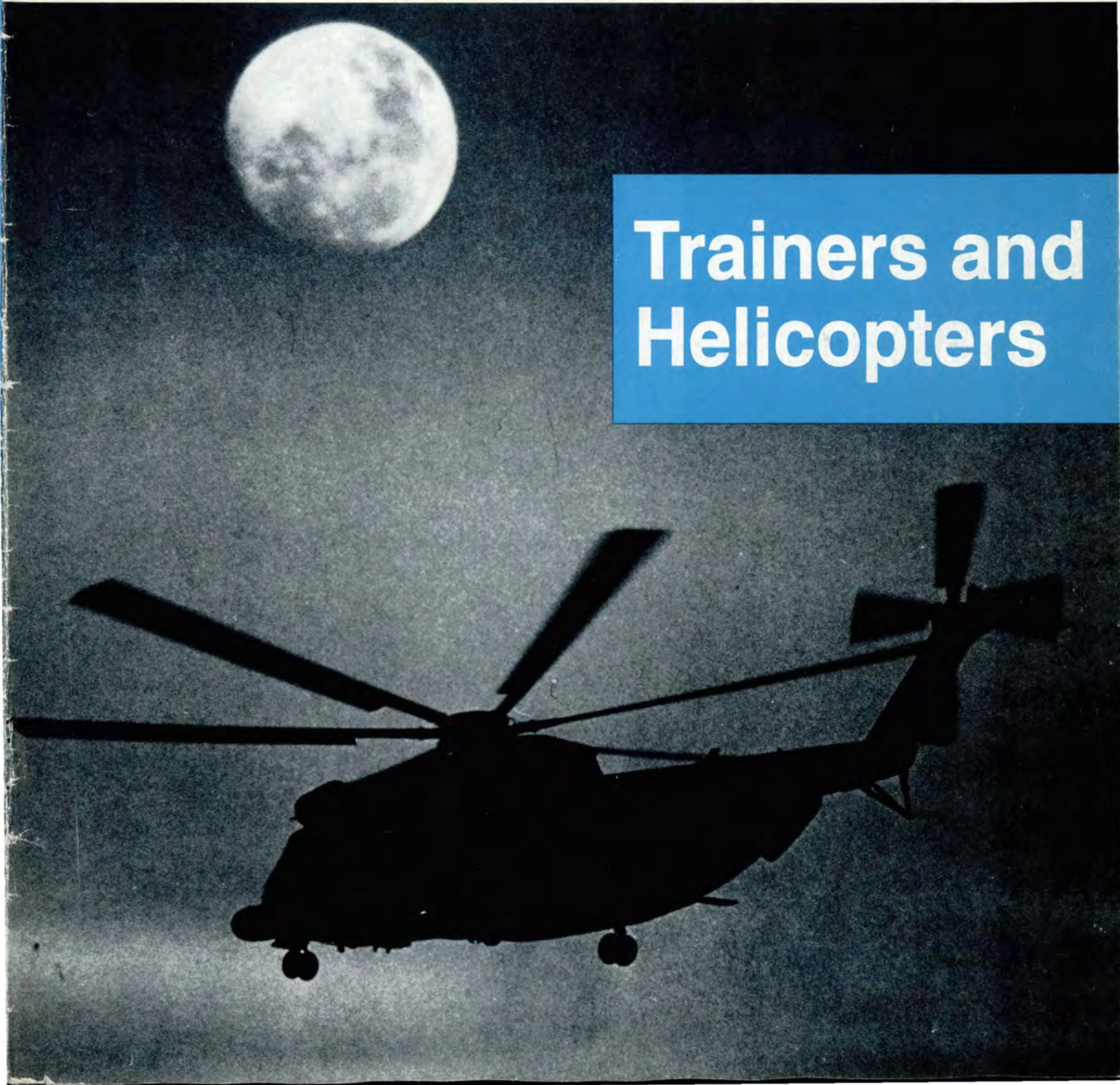
Flying SAFETY

NOVEMBER 1993



Trainers and Helicopters

THERE I WAS

■ We were in a hurry. The aircraft was ready for pickup from the contractor at the depot, and the Air Traffic Control system had a very small launch window for us. If we missed the window, it would be at least another 8 hours before ATC would give us another IFR clearance. We rushed through the Dash-One preflight on our KC-135, started engines, picked up the clearance, and taxied.

We had a fairly light fuel load, only 60,000 pounds, but the aircraft was carrying water. Tower cleared us on to the active. Before Takeoff checklist — push the throttles up, set takeoff EPR, 60 knots, no. 3 isn't taking water, 90 knots, ABORT! Throttles idle, speedbrakes 60 degrees, brakes apply, turn off the runway. The tower tells us if we can make it to the active runway without delay, ATC will still accept us.

No one wants another 8 hours here at the depot. So we taxi quickly! Recompute takeoff data for a dry takeoff. (Remember, we are quite light.) We reach the active, receive takeoff clearance, and take the runway. Before-takeoff checklist, again. Set takeoff EPR, 60 knots, 90 knots — everything looks good. Rotate! Gear up! EPR on nos. 2 and 3 is rolling back! What's happening? EPR on nos. 1 and 4 is now rolling back? What is going on? Crash Landing After Takeoff checklist goes through our minds.

In desperation, I push the throttles to the firewall, and the engines respond. We are barely flying, but the KC-135 is beginning to accelerate. All cockpit instruments register normal. We continue to climb. Needless to say, the crew is trying to figure out what happened. And then the light goes on.

Remember the ABORT? We ran the boldprint, but in our rush to make good a quick takeoff, we did not accomplish the entire abort checklist. The water pumps were left on. On the dry takeoff, we set the engine EPR to a dry setting, but the engines were giving us a wet thrust. The EPR rollback? Merely the water running out. When setting a dry EPR on the gauges and getting wet thrust and the water runs out, the EPR remaining is less than the KC-135 requires to fly. What if I had not, in desperation, pushed the throttles to the firewall? You would probably be reading about this in the Class A mishap file. ■

UNITED STATES AIR FORCE

Flying Safety

NOVEMBER 1993

AIR FORCE SPECIAL PUBLICATION 91-1

VOLUME 49, NUMBER 11

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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, HQ AFSA/SEDP, 9700 Ave "G" S.E., Ste 282 Kirtland Air Force Base, New Mexico 87117-5670. 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 CHIEF OF SAFETY, USAF

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POSTAL INFORMATION — *Flying Safety* (ISSN 0279-9308) is published monthly by HQ AFSA/SEDP, 9700 Avenue G. S.E., Kirtland AFB NM 87117-5670. Second-Class postage paid at Albuquerque NM, and additional mailing offices. **POSTMASTER:** Send address changes to *Flying Safety*, 9700 Avenue G, S.E., Kirtland AFB NM 87117-5670.

T-37 and T-38

CAPTAIN RICHARD D. DUBLIN
Directorate of Flight Safety/AFSA

■ The T-37 and T-38 enjoyed another solid safety year with only four Class A and no Class B mishaps. The same number of aircraft were involved in Class A mishaps in FY92. The FY92 experience involved three T-37s and one T-38. In FY93, the reverse was true. Fortunately, there were no fatalities this year compared to three last year.

Congratulations again go to the 559th Flying Training Squadron, Randolph AFB, Texas, who extended their incredible Class A and B mishap-free record to over 26 years!

Continuing the theme of change in the trainer world, this year yielded the most significant syllabus and command restructuring in the history of Air Force trainer aircraft. ATC greatly expanded to become the Air Education and Training Command (AETC). The Companion Trainer Program (CTP) came fully under the purview of ACC and AMC, and Specialized Undergraduate Pilot Training (SUPT) became a reality, with the first student class graduating from the T-1 Jayhawk at Reese AFB, Texas.

Once again, the instructor pilot force adapted splendidly as evidenced by their outstanding safety record. Only two of the four Class A mishaps involved AETC aircraft despite flying the bulk of the hours. Superb!

A Costly Lesson

Last year's article went to print without a summation of one Class A mishap. A T-37 ACE cross-country sortie impacted the ground, killing both pilots. The AFR 110-14 accident investigation revealed the mishap pilots (MP) flew to the vicinity of one of the pilot's parents' home and performed a series of aggressive, low-altitude maneuvers.

The MPs failed to maintain adequate terrain clearance and impacted into a wooded area, destroying the aircraft. As in several other similar mishaps over the years, the MPs were considered disciplined aviators.

What made them do it? Perhaps their judgment was altered once they knew they were being watched and admired — we'll never know for sure. Don't allow yourself to get in a situation where you may be "caught up in the moment" and do something you wouldn't ordinarily do.

Almost a Perfect Year

AETC experienced no Class A or B mishaps in the T-37 in FY93. The T-37 overall almost achieved a flawless Class A record in FY93. A Tweet flown by an ACC CTP pilot went out of control and crashed. The pilot ejected safely. As this article goes to print, the investigation is still in progress.

Birds — 2, T-38s — 0

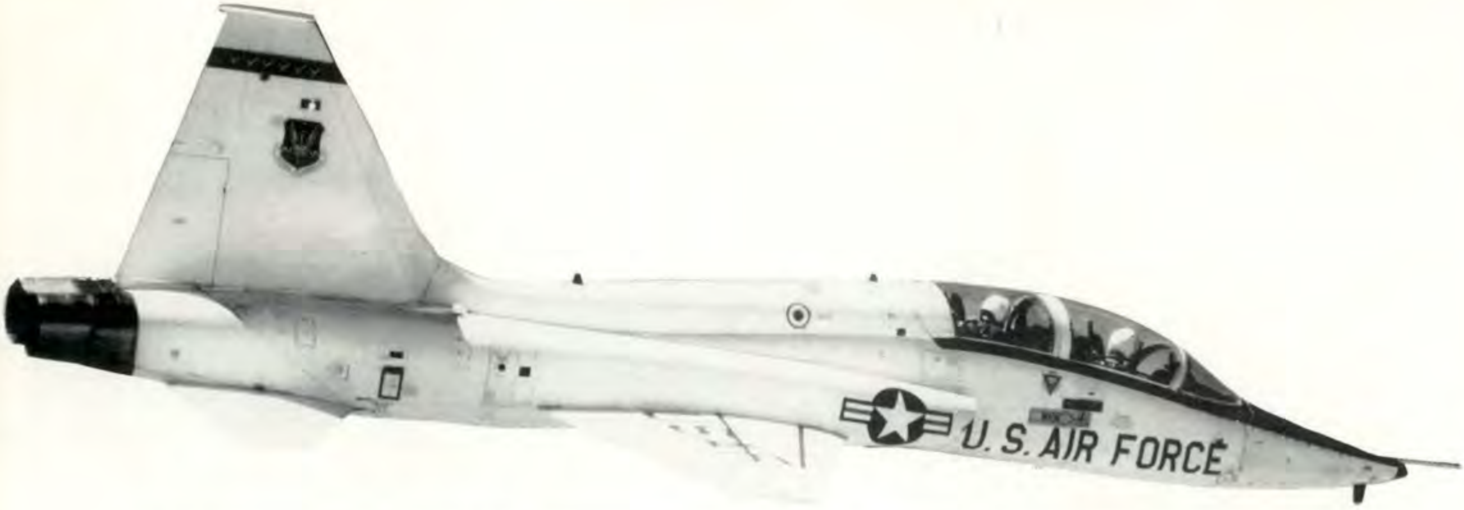
Last year's lone T-38 Class A was due to a bird strike. Birds were the instigators in at least two of this year's three T-38 Class A mishaps.

While on a routine CTP mission, one of them hit a flock of birds on takeoff roll, after rotation, and past adjusted refusal speed. The no. 2 engine ingested a bird and failed completely. The MP complied with Dash-One guidance, to include lowering the aircraft to the runway in order to obtain SETOS (single-engine takeoff speed) plus 10 knots.

Due to obstacles off the departure end, the MP accelerated to only SETOS and "pulled" the aircraft off the runway. Climbing at a steeper rate than single-engine thrust would allow (due to pending obstacles), and unable to raise the landing gear (due to Dash-One guidance directing a minimum of SETOS plus 10 knots), the aircraft began to lose flying airspeed. At 15,000 feet from the departure end, the crew was forced to eject which they did safely.

