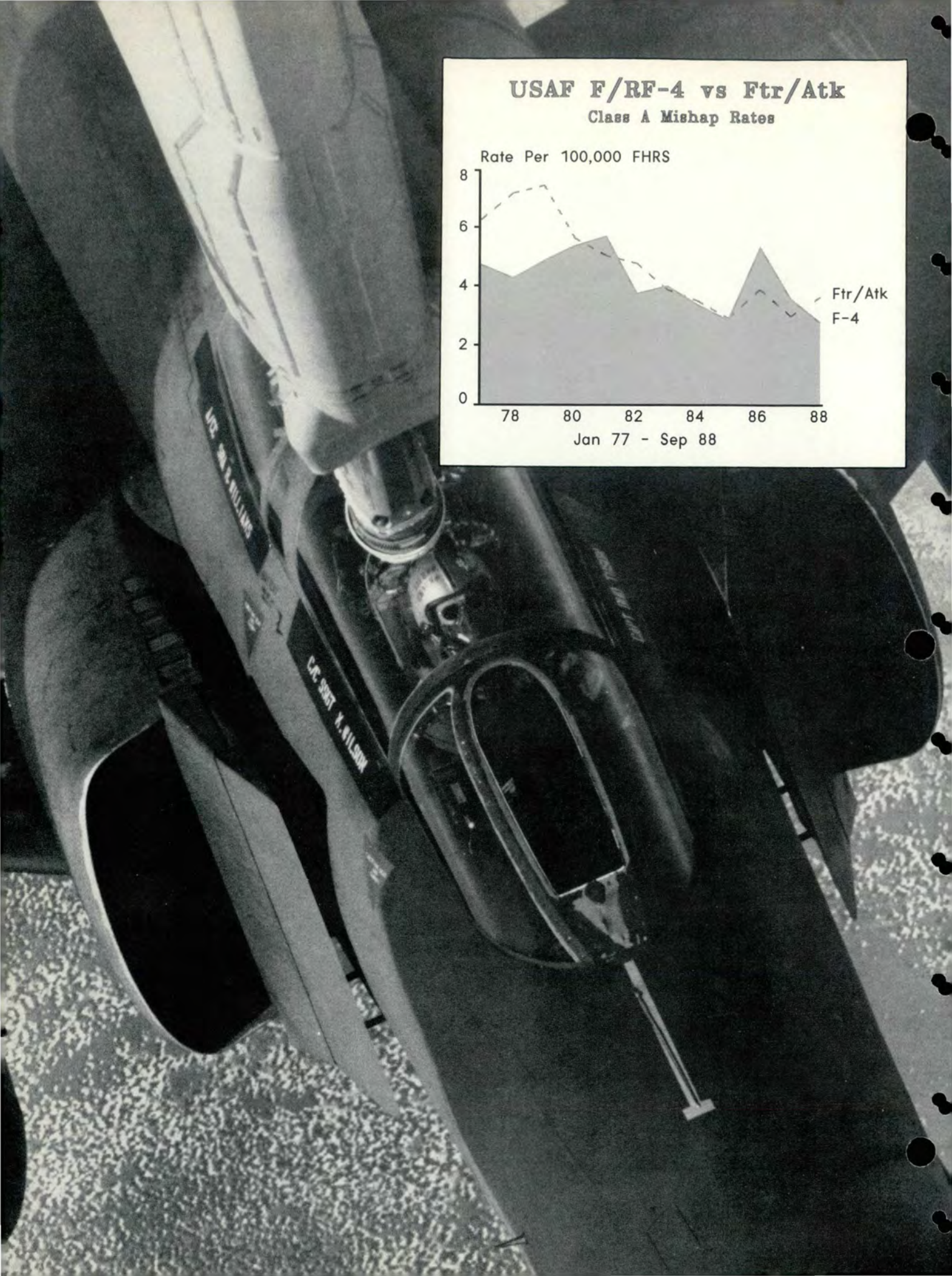

USAF F/RF-4 vs Ftr/Atk
Class A Mishap Rates
Rate Per 100,000 FHRS
8
6
4
2
0
78
80
82
84
86
88
Jan 77 - Sep 88
Ftr/Atk
F-4

# F/RF-4

continued

would have saved his life. The crew chief lost his life as a result of being ingested into the intake of an F-4.

### Aircraft Lost

Five F/RF-4s were destroyed in FY88. This brings the lifetime total of destroyed F/RF-4s to 1,060. Four of the five aircraft lost were due to ops causes while the other was log in nature.

### Log Mishaps

In FY88, we beat the prediction of six log mishaps by three. A synopsis of these mishaps follows:

- On short final at night, the crew was faced with a total utility hydraulic failure (no normal braking or nosewheel steering). A spurious flight control input prompted the crew to land instead of going around. No approach end cable was available. The emergency brakes were *not* applied, contributing to the aircraft departing the runway. After the RF-4 four-wheel all-terrain vehicle departed the prepared surface and became airborne several times, the WSO initiated a successful dual-sequenced ejection, simultaneous with the nose gear collapsing and penetrating the front cockpit. The crew fortunately survived the almost zero-zero ejection.
- During a simulated single-engine low approach, an engine fire resulted from failure of a sixteenth stage compressor disk. Fuel from the damaged no. 4 fuel cell engulfed the engine, causing a catastrophic fire. The crew ejected successfully.
- While at EOR, the mishap aircraft experienced a pneumatic problem. The crew responded to a suggestion to increase RPM in an attempt to build up the pressure, although increasing RPM has no effect on the pneumatic pressure. The crew chief stepped from the nosewheel-well directly in front of the engine intake and was ingested.

### Another Log Mishap Prevented

Three years in a row (1984-1986), the USAF lost one F-4 annually to engine bay fire fueled by the center line tank during takeoff. All three crews failed to jettison the source of fuel for the fire. In 1987, the trend was broken because a crew jettisoned the external load (center line tank) after fire had erupted during takeoff. Last year, a crew again saved an F-4 by jettisoning the center line tank. The (if necessary) option of the BOLD FACE again proved to be a viable option. WELL DONE, PHLYERS!

### Ops Mishaps

- Loss of control continued to be the largest ops factor, accounting for three RF-4 aircraft losses in FY88, costing three lives.
- Misapplication of flight controls at high AOA caused the loss of an RF-4. How did the crew get into that position? Adequate air-to-air training had *not* been provided the crew. The crew was *not* current in ACBT and was mistakenly regaining currency through a DACT sortie. The crew had *never* flown DACT. They were set up! Have you been set up and not waved the __ __ flag? The ejection was successful; however, the pilot was never found and presumed drowned.
- During an ACBT sortie, the pilot abruptly maneuvered the RF-4 into an unexpected, extremely nose-low attitude. Being close to the floor of the authorized airspace, the crew may have rushed their dive recovery attempts, placing the aircraft in several accelerated stalls. The WSO finally pulled the handle at approximately 3,000 feet AGL, and both crewmembers survived. Close! Just a couple more seconds and . . .
- Shortly after turning to the first low-level heading, the wingman repositioned to about 500 feet line abreast and started a roll away from lead. During the roll, the nose abruptly went to a very nose-low attitude (45 degrees). Entering this at-

continued

# F/RF-4 continued

titude at between 1,500 and 2,500 feet AGL, there are three things to do: A perfect recovery, bailout, or hesitate and become a statistic. The handle was pulled too late in this mishap.

■ Inadequate cross-check accounted for the only F-4 loss. On a night range ride, the crew got too busy getting ready for the bomb run and maintaining a visual on lead (4 miles in front) to cross check the altimeter. The aircraft descended into the ground on the run-in line. The crew never knew what they hit.

