# AEROSPACE

SAFETY • MAGAZINE FOR AIRCREWS AUGUST 1979

**LOW ALTITUDE MISHAPS**
*How Not to Hit the Ground*

**BLUE FOUR NEWSLETTER**
*Who's Flying the Airplane?*

**DOING WHAT COMES NATURALLY**

# Low Altitude Mishaps

## or how not to hit the ground

**MAJOR TERRELL J. OSBORN**
Directorate of Aerospace Safety

**A COLD GRAY DAY**

■ You are a new guy in your tactical outfit and are excited about the unit mission. You look forward to "hedge-hopping" and "hassling" in the 300-100 feet AGL block. It's going to be a challenging job, but you know you are up to it. After all, you have almost 200 hours in the bird.

In your first two months in this outfit you fly regularly with your supervisors, who give you some constructive criticism. Overall, you are doing quite well. You have been stepped down to the 300-100 feet AGL block and are now preparing to go to the tactical range to practice for the high-threat war. You are still Blue 2, but that's all right, since the tactics allow each member to do individual maneuvering.

A light snowfall has covered the ground, and the trees are barren. The day is also overcast and a little hazy. But you can still see the targets OK. Besides, you learned the tactical attack business out on the desert where the terrain features were also nondescript. You will just be a little more alert than usual.

That first attack went really well. You are hot today. Now, to give those bad guys a couple of strong jinks and get it back on the deck to set up for the next pass. Lead is "in" now, so you start a firm left turn and see how he does. Bet you can get a better bomb than his. You still have plenty of altitude, at least 300 feet, and will not descend any more. That will keep you above those little hills and hard-to-see trees while looking back, or so you think. You know, maybe you should check the ground out front. Oh, s—!

**LOW ALTITUDE, HIGH RISK**

At the midpoint in 1979 it becomes clear that low-altitude operations are continuing to take a tremendous toll in aircraft and lives. The Class A and Class B mishaps which included low altitude as a factor (and not including takeoff, approach, or landing) are occurring at a rate considerably worse than in 1978. Fatality rates are also up alarmingly, due in part to the increase in low-altitude mishaps.

Approximately half of the aircraft that hit the ground or trees do so on low-level navigation/tactics missions. (These do not involve bombing, cargo dropping, or aerial combat, but just getting from point A to point B with minimum exposure.) Some of these aircraft are alone; others are in formation. But in the last 18 months, almost two dozen aircraft have contacted the terrain while on navigation missions.

It is not surprising that the large majority of these Class A and Class B mishaps involved fighter, attack, or recce aircraft. What is surprising is that one T-38, two O-2s, two OV-10s, one HH-3, and one C-130 crashed during low-

■itude operations in 1978, and the 1979 statistics include a destroyed C-12 and a Class A C-141 mishap.

Missions other than navigation have also been involved in these low-altitude mishaps. Six occurred during gunnery range activities. These weren't "pressing" or "target fixation" losses, but occurred while on crosswind, downwind, approach to the pop-up point, etc. One of these was a midair collision between flight members who didn't see each other.

Three more of the low-altitude mishaps occurred during air combat/intercept operations. These three mishaps weren't over-G or control losses, but the aircraft were simply flown into a surprising situation where the pilot ran out of altitude and ideas.

Some of the low-altitude ■ishaps could have been ■evented very easily. In these cases, the crews were not overtasked, undertrained, or inattentive. They were simply faced with inadequate weather for the route and, due to complacency or excessive motivation, chose to attempt to fly VFR in IMC. One such pilot had twice previously been directed by supervisors to discontinue a low level due to weather. He just did not get the message.

AFR 60-16 is clear in its intent. The idea is to alter course to remain VMC. Obviously, the smart move is to do this soon enough that you are not caught making an unplanned turn in IMC.

If you do not abort the route until already in the weather, it is too late to apply AFR 60-16. Now it is time for emergency procedures; get above the rocks ASAP and obtain an IFR clearance. The speed of an RF-4C, and human reaction times, just will not allow for dodging mountains when the visibility is down to 1 mile.

