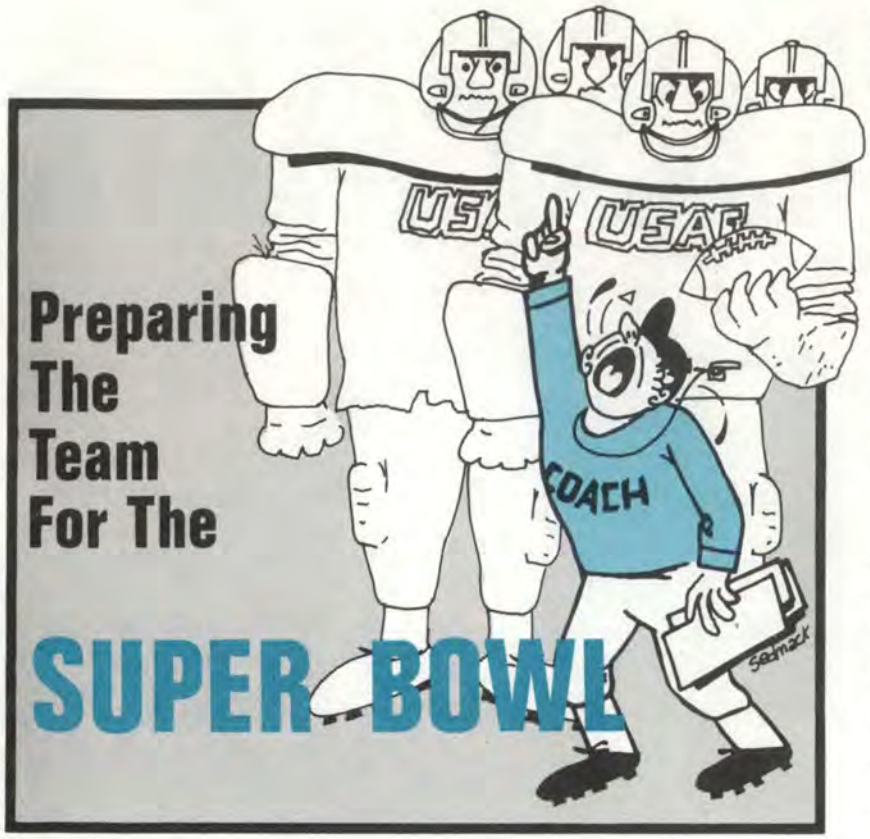
AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS JUNE 1980

ON FIGHTER INSTRUCTION • **Thunderstorm Avoidance**

Get a Bigger Thumb —high performance and warp speeds • **Suds Duds** —foaming falls flat



By COLONEL GARY R. TOMPKINS • Directorate of Inspection

■ On the surface, the goals of readiness and safety appear to be mutually exclusive. But, are they?

Realistic training to meet expanding mission requirements in today's threat environment has inherent risk. Some tradeoff decisions between force preparedness and "acceptable" risk are inevitable; they must be based on how imminent we perceive combat to be, and against what odds, in what place, and to meet what objectives. Resource protection – people and equipment – is equally important in peace and war; attrition unrelated to an *achieved* objective is equally abhorent in each. Yet losses will take place if we're serious about meeting the objectives of either.

In some respects, the apparent dichotomy between readiness and safety can be equated to the problem faced by a pro football coach at the start of the season. The owners demand a winning team, and so do those of the competition. The player selection process is over except for the final cuts, the injury losses, and those pulled up from the reserves. You know what the old heads could do *last* year, and you know what the rookies – trained against different standards – could do in a different league.

The front office has set the budget, and your resources are finite – only a few deep in most positions. Your scouts give you a feel for the competition, but you know you must adjust your game plan as their – and your – strengths and weaknesses are demonstrated. Most of the players are in good physical shape, but few are game-ready. Some old heads hope to rely on past experience, and some new heads aren't prepared for the rigors ahead; you must determine how to train and motivate them all.

As a coach who has been through previous league playoffs, you know what it takes to win. You also know that if you push too hard, too fast you'll commit the worst possible sin: Needlessly injure the players in an exhibition game or, worse yet, in scrimmage – neither of which count in league standings. You also know that everything done – short of a major injury – to improve conditioning, to instill the basics, to learn the plays, to know the competition, to build personal confidence, to create team spirit, and to stimulate judgment and flexibility will get the best out of what you have. It takes drill and more drill to get it right; but, too much will burn them out, increase injuries, and peak them on Wednesday instead of Sunday.

Our "games" of course, are not scheduled; we could be called to play any day. We hope that enemy scouts in watching our scrimmages will advise their coaches to postpone the challenge match week after week. To keep game-ready, we employ a surrogate enemy (e.g., aggressors), drill the specialty teams, occasionally play exhibition games with the whole team(e.g., Red Flag), and have even been known to play in the minor leagues (and perhaps learned some wrong lessons). Our owners, however, insist we remain in the big leagues, only super powers play in the Super Bowl.

In preparing for the game we hope won't come, we work on new and tougher tactics, buy new and expensive equipment, and try to learn from those who played in games that counted. Many of those old – and not so old – heads retire from the active rolls or are transferred to the front office and leave the training of the yearly influx of rookies to those they themselves have trained. They remember many bright young faces who soon left the field grimacing in pain. They feel personally responsible for not preparing them better – showing them how to survive. And yet, they feel equally as strong about having a winning team.

Fortunately for their peace of mind, they know that those they have taught to survive and forced to learn the basics will have a better chance to play in future games – and win them. ■

UNITED STATES AIR FORCE

AEROSPACE

SAFETY MAGAZINE

JUNE 1980 | AIR FORCE RECURRING PUBLICATION 127-2 | VOLUME 36 | NUMBER 6

AFRP 127-2
Entered as a controlled circulation rate publication (USPS No. 447-810) at Terminal Annex, Los Angeles, CA.

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SPECIAL FEATURES

REGULAR FEATURES

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

Get A Bigger Thumb

■ **Question**

In the aircraft you currently fly, how many Gs can you pull without causing structural damage?

Answer

If you responded with a nice firm number like, 8.5 or 7.3, you probably allowed yourself to be conned into spouting the aircraft maximum operating G for a clean aircraft at low combat operating weight. To give a correct response to this question first requires an answer to a series of questions as follows:

What weight?

What airspeed?

Symmetric or unsymmetric maneuver?

What stores are on board?

Where are they positioned?

Most WBFPs* develop thumb rules about things like these. Those with small thumbs limit their effort to memorizing the highest value shown in the Dash One under operating limits. These are the guys who think the F-4 is an 8.5 G aircraft and the F-15 is a 7.3 G aircraft. You F-4 drivers, how many times have you been in a rat race below 37,500 lbs gross, clean configuration, below .72 Mach, and wanted a nice, clean, no-rolling pull-up? Probably never, and yet that is the only time you are allowed 8.5 G. Even if you were clean, 37,500 lbs gross and .72 Mach, just adding a roll to the pull reduces the max allowable G to 6.8.

Before we go farther, we need to have a basic understanding of two very important terms. These are:

Symmetric Maneuver A pitch maneuver where the wings are equally loaded by the lift produced from the changing angle of attack.

Unsymmetric Maneuver Everything else. Any maneuver which introduces a rolling or yawing motion.

You guys with the little thumbs should remember that for any maneuver which involves simultaneous roll, you must reduce the allowable symmetric G by 20 percent. If you refuse to accept this, and you are an F-15 driver, then you are going to bring your bird home with tiny wrinkles in the upper wing skin. Perhaps before finding these wrinkles, you should read "Betting the 50" in *Aerospace Safety*, May 1980.

Now, let's move on to things for the big thumbs. When a 40,000 pound aircraft pulls 7 Gs, symmetrically, the wings are actually carrying a load of 280,000 pounds. In a symmetric maneuver, each wing is expected to carry half the load. However, when the pilot commands a roll, the aileron on one wing deflects down producing a higher angle of attack and additional lift on that wing. If 7 G symmetric was the design limit load for this aircraft, the wing was already loaded to its maximum, the roll has caused that wing to exceed its design capability, and it goes home with a funny shape.

"Then why can't the designer give me a 40,000 pound 7 G rolling capability," you ask? He could, but his airplane comes out so heavy that his proposal never wins the contract and he winds up designing plastic models for a toy company. On the remote possibility that some misguided soul buys his airplane, the new operator's voice would join the song about the aircraft that "goes down fast, up slow, and takes three counties to turn around."

*World's Best Fighter Pilots

MR. JOSEPH F. TILSON
Structures Engineer
Directorate of Aerospace Safety

At this point, I hope you are willing to accept as fact that the roll maneuver greatly increases the load on the wing. Check your Dash One and you'll see that references to roll rates usually assume very modest rates (e.g., 120 Deg/sec).

Today's aircraft have max roll rate capabilities far greater than that. The higher the roll rate, the more severe the loading. If any of you should pull maximum symmetric G and then add maximum roll rate, you would be well advised to make sure your personal affairs are in order so as to minimize the confusion for your dependent survivors.

Now for some heavy stuff that will take both thumbs and maybe even the third one (some Marine Jocks I used to fly with were all thumbs).

Did you know that even though you are within weight and airspeed, you may not be able to pull max G? The next limiting factor you must consider is the configuration of external stores. All pylons and even the stores themselves are not necessarily designed to withstand max G loads. You need to study the Dash One to find out which limit goes with which store. Failing to do this may result in your having to fill out a Dropped Object Report, followed by an engineering analysis report that says, "There was no evidence of fatigue or stress corrosion; the pylon support failed due to structural overload." (That means *you* did it!)

Now for you F-16 jocks who think your angle of attack limiting system protects you from an over-G goof – think again! No matter what is hung on your F-16, the angle of attack limiter treats your aircraft as though it were in a clean configuration. If you have external stores aboard, you are going to have to drag out your trusty thumb to be sure. There is a similar system under development for the F-15, but it will be several years before you see it in your aircraft. However, this new system, like that in the F-16 system, may not cover you all the time.

So, until such time as Darth Vader returns to threaten the intergalactic social order, you will have to study the Dash One with professional care and develop some rules of thumb which you and your beautiful flying machine can live with.