### Loss of Control

It's not really loss of control that's costing aircrew and aircraft — it's not recovering from the ensuing dive after the BOLD FACE has produced a flyable aircraft. Think about it for a second. Loss-of-control situations normally occur at an altitude providing time to perform a low- or high-speed dive recovery. Pulling directly to onspeed AOA can stall the F/RF-4, considering that the AOA gauge can indicate as much as eight units less than actual AOA with as much as a 7-second delay.

In most of the F/RF-4 loss-of-control Class A mishaps, the crews have had the time to fly the aircraft out of the dive, but have tried their best to do a minimum altitude loss recovery, resulting in a maximum altitude loss. Maybe the old technique about reaching over and winding the clock has some merit (in other words, take your time).

### Hottest Ops Topic

"FIRE, FIRE," those doggone false fire lights! Seems like TCTOs 1461, 1462, and 1503 to the fire warning system have created more problems than they have been worth. Not so fast. Let's take a look at a piece of the big picture. Between 1 Jan 88 and 30 Sep 88, there have been 14 engines shut down for *actual* hot spots in the engine bay. Over half of these incidents would not have been detected with the old system. And some of them may have resulted in catastrophic fires, aircraft losses, and maybe even loss of life. True, 85 percent of the fire/overheat lights have been false, but that's *no* reason to "bet your life" that the lights are inaccurate. Let's keep treating the various light indications as valid. A new TCTO to eliminate this problem should be in the hands of your maintenance organization by the time you read this.

### Safety Modifications Update

■ Installation of single-piece windscreens should have started by the time this article is printed. Anticipated installation completion date is August 1991.

■ Hydraulic leaks in slat lines have caused numerous cable arrestments. Over 130 different lines are now scheduled to be replaced each time an F-4 goes through PDM.

■ The high performance center line tank modification, to move the fuel cap aft of the aux air doors and to baffle the tank preventing CG shift, has a projected March 1990 completion date.

### FY89 Forecast

AFISC's analysts are predicting nine F/RF-4 mishaps for FY89 — five ops, three log, and one miscellaneous. The projected ops mishaps include three loss-of-control, one midair collision, and one collision with the ground. The three log mishaps break down as one fuel system, one engine, and one flight control problem. That leaves one miscellaneous mishap, maybe an unknown.

### Bottom Line

As the F/RF-4 fleet winds down in size, it is more important than ever to keep up your vigilance. The F/RF-4 fleet will still be the second largest in the USAF at the end of FY89 with 1,047 aircraft — second only to the F-16s. As transition time approaches your unit, it is prudent to take extra special care with this old warbird.

*Maintain aircraft control.*

*Analyze the situation and take proper action.*

*Land as soon as practical.*

**FLY TACTICALLY SOUND, AND YOU'LL FLY SAFELY.** ■

# F-5

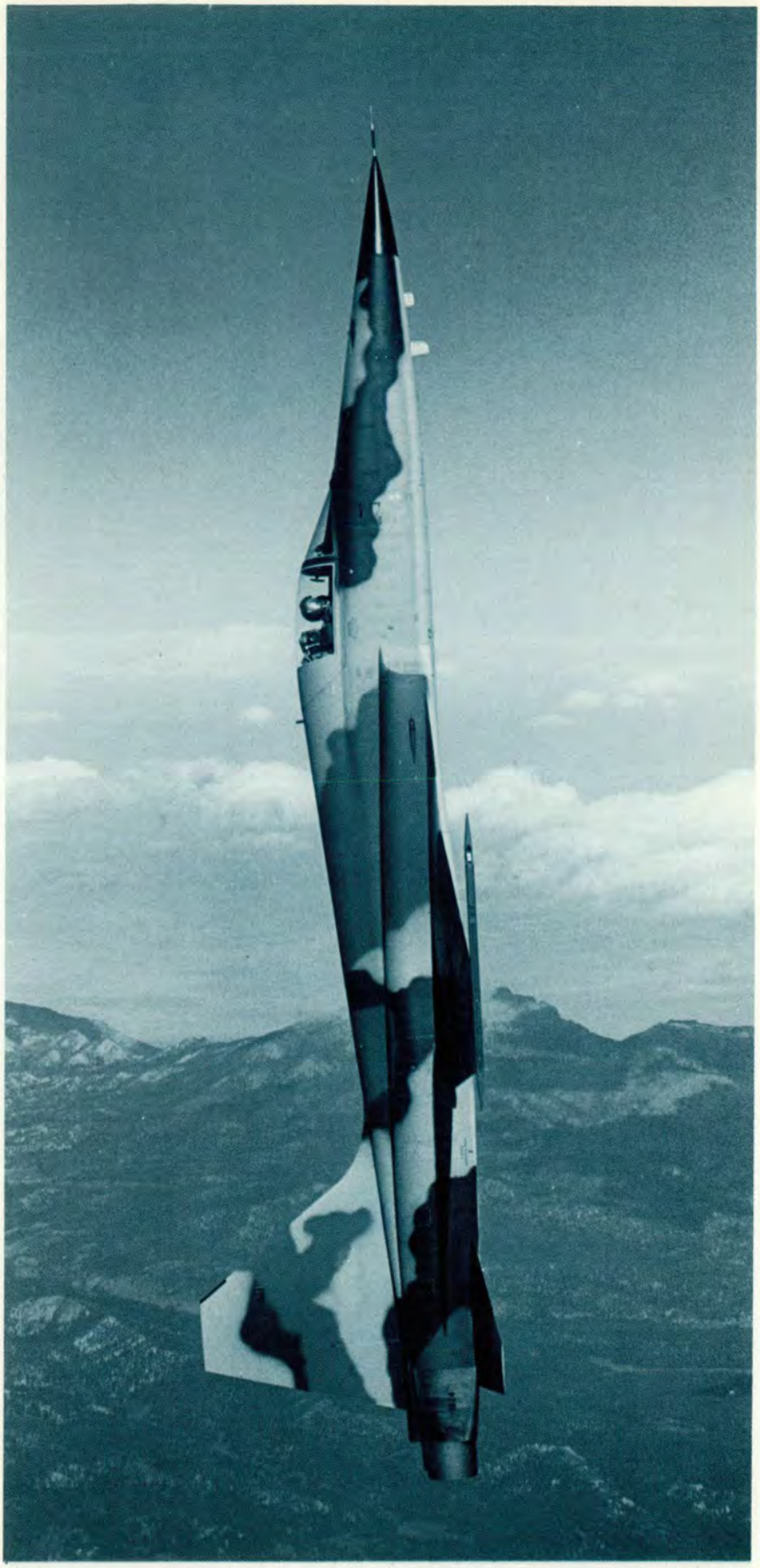
**MAJOR GRAHAM LARKE, CF**
Directorate of Aerospace Safety

■ Overall, FY88 was a good year for the F-5 community. In the 19,000 hours of flying logged, our AFISC computer analysts had predicted three Class A mishaps, whereas we suffered only one.* Hats off to all you F-5 drivers and maintenance and support people for your outstanding achievement. Let's keep up the good work for at least 1 more year. Yes, it's the end of an era, and we are just too professional to sit back on our laurels.

The safety record of any aircraft can only be ascertained by comparisons with records of comparable aircraft. Even then, care must be taken in the analysis because variables such as aircraft design, time in service, mission, and prevailing environmental conditions affect the mishap rate.

Mishap rates themselves are based on 100,000 hours of flying. For FY88, the Air Force rate was 1.62 — the rates for the F-15, F-111, F-4, and A-10 were 0.5, 3.5, 2.8, and 1.4, respectively. The F-5 rate was pegged at 5.2. So you can see that when you are dealing with relatively small numbers of flying hours, one mishap severely affects your track record. Therefore, we cannot afford even one. But isn't that the ultimate flight safety goal anyway — zero mishaps?

Let's now review what happened with the F-5 in FY88 and see if there were any trends. More importantly, let's see if there were any lessons to be learned which might help us achieve a final "mishap-free" year flying this beauty.