This mishap contained some critically important facets which cannot be adequately summarized here. It

continued



T-37 and T-38 continued

highlighted, among other things, possible inadequacies in Dash-One emergency procedures guidance.

The other T-38 was on a routine training mission when it ingested a bird in the no. 1 engine shortly after breaking ground (20 to 30 feet) on a full-flap touch and go. The engine failed, immediately slowing the aircraft to 145 KIAS. The IP in the rear cockpit assumed control of the aircraft and attempted a single engine go-around, but the no. 2 engine failed to achieve maximum afterburner.

Beginning to lose what little altitude was available, the IP alerted the student to prepare for ejection but momentarily delayed accomplishing it. As the aircraft descended, the main landing gear engaged the raised barrier on the departure end, immediately slowing it to 110 knots. At this point, the student successfully ejected.

As the aircraft continued through the barrier cable, it rolled, and the nose impacted the ground. During this sequence, the IP attempted ejection, well out of the envelope. He received disabling injuries. As in the previous mishap, this incident prompted a close look at emergency procedures and training.

A Clear Reason to Eject

The third and final T-38 Class A occurred shortly after takeoff from the home field on a navigation sortie when control was lost in both cockpits, and the crew successfully ejected. As this article is going to press, the investigation is still in progress.

All three T-38 Class A mishaps this year occurred during takeoff. Historical data clearly shows the takeoff phase is one of the most critical phases of flight, particularly in the T-38. Many Class A mishaps occur during takeoff.

A word to the wise — mentally rehearse takeoff emergency procedures just prior to each takeoff. This may allow you to react a second or two sooner to an actual emergency and could save your life. Remember takeoff emergencies can, and probably will, happen to you at some point in your flying career.

Predictability

The Tweet and Talon have been flying for so long their mishap statistics are usually predictable. This year's mishap summary closely parallels lifetime trends in the Tweet and Talon.

A historical survey of the two aircraft reveals the following: The T-37 has a slightly lower Class A mishap rate than the T-38. Both aircraft have lower Class A rates than all fighter aircraft but higher than transport and tanker aircraft.

This year's Class C summary is a virtual carbon copy of last year's. About 40 percent of T-37 Class C's were physiological incidents; about a third were engine-related. Over half of T-38 Class C's were engine-related: most of those were compressor stalls. The T-38 remains highly sensitive to bird strikes. The T-37 experienced more false fire/overheat lights this year than last. The T-38 experienced a few more pressurization problems.

Future Program Changes

This year a nearly disastrous T-38 in-flight electrical shock mishap once again highlighted the need for installation of an improved trim switch. The replacement single-piece "Mason" trim switch is in production and will replace the current two-piece trim switch in the T-37 and T-38.

Both aircraft are scheduled to switch from JP-4 to JP-8 as a primary fuel. The new strengthened T-38 windscreen is still a hot item and is in the OT&E stage at Randolph AFB, Texas. UPT class sizes should remain small for the foreseeable future. USAF Academy graduates are now allotted only 225 UPT slots each year.

And one final change, near and dear to all of us who work in the safety world, the Air Force Safety Agency (AFSA) has relocated. The closure of Norton AFB has allowed AFSA to move to Kirtland AFB, Albuquerque, New Mexico.

To Tweet and Talon operators and maintainers, congratulations on another splendid safety year. Your AFSA T-37/T-38 Action Officer wishes you happy flying in '94, and if you have a sortie or two to burn, give me a call (DSN 246-0738). ■

Helicopters

MAJOR ALAN D. RESNICKE
Helicopter Systems Safety Manager
Air Force Safety Agency

■ "Programs! Get yer programs here! Can't tell the players without a program!"

Sound familiar? And I'm not talking about your hometown ball game. You fliers know that's been the case in the helicopter world for the past 18 months. I keep saying I'm going to buy stock in Velcro®, but I think (I hope) I'm too late to catch the latest patch-swapping craze.

Every Air Force unit flying helicopters changed command (and patches) at least once since the summer of '92, and many have been through five changes! Talk about confusion and uncertainty. Add the fact many of the new gaining commands have never possessed helicopters before and are building programs from the ground up (including safety) — makes for a very turbulent time in the world of turning rotors.

My salute to each of you this year: fliers, maintainers, logisticians, and support folks. You've managed to figure what patch to wear on which day of the week, and then went out to do a professional job getting the mission done. All of the upheaval the last 12 months had the potential to be disastrous, yet we had only one Class A mishap and no Class B's. I consider that incredible, even in a good year. My hat's off to all you pros! continued

HELICOPTERS continued

In case you're wondering who "I" am, I'm the new helicopter guru at AFSA at Kirtland AFB, New Mexico. Having been through Kirtland a few times for training and sim refreshers, I was glad to make a move to this area. And with 10 years' worth of helicopter safety experience stuffed in my flight suit, I'm really excited to have this job!

Class A Mishaps

For FY93, the AF experienced only one Class A mishap, the best year we've had since FY90. Our running 10-year total is 22 helicopter Class A's.

This flight mishap involved an MH-60G during a night NVG, overwater, multiship training mission. The formation encountered weather en route so the mishap aircraft attempted to make a 180-degree return to base, but it descended into the water at cruise speed. There were 12 fatalities and 1 survivor.

Additionally, we had one very unfortunate ground taxi mishap. The crew was repositioning their helicopter to its normal parking spot late in the afternoon on an overcast day. They were taxiing against the flow of other traffic in the area, and their main rotor blades made contact with a cement light pole, causing one fatality, injuring several, destroying the helicopter, and damaging other aircraft nearby.

Class B Mishaps

We matched last year's zero Class B record again this year!

Class C's and HAPs

As of the time of this writing, we have had a total of 25 Class C's, 10 HAPs, and 3 physiological incidents. This number is low based on past averages. The H-1 and H-3 communities had only four reports each, while the rest were evenly split between the H-53 and H-60 communities. The H-60 folks experienced all three of the physiological mishaps (two ear blocks and one case of suspected food poisoning).

Engine-related failures (compressor stalls, chips detected, fuel control failures) accounted for the majority of the Class C reports. Of these, most involved H-60s, but also included

H-53s and a few H-1s. Rotor overspeeds due to operations and logistics factors were the next most frequent incidents reported. There were four reports indicating complete loss, or imminent loss, of all main transmission fluid. (One H-60 was over 5,000 AGL in the weather at the time of loss!) We experienced two tree strikes, two gunner's belt failures, and an H-1 experienced stuck tail rotor pedals. (When was the last time you practiced *that* in your EP sorties or reviewed the Dash-One procedures?)

Pet Peeves

Strange header for a new topic? Maybe, but let's look anyway.

1. A trend noted over the years concerns us at AFSA. Historically, there is a tendency for some aircrews to overfly acceptable landing areas in an effort to take a (possibly) defective aircraft back to home station. One crew had confirmed main rotor problems but elected to try to make landfall instead of ditching, resulting in a Class A with fatalities when the blades came apart over water. A twin-engine helo with single-engine failure flew 70 miles back to home base to make it "easy" for maintenance repairs. An aircrew wasn't sure if they'd struck an object; but, not feeling a vibration or experiencing control problems, chose to fly home instead of landing in an open area to thoroughly investigate the aircraft's airworthiness.

In these situations, the crews may have placed themselves in an elevated risk situation for possibly faulty reasons. We want to give maintenance a reasonable opportunity to fix the aircraft. But we don't want to cause a Class A or B mishap because of overflying acceptable landing areas. A blade coming apart, transmission seizure, drive shaft misalignment and subsequent failure, or problems with your only other good engine or gearbox IS NOT WORTH THE ADDED RISK. The helicopter has the unique ability to land almost anywhere. If you *think* you might have a problem, LAND, SHUT DOWN, AND INVESTIGATE ON THE GROUND! That's better than verifying a problem in flight as the airframe comes apart around you and your fellow fliers.

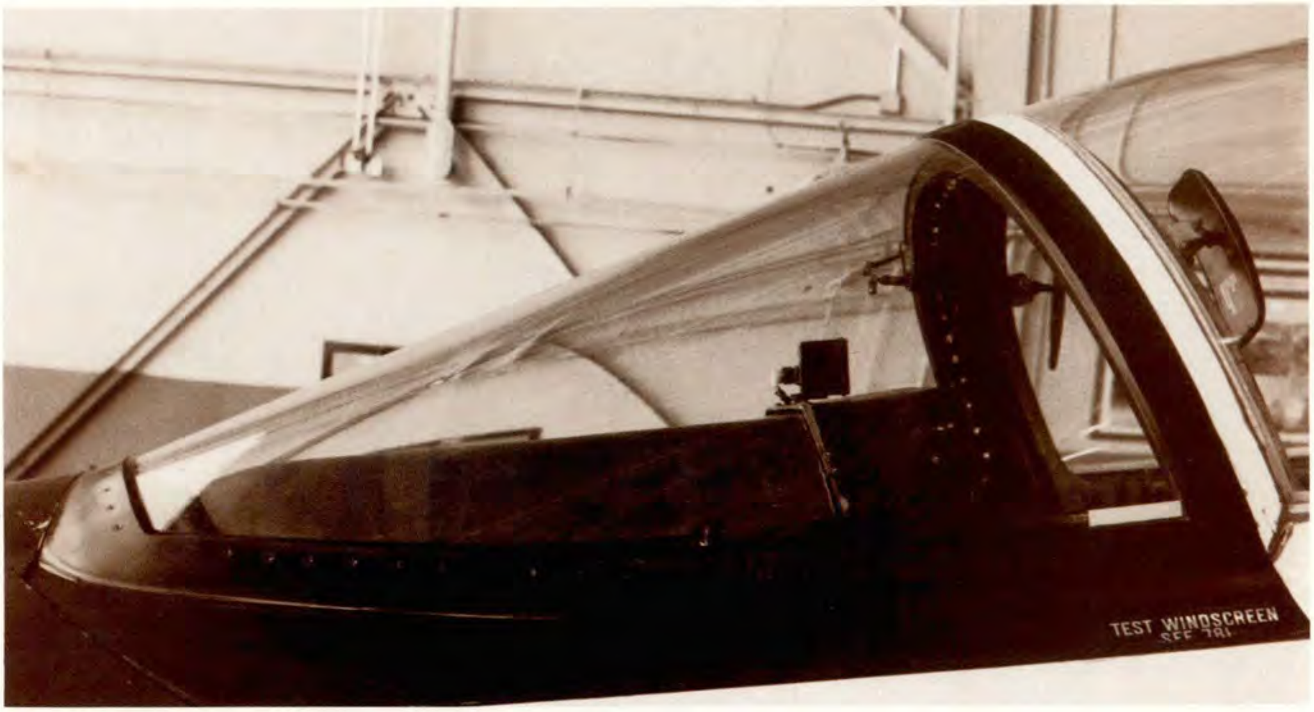
2. A pet peeve I know *you* have is the lack of information flowing to you from other services flying the same airframes. This has been an issue with me since I came into the safety arena 10 years ago. Unfortunately, I am learning I can't make an easy fix to the problem! The other services are (rightly) concerned with the inadvertent release of privileged mishap information, so they release info **only** to other services' safety centers (that's me). So you'll have to trust me to stay in touch with the right folks to keep potential problems under control. I hope to keep you in the field informed with a quarterly or semiannual message. I'll describe other services' problems and trends by airframe and transmit it over the *all-helicopter* AIG (assuming we get that all straightened out). It's the best fix I can think of. Let me know if there's a better way!

Summary

Flying helicopters today is more demanding than it has ever been. NVG operations at low level, cutbacks in total flying time, career "distractions," and changes in the Air Force and helicopter force structure don't make for easy times. We'll soon say good-bye to the H-3s, and shortly thereafter, the H-1Hs. But new airframes have their problems, too.

Human factors continue to be an emphasis in safety, continuing to show up as a leading cause factor in mishaps. (It's a statistical fact the majority of Class A mishaps are caused by human factors, whereas the C's and HAPs are mostly logistics-caused.) Knowing the books, your personal limitations, making a sound plan and flying that plan, are some of the fundamental ways to keep your rotor-side up and the gear-side down. Let me hear from you (as opposed to reading about you) as we face this new FY of challenges together.