The 1978-1979 review shows some other interesting facts. In three of the low-altitude mishaps, a breakdown of crew coordination was a factor. These were cases where a second crew member should have prevented the mishap but did not do his job. In another three mishaps, the pilot could have missed the ground by pulling harder on the pole, but he did not. In a total of 11 mishaps, including the "VFR in IMC" losses, willful violations of directives and sound judgment were factors. Some examples were intentional violations of minimum altitudes, flying too slow, knowingly attempting to exceed aircraft performance limitations, buzzing, showing off, and not wearing required eye glasses.

Poor basic stick and rudder techniques (loss of control) were factors in nine of the mishaps, inadequate training for the low-altitude environment was a factor in another three, and two could have been prevented by an IP who was along for the ride but was not doing his duty.

**TO ERR IS HUMAN**

The last, and toughest area to analyze is that of human factors. A glance at the following table will show the more common physiological factors and their impacts.

| Factor | No. Of Occurrences |
|---|---|
| Visual Illusion | 10 |
| Channelized Attention | 11 |
| Inattention/Distraction | 12 |
| Spatial Disorientation | 2 |
| Loss of Situational Awareness | 10 |
| Overconfidence | 3 |
| Excessive Motivation to Succeed | 6 |
| Task Oversaturation | 4 |

Most of these factors are insidious. The pilot thinks all is well and never knows what hits him (or, more accurately, what he hits). Even "old heads" are not immune to these complications.

In most cases, two or more human factors are involved, much as they were involved in the fictitious example that started this article. All crew members and operations supervisors should be sensitive to the fact that highly demanding missions, environments with low contrast, low recent (or total) experience, and personal stress have additive effects. The inclusion of one extra task may be all it takes to "shift a man's brain into neutral," with a "smoking hole" shortly to follow.

Visual illusions occur in many different environments. Some examples are smooth water, flat snow-covered areas, smooth desert terrain, hills covered with barren trees, and green hills that blend with other green hills. The danger of illusion is worth considering on virtually every low-altitude mission.

Channelized attention is another of the insidious human factors. Examples are fixating on another aircraft during a low-altitude rejoin, target fixation, watching another aircraft during air combat tactics or low-altitude formation flying, and watching something on the ground such as a smoke mark. The need for a crosscheck in the low-altitude environment is as critical as it is on a GCA. Only, in this case, the very important items to crosscheck are the ground, the aircraft attitude, and the flight path. This calls for self discipline and a keen appreciation of how quickly things can go wrong at low altitude.

Inattention and distraction are not the same thing, but both result in a lack of attention to ground clearance. These human factors differ from channelized attention, in that attention is focused on things other than aircraft control and maneuvering. Attention may be drawn to a cockpit warning light, ground features, switches, threat warnings, or emergency actions.

Even more subtle are personal problems which may cause a pilot's mind to wander just when the mission demands full attention. It is a paradox that a person's attention will shift when the mission seems the busiest. But it happens, and the more stressed a person is, the more probable is this preoccupation. Fitness to fly means physically and psychologically. All people have occasional poor days psychologically, and on these days, they are more likely to have accidents.

Spatial disorientation is usually a factor whenever the horizon is indefinite and the visibility is somewhat reduced. A likely situation is air combat tactics over water. It is tough for a pilot to take his eyes off of the flight to check his attitude, but some situations make it necessary. Loss of situational awareness generally means a loss of altitude awareness, and it is frequently related to other human factors such as channelized attention or disorientation. The pilot is generally maneuvering the aircraft aggressively and concentrating on something outside his aircraft. He has no idea he is getting dangerously low, until it is too late.

Call it complacency, ego, or whatever; overconfidence is a feeling that you are in control and nothing can go wrong; then something goes wrong. Unfortunately, a lack of prudence frequently accompanies overconfidence, This immature type of personality is frequently well known to his squadron mates and supervisors. It is a shame when someone, anyone, doesn't talk caution to this man before he "lets it all hang out" once too often.