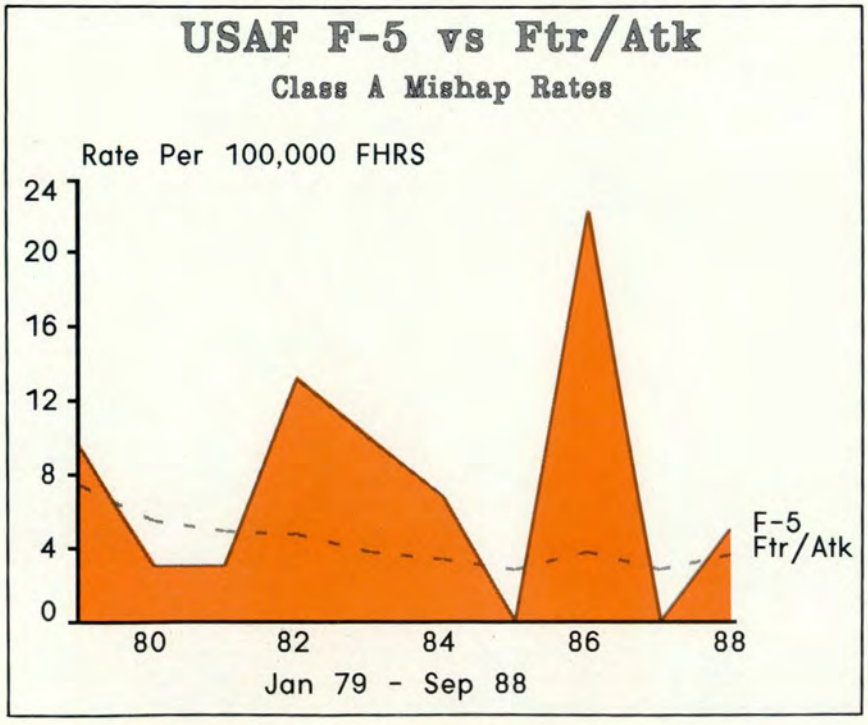
### Class A Review

The one Class A mishap regretably included a fatality.

■ The mishap pilot was lead of a four-ship operational mission. All aircraft were three baggers (heavyweight configuration) due to distances to be flown. The mishap aircraft developed a fuel leak shortly

continued

# F-5 continued




after startup, and although the mishap pilot was told on three separate occasions of his leaking condition, he elected to take off anyway. During the takeoff roll, leaking fuel passed through a faulty boattail seal and was ingested by both engines, causing compressor stalls, fires, and explosions. The pilot, aware of his immediate problem (just after becoming airborne), transmitted his dilemma on the radio for 6 seconds and then finally ejected. It was too late, however, as he was now outside the ejection envelope.

**Lessons Learned** Clearly, there are two valuable lessons to be learned from this mishap. First and foremost is an early decision to eject. Pilots flying the F-5, particularly in a heavyweight configuration, should review their BOLD FACE actions just prior to engine runup. Knowing precisely your actions for the above situation would allow you sufficient time to eject safely within the envelope.

The second lesson is *do not accept* an unserviceable aircraft for a mission no matter how important you

may think the mission. There will always be another opportunity to fly a similar mission, and you will be setting a good example to your flight members and maintenance people.

### Class B Review

The only Class B mishap had the potential for ending in disaster.

- The mishap pilot was on a surface attack tactics mission. Ten minutes into the flight, the right engine fire light illuminated. The pilot reduced the right throttle to idle and climbed to discuss the problem with the SOF. Minutes later, continued heating of the hydraulic lines and actuators resulted in the illumination of the utility and flight hydraulics lights.

The pilot reacted to these lights and commenced a recovery. Continued heating resulted in activation of the right engine fire warning light again, and the engine was finally shut down on the approach to land. The pilot was indeed fortunate on this one, as a fully developed fire could easily have occurred, forcing an ejection and loss of an aircraft.

**Lessons Learned** Proper BOLD FACE actions here would have prevented the severe engine and airframe damage and Class B mishap.

### Class Cs, HAPs, HATRs

Feedback from all of you in the field is extremely important to us safety folk. Analysis of Class C reports, high accident potential (HAP), and hazardous air traffic reports (HATR) identifies trends and permits appropriate preventive measures to be initiated and thus reduces the chance of a mishap. So what did these reports tell us — what trends developed, and what lessons, if any, are there to be learned.

**Class Cs** As you probably expected, engine flameouts led the pack once again on the Class C reports. Other occurrences included a broken AB bracket, broken throttle linkage, broken combustion liner, bird strike, and canopy loss. Other than the engine flameout problem, these are your one-time-only logistics problems common to any type of aircraft.

But what if any of these had happened at a critical stage of flight, such as just airborne or on final approach? What would your actions be? Know your BOLD FACE, think about it now, and you then will be prepared for the event when it happens.

**High Accident Potential Mishaps** Three HAPs included a broken rudder cable linkage, broken elevator/stab attach structure, and a runway departure on a wet runway with drag chute deployment and strong crosswind conditions. The first two could obviously have turned out to be quite serious — and all that can be said under these circumstances is that your actions would most likely be rather obvious. However, on the last HAP, knowledge of landing procedures on a wet runway when directional control is lost should prevent a runway departure.

**Hazardous Air Traffic Reports** Finally, the two HATRs demonstrate just how close we actually came to two midairs. The first was an F-5 outside an assigned altitude block on a large scale night exercise. The F-5 came so close to a head-on collision with an AWACS aircraft that the AWACS crew reported violent shaking of the aircraft as the F-5 passed underneath. The other involved ATC assigning an F-5 below the minimum usable flight level (U.K. airspace) under extremely low altimeter setting conditions. Fortunately, the F-5 pilot saw the C-130, averting a possible disaster. These reports speak for themselves — being on top of the situation should prevent occurrences of this nature being repeated.

### FY89 Forecast

The Air Force Inspection and Safety Center's analysts predict two F-5 Class A mishaps in FY89. The predictions are based on past experience and trends. Most probable cause areas are equally divided among the following ops and log factors:

- Midair collision
- Pilot induced — takeoff
- Pilot induced — loss of control
- Structural
- Landing gear

### Meeting the Challenge

It can be said unequivocally that during its lifetime, the F-5 has established an enviable safety record; however, it has had its share of ups and downs. In our review of FY88, we saw that there were mishaps resulting from improper BOLD FACE actions. We also experienced numerous component/structure failures which, although not serious, could have ended in disasters had they occurred at critical stages of flight. Finally, we saw how close we came to having two midairs.

Hopefully, we have learned something from all this. By knowing your aircraft, knowing precisely your BOLD FACE actions, and by keeping on top of it all — we can avoid having the forecast mishaps. Can you meet the challenge of seeing the F-5 finish its final year "mishap free?" Let's go do it. ■

*An additional F-5 was destroyed in a midair collision with an F-16. Details of this mishap can be found in the F-16 article.

# F-15

**MAJOR MARTIN V. HILL**
Directorate of Aerospace Safety

■ FY88 was an outstanding year for the Eagle — one for which every F-15 pilot and maintainer can be proud. Even though the fleet now consists of over 800 aircraft, and they flew almost 200,000 hours, the loss rate for this fiscal year was the lowest of any year since the Eagle has been fully combat ready. The only year with a better record was 1976, but that was at the very beginning of the program, with a small number of brandnew jets and limited flying hours. Following as this does on the average year of FY87 and the disastrous year of 1986, this is good news for the Eagle and represents a significant downward trend in F-15 major mishaps.

In reality, the FY88 Class A rate of 0.50 per 100,000 flying hours represents one Class A mishap and two aircraft lost. As already mentioned, this is a record low rate for the fleet. It is also the first year since 1976 that there have been no pilot fatalities. Another way to look at it is that since five losses were forecast for last year, based on previous mishap history, there are now three extra airplanes on the rolls.