It would probably be helpful if each squadron conducted a seminar to develop some simple, meaningful thumb rules for operating its assigned aircraft within limits. Unfortunately, most offensive and defensive maneuvers are unsymmetrical and reduce the G limits. Maintaining energy means keeping the Mach up, and that further reduces the G limit. It just seems like you can't win. None of us is naive enough to believe that you are going to be thinking about weight, airspeed, unsymmetrical maneuvers, or what's on the outboard pylon when you are pressing in for the kill, or worse yet, the number 2 WBFP is closing at 7 o'clock. What we really hope you try for is a general reduction in *unnecessary* over-G occurrences. That way the odds are better that your flying machine will take all the abuse you give it should the real need occur. ■

On Fighter

By **MAJOR GARY L. SHOLDERS**
Directorate of Aerospace Safety

■ *You are about to be treated to another installment in the continuing saga of Bear's Theory of Fighter Aviation. You know, I've heard tell that some of you folks out there are not happy with some of my more outrageous statements that have recently appeared in print. That's good – the way I look at it, everybody in the world needs to vent his spleen once in awhile. I invite any of you folks who have heartburn over the content (or lack thereof) of my masterpieces to provide a little counterforce. I guess that there's more than one way to skin a cat. Of course I know that I'm right and that anyone who disagrees with me will end up in my pipper. Who ever heard of a fighter pilot who is wrong?*

Today, I want to talk about fighter instructors. I recently took a trip to a few TAC bases. I was amazed at the attitude of some of the RTU IPs that I talked to. There was a strong undercurrent of hostility hanging in the air toward the instructor job. A lot of guys were just *positive* that the US Air Force was wasting their fighter pilot talents in a useless assignment. The MPC type that I was traveling with said that he has a heck of a time giving away instructor assignments to the RTUs. Apparently *nobody* wants to do it. Well, I have a few words to say about that.

You know, if there's one thing that is a bottom line in the IP business, it is that you, the instructor, are the most important person in the whole airplane driving world. Make no mistake about it. *You* are the guy with the most influence, the most impact, and the most responsibility. *You* are capable of singlehandedly shaping the attitudes and flying skills of the young and impressionable butter bars with whom you fly. *You* are the first example setters, leaders, teachers. *You* are guys who are tasked to make hard decisions about whether Harvey Knucklefutz belongs in the cockpit of a fighter. You're it – the single most important man in the fighter pilot's budding career.

OK, OK, it's an important job, but it's boooooooring. Right? Well, almost. The repetition, the fact that the flying is well below your capabilities, the idea that you have to watch the same mistakes over and over again – that's boring. It sure isn't boring the very first time that some ham fist tries to kill you. It sure isn't boring when you turn some empty headed, utterly dependent butter bar into some semblance of a fighter pilot. It sure isn't boring when your student walks up to you at the completion of his training and says, "Thanks, I really learned a lot about being a fighter pilot from you." What I'm trying to say is – yeah, it can be boring, but every day in the life of an RTU instructor carries a potential to really do somethig worthwhile.

If it's such a wonderful job, then why do so many RTU IPs bad mouth it? I have a theory on that, too. The fact is, there comes a point in an IP's career where he just gets "burnt out." The repetition, the lack of

Instruction

proficiency that is endemic in the IP business begins to play on the nerves and overshadows the good parts of the job. Let me tell you a little story about how that happened to me.

When I was a new IP in RTU, I made a couple of solemn vows. One of those vows was that I would never holler at a student (having been the victim of an insufferable screamer in UPT, the memory stuck with me). Well, to make a long story short, one day I was sitting in the back seat doing air combat maneuvers (ACM) with some guy who was about as good at air-to-air as I am ballet dancing. This guy was floundering all over the sky and refused to point his nose in the general direction of the bad guy. Without even realizing it, I was sitting in that back seat just screaming bloody murder at this poor character. When we got on the ground, I was amazed that the voice coming out of the tape really belonged to me. I made another solemn vow that very day – it was time for me to get out of the RTU business. The great revelation occurred after about 2½ years as an IP.

Looking back on that tour as an IP, I have no regrets. I learned a heck of a lot about airplane flying and how to deal with people. I think that I added something positive to the careers of several aspiring fighter jocks. I was fortunate to be able to leave the business shortly after my "burnout." In short, I think that the RTU IP job is an excellent place for a junior captain on flying status – but, pleeeeese MPC, don't make me do it again!

OK, now that I've convinced all you guys to run out and change your dream sheet, what are some of the wonderful lessons that I learned about IPing that are worth passing on to the world? The following thoughts are lessons that I learned during my IP career that weren't immediately apparent as I began my tour.

LEADING Some time back, I wrote down a few of my thoughts on flight leaders (*Aerospace Safety*, August 1979). I found that the main thoughts outlined in that article apply in spades to the instructor. There is nothing more disgusting than to watch some turkey who doesn't have his act together try to lead a group of newbies around the sky. One rotten apple in the barrel of IPs is enough to cast doubt in the students' minds about the credibility of the entire fighter organization. A new guy quite naturally turns off a troop who doesn't know how to lead. Believe me, it is darn tough to undo the damage done by one of those guys. The problem is, as you get more and more comfortable with the RTU routine, you tend to prepare less and less for each mission. Without realizing it, the IP can slip into a rut where he forgets how to effectively lead a flight. He becomes less proficient in the airplane and less tuned in to the needs of his students. He basically turns himslf into one of those "rotten apples." I've personally witnessed, for example, IPs at the front end of a flight who are unable to control four guys on a basic range mission. A good IP has to consciously fight any tendency to slack off on flight lead responsibilities.

Our job is to produce fighter pilots, not nickelodeons.

COMPLACENCY We've all read about 6 million words on complacency. If there's one place in the world where that little gremlin will rear up and bite you on the butt, RTU is it. Every IP has his own complacency stories; here's one of mine. One day, I was sitting in the back seat on a transition mission. My stud was a good stick – he'd done super on the first two sorties. I was semi-relaxed, hands on the rail, watching Captain Kangaroo on the tube while this fine young jock was performing a simulated single engine approach. I was suddenly jarred into instant wakefulness by a variety of screams, tones, and a sudden sinking feeling. No biggee, says I, and grabbed hold of the stick while calmly telling my stud to "gimmee burner" (the F-4 burner cannot be selected from the back). You guessed it – one each Air Force issue lieutenant in the front chair was too panicked to perform that little chore. After a somewhat tenuous level off at about 6 inches off the deck, I emerged from the cloud of dust with a slightly

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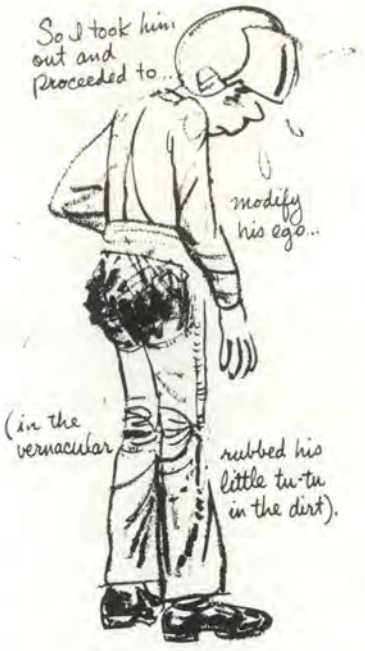
different outlook. One more thought about complacency: most of you people have probably heard the old saw about the most dangerous airplanes in the sky being a flight of two IPs on a cross-country. Well, I'm here to tell you, the old saw is true. I have a story about that, but I'm too embarrassed to tell it in public.

INSTRUCTION I guess there are about ninety-eleven different philosophies on the best ways to instruct somebody. I think, though, that there are a few universal truths which should not be ignored. One of those truths is that everybody is different. Obvious, right? Well, it really isn't so obvious when a guy first becomes an instructor. In every RTU, there are about three jillion written words which describe in exhaustive detail exactly how each little maneuver is to be flown. There are about 450 stan/eval toads who try to standardize everything from traffic patterns to the squadron snack bar; there is a syllabus of instruction that dictates which things get done when. What a zoo!! Nowhere is there a nice little piece of prose which states that different people need different approaches to training. If you are one of these guys who revel in standardizing your mind and body and use that same approach to each student, then you aren't going to be very effective. As a teacher and leader, it is incumbent upon you to recognize that different folks respond to different strokes.



Let me digress a little and tell a story about that. I once was associated with a student who was definitely a one-of-a-kind operation. The guy carried a log around on his shoulder – it didn't seem to faze him that all of us IPs were doing our best to push the right button. We were all concerned because we recognized that he really had the potential to become a great fighter pilot (he was self-

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confident to a fault, aggressive as hell, and never let an opportunity pass to give somebody a ration). Anyway, one day I flew with him. I figured that there was only one way to get to him. So, I took him out and proceeded to modify his ego (in the vernacular, rubbed his little tu-tu in the dirt). For 11 BFM engagements in a row he started out at my 6 o'clock and ended up in my pipper. It was a wonderful thing. When we got down, this kid was worn out, humble and ready to learn. He needed that.

Another universal truth that escapes a lot of IPs is the fact that you are teaching a pilot to *fly his own airplane*. Doggone, you just can't turn a guy into a thinking, breathing, *responsible* fighter pilot unless you give him an opportunity to make decisions and suffer the attendant mistakes that go with poor decisions. I think that too many guys sit in the back seat (or the other airplane) and yap, yap, yap like a magpie; they just won't let up long enough to let the guy think for himself. These same people sit in flight briefings and play 20 questions. They turn the stud into a walking regulation jukebox – stick in a nickel and out pops a regulation. This in itself wouldn't be so bad if they actively encouraged discussion of basic airmanship principles, but somehow it seems that there just isn't time. So, what to do?

The solution is simple – at all levels of supervision, especially at the IP level, we are shooting ourselves right in the big toe if we don't keep our basic objective in sight. *Our job*

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is to produce fighter pilots, not nickelodeons. We need to concentrate the bulk of our efforts on stuff like: what happens when the airplane departs? Why is radio discipline important? How does the airplane feel when it's max performing? Etc, etc. It's unfortunate that some RTU IPs don't have to live with the guys they push out the door. If they did, maybe they'd pay a little more attention to basic airmanship.

One last thought on instructional technique. You know, I perceive that in the last few years we have somehow grown a generation of nice guys in the fighter business. I've watched too many IPs sugar-coat a bad mistake by one of their students. "You know Harv, I really hate to bring this up, but do you remember the time that you mistook me for the dart . . ." Time was that when some character screwed up, he knew it. I think that there are too many people around who are trying too hard to fulfill their student's psychosocial needs and not enough time solving the basic problem. We have got to recognize that the cornerstone of good fighter aviation is discipline. One of the first lessons that an aspiring fighter pilot must learn is that the difference between life and death in our business is the personal discipline that he possesses. He must learn early to take his lumps and to recognize that the lumps are for his own good. I don't think that the average newbie understands that; he doesn't recognize that the most trivial little mistake can be magnified into dead buddies in a combat situation. As his IP, you must hammer this point home early. When he makes a mistake, nail him to the wall – every time.

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Now that I have made three main points, I will sign off with a true story that I think perfectly illustrates what happens when a bunch of instructors don't do their job right (unfortunately, examples of IP success are usually taken for granted): there was once a young nugget who went on an ACM ride. He was educated exactly as the syllabus dictated – he had been standardized, questioned, checked, and his head was full of facts. During that ACM ride, he somehow got himself into a negative G situation. He perceived that he was out of control as his IPs had told him, "If the airplane doesn't do what you want it to do, it is out of control." Now this nugget sure as hell didn't want to have neggies on his grecian body, so he went through the out-of-control procedure, which consisted of pushing forward on the stick. After a few thousand feet worth of red eyes, he and his airplane decided that they didn't like each other anymore and they parted company. The airplane clobbered the ground in controlled flight sans pilot. How 'bout them apples?