Closely akin to overconfidence is an excessive motivation to succeed. Obviously, this is a valuable character trait when properly contained. But it is easy to let the realism and excitement of the current tactical scenarios affect judgment. Here again, supervisors can play a key role in containing aggressive young crew members and making sure they know this can be a deadly business.

The busy mission is a fact of life these days. It is tempting to add one more task that saturates a crew member, causing performance to begin to suffer. Key areas to beware of are the first few rides in a new mission phase, the addition of new tactics or threats, and the sudden addition of unexpected weather or an emergency. But task saturation can happen to anyone on any mission. Every person has a limit to how much he can do at one time, and some people are higher performers than others. A key responsibility of each supervisor is to know the limits of his aircrews, and to be sure they can do the mission before clearing them to fly. No supervisor should ignore this responsibility to his people.

This discussion has not included the numerous crew members who made mistakes as serious as those highlighted, but were lucky enough to survive and return home with only Class C damage to their aircraft. Since 1 January 1978, five fixed wing and six rotary wing aircraft have hit hills, trees, wire, water, etc., and returned home with relatively light damage. (The same could not be said for the self-esteem of each crew member.) Since most of us cannot depend on being able to hit the ground and live, we must try harder to fly above the obstacles. Knowing our own limitations is a good place to start the tough task of staying alive.

The inescapable fact is that today's tactical mission is tough. It is busy and dangerous. An error that might be minor at 10,000 feet can be deadly at 100 feet. The smart operator knows when things are not going quite right and backs off on the mission intensity or raises his altitude a little. The others press on until they end up in a hole. The height of embarrassment is to die for no good reason. A training loss is in this category. ■

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## REGULAR FEATURES



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# So you're going to be a FLIGHT LEADER

**CAPTAIN GARY L. SHOLDERS**
Directorate of Aerospace Safety


■ For most of us in the fighter business, our first exposure to military leadership occurs on the day that we are out in front instead of staring at that infernal light on the star.

Very few of us ever forget our first flight lead experience; for me it was the most important day in my fighter career. Overnight, I felt transformed from just a wingie to the boss, the decision maker, an "old head." As anyone who's ever been there will tell you, however, life ain't always a bed of roses.

Every fighter jock in the world today can remember countless times that he's sat on the wing mouthing his individually tailored string of four-letter words at the antics of some unnamed flight leader. For me, the realization came very quickly that, along with being the boss, I was also the cussee instead of the cussor. In short order I found that even I, the world's greatest young fighter pilot, made an occasional mistake.

In a more serious vein, having been a flight leader in and out of combat for several years, I can say with some authority that the "occasional mistake" often brings tragic results. There is no experience in the world that is more sobering than to watch a good man die — and knowing that it was your fault.

Dramatic evidence of flight lead mistakes which cost us lives and airplanes is available for the asking — you'll have to look no further than the "Project Red Baron" report in your squadron safe or the wing safety shop. If you don't believe what you read, then corner some "old head" at the bar — chances are that he can tell you some true "war stories" which will curl your hair. The point of the above discussion is simply to reiterate one more time that fighter flying simply will not tolerate poor flight leadership.

So now we get to the point of this article: How do you, the world's greatest young fighter pilot, prepare yourself for the flight leader role? There are several things that you can do prior to your first experience out in front that will make you better equipped to do the job. True, you will still make mistakes, but if you prepare yourself well, your mistakes at worst will result in embarrassment instead of a smoking hole somewhere. Incidentally, even if you're a new guy in RTU or an old head, the thoughts outlined below have all come from "the school of hard knocks." Read on — they may apply to you.

LEADERSHIP: This word is basic to any aspiring flight leader. You will not be a flight *manager* or a flight *director*; you will be a flight *leader*. The basic tenets of good leadership apply in spades when it comes to herding your gaggle around in a proper military manner. We've all heard about them over-and-over again — let's outline some leadership points as they apply to the flight situation.