In fact, the Eagle has so consistently beaten its forecast loss rate over its lifetime that there are now more jets around than were originally programmed—almost a squadron's worth. The F-15 truly has been the safest, as well as the most effective, fighter in Air Force history.

Before feeling too good, however, remember that last year's Class B mishap rate is up sharply from its record low in FY87. More importantly, all last year's mishaps consist solely of midair collisions. Any one of these incidents could have easily been a major catastrophe, and it was really only luck that kept last year from being much worse than it was.

Despite the record low rate, there are still serious lessons to be learned from last year's mishap experience. To use a sports analogy, the final score does not accurately reflect the game that was actually played.

## Class A Mishaps

The Eagle started out by experiencing the first Class A mishap in the Air Force for FY88. An F-15, flying at high speed, low altitude, and full A/B, shed a fourth stage turbine blade that lodged further back in the engine. The friction generated enough heat, aided by the oxygen-rich, low-altitude/high-

speed environment, to start an uncontrollable titanium fire that rapidly burned through the engine case and spread into the tail and wing root areas, affecting the flight controls. The pilot was able to control his mortally wounded jet enough to successfully eject, with some minor injuries. However, it was almost too close a call and stands as another tribute to the ACES II seat.

Fortunately, this early start was not a bad omen for the rest of the year. The next, and as it turned out the only other, Eagle lost for the year was due to a midair collision with an F-16 during DACM. The F-15 was hit in the belly by the F-16's wing and caught fire, and the pilot successfully ejected with only minor injury. The F-16, although heavily damaged, was able to safely recover to base.

The major lesson to be learned from this mishap is to be very careful in determining the true aspect and range of the target when employing Aim-9 L/M weapons in pure pursuit. By the time the F-16 pilot could determine that his target was really head-on instead of tail-on aspect, it was too late for him to avoid the collision.

Also, never assume the bandit also sees you in a situation such as this. The evidence indicates the F-15 pilot did not have sight of his attacker at this point and so could not act himself to deconflict flightpaths.

### Class B Mishaps

Note that this last mishap was a midair collision. Even though no more Eagles were destroyed last year, six more were damaged in Class B midair mishaps. Only luck kept some of these mishaps from being tragedies. The difference between disaster and just a bump, or even a near miss, in these situations is only a couple of feet and a heart beat or two.

Two of these midair incidents resulted from the failure to perform the basic skills of routine formation flying. One involved distraction and misprioritization of tasks while on the wing, and the other the failure to promptly go lost wingman when the weather situation dictated. Either could have been much more

continued


# F-15 continued

serious than they were. In fact, other weapon systems lost airplanes and killed pilots this year in almost identical circumstances. The bottom line is that there is never a good reason for hitting your leader when flying formation.

The other midair collision occurred between the leader and his wingman at the termination of a tactical intercept. Both pilots were maneuvering in relation to the targets but did not have visual or radar contact with each other. As the leader broke off his attack in a climbing 180-degree turn, he collided head-on with his wingman, who was still in the final stages of his conversion turn. Both airplanes were moderately damaged but were able to land without further incident. However, this mishap very easily could have resulted in two destroyed jets and perhaps a pilot fatality.

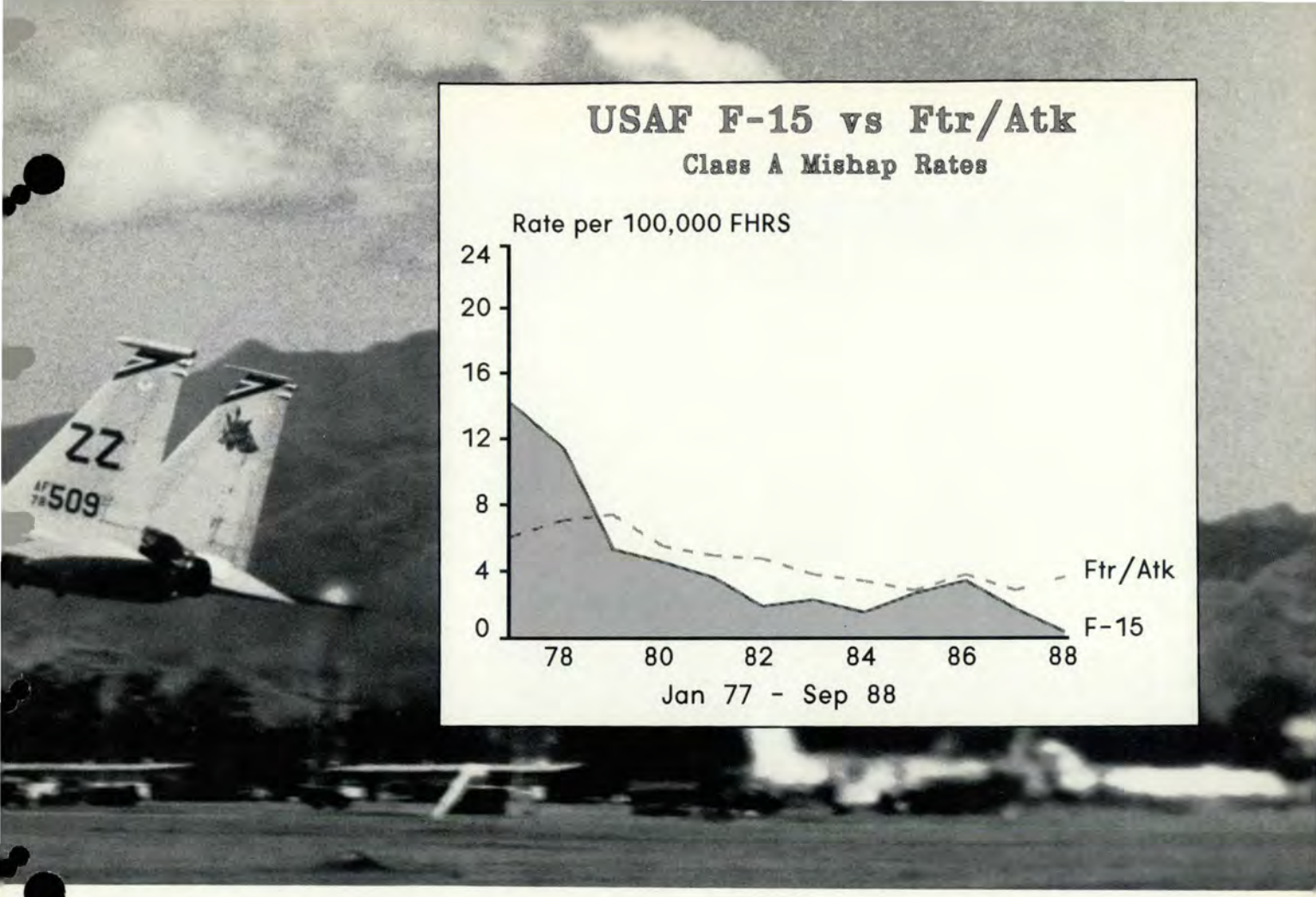
The lessons from these mishaps are no different than those already learned the hard way in the past. It is imperative to constantly clear your flightpath and not allow a feeling of good situational awareness or overaggressiveness when on the attack keep you from doing it.

When in formation, be it close, route, tactical, or whatever, the first wingman concern has to be to maintain spacing. And finally, every Eagle pilot should already fully understand the meaning of turning room. However, it seems to be periodically forgotten just how vital it is to ensure that turning room available always exceeds turning room required when working near the ground.

### Class C Mishaps

There are a couple of concerns from last year's Class C mishap experience that need to be mentioned. First, there has been a dramatic increase fleetwide in physiological incidents, specifically cabin depressurizations or failures to pressurize on climbout. Material deficiency report (MDR) investigations have not identified any single cause, although cabin pressure regulators and canopy pressurization/rain seals have usually been involved. Unfortunately, however, a large number of these recent incidents have been undetermined. Investigation is continuing into canopy rigging procedures and maintenance TO guidance; however, pilot awareness of this hazard is critical.