Do you think that that kid was at fault? I don't. ■

DEFENSIVE FLYING

By CAPTAIN DENNIS STORCK
Directorate of Aerospace Safety

■ A few years ago, a nationwide education campaign known as "defensive driving" was initiated to decrease the number of motor vehicle accidents on our nation's highways. Airplane drivers, believe it or not, we have a similar program. It's called "see and avoid." Judging from 1979 statistics on near midair collisions (NMACs), see and avoid definitely needs more publicity and attention in our effort to reduce those close encounters. This article will present the 1979 NMAC statistics, focus on the hot spots to be particularly aware of, and show you why Air Traffic Control (ATC) can't always bail you out of those situations, (i.e., known but unavoidable system limitations).

The results from 1979 are in and they bear serious consideration. Reported NMACs in 1979 occurred below 12,500 feet. Sounds like the altitudes where general aviation aircraft fly? Right!!! Furthermore, a whopping 54 percent occurred below 3,000 feet above the ground (AGL). Now, that's getting a little too close to the cumulogranite for comfort. We can even narrow this down further, and see that 64 percent took place in airport traffic areas and along designated departure and arrival routes. The remaining NMACs reported occurred along military training routes, in military operating areas, restricted areas, or in other enroute airspace.

But, why should we worry? We military pilots fly primarily on an Instrument Flight Rules (IFR) clearance. Thus, ATC knows exactly where we are and where we plan to go. They'll call out all the bogies to us. Right? Well, let's take a closer look at that one. Actually, you're only partially correct. An IFR clearance does not put a magic bubble around you and your aircraft, keeping both eternally safe. All the IFR clearance does is ensure positive separation from other aircraft known to ATC.

The key word of course is *known*. This suggests that when ATC gives a traffic advisory, it will be given in time for the aircrew to take the necessary evasive action. This assumption is not necessarily true. In fact, in only 24 percent of the incidents reported were traffic advisories given in time to be useful. In many cases this occurred because ATC radar has some limitations that can create a large discrepancy between aircraft "known" to ATC and the actual number out there flying.

For example, the tracking of aircraft at low altitutes is extremely difficult and the probability of the system seeing every aircraft is complicated by several factors – the very place where all the action is, according to our statistics. Ground clutter can block out returns from small aircraft, making it difficult to tell who's who. Furthermore, many general aviation aircraft have no transponder, making identification next to impossible. Others, while equipped with a transponder, have no encoding altimeter and associated altitude readout. Thus, after the position of the target is identified, you still have no information as to whether it is high, low, or at the same altitude as you. This problem will grow more complex as the number of people experiencing the freedom of general aviation flying grows. And, this is precisely what has been happening in recent years.

Navigation facilities/aids can also be a factor. Line of sight problems associated with VOR/TACAN radials can cause aircraft flying at low altitudes and using these navigation aids to get off course unless accurate VFR references are available and used. Navigation facilities also contribute to the potential for NMACs by their location. When located adjacent to military airports and/or traffic patterns, the potential exists for an increased volume (or congestion) of traffic created by aircraft using these aids for navigation. Also, airports make excellent visual, landmarks.

As do highways – but they also pose a hazard when located near an air base. Many VFR pilots navigate by highway which can put them near or even within the base traffic pattern. For example, a recent Hazardous Air Traffic Report (HATR) concerned a civil aircraft flying along a highway which was very near and parallel to the final approach course at an Air Force base. The USAF pilot on final found the near encounter rather sporty. Fortunately, some alert controllers averted what could have been a more serious matter.

The proximity of nonmilitary airports to your origin/enroute/destination military airport should also be a consideration. Because the majority of general aviation aircraft operate under visual flight rules (VFR), ATC has neither knowledge nor control of when those aircraft will depart or where they will be going. Their flight paths are virtually unpredictable.

Finally, you should consider the weather (specifically ceiling and visibility) at your landing base, to help you determine where to be especially watchful for other aircraft. As both a military and general aviation pilot, I always thought the one time I didn't have to be concerned about those bug smashers was when the weather was delta sierra. Who, in their right mind, would be out there in marginal conditions, flying a single engine aircraft, whose performance is significantly affected by weather? Well, I soon found my opinion didn't represent the status quo. Those who do opt for this sporty adventure fly lower, just beneath the clouds. Prescribed cloud clearances are, therefore, not always adhered to. Thus, just when you've worked your tail off maintaining course, glidepath, airspeed, configuration, etc., and prepare to break out of the clouds, ZAPPO, you see someone tooling along traversing your flight path just beneath the clouds.

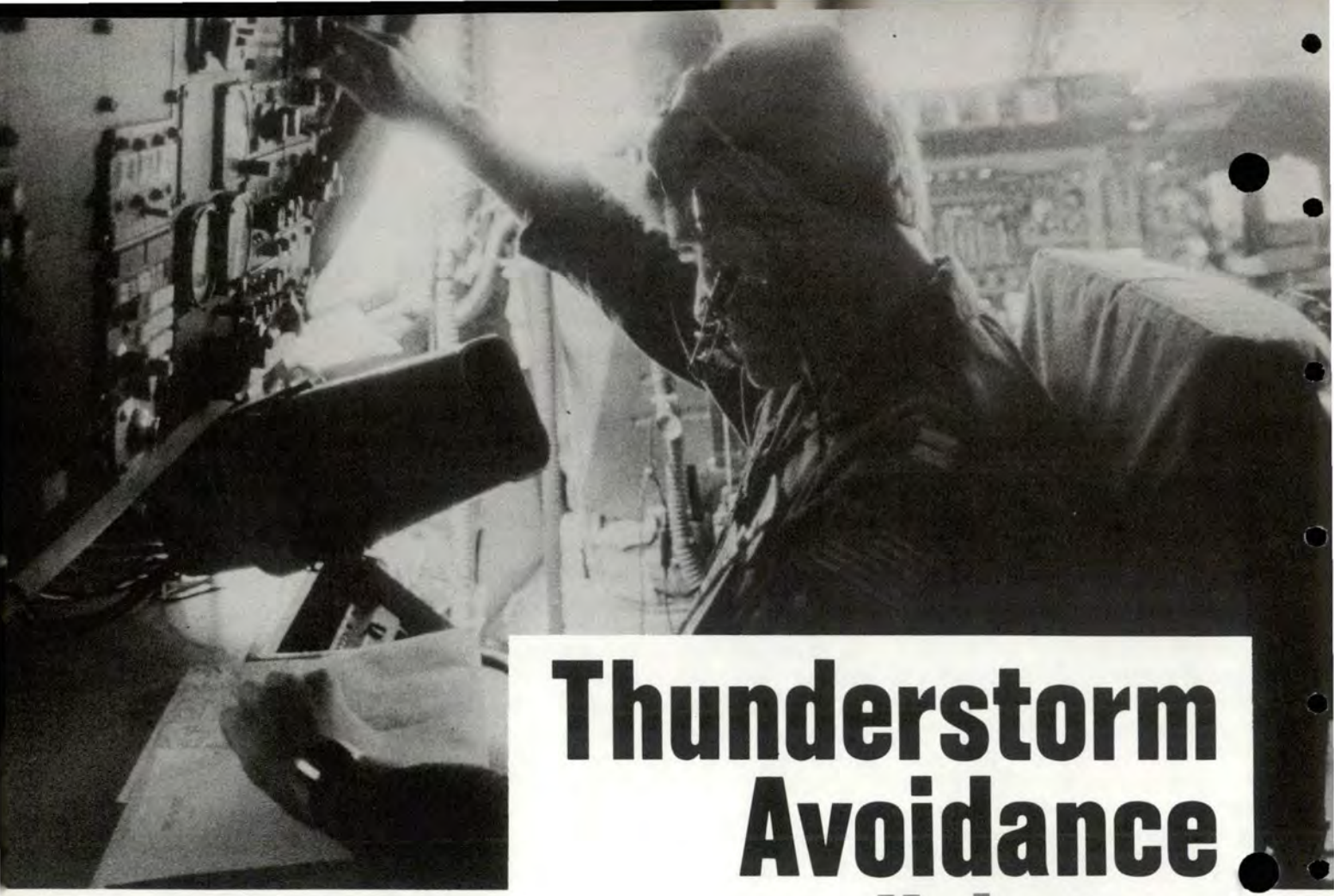
Many VFR pilots navigate by highway which can put them near or even within the base traffic pattern.

Remember, a good many general aviation pilots do not possess an instrument rating. They follow roads, railroads, power lines, etc. If the weather blocks their view of these "IFR" references, they'll descend as low as they can to be able to navigate. Hence, the potential for collision.

Are you beginning to get the feeling that if you don't look out for yourself, no one else will? Well, that should be sufficient motivation. I know that in most cases we're bigger than they are and, therefore, they should see us long before we see them. But often they don't.

And when they don't is usually at low altitude when we have the most tasks to accomplish (i.e., checklists, radio and altitude calls, instrument crosschecks, coping with windshear, weather phenomena, and perception difficulties). All these tasks are essential and we obviously cannot eliminate any of them, in lieu of another. We must, instead, include one more demand in an already demanding job, watching out for the other guy.

The central theme of all those NMACs statistics is that the closer you get to the ground the more attention you need to devote to "defensive flying." We all fly through congested areas and altitudes at one time or another and each flight crew knows approximately how much time will be spent there. Therefore, you should judiciously allocate when and where you should be looking outside. I know this is going to make the mission planning session last a little longer, but it could save your life. ■



Thunderstorm Avoidance Using Airborne Radar

By CAPTAIN ROBERT E. LEBLANC
Chanute AFB, IL

■ When you picked up this magazine and thumbed through the index and saw this article on thunderstorms, you probably thought: "What is all the fuss about thunderstorms, anyway? I have flown around and through thunderstorms without so much as a bump."

Many pilots become complacent about thunderstorms because they have made successful penetrations. As you all know, in the flying business, complacency can kill. The purpose of this article is to review basic principles of operating airborne radar for weather avoidance and scope interpretation.

The best advice I could offer about flying near and through thunderstorms is don't. But, you and I know this is not practical because of mission requirements. Since you must fly to accomplish your mission, let's zero in on what precautions and actions you can take to increase your chances of successfully negotiating thunderstorms. You spend time studying and practicing dash one procedures, instrument approaches and ATC procedures. When was the last time you took a look at AFM 51-12, *Weather for Aircrews*? A professional pilot must have a knowledge of weather, especially its effect on aircraft operations.