I hope you'll give me a call if you need help from my level, or better, stop in when you're TDY here and see our new building. I can be reached at DSN 246-0703, or see me in Bldg 24499. I hope to meet many of you when I get out on grass roots visits being scheduled for FY94. ■



A New Windscreen for the T-38

CMSGT ROBERT T. HOLRITZ
Feature Writer

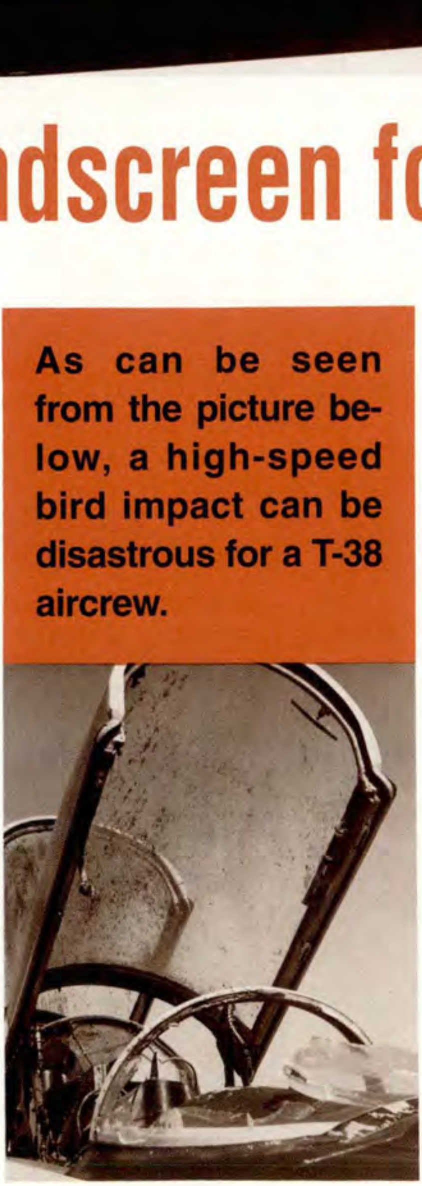
■ In recent years, the T-38 undergraduate pilot training syllabus has placed additional emphasis on high speed, low level operations. As a result, there is an increased potential for bird strike mishaps. And since 1966, the Air force has lost three pilots and three aircraft due to birds penetrating the windscreen. One NASA pilot was also killed when his aircraft struck a large bird.

Early Development

Testing at the Wright Laboratory in the early eighties determined the T-38 windscreen could only withstand the impact of a 4-pound bird at 200 knots. Since the new syllabus requires low level flight at speeds up to 400 knots, the Wright Laboratory at Wright-Patterson AFB, Ohio, and San Antonio Air Logistics Center, Texas, began to look for a replacement windscreen for the Talon.

The requirements for the new windscreen were that it would withstand the impact of a 4-pound bird at 400 knots. The answer was a windscreen made of laminated polycarbonate. Unfortunately, since the new windscreen was designed to flex during bird impact, tests showed the brittle magnesium cast frame windscreen would break up, and the fragments could seriously injure the aircrew. Also, without the support of the frame, the windscreen would deflect and allow massive amounts of bird debris in the cockpit.

As can be seen from the picture below, a high-speed bird impact can be disastrous for a T-38 aircrew.



There were several attempts to modify the frame. One was to install metal tubing on the inner frame, and another was to laminate a Kevlar and fiberglass hybrid composite laminate to the existing frame. The hybrid composite modification met the specifications but during the flight testing, instructor pilots found the increased thickness of the frame's arch interfered with their forward visibility.

USAF Advanced Composites Program Office

The San Antonio Air Logistics Center decided the answer would be

An A-7 windscreen struck by a 4-pound chicken at 400 knots would have resulted in fatal injuries to the pilot.

some kind of composite design. They chose composites, not only because they are lightweight and strong, but also because they would practically eliminate a corrosion problem which is plaguing the T-38 windscreen frame.

Two contractors tried to design a suitable frame. After both failed to come up with a suitable design, the San Antonio logistics folks called upon the people from the Advanced Composites Program Office at McClellan AFB, California, to solve the problem.

According to Captain Stephen D. Hargis, the Advanced Composite Program Office's Deputy Manager, "We did what we do with all our programs. We developed a real team effort on how to solve the problems. We got together with Wright Laboratory, the San Antonio Air Logistics Center, and the Air Education and Training Command (AETC) and started working out the details of what went wrong in past efforts. We then performed an analysis on three windscreen frame arch designs and selected the best one.

"We shot a 4-pound bird (a chicken including feathers) from a modified 8-inch naval deck gun at the windscreen and frame. The bird impacted the most critical point on the windscreen (right in front of the pilot's face) at 400 knots with no bird debris in the cockpit."

Test and Evaluation

Until the new windscreen is in the field, there is a restriction on solo, low altitude missions. Flight testing of the new windscreen and frame is being performed at Randolph AFB, Texas. NASA is also flight testing a T-38 windscreen and frame at their Houston facility.

The new windscreen and frame are completing a 9-month operational test and evaluation (OT&E). If there are no problems, the new windscreen will go into production. There is little doubt the laminate polycarbonate windscreen will pass the OT&E. It has been used successfully by Australia on their F-111. It is basically the composite frame which must be proven.

Maintenance

In addition to providing protection against bird strike damage, the new windscreen has a urethane outer liner. This outer liner protects the polycarbonate windscreen from damage from low level encounter with sand and maintenance handling such as belt buckles and dropped tools.

Captain Hargis demonstrated the urethane outer liner's ability to "bounce back" by digging a fingernail into it. After only a few seconds, the gouge disappeared completely. The new windscreen was designed to comply with the "444" concept. That is, the new windscreen should take no more than 4 people no more than 4 hours to replace, and it must last a minimum of 4 years. ■

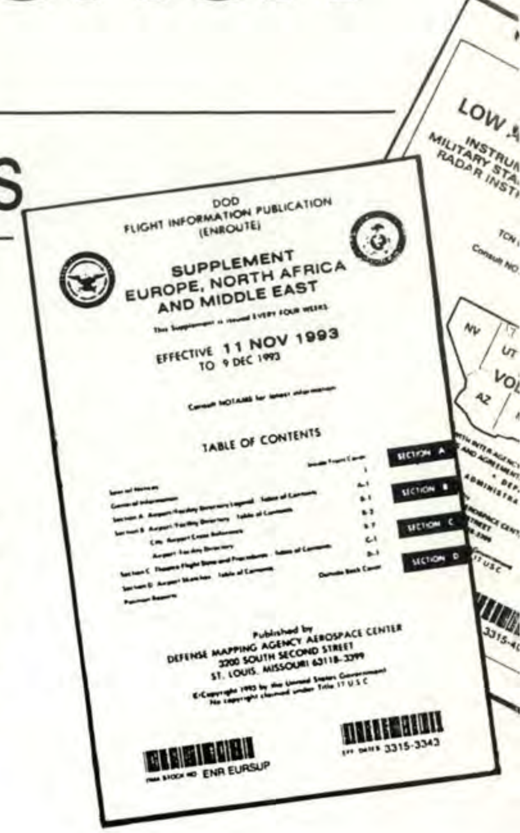
This is a new polycarbonate windscreen after being shot with a 4-pound chicken at 400 knots. No debris entered the cockpit.

A pilot's view of the polycarbonate composite windscreen after a simulated bird strike.

IFC APPROACH

DMAAC — The FLIP Guys

LT COL EDDY JOHNSEN
Air Force Flight Standards Agency



■ And we thought we were doing such a great job! The Flight Information Publication (FLIP) guys have all these great procedures and techniques for getting out "THE WORD" on all the latest and greatest changes to the DOD FLIP Program. Not so fast, oh Great One, master of the airways and all that is aeronautical in nature. First things first.

The Defense Mapping Agency Aerospace Center (DMAAC), St Louis, Missouri, is one of the Defense Mapping Agency's three production centers. Part of DMAAC's responsibility, and some would argue by far the most important, is the production of the DOD FLIP. While FLIP production may appear to be straightforward, any who pride themselves in making the simple complex would be in awe of the procedures required to get approach plates, planning books, Flight Information Handbooks (FIH), supplements, and en route charts to customers worldwide.

While that is a story in itself, it will have to wait for another issue. This article is an attempt to update the "CREW DOG" on what is going on with paper FLIP and what is going to directly affect those of you lucky enough to still be in the cockpit.

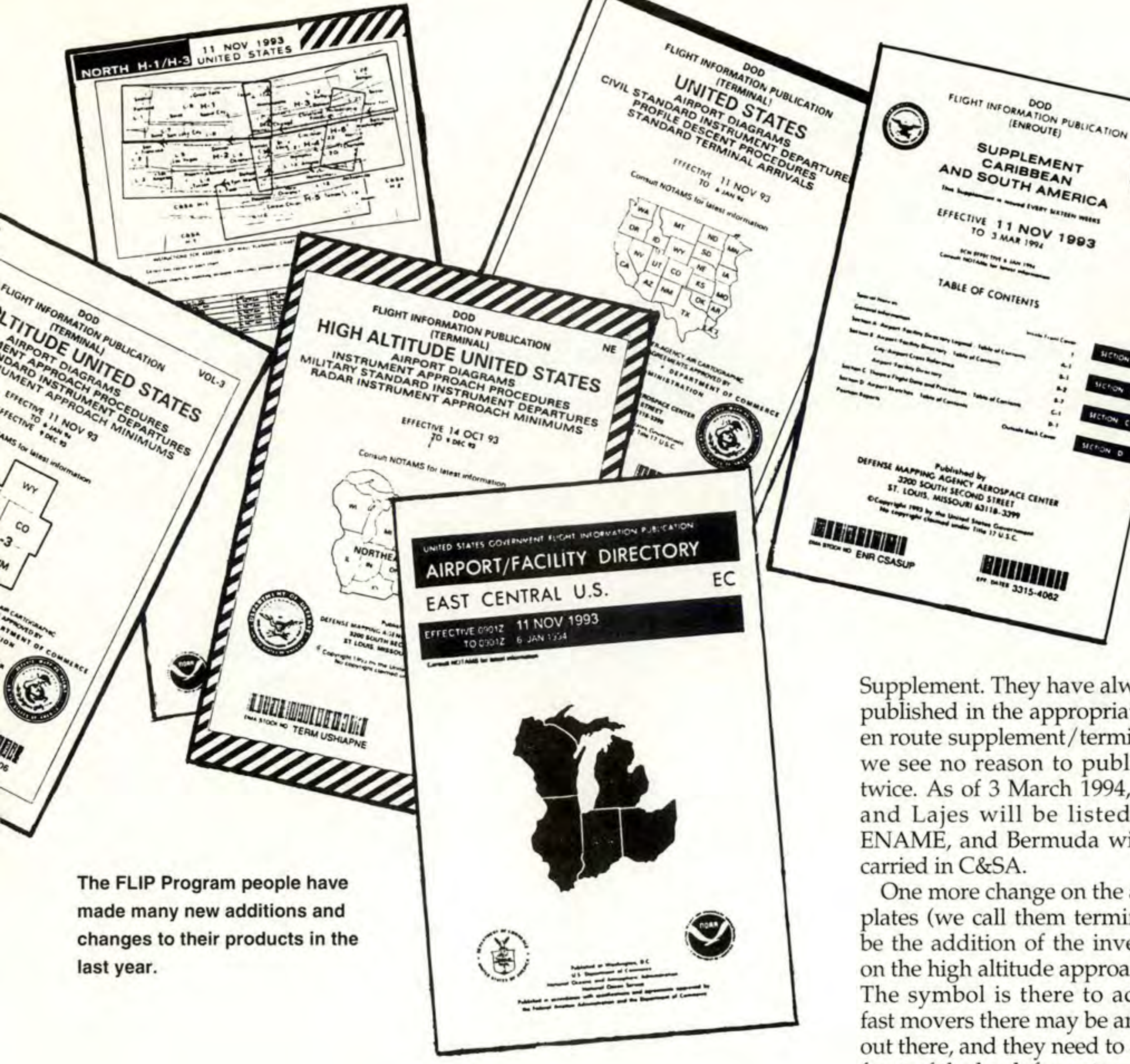
As I mentioned, new information and format changes, etc., have always been listed in FLIP. Where, you ask? They are on the inside front cover of the en route supplements and planning books. (Now, how many of you knew that?)