In a single-seat aircraft, the pilot alone is responsible for monitoring cabin altitude and oxygen system performance. Eventually, there will be a cabin pressure warning light on the telelight panel to help, but everyone must stay alert to this hazard and report every incident so that it can be examined. While there have been no injuries so far, the potential for disaster is obvious and real.




Secondly, there has been a rash of inadvertent in-flight engine shutdowns due to depressing a fire button during heavy air-to-air maneuvering, especially defensive BFM. Luckily, so far the only serious result has been pilot embarrassment; however, the next occurrence might not be so fortunate, depending on the circumstances. Perhaps a better guard can be designed. Until then, however, pilot awareness of this particular problem will have to serve.

Lastly, there has been an increase in wingtips and pieces of the horizontal stabilizer lost in flight, particularly in the A, B, and oldest C models. The good news is that the Eagle handles so well that often the pilot is completely unaware anything has happened. However, the problem is potentially a very serious one. Eventually, these structural issues will be dealt with by the Eagle's new periodic depot maintenance (PDM) program, but until then, closely inspect these areas on the ground and in the air on both your jet and your wingman's. No handling problems have yet been reported from any of these incidents, but the mission should be terminated and the aircraft immediately recovered.

### FY89 Forecast

Reflecting back on the Eagle's mishap experience for the last several years, the forecast of FY89 is for three Class A mishaps, two of which should be operations related and one logistics related. Given the propensity last year for Class B midair collisions, it should be no mystery that at least one Class A midair is expected. Unfortunately, if past experience is a guide, it will cost two jets and at least one life.

Also, an engine-related loss is expected. All safety aspects of the F100 engine in the Eagle fleet are much better now than several years ago. However, it is still the leading logistics concern and was the cause of the one F-15 Class A for last year.

The other forecast mishap is either to be a pilot-induced loss of control or a collision-with-the-ground loss. While neither occurred last year in the U.S. fleet, each did occur the year before. The evil of the latter type of mishap is that it has always cost a life as well as a jet in the past, and somehow seems an especially tragic and preventable loss.

In summary, while last year was a record good year, it was nowhere near as good as it looks at first glance. Some headup flying and not a little bit of luck helped out dramatically. The most encouraging sign is that no pilots were killed. We should hope to keep tying this record in the future regardless of the number of airframes destroyed.

Both the Eagle pilot and his aircraft can be truly defined by the word *priceless*. If lost through mishap or negligence, neither will be available for combat when most desperately needed. ■


# F-16

**MAJOR JERRY R. PERKINS**
Directorate of Aerospace Safety

■ Well, it's time to reflect on the year we had and see what we can learn from it. When we started FY88, everything looked really good. Our mishap rate was continuing a nice, gentle decline (figure 1), and we hoped to continue the trend. But instead of continuing to improve, the mishap rate for FY88 increased. Everyone, including the press, has been asking *why?* That's a real good question, and one that I have been spending a lot of time on since I took over this job in July.

Some of the first things I looked at were the types of mishaps we were having. The initial review showed me we had not invented any new ways to destroy airplanes or aircrews. In fact, we were doing it in pretty much the same way we always have. Figure 2 depicts the historical mishap causes since day one of the F-16.

As we compare the different mishap cause factors, we can see that the two show stoppers are engines and collision with the ground. In FY88, the same two problems were causing the majority of our mishaps. So this did not explain why the large increase in the rate for FY88.

The next thing I looked at was ops vs log mishap history. Figure 3 shows the comparison of the two rates, and the big difference between FY87 and FY88 seems to be quite clear. The difference in the two years is primarily the increase in the ops mishap rate. In FY87, we had 2 ops mishaps, and in FY88, we had 14. It appears to me that ops deserves an indepth look. So I will discuss our ops mishaps in a fair amount of detail first.

### Collision With the Ground

Running into the ground is nothing new — we have been doing it for years. But this is the one that normally proves fatal to man and machine, so we need to get smart on this. In FY88, we had six collisions with the ground. Two of the mishaps were GLC incidents, which resulted in two fatalities.

In both cases, the pilots were in good physical condition, maybe too good. Our GLC experience shows that those people with pulse rates below 60 are in a high risk group, and both of these guys fit that description. One was probably running a great deal more than he should have, and the other still had the residual conditioning effects from all the running he did while pulling down a staff job before he started flying the F-16.

This doesn't mean that if you take your pulse and it is over 60 you don't have to worry about GLC, because we are *all* susceptible. However, those having a pulse rate under 60 need to spend less time running and watch the "G" onset rate. A little weight training might do us all some good.

The other four collisions with the ground (or things attached to the ground) seem to have one thing in common. The pilots in all four mishaps had their attention focused on the wrong thing. Three of the four had their heads in the radar scope at low altitude trying to acquire or analyze a radar contact on another member of the flight. Two of the three died from that mistake. The fourth pilot did not realize he was close to a tower and spent too much time on nice-to-do things when the big threat was at 12 o'clock.

Of the last nine collisions with the ground, seven have been F-16Cs. I don't know if having a couple of multifunction displays in the cockpit is the reason, but I can say that those guys spent too much time heads down in the cockpit. If you want to live to be an old fighter pilot, you need to learn to time-share. However you share your time, make sure you spend a fair share using your visual sensors (MOD 1 eyeball) to check 12 o'clock.

### Midairs

In FY88, we had three midair collisions, or about twice our historical percentage. Each mishap was different, so I will cover each one briefly.

- The first happened when a flight member (F-5 aggressor) experienced radio failure and proceeded to join to route to try and get lead's attention so he could pass the radio-out signal to him. About this time, lead started a three- to four-G tactical turn, and the F-5 could not move fast enough to avoid the collision.

With normal reaction time, you would need about 500 feet to safely avoid a tactical turn into you. Remember that number, it might come in handy sometime. Also, if lead had paid closer attention to the radio changes, he might have expected radio failure for the F-5 and been looking for him to join up. And, since we are all responsible for flight safety, if the wingman had just said something on the radio as the F-5 closed (which he saw), I wouldn't be writing about this mishap.

- The next mishap was a DACT mission, one F-16 against two F-15s,

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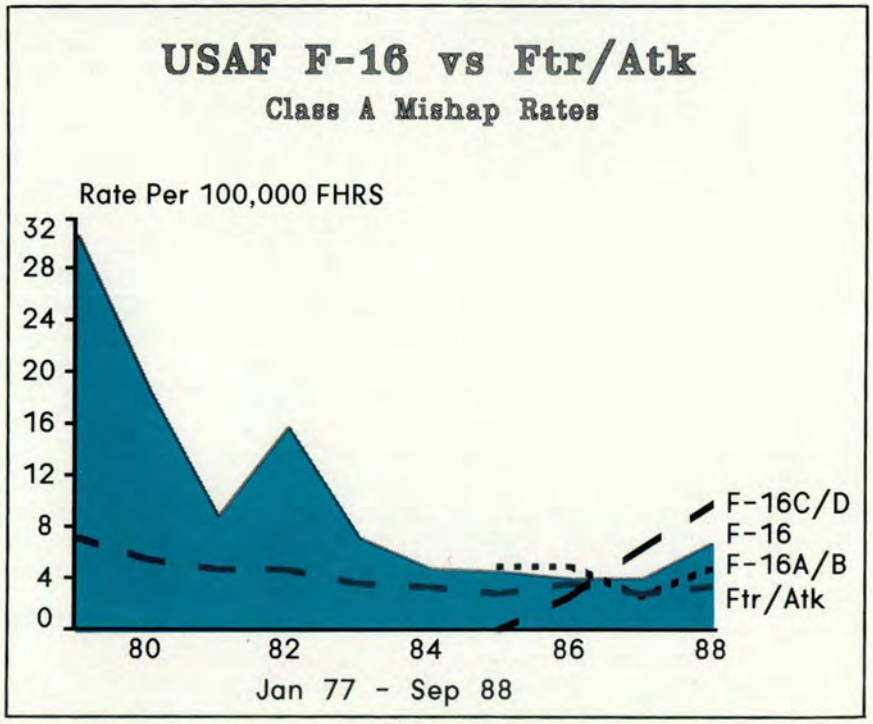


**Figure 1**

and also included a VIP aboard the F-16. There were a number of factors involved in this mishap, including some different perceptions by the flight members on exactly what was going to happen during "canned ACM setups." It never hurts to be very specific when you are flying with someone new.