Successful encounters with thunderstorms begin with a thorough knowledge and understanding of thunderstorm characteristics and structure. There are many sources of information on this subject. Chapter 11, AFM 51-12 is a good place to start. Aircraft with airborne radar have an advantage when it comes to avoiding thunderstorms. Radar allows you to circumnavigate potentially dangerous cells. However, it does not guarantee success. It may keep you out of the strongest cell, but the innocent looking cell you decide to penetrate may pack a punch that exceeds the structural limits of your aircraft. Any thunderstorm is potentially dangerous. Successful penetration of thunderstorms with airborne radar depends on three factors: radar set calibration, your knowledge of radar principles and your skill in interpreting the radar scope.

The first factor, radar set calibration, is beyond your control except that you write up malfunctions in the aircraft forms. If the set is not calibrated, you will not be able to compare radar returns from one day to the next. Scope interpretation is a very subjective process. Without an accurate reference level, your previous experience will be of little use in your decision of which cell to penetrate.

The following radar principles apply to all airborne radars. Your particular set may be more sophisticated, but time and space do not permit detailed examination of specific radars. Let's begin by examining beam width.

BEAM WIDTH The radar beam used in most airborne radar is a narrow 3° pencil beam that is able to define the size and shape of thunderstorm cells. The size of the radar beam cross-section increases significantly at increased ranges. Figure 1 illustrates the width of a 3° beam at 30, 80 and 180 nautical miles.

Beam characteristics account for the phenomena of splitting cells. As you approach an area of thunderstorms, a cell may appear to split and form two separate cells. Although splitting may occur occasionally, in the majority of cases this is only an illusion caused by the finite width of the beam. For example, the beam width at 180NM is approximately 10 nautical miles wide. If there are two cells, eight miles apart, they will appear as one cell. As you get closer, they appear to split when the beam width becomes less than eight miles. If there is any precipitation within the beam, it will be displayed as if the entire beam were "filled" with precipitation targets. The target displayed on the scope will not appear to become weaker prior to splitting into two targets.

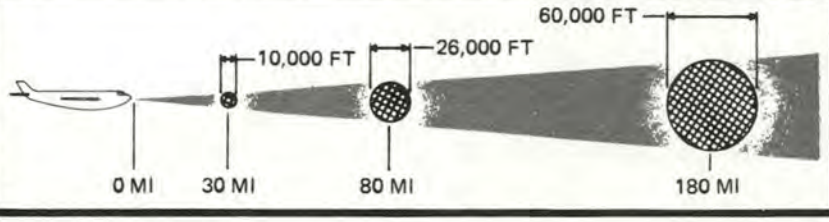


Figure 1. Radar beam cross-section illustrating width at 30, 80, and 180 nautical miles.

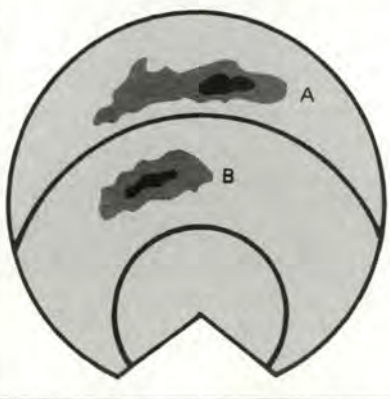


Figure 2. Effects of attenuation caused by other thunderstorms.

Figure 3. Contouring pattern illustrating precipitation.

ATTENUATION Attenuation is a reduction of the energy in a radar beam due to absorption in the atmosphere. Of particular importance to the pilot is the attenuation caused by precipitation. The intensity of strong cells can be masked by other cells that lie between your aircraft and the strong cell. Figure 2 illustrates the effects of attenuation. The left side of cell A appears to have a weak return. This is caused by attenuation by cell B. The left side of a cell may be more intense than the right side. Be suspicious of weak returns located behind other cells.

RANGE EFFECTS The power of the reflected energy received back at the radar set is inversely proportional to the square of the range. For example, if you observe two cells of equal intensity, one at a range of 10 miles and the other at 20 miles, the cell at 10 miles will appear four times stronger. This is why cells sometimes appear to become stronger as you get closer to them. Many radar sets use a Sensitivity Time Control (STC) to reduce the problem caused by range effects. All echoes of the same intensity displayed within the STC range will have the same intensity displayed on the scope. Know your set.

GAIN AND INTENSITY Gain and intensity controls can be very helpful if used correctly. The gain and intensity controls are usually set at a standard setting. If, for some reason, you must penetrate an area of strong cells, reducing the gain and intensity will have the effect of eliminating all but the most intense thunderstorms. On the other hand, if you wanted to avoid all areas of precipitation, increasing the gain and intensity will enable you to paint weaker returns.

CONTOURING Contouring is the ability of the radar set to blank out signals above a preset value. The most intense part of the cell can be blanked out al-

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Thunderstorm Avoidance continued

lowing easier identification of potentially turbulent areas. This feature is of limited value since it does not provide a quantitative measurement of intensity. However, contouring does show the gradient of precipitation intensity. Figure 3 is an example of contouring. A gradient is the change of a property over a specific distance. The gradient between A and B is much greater than the gradient between A and C. A tight gradient usually indicates an area of turbulence, because it is an area of weak vertical motion adjacent to an area of strong vertical motion resulting in wind shear. Caution is in order when the tight gradient is on the back side of a cell. The gradient may be the result of heavy attenuation.

TILT CONTROL The radar antenna should always be used to vertically scan thunderstorms. Thunderstorm intensity varies significantly throughout the vertical extent of the cell. The strongest updrafts occur in the mid-levels, between 18,000 and 30,000 feet. Changing the antenna tilt will ensure that potentially hazardous areas will not go undetected.

Radar returns of precipitation areas indicate the intensity of precipitation, not the severity of turbulence. Radar measures the reflectivity of the precipitation. Large drops reflect more energy than smaller drops. Hail, which is covered with a thin layer of water, reflects still more energy. Large water droplets and hail exist in strong updrafts. It is in these updrafts where turbulence is located. Therefore, we can generalize that areas of strong radar returns are indicative of turbulence. There is no rule of thumb that correlates the strength of the return with the severity of the turbulence. Beware! One day you may penetrate a strong return and not feel a thing; the next penetration of a weak area may result in a turbulent encounter.

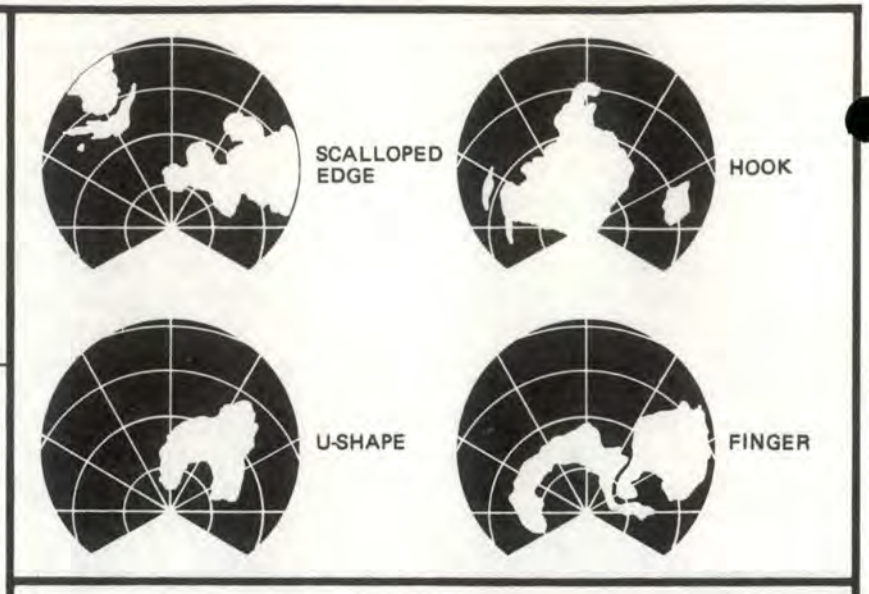

Figure 4. Radar echoes of severe thunderstorms.

The best way to avoid severe weather associated with thunderstorms is to effectively use airborne radar. Your ability to successfully circumnavigate potentially dangerous thunderstorms depends on your scope interpretation skills. Scope interpretation is extremely subjective. Improving your skill requires a detailed knowledge of thunderstorm structure and the capabilities of your radar.

Experience has shown that there is a good correlation between certain radar echoes and hail, severe turbulence and tornados. Figure 4 illustrates these echoes: scalloped-edge, hook, U-shapes and fingers. Cells exhibiting these signatures should be avoided. A scalloped-edge echo is a good indication of a rapidly changing and potentially severe thunderstorm. Finger shaped appendages are good indicators of hail. The hook-shaped echo is an indication of a possible tornado. Most tornados occur below 5,000 feet, so you must tilt your antenna down to detect a hook echo if you are above 5,000 feet. The cyclonic circulation associated with a tornado extends throughout the thunderstorm. Avoid cells with hook echoes – they are dangerous.

Avoid all severe cells by at least 20NM. Outside the cloud, shear turbulence has been encountered several thousand feet above and 20 miles laterally from a severe storm.

Airborne radar is a definite asset when circumnavigating thunderstorms, but do not be lulled into a sense of false security because you have airborne radar. Any thunderstorm packs enough energy to destroy any aircraft if you fly into the right area at the right time. Airborne radar helps, but it is not a substitute for tempered judgment. Be prepared! Review chapters 11 and 18, AFM 51-12, for the capabilities of your airborne radar and thunderstorm penetration procedures. ■

About The Author

Captain Leblanc enlisted in the Air Force in 1961 and worked as an aircraft mechanic until accepted into the Airman Education and Commissioning Program. In 1970 he graduated from the University of Utah with a BS in Meteorology and received a commission through Officer Training School. He received a MS in Meteorology in 1974 from the University of Wisconsin. He served as a weather forecaster at McCoy AFB, Florida and Kadena, AB, Japan. He is married and has three children. Captain Leblanc is presently a course supervisor in the Weather Training Branch at Chanute AFB, Illinois.

OPS topics

Secured For Takeoff?

■ A pilot was on a solo functional check flight mission in a T-38. The FCF went along smoothly until he attempted to fly inverted. At minus three-fourths "G" and 300 knots, he heard a thump. He rolled upright and found that control stick motion was severely limited to the left and aft. A controllability check showed that 210 knots with gear down and flaps up was the minimum controllable landing speed. He landed at 210 knots, losing only some tread from the nose gear tire.

A look at the aft cockpit revealed an upsidedown survival kit wedged against the control stick. It apparently had not been properly secured prior to takeoff.

This incident fortunately ended uneventfully, but it could have had disastrous results. Don't you agree?—Mr. Rudolph C. Delgado, Directorate of Aerospace Safety.

For Aero Clubbers

An airman flying an aero club C-150 reported the engine started losing power which finally led to a crash landing in rough mountain terrain. Why the engine lost power could not be determined, but a possibility could be carburetor icing. In any event, the pilot and passenger were lucky—they were uninjured, although the aircraft was totaled. The lesson from this episode is that flight over mountains or any rough terrain should be at an altitude that will permit maneuvering to a suitable landing site. The C-150 was being flown at 500 feet and when the engine gave out, there wasn't time to do much maneuvering. Remember the old saying about the "runway behind and altitude above."