It is becoming apparent to us we can do a much better job getting out new information to our DOD aviation community. A quick footnote here: There is an indepth explanation of the FLIP Program in Chapter 3 of General Planning and procedures for ordering FLIP products in Chapter 11. So here is a rundown on what the FLIP guys have been cooking up in the past year.

An entire new theater has been added to the FLIP product line, Eastern Europe and Asia (EEA/orange book). The premiere edition hit all base operations around the world on 22 July 1993 — that is, if your pubs guy ordered it. The supplement and terminal information have been combined in one book (like Africa/ brown book). There are four en route charts for this new theater. A fifth chart will be added to the set on 11 November 1993. The Planning Book that covers the new area is AP4/4A.

There is cycle extension underway for the Caribbean and South America (C&SA/blue book) en route supplement and charts. On 11 November 1993, the C&SA supplement will go to a 16-week cycle, with an en route change notice published at the 8-week point.

Now for a demonstration of making the simple complex — the C&SA en route charts H 1-6, L9-18, and Area Arrival Charts Depicting Terrain Data will also go to the 16-week cycle. HOWEVER, low charts 1-8 and the arrival chart 1&2 will remain on an 8-week cycle. It is a long story I hope to explain in another article. Suffice it to say, **when 6 January 1994 rolls around, don't throw all the C&SA charts away.**



The FLIP Program people have made many new additions and changes to their products in the last year.

Some will still be current. There is also a cycle extension coming up for the Europe, North Africa, and the Middle East (ENAME/green book) terminals and Standard Instrument Departures (SID). Starting on 14 October 1993, the approach plates will go to a 16-week cycle with a terminal change notice published every 4 weeks. Plans are also in the works to combine the SIDs with the terminals so all the procedures are in the same book.

Did anyone notice the US-VFR supplement was resized on 24 June 1993? It really was done to standardize all the supplements. The 9 December 1993 edition will start to carry sectional as well as en route chart information in each airport directory entry.

In an effort to keep the aircrews from digging through the basic planning book AP/2 and two planning change notices (PCN) for the most current preferred routing in Germany, we have decided to publish the most current routing, in its entirety, in each of the AP 2 PCNs.

Four-color chart conversion is coming along nicely. US high and low charts are complete. We now publish Africa, EEA, and just over half of ENAME. When ENAME is complete, C&SA will be next, with Pacific, Australasia, and Antarctica (PAA/yellow book) being last.

We have continued to carry the approach plates for Keflavik (BIKF), Lajes (LPLA), and Bermuda NAS (TXKF) in the Canada and North Atlantic (CNA/gray book) terminal book long after those airfields have been deleted from the Canada Flight Supplement. They have always been published in the appropriate theater en route supplement/terminals, and we see no reason to publish them twice. As of 3 March 1994, Keflavik and Lajes will be listed only in ENAME, and Bermuda will just be carried in C&SA.

One more change on the approach plates (we call them terminals) will be the addition of the inverted "T" on the high altitude approach plates. The symbol is there to advise the fast movers there may be an obstacle out there, and they need to check the front of the book for notes under departure procedures.

This is the first of what we hope is a series of articles explaining DMAAC and how we are continuing to strive to make the FLIP products as useful and accurate as possible. There are a few things each of you can do to help us:

1. If you notice an error or have a suggestion, fill out a Quality Feedback Card (in the middle of all the supplements) and send it to us. We review and respond to every one of them.

2. Read the inside cover of the supplements. You would be surprised at the information that is carried in the Special Notices and New FLIP Features.

3. If there are any questions, our phone number is DSN 693-4806 or COMM (314) 264-4806. ■

Composite Aircraft Mishaps:

High Tech Hazards? PART ONE

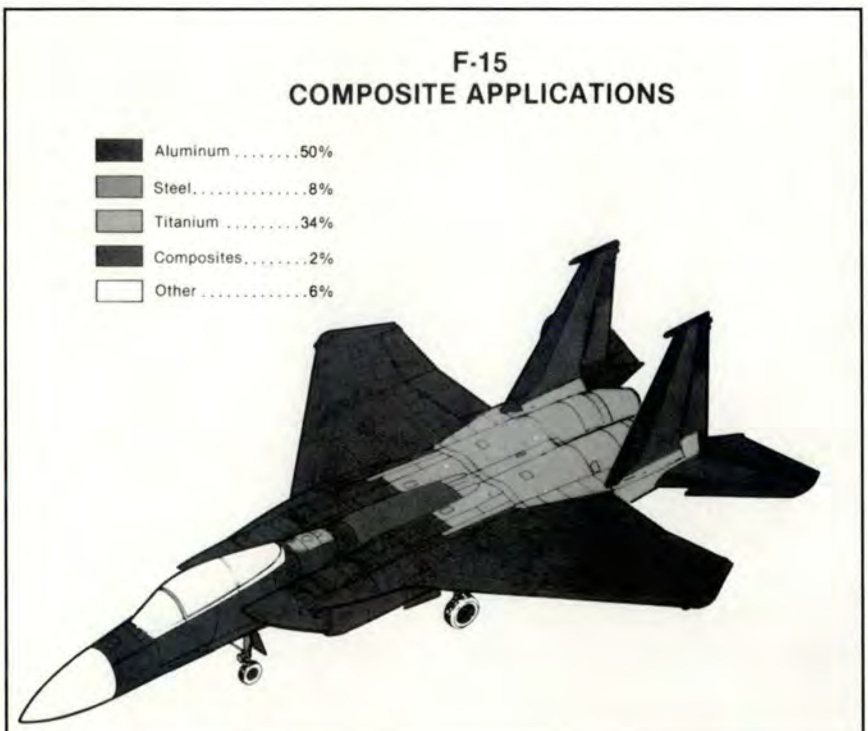
LT JOHN M. OLSON
USAF Advanced Composites
Program Office
McClellan AFB, California

■ What do the YF-22A, AV-88, F-117A, Beech Starship, and B-52 have in common? Sexy lines and sweet performance? Well, yes, but what else? Landing gear? Get real. Actually, all of these aircraft have a significant amount of advanced aerospace materials or composites, giving them unparalleled performance in several areas.

However, the first three have been involved in mishaps, and the last two could be at some time. These high-tech aircraft present some unique environmental, safety, and post-mishap health concerns which need to be addressed.

Nobody likes to consider the possibility of an aircraft mishap — the goal is successful mission accomplishment. Nevertheless, knowledge of fire, explosion, or high-energy impact damage effects on advanced composites is essential, especially for mishap response personnel.

Given the strength-to-weight, cost, and performance advantages of advanced composite materials, their use for new production, repairs, and modifications will continue to increase. Yet, the relative infancy of advanced composites combined with the mystique, secrecy, and complexity associated with their aircraft applications has led to a general lack of composites understanding, and in many cases, misunderstanding.



The goal of the month's article (Part II to be published in December) is to define the issues and address the solutions within a realistic and factual context. Unique composite aircraft mishap hazards will be discussed as they pertain to all phases of a mishap response, including fire-fighting, investigation, recovery, cleanup, and disposal. Additionally, maintenance and aircraft battle damage and repair concerns will be addressed.

Composite materials consist of two or more distinct substances combined to produce a material with specific physical characteristics for specialized applications. Composites are often incorrectly described purely in terms of the fiber, or reinforcement (i.e., graphite or boron composites), without reference to the resin, or matrix, material. However, only the matrix resin (roughly 30 percent by weight) is flammable in aircraft fire conditions (typically 1,000°C), making this information very important.

It should be emphasized composites are comprised of a complex mixture of materials whose composition, concentration, and toxicity are not always known, especially in a mishap environment. Because of the unknown hazards, diverse locations, and complex scenarios, conservative protective measures are required.

Myths

Early aircraft fire and crash studies on composites have incorrectly led to several **fallacies** concerning mishap hazards, including:

■ Release of material will cause a widespread electronic blackout.

■ Dispersed composite material is biologically malignant and should be treated like asbestos.

■ Large concentrations of particulates can be carried very long distances downwind.

■ Exposure to fractured composites can cause major long-term health problems.

In fact, on several accounts, these claims have been proven by new research and experience to be over-reactive and inaccurate.

In order to correctly address the unique hazards posed by a composite aircraft mishap, the USAF has been working with DOD, government agencies, private industry, and other nations to develop and refine general guidelines and precautionary measures for composite mishap response efforts. The objective is to consolidate and update the pool of information from sources all across the spectrum, whether operational, research, or policy oriented, and then disseminate the information to end-users in the form of pre-mishap plans, training, and technical order precautions.

Composite panel showing post impact and heat damage with resulting released fibers.

Bad Burners

Composites represent only one of the many hazards (weapons, fuel, radioactive materials) associated with an aircraft mishap. However, the potentially harmful vapors, gases, composite particulates, and airborne fibers generated from a composite aircraft mishap pose possible toxicity danger which necessitates several safety precautions. Likewise, given that secondary exposures due to investigation, handling, cleanup, and disposal operations could cause exposures greater than the original incident response effort, situational control is critical.

Resins or binders generate toxic combustion products when burned in a mishap, exposing loose fibers and small particulates. While smoke and fumes from burning composites should be avoided, the dangers are not exceptionally acute in comparison to other mishap fire products.The fibers may become oxidized by the heat, thereby altering their size, shape, and characteristics. The combined effect of breakdown and explosive dissipation forces can lead to potential hazardous exposures. Exposure of unprotected eyes, skin, or the lungs to contaminated fibers and particulates may lead to acute or chronic respiratory and skin problems.

Although past research has often been inconclusive, evidence shows burned or exploded composite materials DO cause safety and health problems IF you are not properly protected. The key factors are fire, explosion, and high-energy impact related. Without these elements, composites are generally well understood and considered biologically benign. Likewise, the particulates generated from breakup without fire damage effects are too large to be respirable.

Look for Part II of Lt Olson's article, covering mishap response, in the December issue.

In the meantime, if you have any urgent questions about composite material hazards, you may contact Lt Olson directly at DSN 633-3810. — Ed. ■

COMPOSITE AIRCRAFT

Carbon/Graphite Fibers

Air Force F-15	Navy F-14
F-16	F/A-18
F-117	A-6E (SWIP)
B-2	V-22
U-2/TR-1	USMC AV-88
F-22	
Space Shuttle	

Boron Fibers

Air Force F-15, FB-111, B-1B

Medical/Health Considerations

Okay — the jet crashed and burned. What are the medical concerns?

Although people, exposures, and conditions are infinitely variable, the following are some of the symptoms of adverse exposure to burned composites:

- Respiratory tract irritation
- Reduced respiratory capacity-fatigue
- Eye irritation/redness
- Skin irritation/infection/rashes
- Local and/or systemic sensitization
- Splinter-type wounds that fester

What are the effects? Good question. The responses span the spectrum. Some reveal acute and chronic effects. Others insist on treatment as a nuisance dust. However, all agree further research is necessary and long-term information is either not available or embryonic.

What drives the toxicology and disease-producing potential?

1. Dose or amount of particulates deposited in lungs

2. Physical dimensions of particulates

3. Particulate durability (lifetime) in lung

Additional complications:

Mechanical abrasion, puncture, or lacerations caused by skin contact with composites covered with human remains could possibly serve as infection points for bloodborne pathogens. Bloodborne pathogens are viruses, bacteria, or parasites present in the blood or other body fluids of infected persons. The HIV virus and Hepatitis B are of most concern.

FACT: Dried bloods infected with hepatitis B can be infectious for 7 days at room temperature!

How do I protect myself?

Simply follow the personal protective equipment guidelines — long sleeves and outer leather work gloves and inner nitrile rubber gloves should do the trick. Just be cautious at the mishap site.