But the thing that really set the stage for the midair was the deteriorating eyesight of the F-16 pilot. His loss of distance vision allowed him to get a tally, but denied him the acuity to determine things like aspect and closure as easily as other people. So if you are experiencing increased difficulty in seeing aspect, you might want to have your eyes checked more than the once a year during your physical.

■ The third midair involved two F-16s during RTB from an uneventful mission. The upgrading flight lead had made a navigation error, which the IP did not initially catch. They inadvertently flew into controlled airspace. During the attempt to get below the controlled airspace, the IP performed a vector roll around lead, misjudged closure, and ran into the lead aircraft.

Fatigue was a big factor in this mishap. The descriptions of the IP by everyone that knew him sounded like a "definitely promote." It just tragically points out that even our best pilots don't function up to par when we allow or force them to work too hard.

### Landings

In FY88, we had three landing mishaps. This is more than twice our normal rate.

■ The first mishap happened when the pilot experienced wake turbulence from an EF-111 at about 100 feet over the overrun. The mishap pilot had approximately 6,000 feet of spacing. However, once the wake turbulence was encountered, there was insufficient control authority/power to prevent the hard landing. The quartering tailwind provided the perfect environment to hold the wake turbulence over the runway.

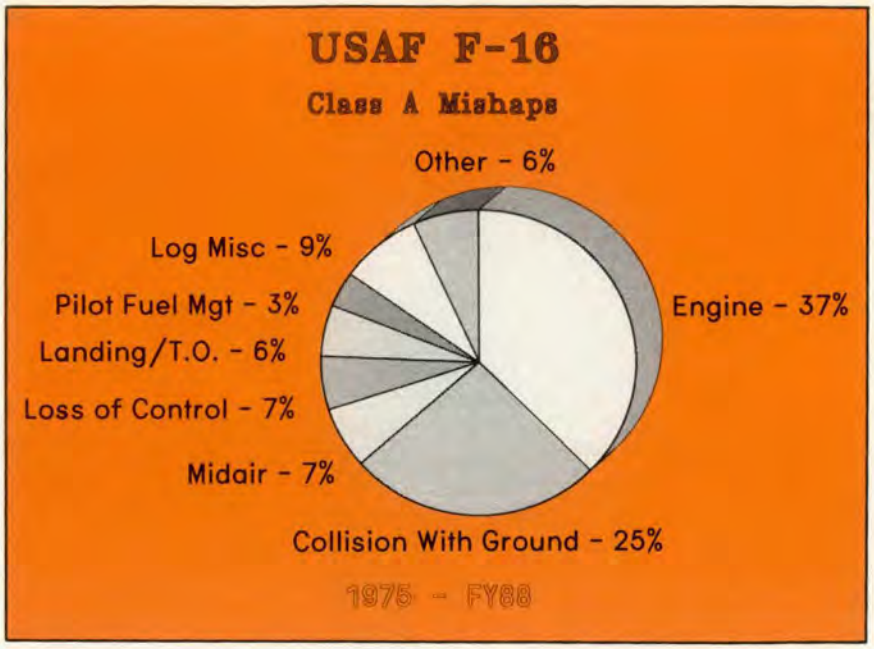


**Figure 2**

■ The next mishap involved a hard landing from an SFO planned for a touch and go. The mishap pilot had gotten lower than he should have and continued the approach. When he went to roll out on final, the horn came on. He selected full afterburner, but still landed hard enough to collapse the gear. I can hear you saying to yourself, "How could he have screwed up the pattern that badly?" Well, he was flying a heavy C model, and his sink rate was actually less than a normal SFO. But the combination of the heavy airplane and being lower than normal did not allow sufficient altitude to break the sink rate.

We have also had two Class B mishaps from SFOs that didn't "look that bad." The Dash 1 has been changed so that you add knots for gross weight. Every time you do an SFO, check that you have the minimum airspeed and altitude at base key. If you don't have the minimum for *both*, initiate a go-around from this point, and analyze the pattern to figure out where you went wrong rather than try and salvage a bad SFO.

■ The last landing mishap might be described as a "hurry-up-and-get-it-on-the-ground" mishap. The mishap pilot had experienced a loss of thrust while at altitude, but was very slow to go through the checklist. When BUC was finally selected, the mishap pilot did not check for usable thrust (which was available) and decided to land opposite direction traffic at a Navy base.

The combination of a long, hot landing, a tailwind, and BUC-idle thrust made the landing roll longer than the runway. Because he landed opposite traffic, there was no barrier available. At this point, his good options were already used up. So the mishap pilot elected to depart the side of the overrun instead of going into the water off the end of the overrun. The airplane flipped over, and the mishap pilot spent some very anxious moments trapped in the airplane. It is understandable to have some pucker factor with a thrust-loss situation, but you just have to get through the checklist steps in a timely manner.

Another factor in this mishap is an apparent lack of trust in the BUC. If the mishap pilot had just pushed the throttle up and realized he had usable thrust, he probably would have landed from an approach to the active runway. This would have given him a cable to catch, and this story would have had a happy ending instead of an upside down one.

### Loss of Control

We experienced one loss-of-control mishap this year involving a B course student who found himself in a nose high, low airspeed condition and used improper procedures during the recovery. I can hear the "bar talk" saying that could never happen to a pilot as good as me. I hope you're right. But I want to caution all of you, especially the guys flying the C models with the GE110 and the big inlet.

The flight test data show that this airplane is much easier to depart, and also harder to recover. The real culprit in this case is the adverse yaw that can develop from high-roll rates. This should be noticeable in the cockpit as you get pushed sideways in the seat. If you feel this, I suggest you use a technique that was made famous in the heyday of the F-4, UNLOAD FOR CONTROL.

### Fuel Management

We lost an airplane in FY88 to fuel starvation while there was still gas in the airplane. About every other year, it happens to someone in the F-16. Here are some clues that should help until they build a foolproof fuel system:

- Every time you put gas in the tanks (that includes AAR), assume they won't fully feed until you have confirmed they are empty.
- Whenever you use the AB, remember you can burn gas faster than you can pump gas into the F-1 tank.
- AB fuel flow can easily exceed 40,000 pounds an hour.
- Any fuel transfer problems will happen right after you have checked your gas, so check it again.

### Lightning Strike

In FY88, we lost one F-16, and had another badly damaged, from a lightning strike while they were flying formation in the weather. This mishap resulted in some recommendations that in the long run should make the airplane less likely to suffer significant damage from a lightning strike. However, we need to minimize our exposure to lightning conditions as much as possible.

One thing the final report highlighted, that I had not heard before, was that a formation flight is more likely to trigger a lightning strike than a single ship. So if you are going to have to fly in conditions conducive to lightning strikes, you should consider the option of splitting up the flight prior to passing the freezing level — particularly if you had planned on splitting the flight up anyway.