1. Set the example: In fighter pilot language, get your "stuff" together. There is no room in the flight lead business for some yo-yo who isn't an expert in his unit mission and the particular tactics associated with his weapons system. In order to gain/maintain control over a group of potentially unruly fighter jocks, you *must* have the credibility that inspires your wingman to listen when you speak. Without credibility, your wingie will subconsciously (and sometimes consciously) reject or question your briefed procedure or tactic. He may not say anything during a flight brief, but rest assured he will tend to go his own way when the going gets rough. The quickest way to lose control of a flight is to display your ignorance to its members. Be honest with yourself; ask the question: "Am I credible enough to do the job?" If the answer is no, you have no business at the front end of a flight.

2. Have integrity: Although integrity is an overused word in our Air Force, it is nevertheless vital to the safe and professional conduct of your flights. The perfect job of leading has never been accomplished; a good flight leader, recognizing this, will admit his mistakes to his flight members and honestly invite them to critique his performance. He will reflect for a moment after every flight and try to dream up ways to make himself better the next time. With honest self-criticism, you will avoid the trap of becoming an insufferable know-it-all who inspires no one but himself.

3. Accept the responsibility: If there is one bottom line in the fighter leadership game, it has to be: "The buck stops here" to quote the late President Truman, a fighter pilot if there ever was one. In today's Air Force, it's easy to blame oversupervision or too many regulations for everything that goes wrong.

Recent history is replete with guys who lost one or more wingmen in combat through no fault of their own. I have personally listened to the rationalizations of several folks who have deluded themselves that the SAM that hit number 2 in the cockpit "came out of nowhere." In fact, the missile came out of a cloud deck 500 feet below the flight or snuck up unseen at 6 o'clock.

The point of this discussion is that as a flight leader, YOU ARE THE BOSS; the safe conduct of your flight is your responsibility — period.

Fighters do not fly and fight on the strength of a book of regulations or a bunch of generals in their offices. Fighters fly and fight because of a group of motivated folks led by a motivated leader who is credible, mature, and willing to accept the consequences of his actions. Regulations and generals can (and will) provide pertinent guidance but it will always be up to you, the flight leader, to provide a proper decision in a sticky situation.

PREPARATION: Most of us have been "inspired to greatness" several times by flight leaders who walk in 5 minutes after scheduled brief time and proceed to ask everybody in sight what the mission is. If there is one way for an otherwise credible leader to screw up a flight, this is it. It really doesn't matter how many times you've led the same mission, preparation is always required if you plan to do the job right.

In the first place, even though it may be a repeat of yesterday's mission, the players will invariably be different. A little investigation into the training progress and capabilities of each flight member is essential if you are to lead an effective flight. Individuals do vary, in spite of our standardization efforts. The flight leader who doesn't think about tailoring each mission to the requirements of the flight members may just run one of his universally-assignable wingies into the dirt.

In the same vein, a good flight leader needs to look at each mission and set attainable goals for each flight based upon all of the pertinent factors. He needs to consider the players, the weather, the airspace, etc., and devise a mission scenario which will accomplish the desired goals. For example, I have personally been involved many times with basic mudbeater F-4 types who set impossible air-to-air training goals and then fail to meet them.

I have seen flight leaders with their hair on fire briefing incredibly complicated air-to-air scenarios; during the engagement, the entire flight races around at a thousand miles an hour and gets shot six times without even knowing it. The conclusion to this gaggle is invariably a giant bomb burst of F-4s bailing out of the fight in four different directions — screaming for help all the way.

The flight leader in the above example could have gained a lot more training for his JP-4 if he had stuck to a more basic scenario which his flight could handle. The key to success is simple: Prepare yourself to lead each flight so that you will gain the maximum from your mission without overloading your flight.

MISSION ORIENTATION: Well, we've solved the leadership and the preparation problem; we should be ready to climb into our all-metal/composite material jets as good, solid flight leaders. Not quite guys — we've got one more thing to think about. The fact is that the basic mission which we are tasked to perform is still there.

Sometimes the job of a fighter squadron tends to become a bit obscured to the guys in the trenches. Many of our younger jocks perceive that their only responsibility is to say "two" and obey all the regulations. Their real job is hard to see amid all the gobble-de-gook and officialese of the everyday Air Force.