AIRCRAFT DEICING

Why the Aircraft Should be Kept Clean

AAGE ROED
Air Line Pilot, Sep/Oct 92

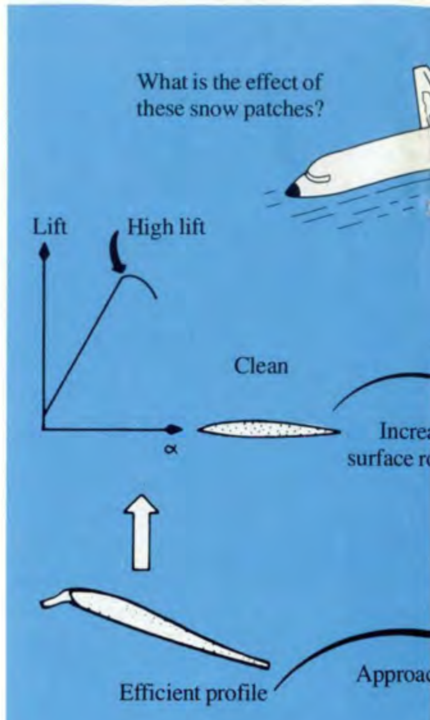
■ How well must an aircraft be cleaned of frost, snow, and ice before takeoff? Which rules should govern the need for deicing? Which experiences are valid? These important questions confront both pilots and ground crews during winter operations.

To these questions, there is only one good, simple answer: *If you keep the aircraft clean, you maintain the surfaces the way they were when the aircraft was certificated.*

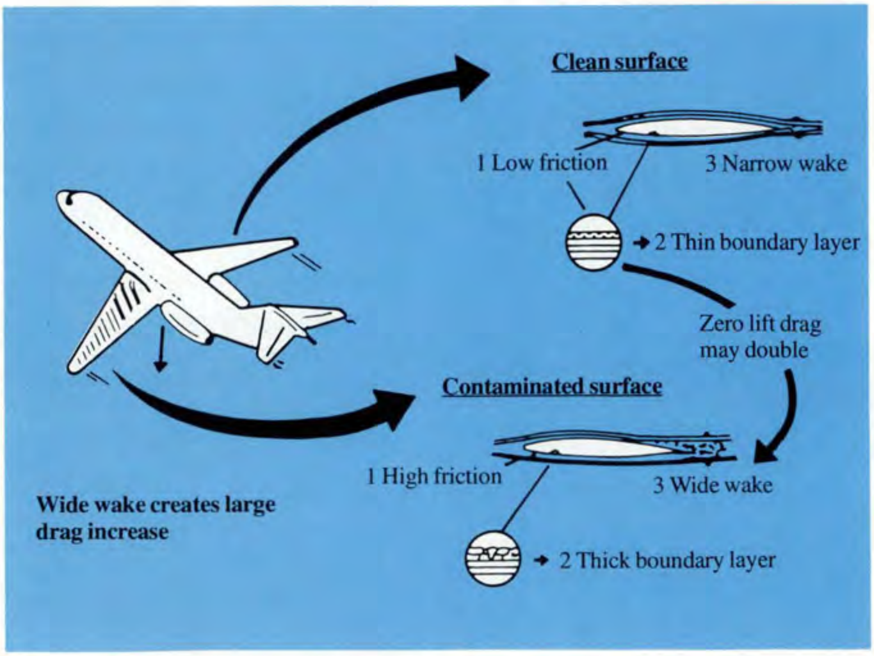
The performance values in the flight manual are valid only for aircraft with smooth surfaces. Any contamination or surface roughness will increase both fuel consumption and stalling speeds. The effects may be large.

Aircraft drag is, to a large extent, determined by surface friction. The smoother a wing, the closer the zero-lift drag (i.e., the total drag minus drag due to lift) comes to the ideal low friction drag of a smooth, flat plate at zero degree angle of attack. Rough surfaces decelerate the airflow along the aircraft's surfaces. The airflow will also tend to separate from the rearward sloping surfaces, such as the trailing edge of the wing and the aft end of the fuselage. Thick trailing wakes similar to those that blunt bodies create will be formed, and the friction drag may more than double.

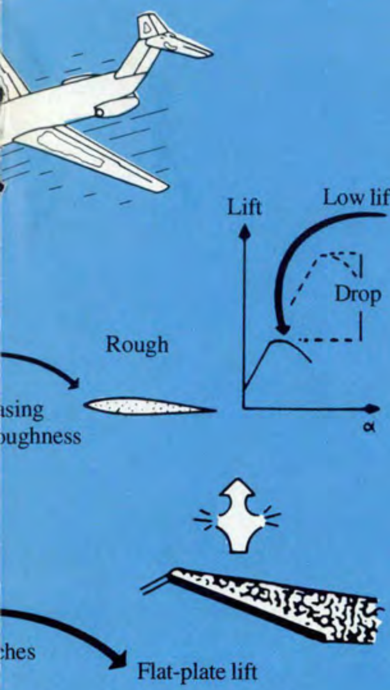
What happens to lift when the wing upper surfaces are contaminated with frost, snow, or ice? Tests made in Sweden with a small aircraft show a 1-millimeter layer of hoar frost on a wing may result in a 50 percent reduction in maximum lift. The lifting capacity of the modern, efficient wing profile may be reduced to the same low level as that of a flat plate.



Roughly 50 percent loss of max lift (30 per
The contamination at the leading edge or alo
reduction in the maximum lift capabilities of
nation thickness, maximum lift may approac
reduce lift by 50 percent. This increases stall



Wide wake creates large drag increase



cent increase of stalling speed)
ng the upper profile surface results in sharp
an efficient profile. With increasing contami-
h the flat plate level. A rough surface can
ing speed by 30 percent.

Generally, the better the wing is shaped, the larger the lift losses and drag increases due to surface contamination. Even mosquitoes deposited along a wing leading edge during summer operations have considerable effect on the stalling speed of some modern aircraft.

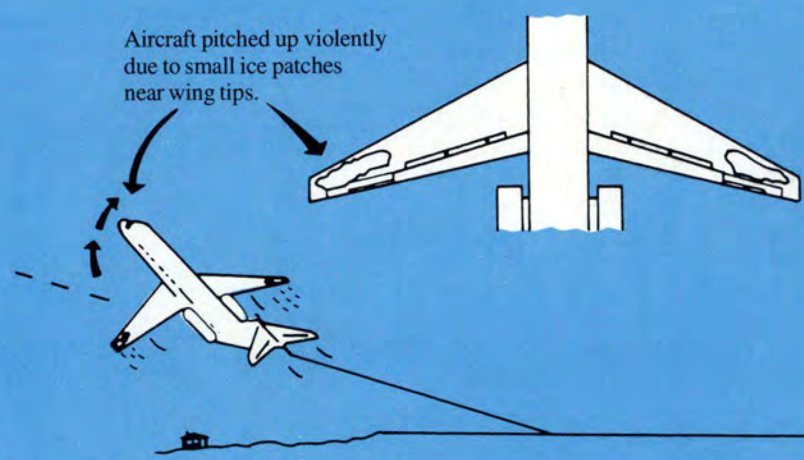
How large will the effect be if only part of the wing is covered by frost, snow, or ice? No one can give an exact answer to this question. Good, systematic research, including flight tests, has only begun in this area.

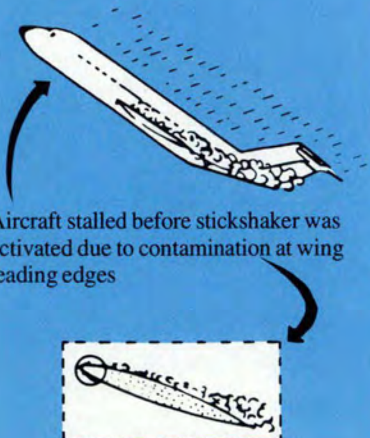
What about past experience? Should we not be able to use years of experience for guidance? We can to a certain degree. Experience can tell us when the contamination is sufficient to cause a mishap or serious incident.

But, when a successful takeoff is made with no apparent effect of the contamination, we have no experience to tell us how much the margin before stall or loss of control has deteriorated. It is easy in such instances to conclude the contamination effect was zero and to gain the false impression deicing could have been a waste of time. The truth is *some adverse effect always results from wing contamination.* The question is only whether it is sufficient to cause a mishap. continued

Aircraft rolled inverted after takeoff roll due to frost on *one* wing.

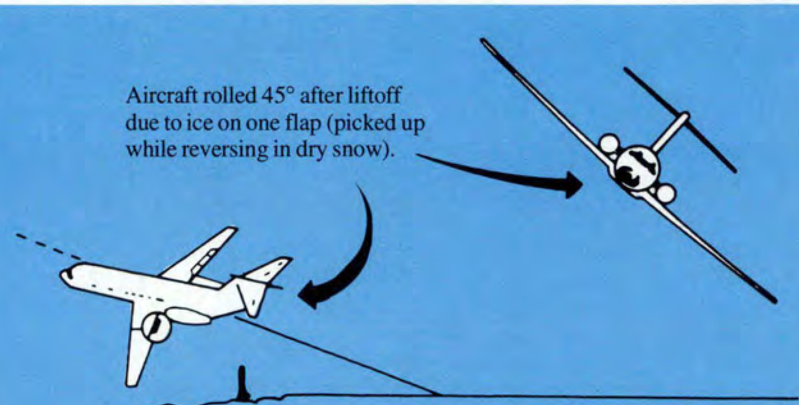
Aircraft pitched up violently due to small ice patches near wing tips.





Aircraft stalled before stickshaker was activated due to contamination at wing leading edges

Aircraft rolled 45° after liftoff due to ice on one flap (picked up while reversing in dry snow).



Using the false "no effect" experience as an excuse for neglecting deicing is not advisable. If you do, you may one day experience the real danger of contamination. Many general aviation and air transport pilots who have fallen for this temptation have later shared their experience with mishap investigators. Others have not been so fortunate. The illustrated examples and incidents show what dangerous situations can result from the belief "my experience tells me the effect is negligible."

Because no one can determine with any exactness the effects of frost, snow, or ice on aircraft surfaces, the problem has only one solution: *Keep the surface clean!*

This is vital for all aircraft, large and small, and particularly for modern aircraft with smooth, efficient wing profiles. (Note: Watch out for "deicing slush" between control surfaces and fixed surfaces. It will freeze at high altitude and lock the controls. Deicing fluid with a thickening agent sprayed on engine fan blades will lower the engine's stall margin.) ■

Icing Troubles Us All

■ Most of us remember where we were when we heard the news about the 1982 Air Florida Boeing 737 mishap. It was one of the coldest winters D.C. had experienced in about 50 years, and the aircraft had gone down in the icy waters of the Potomac River killing 74 of the 79 people on board.

The National Transportation Safety Board's investigation concluded the most probable cause of the crash "was the flight crew's failure to use engine anti-ice during ground operations and takeoff, their decision to take off with snow/ice on the airfoil surfaces of the aircraft, and the captain's failure to reject the takeoff during the early stages when his attention was called to anomalous engine instrument reading."

Over the last 5 years, the Air Force has had 1 Class A and 45 Class C icing related mishaps. No aircraft type was exempt — these mishaps involved all of us — heavies, trainers, and fighters.

As the story here reports, "Because no one can determine with any exactness the effects of frost, snow, or ice on aircraft surfaces, the problem has only one solution: *know the icing restrictions specified in your aircraft's Dash-One.* If you must use deicing fluid to remove snow and ice (and, on some aircraft, heavy frost), make sure you abide by the takeoff time restrictions associated with deicing fluid usage. ■

LEFT–LAND; RIGHT–RUN-ON

STEVEN M. WALKER
58 ALS

■ Many helicopter mishaps have been caused by something as simple as a stuck antitorque pedal, also known as a fixed pitch failure. A stuck pedal can easily be recovered from if the pilot knows how to efficiently and effectively deal with the emergency situation. The most critical element to any tail rotor malfunction is quick diagnosis of the problem. Next to the actual loss of a tail rotor, or one of its components, a stuck pedal is one of the most aerodynamically unstable emergency situations.

A pedal may become stuck left, right, or in the neutral position. Each possible position has to be dealt with differently, depending on things such as altitude, airspeed, terrain, and flight conditions. If the pedals become unmovable during hovering, this presents a different problem. However, for most pilots, I believe the easiest way to remember the procedures to correctly handle the situation is **LEFT — LAND, RIGHT — RUN-ON**.