Advice From an Engine

There's a saying just now being coined: "If you take anything for granted, it might take you." How true in the following scenario.

Crew chief finished preflighting an F-4, goes to lunch, leaving his mike cord in the right intake.

Ops and maintenance control agree to an early launch.

Two other crew chiefs sent to fill in and expedite the launch.

The A/C saw the cord but assumed the crew chief would remove it to launch the aircraft.

Substitute crew chiefs did not see the cord.

Engine start: engine sucks up cord. Sparks and fire from tailpipe.

Engine very sick.

Engine offers advice: don't assume, don't take anything for granted, or you too may spit sparks.

Airplanes by Eric Johnson

Did you know there are four forces of flight. They are Lift, Drag, Trust and Gravity.

Lift is like if you let a piece of paper and a paper ball fall down because air slows down the paper because the spread out wings make it go slower before it hits the ground. Drag is partly like lift because the front part of the wing is tilted up and if tilt up too much the plane goes backwards. Gravity makes the plane go down. Trust makes it go forward.

We thank Eric for his contribution, which may be of more general application than he thinks. As a matter of fact, Trust makes most things go forward.—From NASA's *ASRS Callback*. ■

SAFETY TROPHIES for distinguished contributions during 1979

CHIEF OF STAFF INDIVIDUAL SAFETY AWARD

Presented to Air Force personnel who made significant contributions to safety during 1979.

COLONEL ROBERT R. SAWHILL, JR.
Chief of Safety, National Guard Bureau

Colonel Sawhill managed the ANG safety program during a period of change marked by integration into the total force concept and increased responsibility and modernization. His safety program leadership for 91 flying units at 86 locations produced an all-time low in Class A flight mishaps.

CAPTAIN JONNY J. HEPLER
51st Composite Wing (Tactical), PACAF

As Chief, Weapons Safety Branch, Captain Hepler's efforts resulted in a reduction in explosives quantity distance waivers while freeing needed land for other essential facilities. This produced safer working conditions and enhanced operational efficiency.

CAPTAIN GEORGE M. WOLFE
388th Tactical Fighter Wing, Hill AFB, Utah

As flying safety officer for the 4th Tactical Fighter Squadron, his innovative trend analysis program and knowledge of aircraft systems led to significant cost savings and improvements in maintenance procedures. Through his efforts, deficiencies in boundary layer control, brakes, nose wheel steering and engine components were identified and corrected which provided a safer flying environment.

STAFF SERGEANT LARRY W. KERR
554th Civil Engineering Squadron, PACAF

As squadron safety technician, his initiative and professionalism produced outstanding safety support for a program involving $11 million, 750,000 military and 2,000 DAP civilian manhours, 275,000 local national manhours and 170,000 miles of general vehicle operations.

THE KOREN KOLLIGIAN, JR. TROPHY

Awarded to a USAF aircrew member for coping with a serious inflight emergency. Major Peters' handling of a serious aircraft emergency in an SR-71A, during which one engine had to be shut down while the other exhibited erratic performance and reduced thrust, resulted in a successful landing and saved the Air Force a valuable reconnaissance aircraft.

MAJOR DAVID M. PETERS
9th Strategic Reconnaissance Wing
Beale AFB, CA (SAC)

THE COLOMBIAN TROPHY

Symbolic of excellence in military aviation safety, The Colombian Trophy for 1979 was awarded to the 18th TFW. The wing flew more than 23,000 mishap-free hours in seven different types/models of aircraft while converting to the F-15. This achievement occurred while the wing flew a high risk, complex mission and participated in numerous exercises and deployments.

18TH TACTICAL FIGHTER WING (PACAF)

THE SICOFAA AWARD

Awarded by the System of Cooperation Among Air Forces of the Americas for excellence in aircraft accident prevention. For its significant accomplishments of flying 17,508 hours without a Class A or B mishap, while accomplishing a most demanding mission in a high threat environment, the 347th was selected winner of The SICOFAA Trophy.

347TH TACTICAL FIGHTER WING
Moody AFB, GA (TAC)

Excellence In Safety

Annually the Air Force recognizes a number of individuals, units and commands for outstanding performance in safety. However, competition is keen and not all those nominated can win awards, although their excellent performance earned them a nomination. Heretofore, only the winners of the safety awards received recognition. We think, however, that nomination for an award indicates demonstration of excellence and that, even though a nominee did not win the big one, some recognition is in order.

Space does not permit a narrative description of the accomplishments of the individuals, units and commands listed (however, the nominees for the Kolligian Award were all Well Done winners and their stories have been told in these pages); herewith then, a listing of those nominated for top performance in safety in 1979.

CHIEF OF STAFF
INDIVIDUAL SAFETY AWARD

Ssgt William L. Paskiet, Ground Safety Technician, 314th Tactical Airlift Wing (MAC), Little Rock AFB, AR.

Capt Charles M. Westenhoff, Squadron Flying Safety Officer, 1866th Facility Checking Squadron (AFCC), Rhein-Main AB, Germany.

Maj Kenneth S. Harvell, B-52 Flight Commander, 7th Bombardment Wing (SAC), Carswell AFB, TX.

MSgt Anthony E. Baur, Ground Safety Superintendent (ACC), Elmendorf, AFB, AK.

Capt James S. Shaddock, Flight Safety Officer, 5010th Combat Support Group (AAC), Eielson AFB, AK.

TSgt James O. Cheek, Ground Safety Technician, 5010th Combat Support Group (AAC), Eielson AFB, AK.

SSgt Steven W. Ulrick, NCOIC Ground Safety, 1974th Communications Goup (AFCC), Scott AFB, IL.

Maj David M. Mills, III, Chief of Safety 452d Air Refueling Wing (AFRES), March AFB, CA.

Mr. Theodore Zoska, Jr., Safety Specialist, 14th Flying Training Wing (ATC), Columbus AFB, MS.

Capt James S. Davis, Squadron Flight Safety Officer, 80th Flying Training Wing (ATC), Sheppard AFB, TX.

Mr. Kenneth L. Groves, Chief, Ground Safety, 1606th Air Base Wing (MAC), Kirtland AFB, NM.

TSgt Russell A. Glen, NCOIC Missile Safety, 321st Strategic Missile Wing (SAC), Grand Forks AFB, ND.

Mr. Richard C. Robeen, Ground Safety Officer, 1st Special Operations Group (TAC), Hurlburt Field, FL.

KOREN KOLLIGIAN, JR.
TROPHY

Maj Robert G. Little, Jr., 48th Tactical Fighter Wing (USAFE), RAF Lakenheath, UK.

Capt William T. Malarkey, 48th Tactical Fighter Wing (USAFE), RAF Lakenheath, UK

Capt Eric M. Coloney, 50th Tactical Fighter Wing (USAFE), Hahn AB, GE.

Maj Richard H. White 3d Tactical Fighter Wing (PACAF), Clark AB, PI.

Capt Richard L. Cline, 3d Tactical Fighter Wing (PACAF), Clark AB, PI.

Capt Michael W. Lichty, 31st Tactical Fighter Wing (TAC), Homestead AFB, FL.

Maj Jerome C. Hauck, 602d Tactical Air Control Wing (TAC), Bergstrom AFB, TX.

Maj Michael E. Brinkley, 314th Tactical Airlift Wing (MAC(, Little Rock AFB, AR.

Capt Robert E. Colley, 349th Military Airlift Wing (Associate) (MAC), Travis AFB, CA.

COLOMBIAN TROPHY

347th Tactical Fighter Wing (TAC), Moody AFB, GA.

28th Bombardment Wing (SAC), Ellsworth AFB, SD.

The 463d Tactical Airlift Wing (MAC), Dyess AFB, TX.

86th Tactical Fighter Wing (USAFE), Ramstein AB, GE.

917th Tactical Fighter Group (AFRES), Barksdale AFB, LA.

109th Tactical Airlift Group (ANG), Schenectady County Airport, New York.

SICOFAA FLIGHT SAFETY
AWARD

928th Tactical Airlift Group (AFRES), Chicago, O'Hare International Airport, IL.

436th Military Arlift Wing (MAC), Dover AFB, DE.

463d Tactical Airlift Wing (MAC), Dyess AFB, TX.

18th Tactical Fighter Wing (PACAF), Kadena AB, JA.

3d Tactical Fighter Wing (PACAF), Clark AB, PI.

28th Bombardment Wing (SAC), Ellsworth AFB, SD.

6th Strategic Wing (SAC), Eielson AFB, AK.

479th Tactical Training Wing (TAC), Holloman AFB, NM. ■

The best pilot in the squadron

By MAJOR MICHAEL T. FAGAN
Directorate of Aerospace Safety

■ Not long ago, as an unproductive happy hour wound to a close, several of my flying colleagues and I were gathered around the dregs of the last pitcher, which was rapidly approaching being too flat to drink. As is often the case when aircrew members "stand to their glasses," the conversation drifted from war stories through "where is ol' so-n-so," to memories of those no longer with us.

Some had been recruited by the airlines and some had gone to rated sup, but the talk centered on one of our number who had met an untimely end on a desert gunnery range. If there is a special eulogy for pilots, it is not delivered by a chaplain from a pulpit – it is spoken by his messmates in the bar as the happy hour crowd thins out and the beer gets warm. No congregation could be more sad-faced. No higher praise could be given. The ceremony is as predictable as any formal funeral. Sometimes there are even hymns of a sort, and green Nomex is a kind of vestment. It was an unfortunately familiar scene to most of us who had been around for a few years. Inevitably, someone said, "Yeah, he was the best pilot in the squadron." All who knew him nodded their heads in silent accord.

He certainly had been a memorable figure. He had been assigned to standboard as a lieutenant. An

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The best pilot in the squadron continued

academy graduate, his bearing and conduct were exemplary. He knew the dash-1 down to the publisher's initials and was an authority on all the "non-boldface boldface" published by the MAJCOM on down. Though he got to SEA too late for the hot part of the conflict, he extended until the very end and played a highly decorated part in the evacuations and the Mayaguez affair. He was always chosen to lead the tough missions and earned the total respect of his superiors at all levels. His exploits were legendary. He was the one who went to the development conferences and flew the test program. His physical appearance was striking, he was well ahead in his PME, he was always available when the schedule changed at the last minute, and he more than pulled his weight in the additional duty department. Besides that, he was a nice guy. No one was surprised when he was selected for major below the zone.

He was the best pilot in the squadron.

It does not pay to speak ill of the dead, but wait a minute! If he was so good, why is he dead? At the risk of asking a sacrilegious question, how about those other well-remembered colleagues who have been honored with the posthumous title of "best pilot in the squadron?" Is there something about being the best which is fatal? What good is being the best if it kills you? What good is having the best in the squadron end up in a box when he is needed in the cockpit? Let's take another look at this paragon of pilot virtues.