As a flight leader, you are the first and most important link in the leadership chain that can help to clear the air for your wingmen. You have a golden opportunity to orient yourself and the flights that you lead toward your outfit's mission in life. A mission-oriented flight every time that you suck up that gear handle will add purpose and motivation to every hour that you spend on your job. Believe me, guys, that motivation among the troops is precious. Motivation sparks interest, interest sparks harder study, and harder study builds credibility. The net result of a motivated bunch of fighter jocks is a more effective flying operation. In short, as a new flight leader, you owe it to yourself and your organization to develop a keen sense of mission. Remember that from now on, what you say and do affects others as well as yourself.

Now let me answer the question that must have popped into your heads by now: "What is this article doing in *Aerospace Safety?*" Simple. Imagine yourself as a flight leader filling all of the squares that this article has been talking about. Do you think for 1 minute that any of your wingies will end up as a smoking hole in the ground because of your carelessness? I don't. ■

**ABOUT THE AUTHOR**

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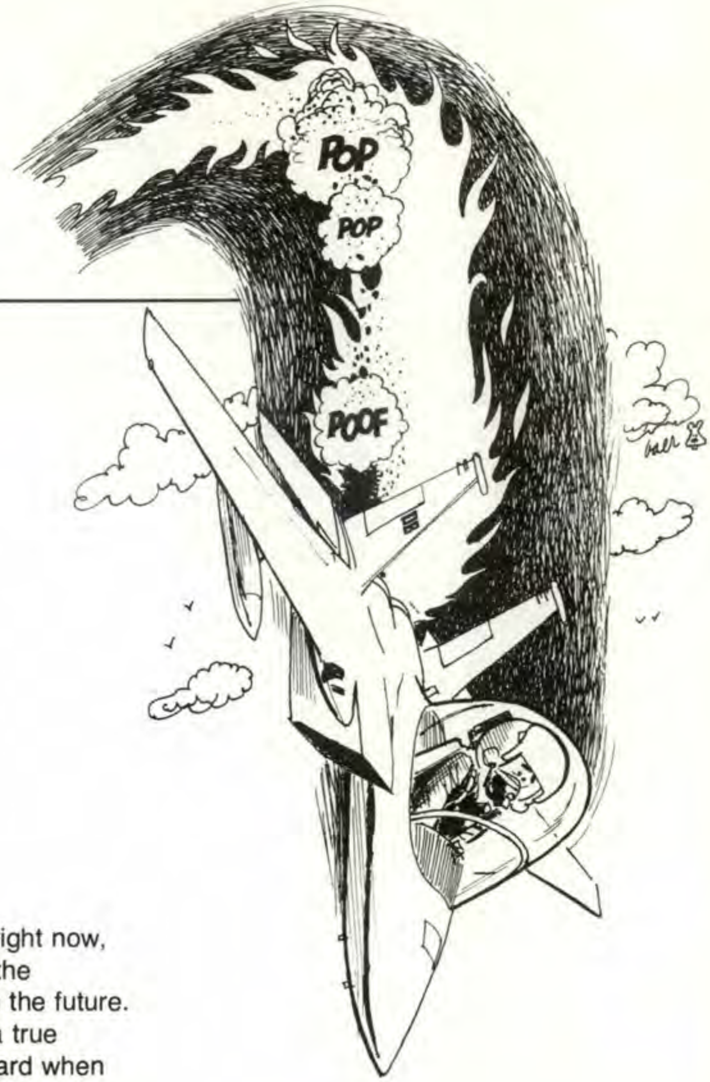
**MAJOR WILLIAM C. MORRISON**
Directorate of Aerospace Safety

# How safe is the F100 ENGINE?




■ As the prime motivator for the F-15 and F-16 aircraft, the Pratt & Whitney F100 engine has been the subject of considerable attention. The engine has shown a disturbing tendency to stall and/or stagnate at exactly the wrong time (i.e., right in the middle of a fight) and has even asserted itself by coming apart once in a while.