Quick diagnosis of the emergency situation is critical. The Air Force Dash-One for the UH-1N Huey states:

The key to successful handling of a tail rotor emergency lies in the pilot's ability to quickly recognize the type of malfunction and to select the proper emergency procedure.

Once the pilot has identified the specific problem, there is plenty of time, in most cases, to make a safe landing. However, if the pilot incorrectly identifies the cause of the problem, and seeks to recover from it using the wrong procedures, the end results could be disastrous.

For the most part, fixed pitch failures can be dealt with easily. Of course, the procedures in the technical manual for the specific type of helicopter should be followed. The procedures for the Huey are fairly simple. If it's a stuck left pedal, the pilot should attempt to fly the aircraft down to the ground using a shallow-to-normal approach. The pilot should plan to arrive about 2 feet above the ground and then use the throttles to align the aircraft for the actual touchdown.

In the case of a stuck right pedal, the pilot should set up for a running landing. At about 2 to 5 feet above the ground, the indicated airspeed should be about 25 knots, and the throttles should be reduced to provide lane alignment before touching down.

With pedals stuck in the neutral position, the procedures will be the same as a stuck right pedal. However, if the pedals become stuck while at a hover, the pilot should attempt to fly out of it unless a severe right yaw occurs.

The whole purpose of this article is to give pilots a way to remember how to correctly deal with this emergency situation if it ever happens to them. It is easy to remember. If your pedal is stuck **LEFT, LAND** (as in from a hover). If the pedal is stuck **RIGHT, RUN-ON** (as in a running landing).

Also, if the pedals are stuck in the neutral position, remember, **RIGHT — RUN-ON.** Or, if the pedals are stuck during hovering, don't autorotate — unless a severe right yaw occurs.

Fixed pitch failures are not a common emergency. The procedures to recover from them aren't "bold face." And the procedures in the technical manual are not very concise. Therefore, the corrective actions aren't usually committed to memory. However, as easy as stuck pedals are to recover from, the emergency situation could be complicated, to say the least, if it's not identified quickly and handled correctly. ■

AIR WARRIOR

CMSGT ROBERT T. HOLRITZ
Feature Writer

■ For more than a decade, the Air Force's Air Warrior Program has provided joint training for close air support with the Army's National Training Center (NTC). However, lessons learned during Operation Desert Storm prompted the Pentagon to provide even more emphasis on air/land battle training.

NTC

Air Warrior provides the close air support function to the NTC. Located at Fort Irwin in California's Mojave Desert, it is only 20 to 30 minutes' flight time from Air Warrior's home base at Nellis AFB, Nevada. General H. Norman Schwarzkopf trained as a battalion commander at the NTC. In his book, the General noted the terrain of the Mojave Desert was ideal for training because the shale mountains and scrubby plateaus closely resembled that of northern Iran.

The NTC is by far the most sophisticated and realistic combat practice range ever devised. It is home to hundreds of tanks and other armored vehicles. Each of these vehicles are electronically tracked on a computer display. In fact, every vehicle on the entire battlefield, which occupies an area approximately the size of Rhode Island, can be observed on wide-screen, color monitors.

Electronic Battlefield

The Air Force has used a similar system to track aircraft during air combat training. The Army and Air Force have combined their systems to provide the capability to track ground and air activities simultaneously on one screen.

Dubbed the Air Warrior Measurement and Debriefing System (AWMDS), it can not only follow vehicle and aircraft movements, but it can also track simulated SAM launches and calculate the probability of kill (P_k) for simulated munitions deliveries without the hazard or expense of using live ordnance.

AWMDS provides commanders with a real-time assessment of what is going on in the air and on the ground. It not only allows them to plan combat strategies but also alerts them to simulated friendly fire mishaps.

Joint Service Training

During Operation Desert Storm, the air war was fought using aircraft from the Air Force, Navy, and Marines under the command of (then) Air Force Lt Gen Charles Horner. As a result of the Gulf War, General Horner and other Pentagon officials saw the need for a joint service close air support training program. In October 1993, the first all-service Air Warrior Exercise supporting the Army, USAF, Marines, and Navy was conducted. A planning meeting is held 8 weeks prior to each Air Warrior exercise. During the meeting, representatives from each of the deploying units, including the Army, discuss facility requirements, availability of support equipment, and, most importantly, each service is encouraged to share new close air support tactics which they believe will enhance the syllabus.

According to Captain Harold Huguley, Chief of Air Warrior's Reports Branch, there are three training exercise scenarios during each Air Warrior deployment.

"During the 'FORCE on Force' scenario, we simulate weapons firing. The AWMDS records the weapons effects. In live fire missions, live weapons are expended on two-dimensional targets. There are about 1,500 popup targets on the range. Both ground forces and aircraft combine their fire on these targets to detect this computer-controlled enemy. The third is the Extended scenario. During this scenario, fighter pilots practice CAS tactics against unmanned armor arrays, convoys, and airfields.

Two Navy FA-18s stand ready for close air support training at Air Warrior.

Air Tasking Order

Unlike most flying training, there is no solid schedule during Air Warrior exercises. Instead, close air support is driven by the air tasking order and the realism of the fluid battle field at NTC. According to Major John Miller, who leads the Air Warrior maintenance team, "We don't track deviations, and there is no such thing as a late takeoff or landing. While we print a hard schedule, it is only used as a guide. What we fly depends entirely on the ground commander's need for necessary close air support.

"To put it simply, our job is to support the ground commander when needed, not to meet a flying schedule. The day starts about 2 hours before sunrise as maintenance troops arrive to prepare their aircraft and pilots begin their premission planning."

The acting flying safety officer monitors combat activity in the air and on the ground. All activities are being recorded on videotape and are used during mission debriefings.

The Payoff

There are 12 Air Warrior exercises per year. Each one is 18 days long with only a 10-day break in between. The dates and duration are driven by the field maneuvers at the National Training Center. The training is very demanding and extremely realistic. For the aircrews and maintainers, it usually means working 12 hours a day with no holidays or weekends off. But, as one pilot put it, "We learned a lot of lessons during the Gulf War. The training we receive here gives us the edge and confidence to defeat the enemy." ■

THE
FSO's
CORNER

The Extra Step in Combat

If you and 30 or 40 of your buddies were about to die because of a combat mistake, but your lives would be saved if someone would take an extra moment to check on things, you would naturally have deep respect for the processes of getting that person to make the added effort. But what if, one day you were the person who could make the decision to take the extra step, would safety and professionalism make a difference in combat?

MAJOR DALE T. PIERCE
919th Special Operations Wing
Eglin AFB FL

■ As an AC-130 SPECTRE gunship aircrew member, the greatest part of participating in airshows has not been telling the story, but hearing occasionally from satisfied customers whose lives were saved by SPECTRE. The next best part is hearing someone relate their experience of having been awed by observing SPECTRE provide close air support.

In the 919 SOW, our history of effective mission accomplishment is replete with examples of quality in action. Like most people in the Air Force, we didn't know exactly what to call it, or how to document it — we just found a way to do it.

It was an evolving process but one of the most important steps we used was talking to the folks who asked for our services before and after each mission. By being responsive to real needs and individual conditions, we were able to incorporate changes to tactics and procedures to provide more effective support based on their changing requirements. We worked logistics and support issues with our suppliers to ensure our support was available to our customers when needed. Most of these changes were instituted at the worker level, where we actually interface with our suppliers and customers, and, when time permitted, were blessed by our management. When time did not permit, we were empowered to adjust to customer requirements and back-brief so the lesson was not lost.

All of this activity not only re-

AC-130 firing 40mm tracer high explosive incendiary on Eglin Range 52.

sulted in continually improving the effectiveness of our support, but also resulted in "error free" mission accomplishment.

For example, during Just Cause, we were called on to fire on a target. When we got there, our sensor operators identified the area as being overrun by friendly personnel. We knew who they were because we had talked to them before the mission. The forward controller insisted they were enemy and that we hit the target. Again, we refused to fire.

As a result of our refusal, over 40 of our troops made it home after the conflict. This survival story was possible because, whenever possible, our process for customer support includes talking to our customers before the mission.

We often include this step during mission planning. On the way to a mission in another country, I've made en route stops in a third country to discuss mission procedures with our customers — not the planners, but the personnel on the ground who will receive our close air support. We confirm locations, times, frequencies, call signs, identification procedures, and develop contingency procedures. All this to ensure our customers get the support they want, when and where they want it.

So what does all this have to do with safety? After all, safety is just preventing mishaps, isn't it?

Consider this definition of the word mishap: "An unintentional or unexpected happening which is undesirable or unfortunate and results in injury, damage, harm, or loss."

In the mission environment, safety and quality are integral parts of mission accomplishment. In quality terms, firing on friendlies, or fratricide, is an example of nonconformance resulting in significant rework. In safety terms, fratricide is an unintentional or unexpected happening which is undesirable or unfortunate and results in injury, damage, harm, or loss. At best, the lost capability must be replaced, people recruited and trained, and hardware procured and shipped to the battle area. At worst, we lose an irreplaceable combat capability and undermine unit morale and trust.

Not showing up for a time-on-target (TOT) is another example of nonconformance. Not providing required air cover can give the enemy an unplanned advantage and can result in the same losses as fratricide.

No one shoots a friendly or misses a TOT intentionally, but in the heat of battle, who has time for quality? During Just Cause, we did, and it saved dozens of American lives. Quality helped us avoid a combat mishap and make all TOTs. As a result, we retained our combat capability and negated enemy combat capability instead of the reverse.

Quality and safety apply to mission accomplishment. Individually, they enhance performance and retain combat capability. However, the synergistic effect of quality and safety on mission accomplishment is to greatly increase combat capability. ■

Safety Warrior

FLYING SAFETY...

We've Come a Long Way

LT COL JIMMIE D. MARTIN (RET)

■ The first U.S. Military aviation mishap involving powered flight occurred before the Army even owned an airplane. The crash was at Fort Myers, Virginia, on 17 September 1908. The occasion was the final flight in the acceptance trials of the first aircraft purchased from the Wright brothers.

Lieutenant Thomas E. Selfridge was flying with Orville Wright. After they had been airborne about 3 or 4 minutes, the aircraft suddenly nosed over and crashed at a steep angle. Lt Selfridge was fatally injured and died several hours later. Orville was seriously injured and hospitalized for 7 weeks. Thus, the first powered flight of a military man ended in his death — not a very auspicious beginning for military aviation and flying safety.

The Army ordered an investigation to learn the cause of the mishap. The investigation consisted of observing the remains of the crashed aircraft and taking witness statements. The board found a new, longer propeller contacted a rudder guy wire and eventually caused the wire to come out of its socket. This allowed the rudder to fold sideways, and the pilot lost control.

This first mishap investigation was very unsophisticated when compared to our investigations today. But so were the aircraft. The purpose was the same — to find out what happened so it could be prevented from happening again.

And it worked. The Wright brothers designed an improved version of their aircraft with structural changes which ensured the propellers could not hit any guy wires. This marked the beginning of the flight safety program so familiar to us today.

Early Safety Program

The safety record of the early military fliers was dismal to say the least. Fortunately, they usually walked away from the crashes uninjured, or at least not seriously injured. The first serious mishap occurred during training at Fort Sam Houston, San Antonio, Texas, on 10 May 1911.

Lieutenant G. E. M. Kelly took off on his primary pilot qualification flight in the Army's second aircraft, a Curtiss. The aircraft crashed during landing, and Lt Kelly died a few hours later due to a skull fracture.

This was the final straw for the commanding general of the Maneuver Division. He was fed up with the many crashes which had been occurring. He took the first positive action to solve the flying safety problem — he prohibited further flying at Fort Sam Houston. Problem solved.

The fliers were not satisfied with this solution. They moved the flying school back to College Park, Maryland, where it had started. The instructions and rules they operated with were much simpler in those days. For example, the instructions issued with the 1911 Curtiss aircraft included the following gems.

■ "When the mechanism is facing into the wind, the aeronaut should open the control valve of the motor to its fullest extent, at the same time pulling the control pole toward his middle anatomy.

"When sufficient speed has been attained, the device will leave the ground and assume the position of aeronautical ascent.

■ "Should the aeronaut decide to return to terra firma, he should close the control valve of the motor. This will cause the apparatus to assume what is known as the 'gliding position,' except in the cases of those flying machines which are inherently unstable. These latter will assume the position known as 'involuntary spin' and will return to earth without further action on the part of the aeronaut.