### Ops Summary

We have described all our ops mishaps for FY88, but that still doesn't explain why we went from 2 to 14 ops mishaps in 1 year. I don't have a magic crystal ball that gives all the answers, so I did some more number crunching to try and figure out what guys are involved in ops

continued

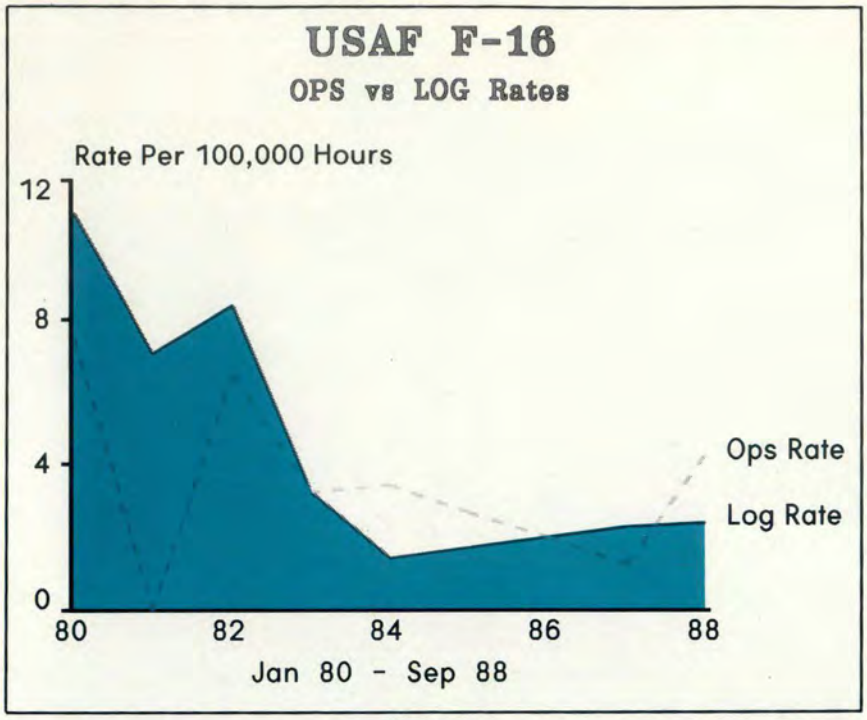


**Figure 3**

mishaps. I was very surprised to find out that 10 of the 14 were experienced F-16 pilots, and 1 of the 4 inexperienced in the F-16 needed only 10 hours to be classified as experienced, and was experienced in another fighter. The average time for the ops mishaps was over 400 UE and over 2,000 total.

I guess we should ask the supervisors to pay close attention to the experienced guys, but guess what, these guys *are* the IPs and squadron supervisors. Experience does not make one immune to mistakes, mishaps, or overwork. In fact, this last year, the opposite was the case. It may be time for you supervisors to look at your workload and know "when to say when."

### Logistics Factors

For the last 3 years, all logistics factor mishaps have been engine problems. In FY88, we lost eight airplanes due to engine failure. Fortunately, in every case, the pilot was able to successfully eject. But I think we should look deeper at this problem. Most of these mishaps were "hard" failures of the engines, and despite the best efforts of the pilots, they were not going to get usable thrust. To the guys who analyzed the situation and made every effort to get the engine running again, I say "well done."

The engineers are working hard to fix the problems that caused these mishaps. However, there were times this year when F-16 drivers experienced engine problems and never got through the CAPs. The most prevalent situation was a loss of thrust right after takeoff. This high pressure situation sometimes short-circuits the analytical process that goes with the proper handling of any emergency. While you maintain aircraft control, you have to quickly analyze the situation. The analysis should be fairly simple. Do I have low thrust? If the answer is yes, then the CAPs for low thrust on takeoff is the proper response.

Why am I harping on the analysis part of this? I'll tell you why. I have read too many HAPs and yes, Class A mishaps where the analysis was: Do I have enough thrust to get me to low key? Don't get me

wrong, that should be part of your thought process. But the first step on the fault tree is, do I have low thrust? If the answer is yes, proceed with the CAPs and *then* continue to analyze the situation. The CAPs should either restore usable thrust or lead you somewhere else in the checklist.

### What to Expect for FY89

I asked the computer wizard to tell me what we could expect for the year to come. He had a rather wry smile on his face and said, "I have some good news and some bad news." I told him to give me the good news first. He said, "The F-16 mishap rate for FY89 will be down to 5.9 Class A mishaps for every 100,000 hours of flying."

I don't know about you, but that doesn't sound like very good news to me. Sure, it's down from the 6.8 rate we had in FY88, but that was the worst year since 1982. The 5.9 rate would still give us the worst rate for any major weapons system in the Air Force.

Well, after the good news, I was almost afraid to ask what the bad news was. But being a fighter pilot, I said, "Hit me with your best shot." He said, "You will lose a squadron worth of F-16s." That *really* hurt. I thought for a minute and said, "That can't be!" He said, "Yes, and here is how you will lose them."

| Category | FY89 Forecast | FY88 |
|---|---|---|
| Out of Control | 1 | 1 |
| Collision With the Ground | 4 | 6 |
| Midairs | 4 | 3 |
| Weather Related | 2 | 0 |
| Takeoff/Landing | 1 | 3 |
| Engines | 9 | 8 |
| Other Ops Reasons | 3 | 1 |
| | 24 | 22 |

It is really hard to understand how we can lose that many airplanes when no one is shooting at us. I don't buy the story that I read in one newspaper that said the F-16 was too "HOT." Sure, it's got some of the most modern technology in the world, but it's also some of the most reliable equipment in the world. So, what's the solution? Right now, no one can tell you for sure, but here is my opinion on what we need to do to lower the mishap rate.

I think the ops rate can be lowered significantly. The area that needs our greatest concern is why the mishap rate for the C models is so high. The mishap rate for the C/D is almost twice the rate of the A/B (figure 1). It may be because of so many new and fancy toys to play with. If that is the case, we need to get a handle on it quickly because the LANTIRN SYSTEM is going to raise this problem to a much higher level. The real problem is proper task prioritization. If you spend too much time on the wrong thing at the wrong time, you are headed for a mishap.

The next greatest area of concern is collisions with the ground. Earlier, I talked about checking 12, and that will help, but we really need to get a ground collision avoidance system (GCAS) in the airplane. We have lost 17 pilots and 19 F-16s, and we could have saved a great deal of those men and machines with something as simple as a radar altimeter that was tied to "Bitching Betty." Studies have shown that a simple system would be about 80 percent effective.

The last area that shows great room for improvement is the engine. Things like blade failures and bearing failures are already being worked hard. But we have a lot of thrust loss in flight where the unified fuel control (UFC) is removed and replaced, and the depot cannot duplicate the problem. This problem is being worked, but we just don't have a facility that can adequately simulate the flight environment. Such a facility would be very expensive, but so is an F-16.

If ops drove the Class A mishap rate up for FY88, it can drive it down for FY89. I know that none of you are going to have a mishap this year, because it always happens to someone else, right? So, please do me a favor and watch your wingman, or leader, and don't let him make the kind of mistakes that will cause a mishap. ■

# F-111

**MAJOR NATHAN T. TITUS**
Directorate of Aerospace Safety

■ As an F-111 pilot, it's difficult for me to admit that all three of our FY88 Class A flight mishaps will be recorded as "ops." Overall, ops vs log mishaps for the history of the aircraft are about even, but for the last 2 years, five of six have been ops. The only log mishap could have easily been tallied as ops.

Taking a look at the year as a whole, we had a Class A mishap rate of 3.5 with four fatalities. While not the worst year in F-111 history, it was our worst year since 1982. Even though aircraft malfunctions played a part in two of the three mishaps, all three were flyable aircraft that had a good chance of being landed. Let's take a look at each of these mishaps, and see if we can learn from other's mistakes.

## 1988 Mishaps

■ The first mishap occurred on takeoff. The left seat was occupied by a student pilot with a history of aircraft handling difficulties, and the right seat by an instructor pilot who had only one other right seat sortie in the last 88 days.