He was aggressive, ambitious, and confident. These are admirable qualities – –in fact, they are requirements for the job. There is, however, an important distinction between confidence and over-confidence, aggressiveness and over-aggressiveness and even achievement may be over-done, or done too fast.

He had required a little command assistance to transition into a new weapons system when he did, and no one was surprised when he got it. That he was killed on a range *was* a surprise. He had a lot of low level experience. He liked being down in the weeds, and he was good at it. The investigators found nothing wrong with the aircraft. It appears that he simply flew into the ground after pulling off the target. He either didn't hear the "knock it off" call or it came too late. In any case, he got low enough to prompt a call and apparently did not react to it prior to impact.

Could there have been a malfunction? He had previously demonstrated exceptional ability to bring the aircraft home when another pilot might have landed at an intermediate point, even though maintenance would have been inconvenient and the squadron would have bought a bunch more down time. He was good enough (and mission oriented enough) to take a bird with minor discrepancies, work around them, and get the job done. He was a mission hacker. "Ya gotta be tough . . ." he had said more than once. It probably wasn't a malfunction. He could have handled any malfunction small enough to be missed by the investigators.

The flight was a late afternoon launch, but there is no reason to believe that he had been fatigued. He was not a heavy drinking man and he had had no duties which would have conflicted with crew rest. Besides, during the Mayaguez mission he had demonstrated that he could perform when tired. He had flown sortie after sortie, on his own adamant insistence, even though there were more rested pilots available. He kept getting an airplane despite fatigue. After all, he was the best pilot in the squadron, and that was one tough mission. A little fatigue wouldn't have bothered him.

He bought the farm on a check-ride, but stress couldn't have been a factor – he always did well on checkrides. In fact, stress may actually have improved his

performance. At Kho Tang Island he earned a medal for going in on the hottest objectives. In one case, he went in a third time after being shot off twice. Now, that's stress! No . . ., he was not one to choke under pressure.

In the final analysis the report concluded that the cause of the accident was "pilot distraction" or "disorientation." In other words, what used to be called pilot error. But errors are not something one would expect from the best pilot in the squadron. On the other hand, if he had not "gotten caught," no one would have ever suspected that he had been disoriented or distracted. He had exhibited no such tendencies, or at least none had been recognized.

But it only takes once, and it's hard to make a habit out of having fatal accidents. The diagnosis has to come before the fact in order to do any good, and it's no easy task.

The distinction between the spirit of attack and dangerous lack of caution is not always readily apparent. What passes for aggressiveness may be found to be (or at least labeled) recklessness after an accident. Spirit, however, is a prerequisite, and an excess of caution is self-defeating. A force of timid pilots, relucant to take any risks, is not acceptable. Neither is a corps with the disdain for death of kamikazes (especially if training flights are required). What is required are pilots with the will to accomplish the task at hand, but the sense to recognize that a given result is not worth the loss of an aircraft and crew. This is especially true in a training environment.

During the early 70's, when Vietnamese aviation cadets were receiving primary training in the United States, one Vietnamese training officer would address each arriving class with the following safety philosophy: Each student must become the best possible pilot. That requires both nerve and skill. Since the mission doesn't end with a single sortie, a good pilot must be available to fight tomorrow. Good pilots bring both themselves and their airplanes home. Dead pilots are bad pilots. The loss of an airplane in training is as detrimental to the war effort as a direct hit from an SA-7. Sometimes it takes nerve to refuse an aircraft or abort a mission. That's part of what it takes to be a good pilot – nerve.

So what does this have to do with the pilot who is the subject of this tale? Little or nothing. Flying safety lectures will do him no good now, and apparently didn't do him enough good when he was alive. All those monthly meetings, special briefings, and bulletin boards weren't enough to keep him alive. Neither were his skilled, highly trained hands and feet, vast knowledge of regulations and procedures, or extensive experience. For all his education, ability, and desirable attributes, his final professional act was costly and wasteful. He destroyed a valuable aircraft and killed its pilot. At the very best, he did not prevent the loss, and he was the last person who could have done so.

The best pilot in the squadron? He's still in the squadron. He, too, knows the books, has the skills of a brain surgeon, and reeks of moxie, but he comes home with his airplane intact. Maybe it's that little bit of extra for Mom and the safety officer. Who knows? One thing is for certain though; the best pilot in the squadron will get the job done without unnecessary losses. While he's there to fly and fight, he knows that broken birds stay on the ground and dead pilots don't defeat anybody.

The pilot's epitaph will, unfortunately, be occasionally intoned in the bar while the ice melts and the happy hour crowd drifts out the door with the smoke. It's a traditional way to honor our dead. But in the meantime, let's be honest – here's to the real best pilot in the squadron. The one who's still with us. ■

NEWS FOR CREWS

Career information and tips from the folks at Air Force Manpower and Personnel Center, Randolph AFB, TX.

RATED PRIORITIZATION – setting the record straight

By COLONEL HENRY VICCELLIO, JR.
Chief, Rated Officer Career Management

■ Whether you're presently serving at wing, MAJCOM, or Air Staff level, you've probably heard of rated prioritization, and even may have seen some of its early effects on your organization and its people. Being right in the middle of this initiative, and being hit with dozens of questions daily from around the Air Force, we thought a bit of the basic background and thrust of prioritization – why it's here and what it's aimed at – might clear up some of the misconceptions we know exist.

The Rated Shortfall

The principal driving factor behind prioritization is our current shortage of rated officers – we could be over 2,000 pilots and 400 navigators short of total AF requirements by the end of fiscal year (FY) 1980, with projections through 1985 looking even worse. These shortages have evolved as the result of three simultaneous factors. First, due to sizable rated officer surpluses following the Southeast Asia (SEA) conflict, we were forced to program the lowest UPT/UNT rates in 30 years – we only trained 1,047 pilots and 594 navigators in FY79. Simultaneously, we began to see a substantial decrease in both pilot and navigator retention – we lost 2,946 pilots and 1,136 navs in FY 79. The third factor was an unprogrammed increase in the rated officer requirement beginning in FY77. All of these added up to a rapid transition from overages to substantial shortages – shortages that we'll be living with for a while, despite the fact that we plan on doubling the training rate over the next four years!

Handling the Problem

Given the unavoidable fact that we're facing rated officer shortages over the next few years, the next obvious question is how to best distribute that inventory? Where can we best afford the impacts of drawing down and operating with some degree of undermanning?

Traditionally, the Rated Supplement has acted as the primary "shock absorber" for fluctuations between the rated officer requirement and inventory. When requirements dropped off after the Korean conflict, for example, over 18,000 rated officers were assigned "behind the lines." As the SEA conflict blossomed, the number of rated officers in support duties shrank to around 4,000, only to grow again to the 7,700 mark after the conflict ended. As anyone who has been following this column realizes, the past three years have been marked by yet another sharp supplement drawndown, as the factors mentioned above began to reduce our rated overages. It became clear as early as two years ago, however, that simply drawing down the supplement wouldn't handle this situation – things were happening so fast that the supplement would disappear by 1981! This was unacceptable to USAF leadership and management. Not only does the supplement represent our surge capability during wartime, but a high-priority need for qualified rated presence at AFIT/PME and in such areas as engineering, maintenance and logistics, planning and programming, and at the precommissioning sources (USAFA, ROTC, OTS) has been well established.

What was called for was a plan that balanced the need for rated officers in each part of the requirement structure. How do crew force needs stack up against manning levels in the staff? How about high-visibility Joint requirements in JCS and overseas? Where do AFIT and PME fit in? These and other questions needed answering, and the answers weren't simple. Decisions from the top were needed, backed by thorough analysis and experienced judgment. To pursue the needed answers, a series of prioritization conferences was held, involving worldwide

participants from action officer level to the Assistant Vice Chief of Staff and MAJCOM Vice Commanders. The rated supplement and rated needs of each major USAF agency were studied in detail, with the mission and personnel management impacts of undermanning at various levels clearly spelled out. The plan that emerged for FY80 was based on several general findings:

a. Sufficient rated inventory will be available to man the crew and instructor (CCTS) line force at full strength, avoiding direct readiness impacts.

b. Resultant undermanning in the rated staff (wing through Joint/Air Staff levels) will have significant impact, but should not preclude basic mission accomplishment so long as identified "crunch points" can be sustained.

c. Career development opportunities for rated officers will still be available, but will be somewhat reduced in scope as rated staff and supplement manning is reduced.

- The supplement will face additional drawdowns in nearly all career fields, but identified "bottom line" levels in the key areas mentioned above and a few others will be sustained.
- AFIT/PME quotas will remain filled so as to provide a properly trained rated officer force for leadership/management duties throughout the requirement structure.

Based on these determinations, a detailed prioritization plan was developed which fully manned the line force and undermanned the rated staff by as much as 25 percent, depending on aeronautical rating (pilot/nav), level (wing, numbered AF, MAJCOM, etc.) and agency (MAJCOM/SOA). Only those staffs with truly unique responsibilities or a small, geographically dispersed structure remained unprioritized. The supplement target was fixed at around 2,450 pilots and navs, based on an analysis of the needs in several key career fields. This overall prioritization plan was used to determine manning entitlements for each MAJCOM or SOA, which in turn has developed its own internal distribution plan reflecting that agency's unique needs.

Prioritization and You

In attempting to discuss what prioritization might mean to the individual rated officer, the overwhelming bottom line is that each case will be worked on its own merit. Any individual will still be based on numerous factors, such as current unit manning versus prioritized "entitlement," the officer's qualifications and/or volunteer status, unit commander and MAJCOM inputs, and a view of the proposed move in light of what prioritization is trying to achieve from a broad perspective.

Despite this sizeable caveat, some generalities can be made concerning what prioritization will mean from a personnel management standpoint. First, rated duties will play a bigger part in career development than they have in the recent past. With reduced rated supplement opportunity being an inevitable and unavoidable by-product of the prioritization plan, extended supplement tenure and duty in career fields where rated presence is not truly critical will become a less viable option for the great majority of rated officers. Career progression through supervisory positions at squadron/wing level to staff duties at MAJCOM or even Air Staff levels will become the norm for those officers not qualified for – or interested in – those career fields where supplement opportunity remains.

A second effect of prioritization will be an increase in the average grade of officers assigned to rated duties. Following the Southeast Asia conflict, a conscious management decision was made to retain our combat-experienced rated assets – at the cost of sharply reduced nonrated accessions and abnormally low UPT/UNT rates. As a result, the rated force has matured to a point where we are somewhat heavy in field graders and short in the captain and lieutenant ranks. With full rated staff manning and the sizable supplement inventories we've enjoyed over the past few years, this had little

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impact – there were plenty of spaces calling for rated field graders. As staff manning and the supplement are reduced under prioritization, however, there will be some "overgrading," both in line units and in staffs at every level. While this will be quite noticeable at first – since it's a distinct change from utilization patterns established over the past decade – it should not reach serious proportions, and will slowly rectify itself as increasing UPT/UNT rates reestablish the grade balance in our rated inventory. While the utilization patterns stemming from prioritization certainly aren't optimum, they *are* decidedly preferable to the alternative that AF personnel planners in the mid 70's were able to avoid through other actions – aggressive RIFs of combat-experienced rated officers!