■ "On approaching closely to the chosen field or terrain, the aeronaut should move the control pole gently toward himself, thus causing the mechanism to alight more or less gently on terra firma."

The Army didn't track mishap rates in those days. But, in 1914, the War Department issued a memorandum recapping the mortality record in army aviation. Between 1908 and

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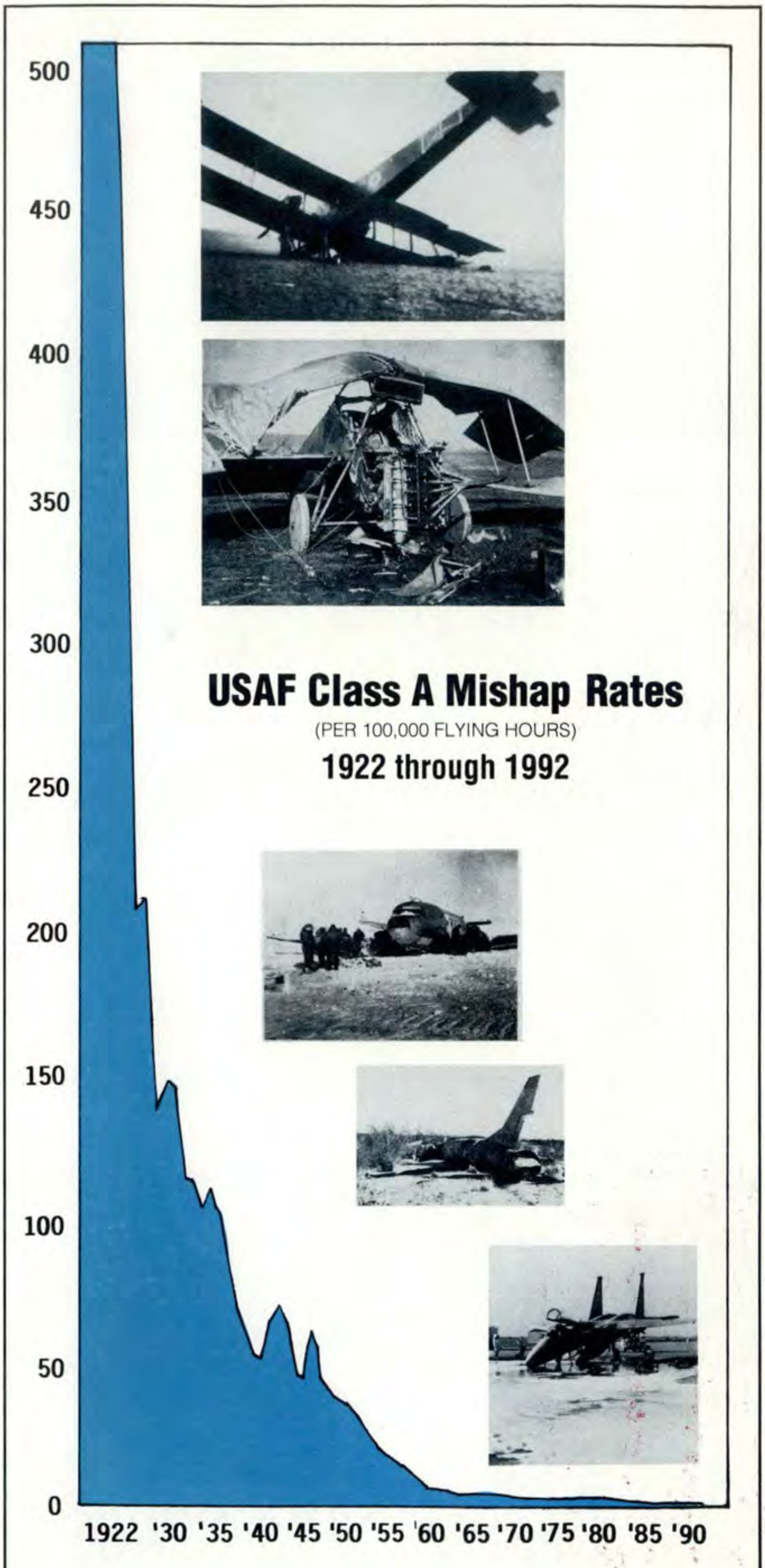


1914, there were 11 fatal mishaps. These cost the Army 12 commissioned officers, 1 noncommissioned officer, and 1 civilian.

In 1921, the Army began keeping track of mishap rates. That year the Army flew 77,000 hours and had 361 major mishaps. When converted to the type of rate we use today, this equates to 467 mishaps per 100,000 hours. If we flew like that today, we'd be crashing 1,350 aircraft per month and use up our entire inventory in 7 months.

The following year (1922) gave us our highest mishap rate on record — 506 per 100,000 hours. But, as our aircraft and our training improved, the mishap rate also slowly improved. By 1934, when the Army was involved in carrying the mail, the rate was 110 per 100,000 hours, but we lost 54 pilots.

Oscar Westover, the Army's Chief Aviator, tried to solve the problem with an approach similar to the one used at Fort Sam Houston in the early days. He sent a message to all his zone commanders saying: "There will be no more accidents." B. Q. (Barbeque) Jones put things in proper perspective when he wired back: "There will be no more flying."

The War Years

The history books are full of stories of the combat losses of men and aircraft during World War II, but you don't read much about the noncombat losses. We lost more aircraft and crews in training and routine flights than in combat.

The worst year for total numbers was 1943. In that year, we had 20,399 major mishaps in the CONUS alone, killing over 5,600 aircrew. We lost 1,100 more people and destroyed 1,200 more aircraft due to noncombat flying mishaps than we lost in combat.

Since we flew over 32 million hours, the rate didn't look all that bad at 64, but it worked out to be 56 aircraft per day. The slogan that year at B-25 conversion training in Tampa, Florida, was "One a day in Tampa Bay." This was also the year a formal flight safety program was begun.

In 1944, *Flying Safety* magazine began as a part of the Army Air Force's flying safety program. A few of the excerpts from "Letters to the Editor" in 1948 attest to the magazine's effectiveness:

■ "The November issue of the magazine *Flying Safety* is the first copy which I have been privileged to receive. I believe this magazine has more to offer of interest to the pilot than any magazine which I have ever read. Every article is well written and easy to read.

"Although flying safety should always be foremost in a pilot's mind, a story which tells what happened to some other pilot, who did not keep this thought foremost, always 'sticks' a little better. (February 1948)

■ "Having been a devotee of *Flying Safety* since its initial issue, I'm one of your most avid readers and I'm certain the effect of your excellent and hard-hitting publication on my piloting has been beneficial." (September 1948)

■ "The officers in this Command Headquarters read with immense interest copies of *Flying Safety*.

"This publication has done much

to enhance the Flying Safety and Accident Prevention Program of the RCAF Air Transport Command." (October 1948)

The flying safety program continued after the war with slow, but steady improvement in our mishap rates. By the time the Air Force became a separate service in 1947, we were down to a little over 1,500 mishaps a year and a rate of 44 per 100,000 hours.

Major Change

The next major turning point came in 1949 when Major General Victor E. Bertrandias took charge of the Air Force's safety program. Prior to this time, the safety program had mainly consisted of keeping records and investigating major mishaps. Under his leadership, the emphasis shifted from reacting to mishaps to preventing them. Investigators used information from mishaps to discover patterns and common causes. Then they took action to prevent similar mishaps.

General Bertrandias also stressed building safety into our aircraft and systems. The Directorate of Flying Safety was moved from Langley AFB, Virginia, to Norton AFB, California, to permit close liaison with the aircraft industry. He also recommended the name of the Directorate be changed to Flight Safety Research to better describe its expanded role.

As a result of the improved methods of investigating, reporting, and analyzing aircraft mishaps established by the Director of Flight Safety Research, it soon became apparent a systematic technical inspection system was necessary to improve the caliber of aircraft maintenance in the Air Force. On 21 September 1950, the Vice Chief of Staff approved the creation of a Directorate of Technical Inspection at Norton AFB, California.

General Bertrandias was named the Deputy Inspector General for Flight Safety Research and Technical Inspection. His two directorates complemented each other.

The Directorate of Technical Inspection made inspections and recommendations for improving the effectiveness and economy of aircraft, equipment, and weapon systems maintenance to provide increased aircraft utilization and safety. The Directorate of Flying Safety Research analyzed all aircraft mishap information to develop basic mishap cause factors and made recommendations for expediting corrective action.

You Can't Do That

The mishap rate continued to fall. By 1950, the rate had been reduced to 36 and by 1955, to 17. But we had 800 fatalities in 1955. There was obviously more work to be done. During this postwar period, the Air Force developed a penchant for solving mishaps by regulation. When there was a mishap, they regulated against whatever the pilot was doing at the time. During this period, we developed many of the aircrew "be no's" we live with today.

Obviously, some of these "be no's" were badly needed — "There will 'be no' buzzing," and similar prohibitions. But there is a limit to how far this can be carried without interfering with combat capability.

Continued indefinitely, the mission will be sacrificed to safety like the "There will be no more flying" approach used at Fort Sam Houston in 1911. It was this type of approach which gave Safety the "black hat" image still lingering in some minds today. "Don't let Safety get involved or you'll never get anything done."

Safety Training

The Air Force recognized an effective safety program needed trained people. Therefore, in March of 1953, a special school for flight

continued

safety officers was opened under contract at the University of Southern California. This was the only school of its kind in the world. It soon attracted the attention of civilian aviation organizations as well as foreign governments.

The school's purpose was to train flying safety officers in how to impress pilots, crews, and maintenance people with a greater realization of the importance of safe practices and also to foster a sense of flying safety consciousness. The subjects covered ranged from aeronautical engineering and aviation physiology to accident investigation and prevention.

Graduates of the school quickly established very effective programs which were instrumental in lowering the Air Force mishap rate. Today the Safety Education and Development Division at Kirtland AFB, New Mexico, manages many safety education courses. Flying safety courses are taught under contract by the Southern California Safety Institute.

In July of 1965, a unique outdoor classroom opened at Norton AFB — the "Crash Lab" (located now at Kirtland AFB). In it, the wreckage from actual aircraft crashes is laid out in the same pattern as the original crash. Students at the aircraft safety schools then use the investigative techniques learned in the classroom to discover the causes of the mishaps. It is their first chance to put theory into practice, and it is done under controlled conditions which greatly increase the effectiveness of their training.

A New Ally

From about 1956 to 1960, we went through another transition period looking for a new approach to the flying safety problem. We began to concentrate on more efficient and effective ways to do the mission. Flying safety picked up a new ally — standardization. (Let Stan Eval wear the black hat.) As standardization became a way of life, safety improved. In 1960, the rate was down to 5.8 — a remarkable achievement in a few short years.

Commanders began to be charged more directly than they had in the past for their responsibility and role in safety. During the 1960's and 1970's, the function of safety grew and flourished as never before as a result of all the attention it received, and the number of trained professionals available.

The Cost of Doing Business

By the late 1970's, the rate had dropped to — and appeared to have stabilized at — around 3.0. Some were saying 3.0 was a reasonable rate if we were to continue to "train the way we fight." It was just the cost of doing business.

Fortunately, this philosophy did not prevail, and safety and ops continued to work together. Safety had evolved from the "be no" approach to trying to find ways to accomplish the mission more effectively and safely. Ops had discovered "making safety part of the planning" not only reduced aircrew fatalities but also resulted in more effective mission accomplishment and increased combat readiness.

The mishap rate continued its overall decline, and in 1983, it dropped below 2.0 for the first time. The rate that year was 1.73, and it has remained below this level for the last 10 years. FY93 was our second best year at 34 mishaps and a 1.34 rate.

Is this the cost of doing business? Our safety and ops professionals are not willing to accept this premise, and they continue to work to improve our safety record.

What's the Point?