Takeoff clearance was granted by the tower, with a warning for a "heavy" on 6-mile final. The crew hurried their checks and took off with minimum spacing on the tanker. As the aircraft broke ground, the right canopy hatch came fully open. The aircraft then began a continuous controlled descent, perceptible deceleration, wing rock, and nose oscillations. Shortly thereafter, the gear was extended. The aircraft continued to descend, then yawed left, and began a left nose low roll. An ejection was initiated just prior to impact, but the sequence was interrupted. Both crewmembers were fatalities.

The right canopy latch was not properly closed (remember the "jiggle" check?). In addition, the left seater had pulled the throttles to idle and lowered the gear in a thrust-critical phase of flight. This seems like a crazy thing to do, but remember this: The IP was extremely distracted by wind blast, and the student probably reverted to habit patterns by lowering the gear in response to the gear warning horn. We know from another hatch opening on takeoff that the F-111 is completely controllable in this situation. If only the crew had followed the first rule of any aircraft emergency: *Maintain aircraft control.*

■ Mishap number two was a rapid fuel depletion while rejoining off the range. The crew analyzed the malfunction to the left engine and started an immediate return to base 25 miles away while the IWSO initiated the Rapid Fuel Depletion Checklist. The approach was

rushed, and the AC started configuring at 5 miles and 340 knots. No prelanding or single-engine checklists were initiated. On short final, the fire pushbutton was depressed, completing the fuel depletion checklist.

With one engine shut down and one at or near idle, the aircraft crossed the overrun at 210 knots. The aircraft pitched down and was recovered, then pitched down again, striking the runway nosewheel first and porpoising into the air. The aircrew realized the aircraft was out of control and initiated a successful ejection.

The most probable cause of the pitchdown was a flight control transient due to excessive demand on the hydraulic system. The combination of low engine rpm, a partially deficient hydraulic pump (incorrectly overhauled), and flight control inputs probably exceeded the capability of the system and resulted in a pitch transient.

Task management and task saturation were areas where the crew failed to uphold their end of the bargain. Rushing, not completing checklists, and continuing an approach well outside parameters caused the crew to put themselves in a position where the aircraft couldn't keep up. Remember — *Analyze the situation and take proper action*, and *Land as the situation dictates*? The crew in this case analyzed the situation, but failed to take all the proper actions. Not completing the checklists caused them to make mistakes.

Land as the situation dictates is harder to criticize in this situation; however, once the crew had pushed the fire pushbutton on short final, the fuel leak essentially quit, and the crew had 3,000 lbs of fuel to work with. The crew continued an excessively fast approach because they were convinced this was their one and only chance to land.

■ Our third mishap does not fit neatly into the three basic emergency rules. In fact, it's hard to believe until you spend considerable time analyzing it. The mishap aircraft was lead of a three-ship planning a day tanker, night low level, and finishing with night range work.

The first pass on the range was flown at 600 feet AGL and 540 knots. The second pass was flown at minimum en route altitude and was "dry." The third and final pass was flown at 400 feet AGL. On final, the range control officer noted the aircraft below 400 feet and descending and transmitted a "pull up" call. The aircraft did not respond and hit the ground, killing both crewmembers.

The aircraft probably experienced a TFR malfunction (it had a history of TFR malfunctions) on the first two passes, and the crew was attempting to hand fly at 400 feet/540 knots on the third pass. Significant altitude deviations during the first two passes indicate the crew was probably trying to sort out a TFR problem. At 8 nm from the target on the third pass, the aircraft made a rapid descent from 2,300 feet AGL

continued

# F-111 continued

to 400 feet AGL, indicating the pilot was hand flying. Also, both TF channels were found out of the TF setting.

Why would anyone try to hand fly at that altitude at night? Consider this: The crew had only computed ballistics for 400 feet deliveries, they had previously gone dry for a TFR malfunction, and the crew was intimately familiar with the range and may have become complacent. With these pieces of information, you can begin to see how such a faulty decision was made.

### Current Safety Concern

The system safety group is currently working several ongoing items, including the new capsule recovery parachute system and windscreen embrittlement. After some funding delays last year, the parachute program is back on track. Qualification testing is scheduled to be completed in March 1990, and installation will begin shortly thereafter. The recent discovery that our birdproof windscreen "age hardens" rather quickly after installation has no current solution. To help alleviate this situation, we have gone to a mandatory time changeout.

Two other safety concerns are an increase of flight control malfunctions and the high rate of compressor stalls in the TF30/P109 engine. The F-111Ds at Cannon AFB, New Mexico, have a significantly higher rate of compressor stalls than the rest of the fleet. Cannon has formed an engine working group to help sort out the problem. Curiously, the EF-111, which also uses the P109, has not had a high stall rate.

Flight control malfunctions have plagued the F-111 since its early days; however, they've been on the rise lately, especially in the F-111E. The digital flight control system is still years away and will be a permanent solution to the problem. In the meantime, we need to diligently look for answers to the problems with our current system.

### FY89 Mishap Forecast

For FY89, the experts at AFISC predict four Class A mishaps. As usual, probable causes will be collision with the ground, engine failure, and loss of control. Last year, they "guessed" two out of three correctly. The predicted rate for 1989 is 4.63, which reflects our increasing trend for the last 2 years.

Considering the number of ops mishaps, we can do something about our rate. Next time you have an aircraft emergency or malfunction, think about the three basic rules. They may seem simple, basic, and obvious. But remember — they are "bold face" and have proven themselves worthwhile in getting you *and* the jet back safely. ■



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UNITED STATES AIR FORCE

# Well Done Award

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

CAPTAIN
**Aaron G. Olmsted**
**337th Tactical Airlift Squadron**
**Westover AFB, Massachusetts**

MAJOR
**Charles A. Brown, Jr.**
**337th Military Airlift Squadron**
**Westover AFB, Massachusetts**

■ On 12 March 1987, Captain Olmsted, instructor pilot, and Major Brown, pilot, were flying a C-130 in the traffic pattern. Flying in the right seat, Captain Olmsted was on downwind when the aircraft began vibrating and yawing to the right. Since the winds were calm and three other C-130 aircraft were in the pattern, he thought he was encountering wake turbulence and initiated a slight climb.

Upon level off, his aircraft vibrated again and rolled right to about 45 degrees of bank. Captain Olmsted attempted to counter the roll with left rudder and aileron but could not get any flight control movement. Major Brown and Technical Sergeant Miller, the flight engineer, scanned for runaway trim and a possible engine failure. Neither had occurred. Unable to make any control input due to his frozen controls, Captain Olmsted transferred control to Major Brown.

As Major Brown took control, the aircraft rolled hard over to the left. Captain Olmsted declared an emergency, then he and Sergeant Miller disconnected the rudder boost. With Captain Olmsted and Major Brown both on the controls, they managed to overcome the left roll and begin a turn to base. Major Brown increased airspeed to get maximum response from the ailerons and rudder to maintain control.

On final approach, both pilots used full right rudder and aileron to keep the aircraft from rolling left. The high airspeed necessary to maintain control effectiveness resulted in a touchdown above tire rotation speed. After touchdown, they had to use wheel brakes alone until the speed dropped enough that the engines could be brought into reverse. Major Brown used differential braking and reverse thrust to overcome the left turning tendency and bring the aircraft to a safe stop.

The superior flying skills, systems knowledge, and crew coordination demonstrated by Major Brown and Captain Olmsted resulted in the safe recovery of a valuable aircraft. WELL DONE! ■

# Write A Dumb Caption Contest Thing


Knock, Knock! "Who's there?" "Opportunity." Can you beat our dumb caption? If you send us the best one, we'll send you our cheap little prize and also feature your caption in our April magazine. How's that for a big deal?

Write your caption on a slip of paper and tape it on a photocopy of this page. DO NOT SEND US THE MAGAZINE PAGE. Use a "balloon" caption or use a caption under the entire page. You may also submit your caption on a plain piece of paper. Entries will be judged by a panel of experts on dumb humor on 20 February 1989. All decisions are relatively final.

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