What's Needed to Make it Work

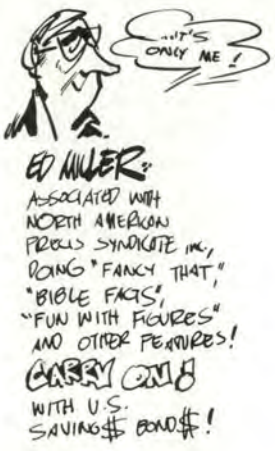
Transitioning from our current manning distribution to a prioritized structure in something less than a year won't be a simple matter. It will require close cooperation among everyone concerned and an expansive program of education so that those potentially affected will know what's happening, why, and what their options are. The drawdown of the supplement and staff agencies that have been manned at or above full authorized levels for many years will naturally have some impact. Mitigating that impact through understanding, cooperation, education, and *preplanning* is the purpose of this article and other similar efforts.

Who will be affected by prioritization? If you're currently assigned to a staff job at any level, completing a supplement tour in FY80, or otherwise "on the move" (DEROS, tour completion), you're a candidate for reassignment in accordance with prioritization directives. This doesn't necessarily mean that you'll be reassigned to an out-of-the-ordinary job or location, or even moved at all. It only means that you're among the large pool of officers potentially available to meet prioritization guidelines.

With this in mind, let's take a look at where our greatest needs for qualified officers exist during FY80. In the supplement, inputs are needed in engineering (AFSCs 26-29XX, 305X, 55XX), maintenance (40XX), instructor (0940 – principally at USAFA), and air traffic control (16XX). General ops staff jobs (AFSC 1495Z/2295Z) at levels from wing through MAJCOM are available worldwide, particularly in TAC, USAFE, and PACAF. A few jobs, both rated and supplement are available in the Departmental/Joint arena, as are a few in certain Separate Operating Agencies. To give you a better understanding of what prioritization means and what opportunities are available, we'll be updating AFP 36-6, *Assignment Information Directory* this summer. If you know you'll be on the move this year, or if you're interested in one of the above areas, talk it over with your commander and give your rated resource manager here at AFMPC or at your MAJCOM a call. Getting the right people – in terms of qualifications, availability, and volunteer status – into the right job is what effective rated management is all about, and that fact is one thing prioritization won't change! ■

About The Author

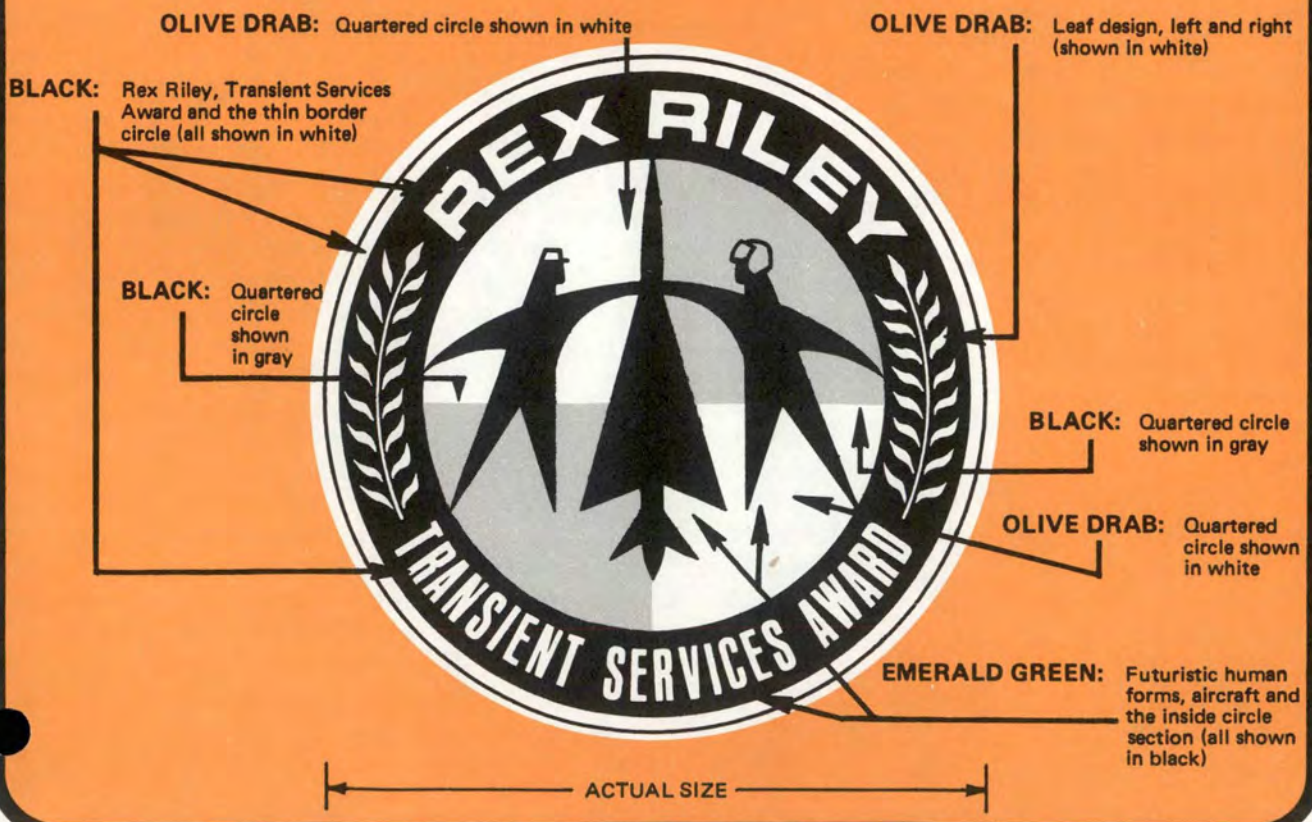
Colonel Viccellio is Chief of Rated Officer Career Management at AFMPC, and has written several articles for *Aerospace Safety* concerning key rated officer issues. His background includes tours in the F-100 and A-1 and duty as an F-4 ops officer, squadron commander, and ADO in the 33TFW at Eglin AFB, FL.



REX RILEY Patch

Optional Subdued Color Scheme

The wearing of Rex Riley patches is at the discretion of the unit commander. We have, however, received numerous inquiries about subdued patches, so we're passing on an idea for a subdued color scheme. If you go this route and are pleased, drop Rex Riley a note with a photo of sample. Rex Riley, AFISC/SEDAK, Norton AFB CA 92409.



SUDS

By MAJOR GLEN D. CHAMBERS
Directorate of Aerospace Safety

■ If you have to make an emergency landing after July 1, don't plan on a foamed runway.

The Air Force has decided to discontinue the practice of foaming runways for aircraft emergencies starting July 1, 1980 for all but seven of its bases.

The origin of foaming a runway in preparation for an emergency landing of an aircraft with gear failure is not exactly known. However, during the Korean conflict, the practice of spreading a layer of foam on the runway surface evolved. The foam used is actually a mixture of protein foam concentrate and water in a 6 percent solution. This means there are 94 percent water and 6 percent concentrate per gallon of foam product. The foam acts as a medium to carry water and help keep it in place on the runway surface.

The claim for using foam was described as allowing the aircraft to land on a "cloud of shock-absorbing foam." Three theoretical benefits where advanced by advocates in support of this practice: (1) Foaming reduces aircraft damage by cushioning the contact between airframe and runway, (2) Foaming reduces the coefficient of friction between the airframe and runway, and (3) Foaming reduces the friction spark hazard. Tests conducted by the US Navy showed that "(3)" was the only benefit supported by any substantial fact.

Different metals react in distinctive ways to the grinding action while sliding in contact with the runway surface.

> Sparking from aircraft aluminum is not considered an ignition source. Aluminum tends to "smear" off and coat the runway leaving a trace of metal behind and does not produce sparks as it slides.
>
> Titanium alloys produce very bright sparks when dragged along the runway. Navy tests showed that in all cases, ignition of fuel/air/foam mixtures resulted. Titanium is a definite ignition source, and foam is incapable of suppressing the sparks or resulting fire.
>
> Foam was capable of suppressing some of the sparks associated with stainless steel and other iron alloys. Success varied from approximately 50 percent to 100 percent.

While friction sparks may serve as the ignition source, a combustible mixture must be present to sustain the fire. Before an emergency landing is accomplished, the aircrew reduces the fuel load as much as possible consistent with the situation present. Therefore, the probability of fire rests wi[th] rupturing a full or partially full fu[el] cell or hydraulic lines and having this mixture ignited by sparks.

A recent study, coupled with an analysis of selected mishaps reports, was conducted by Headquarters, Air Force Inspection and Safety Center (AFISC), Norton AFB, to determine the effects of foam versus no foam for reported Air Force mishaps. In order to enable analysis, it was decided that the incident must meet the following criteria: (1) Be a declared emergency with gear problem or any other incident when foam was laid, and (2) Be a mishap that results in damage to an aircraft. This included unintentional wheels-up landings. Excluded were those that departed the runway surface since damage would be caused by other than contact with the runway surface and could not have been prevented by foam.

Two hundred and ninety-two mishaps were experienced during the 1968-1978 period. Of these, 1[34] landed on a foamed surface with the remaining 158 using an unfoamed

DUDS

runway. The study concluded:

No loss or saving of life can be attributed to foam or no foam. No fatalities resulted from the 292 mishaps.

The probability of fire, providing the aircraft remains on the runway, is essentially the same.

The two fires experienced when foam was used were minor in nature, easily extinguished by the fire department.

Three fires were experienced when foam was not used. Two of these fires resulted in no fire damage to the aircraft. The other aircraft received major damage due to the hard impact/slide with the runway, coupled with some fire damage.

Damage to the aircraft is essentially the same whether or not the runway is foamed.

When declared emergency landings were accomplished on a foamed or unfoamed runway, pilots with sufficient time to reduce or balance fuel loads, if needed, landed as safely in either case. Aircraft received about the same amount of damage. The psychological effect of foam also appears to have made no difference.

Sparks flew as a T-29 landed without nose gear. Runways have been foamed for emergencies such as these, but its benefits were more psychological than real and its use will be discontinued.

Elimination of runway foaming will save approximately $650,000 now spent annually for protein foam. In addition, aircraft engines that ingest protein foam must be removed/cleaned and inspected. Discontinuing foaming reduces associated maintenance costs and enables the aircraft to be put back into service sooner. There will be no savings in fire department manpower since the foaming vehicle is cross-manned by personnel from other crash fire trucks. Air Force is now considering other uses for the runway foaming vehicles that should result in additional cost avoidance or savings.