Are we expending all this effort so we can produce ever more impressive rates for all the world to see? No. The rates are only a measurement of how well we are doing in what's really important — saving lives, equipment, and money while increasing our combat capability. It's a way of keeping score in a game we all win — the fliers, the Air Force, the Nation, and the free world. ■

MAIL CALL

"UNDER ARREST"

Dear Editor

Reference your article, "Under Arrest," in the July 1993 issue. I am the Air Force Civil Engineering Support Agency (HQ AFCESA) representative for management of aircraft arresting systems. As the project officer for this USAF program, I am keenly aware of the general population's lack of knowledge of arresting systems. I appreciate your efforts to expand awareness in this area but feel obligated to point out some technical errors in the subject article.

Approximately two-thirds through the first paragraph on page 5, under the subtitle "BAK-12," you state: "The BAK-12 is also available as a deployable system. In this configuration, it is designated the BAK-13 mobile aircraft arresting system (MAAS)." This is incorrect.

The BAK-12 is, in fact, a deployable system. It can be installed in an expeditionary configuration using earth anchors (more commonly referred to as "Dead Man" anchors) in approximately 100 man-hours. The MAAS is a mobile version of the BAK-12 which can be installed in approximately 20 minutes. It has no military designation other than MAAS, Model AM 32A-96. The commercial designation is Portarest IV.

The BAK-13 is a completely different type of arresting system. It is a rotary hydraulic-type system which converts the energy of the engagement to heat through fluid turbulence. The BAK-12 is a rotary friction-type energy absorber which uses a multidisc friction brake, much like an aircraft brake, to dissipate the energy of the engagement.

Also, your photo layout pictures a BAK-13 with a caption which reads: "The BAK-12 is the most successful barrier yet developed."


Under Arrest

Others depict a Dual BAK-12 captioned "F-111 engages BAK-12 during tests in the early '60s," and a MAAS with the caption: "The BAK-13 mobile system can be rapidly set in combat areas."

I must also point out your use of the term "barrier" in the BAK-13 photo caption is in error. AFR 55-424, *Management of Aircraft Arresting Systems,* defines the term "barrier" as: "A device, not dependent on an aircraft hook, used to engage an aircraft and absorb the forward momentum of an emergency landing or an aborted takeoff." This is the agreed definition in Joint Pub 1-02, *DOD Dictionary of Military and Associated Terms,* as well as AAP-6, *NATO Glossary of Terms and Definitions,* and ASCC Air Standard 85-1, *Terms and Definitions.* The term "arresting system" would have been more appropriate in your caption.

Arresting systems which must be engaged via an aircraft tailhook should not be called a barrier. The misnomer can cause confusion at a time when there is no margin for error. Before the mid 1970s, the terms "arresting system" and "barrier" were synonymous. However, when a pilot lost his life due to his lack of distinction between the two, formal definitions were promulgated to prevent future recurrence of the incident.

You may be able to find a record of this mishap if you check Eglin AFB for location or F-111 for type of aircraft. I remember the pilot called for a barrier, when he really wanted a cable, and was diverted from a runway with two BAK-12 systems to a runway with an MA-1A in the overrun. If I recall correctly, the aircraft engaged the system but went through the overrun and flipped over. I think both the pilot and the aircraft were lost to fire.*

I offer my assistance for technical information should you ever decide to publish another article on arresting systems. I can be reached at HQ AFCESA/DMPS, 139 Barnes Drive, Tyndall AFB FL 32403-5319, DSN 523-6351.

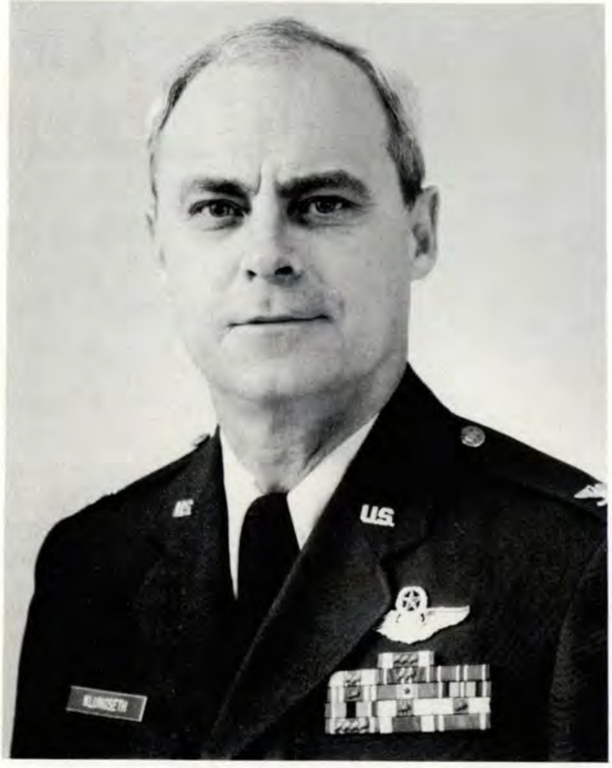
Sincerely

MICHAEL D. ATES, GS-12
Equipment Specialist

Dear Mr Ates

The subject of barriers and arresting systems is one of which many aviators lack much-needed knowledge. Your comments about the difference between the terms "barrier" and "arresting system" may save an aircrew. Thank you for taking your time to read the article and to send us your comments. — Ed. ■

*We searched our files and couldn't find a record of Class A or B mishap that comes close to this description.



COLONEL
Terry J. Klungseth

CAPTAIN
Matthew J. Dickerson

HQ 67th Reconnaissance Wing
Bergstrom Air Force Base, Texas

■ Colonel Terry J. Klungseth, RF-4C Aircraft Commander, and Captain Matthew J. Dickerson, Weapons System Officer, were flying a single-ship, visual surface attack sortie. While descending to 500 feet AGL at 480 knots ground speed, a large bird struck the left side of the center windscreen. The impact shattered the center windscreen, bent the canopy bow aft, and ruptured the forward canopy. Col Klungseth was momentarily stunned by the wind blast and flying debris. Capt Dickerson assumed control of the aircraft.

While initiating the climb, Capt Dickerson declared an in-flight emergency and elected to initiate a divert. When Col Klungseth assumed control of the aircraft, he was unable to communicate with Capt Dickerson or hear ground communications. Col Klungseth elected to return to Bergstrom AFB rather than divert. His face curtain ejection handle was extended approximately 10 inches due to the impact and wind blast. Forward visibility was only available through the quarter panel with his head partially in the slipstream.

En route to the field, Capt Dickerson broadcast their intentions to the Bergstrom Command Post and their need for a chase aircraft — all in the blind. Both crewmembers were unable to hear each other or ground communications until the aircraft was slowed to configure.

Col Klungseth performed a flawless landing and approach-end arrestment in a critically damaged aircraft. After egress personnel disabled the front ejection seat, the crew ground egressed. The timely actions of this crew in analyzing the situation and performing the emergency recovery, as well as displaying exemplary aircrew coordination, prevented the loss of a valuable Air Force resource.

WELL DONE! ■

*U.S. GOVERNMENT PRINTING OFFICE 1994-573-261/84002

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.

FIRST LIEUTENANT

Richard S. Groggel

80th Flying Training Wing
Sheppard AFB, Texas

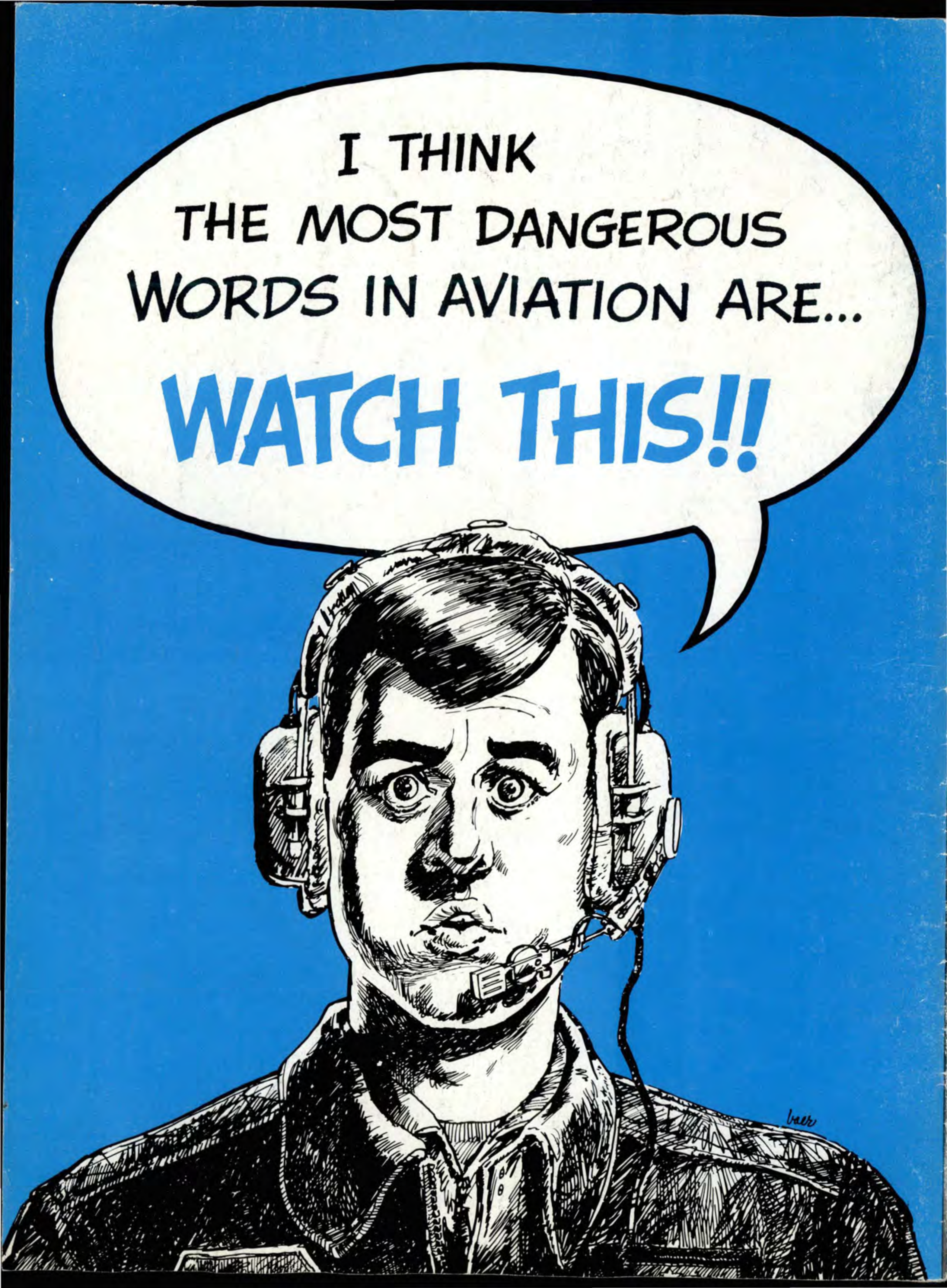
■ First Lieutenant Richard S. Groggel and another instructor pilot were flying a T-38 two-ship formation in support of a student low-level sortie when their aircraft sustained a major bird strike. They were flying as lead in tactical formation, approximately 400 knots indicated airspeed, 500 feet above ground level, in straight-and-level flight. The pilot in the front cockpit was flying the aircraft at the time of the strike. The bird, an adult turkey vulture weighing approximately 4½ pounds, impacted and penetrated the upper left quadrant of the windscreen.

The pilot in the front cockpit received fatal head injuries from the impact. Lt Groggel, who was uninjured, assumed control of the aircraft and began an immediate climb. Once out of the low level structure, Lt Groggel relayed the situation to his wingman and directed a rejoin. The wingman confirmed the damage to the aircraft, and the front cockpit pilot slumped over to the left.

Lt Groggel then directed the formation to divert to the nearest airfield 30 NM away. The formation declared an emergency and relayed the need for immediate medical attention. In light of the front cockpit pilot's condition and normal flight control response, Lt Groggel and the wingman agreed on a modified controllability check to expedite recovery. Lt Groggel lowered the gear and flaps while being vectored to a 51-mile final.

The wingman confirmed all three gear were down and locked. Lt Groggel continued the approach and, despite limited forward visibility, executed a flawless straight-in approach to a full-stop landing.

WELL DONE! ■


I THINK
THE MOST DANGEROUS
WORDS IN AVIATION ARE...
WATCH THIS!!
baer