The seven bases which will continue using foam for runways are Travis AFB CA, Altus AFB OK, Dover AFB DE, Ramstein AB GE, Hickman AFB HI, Clark AB PI, and Yokota AB JA, in support of the highly expensive C-5 aircraft until there is a future basis for comparison with other large military aircraft such as the B-52 and KC-135 emergency landings on nonfoamed runways. ■

Who's minding the bird?

By CAPTAIN MICHAEL WETHERELL
3350 Technical Tng Group
Chanute AFB, IL

■ How many times have you heard your buddies sitting around discussing war stories? Sometimes it sounds like their daring and skill can get that jet to do anything. With their hands at the controls, the bird does magic. Maybe once or twice you've participated in these sessions yourself. Well, you guys do deserve a lot of credit – flying isn't easy, and we on the maintenance side of the house realize that. But let me remind you that other people helped make your success possible.

Do you remember the last time you flew? You walked out to the aircraft ready to take on the world. There, you were met by your young crew chief with a set of 781 forms. Come what may, that airman tried his level best to get you off the ground safely. Have you ever considered how valuable a service that young man or woman provides? Let me tell you a little about your crew chief.

Everyone has his own opinion of the crew chief: specialists can never find him; inspectors never get the right one for the right aircraft; support people swear he's always late for everything; pilots look out the corner of their eye at him as he explains about that little hydraulic leak; bartenders claim he drinks too much; and hostesses say he's the noisiest guy in the house. Some say he can cuss out his plane for 15 minutes, but if someone else says a bad word about his bird, he'll spend 30 minutes telling you how good it is.

Perhaps all this is true, but the crew chief is also one of the hardest workers I know. Rain or shine, he's out on the flightline working on his bird. Have *you* ever tried to hang a set of wing tanks on a broiling hot summer afternoon? Would *you* know what it's like to be so covered with grease, oil, JP-4, and hydraulic fluid that your wife and kids are afraid to hug you when you finally get home from work? Crewing an aircraft is a hard, thankless job.

Some people say the crew chief is the biggest complainer on the flightline. Possibly so, but put him in an office and he'll scream and holler even louder. The crew chief is proud of his work and he really cares about his bird.

Other than flying planes, fixing them is the most important job in the Air Force. The next time you fly, don't be in such a hurry to strap in and take off. Take a moment to say a few pleasant words to your crew chief. Pat that young airman on the back. He or she deserves it. ■

About the Author

Captain Wetherell entered the Air Force through OTS in 1974, attended the Aircraft Maintenance Officer Course at Chanute AFB and was assigned to the 363 TRW at Shaw AFB. For the next three years, he worked with RF-4C reconnaissance aircraft as a flightline maintenance officer and was then transferred to Chanute AFB where he is an instructor.

The fire's out... NOW WHAT?

By MAJOR TIMOTHY D. BROWN
Flight Safety Officer
Bergstrom AFB, TX

Fire suppressant applied to jet engines can result in serious damage unless proper cleaning procedures are used.

■ Often, there is a fine line between "just another incident," and a significant mishap that becomes an item of special interest. Recently, what would have been "just another incident" was pushed over the line. Following a barrier engagement, the pilot did not shut off the engines before he egressed the aircraft. The fire department elected to snuff the engines out using light water foam (Aqueous Film Forming Foam) to do so. The damage to the aircraft and subsequent cost of repair was relatively minor to that point.

Engines subjected to fire suppressant agents usually require shipment to depot for overhaul, and did in this case. Now, the reportable cost of the mishap has increased by about $60,000! But it's not over yet. The real cost to the Air Force for this mishap will include repair or replacement of any engine components which are damaged by the corrosive affects of the fire suppressant.

Chemical agents have varying corrosive effects on different types of metal. They range from protein foam (highly corrosive runway foam soon to leave the inventory) to Halon 1211 which is not corrosive. The longer the engine is exposed to chemical agents without corrective action, the greater the damage will be.

The cost of engines and engine repair is very high and is not decreasing. Therefore, the cost of a mishap can be greatly increased by failing to take timely action against the corrosive effects of chemical agents. The procedures vary but generally include a water wash ASAP after the incident, drying, engine teardown, preventive lubrication, and expeditious shipment to depot. In the subject mishap, the engines were not water washed, were not removed from the aircraft for a month, and were not shipped to depot until four months after the fact. The actual damage to the engines remains to be seen.

There currently exists a 2-J series tech order for all jet engines except the F-100 which is still being tested and the TF-30. The general procedures in T.O. 1-1-1, Chapter 4 can be used on the TF-30. The tech order describes procedures to be followed in case an engine is subjected to fire suppressants. It is important that every unit recognize the need to apply these procedures and knows where to find the information. The chart (subject to change, of course) should help.

ENGINE	TECH ORDER	PARAGRAPH
J-79	2J-J79-46, 56	11-22
T-85	2J-J-J85-56-1	3-11A
T-58	2J-T58	11-25
TF-34	2J-TF34-6	11-7
J-75	2J-J75-6	3-30 (Note)
TF-41	2J-TF41-3	3-9A
F-100	Under Investigation	
TF-30	1-1-1	Chap 4

It would behoove each flying unit to be familiar with the required procedures to use following fire suppressant ingestion into engines. If supervisors know where the procedures are written and ensure timely compliance, we've established one more way to keep "just another incident" on this side of that fine line. ■

MAJOR
David M. Jones

STAFF SERGEANT
Richard R. Bobo

CAPTAIN
Andrew A. Fairlie

STAFF SERGEANT
Douglas F. Wyman

1st Special Operations Wing
Hurlburt Field, Florida

■ On 20 August 1979, Captain Fairlie and crew were performing overwater training in a CH-3E Helicopter near Eglin AFB. They had just completed three water hoist patterns and were in a hover simulating a rope ladder pickup when the main transmission oil pressure reached 135 degrees centigrade (145 degrees is maximum allowable). Captain Fairlie began forward flight to cool the transmission. At 50 knots and 50 to 60 feet above the water, the crew heard a loud howl followed by a bang. The number two engine instruments went to zero. Captain Fairlie and Major Jones promptly performed the bold face for engine failure and began a turn toward the shore which was two miles away. Then the main transmission chip light illuminated, and fluid began running down both sides of the aircraft from the transmission area. Captain Fairlie declared an emergency with Eglin Mission Control as Major Jones sqawked emergency on the IFF. Burning fluid was now leaking into the cabin area. Sergeant Bobo called out that the aircraft was on fire, but there was no fire indication in the cockpit. Sergeant Wyman stated that the fire was aft of the engines. The pilots checked the instruments again and saw that both engine oil pressures were reading zero. Captain Fairlie, realizing he could not make land, began an immediate descent, radioed that they were on fire, and were going to land on the water. The crew prepared to ditch the aircraft. Upon landing, Captain Fairlie and Major Jones shut down the engines while Sergeants Bobo and Wyman fought the fire with the cockpit fire extinguisher. They were unable to get to the life raft or the aft fire extinguisher because the fire blocked the way so Captain Fairlie gave the order to abandon the aircraft. The crew egressed, and LPU deployments were successful. As the crew swam away from the aircraft, they saw three to four-foot flames coming from the transmission area. After approximately five minutes the fire went out, and Captain Fairlie decided to return to the aircraft. Upon boarding, Captain Fairlie used the aft fire extinguisher to spray all areas where the fire had been. He then helped the flight mechanics on board and used his survival radio to contact another CH-3 now overhead. The crew deployed the sea anchor, got out the bilge pumps, and checked the aircraft for seaworthiness. Within 45 minutes an Air Force boat from Eglin AFB arrived at the aircraft. After six hours of towing, with the crew operating the bilge pumps, the helicopter was safely recovered at Eglin AFB. The skill and prompt reactions of Captain Fairlie and his crew during this emergency prevented possible loss of life and saved a valuable aircraft. WELL DONE! ■

☆U.S. Government Printing Office: 1980—683-214/8

UNITED STATES AIR FORCE

Well Done Award

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

CAPTAIN
Chris R. Glaeser

CAPTAIN
Johnny R. Jones

50th Tactical Fighter Wing

■ On 7 August 1979, Captain Glaeser and Captain Jones were leading a two ship F-4E low level tactics mission 100 nautical miles west of Zaragosa Air Base, Spain. During the low level, at 480 knots the aircraft hit a large condor which shattered the radome, ripped eleven panels, and tore three spars on the aircraft fuselage. The bird entered the left engine intake, causing massive damage to the intake, generator housing, and compressor section of the engine. A portion of it passed between the intake and cockpits, where it penetrated the aircraft, severing electrical and hydraulic lines. Complete loss of radio and intercom transmissions from the front cockpit occurred as well as simultaneous jettison of the left outboard external fuel tank. The loss of the fuel tank, coupled with a simultaneous compressor stall of the left engine, caused the aircraft to yaw and roll. Captain Jones took control, recovered the aircraft, and started to climb. Turning towards Zaragosa and slowing to 300 knots, he directed the wingman to rejoin and confirm the damage to the aircraft. After ascertaining that Captain Glaeser was all right he returned control of the aircraft to him and continued to relay vital information to the wingman while coordinating the emergency recovery of the aircraft. With EGT on the left engine climbing and the oil pressure decreasing, Captain Glaeser decided to shut down the engine to prevent further damage. Enroute to Zaragosa, Captain Glaeser regained limited radio and intercom communications, and the crew accomplished the necessary checklist items. During the descent, the utility hydraulic pressure decreased below limits and caused significant degradation in flight control response. The crew decided to restart the left engine on final approach to improve controllability. When the landing gear was lowered, cockpit indicators showed that the right main gear was down but not locked, and the wingman confirmed the gear problem. The emergency gear extension checklist was initiated, without results. The crew decided on an approach end arrestment. Touchdown was planned to be on the left gear first, to minimize the danger of the right gear collapsing. This was accomplished successfully, and the barrier was engaged without further incident. The professional efforts of Captains Glaeser and Jones under the most trying conditions of an inflight emergency reflect the high degree of discipline and training which characterize Air Force crews. WELL DONE! ■

YES . . . YOU!

IP: BAILOUT . . . BAILOUT . . . BAILOUT!

STUD: Who . . . me?

Only minutes before, we had declared an emergency and started a descent. Our flight control problem seemed to be getting worse.

WHO . . . ME?

We had also completed the emergency check list for ejection. I adjusted straps and stowed loose items.

WHO . . . ME?

The IP reconfirmed he wanted *me* to get out of the airplane . . . *NOW*. Still . . . I couldn't believe it was happening.

WHO . . . ME?

I thought of my wife. I thought about being paralyzed. I thought of being afraid of dying.

WHO . . . ME?

I raised the handgrips.

W H O . . . ME?

I SQUEEZED THE TRIGGERS.

. . . ME!

The next thing I remember was seeing the chute above me. I smiled. On the way down I watched a fireball that only seconds before was the aircraft I was so hesitant to leave.