These characteristics have provoked raging arguments; on one hand, we have fighter pilots, safety people, and assorted other folks who feel that the record of this piece of machinery just isn't good enough. On the other hand we have fighter pilots, safety people, and assorted other folks who point out the fact that the F100 engine has an excellent safety record compared with some other engines.

In this article, we will try to resolve some of these emotional outbursts and talk about some of the programs in being right now, which should increase the reliability of the F100 in the future.

The F100 engine is a true technological leap forward when compared to engines of the past; its thrust to weight ratio is twice as high as the J75. The engine required about four times as much design engineering as the TF30 engine, which is its closest rival in performance. Experience with vintage engines such as the J57 and J75, as well as recent experience with fan engines like the TF30, was used in the design of the F100. In short, the F100 engine represents nearly the sum total of our engine technology.

Unfortunately, all of this wonderful technology did not result in a 100 percent trouble-free engine. We have experienced failures and engine anomalies. The primary concerns to the F100 user today are turbine failures and stall/stagnations. There are several ongoing efforts to eliminate these problems as well as to identify and solve potential problems before they happen.

One of the major tools that has been used to define problem areas is called accelerated mission testing (AMT). The F100 is the first engine to be subjected to AMT this early in its life cycle. Basically, AMT consists of a statistically derived pattern of starts, stops, cruises, snap accelerations, and augmentor lightoffs which are performed on a test cell. By eliminating

# How safe is the F100 ENGINE? continued

nondamaging portions of the flight envelope such as idle and extensive steady-state cruise, an engine undergoing AMT can accrue wear at an accelerated rate of 2 or 3 to 1 compared to an installed engine. By running a test cell day and night, failure modes can be identified and corrected years before they will appear in the field.

AMT is not a panacea for identifying potential problems, however. An AMT engine cannot be subjected to the day-to-day rigors of field usage like G forces and altitude changes; in addition, AMT is a very poor measurement of wear on items like pumps and gearboxes which are not normally affected by the accelerated profile.

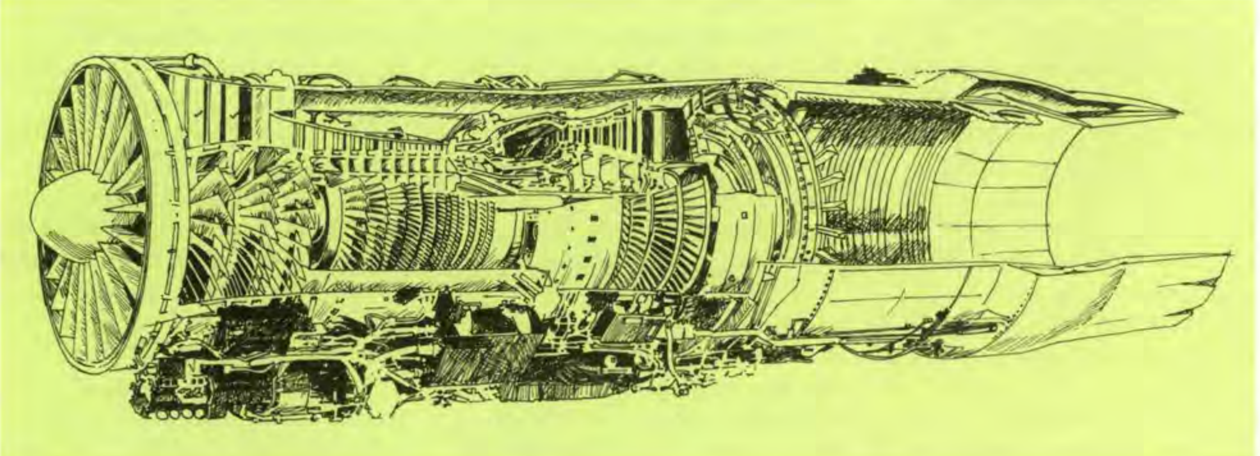
To supplement the AMT analysis, the Pacer Century program was devised. This program has deliberately accelerated field usage of selected engines so that they "lead-the-force" in total time. Pacer Century engines receive very detailed teardown inspections on a regular basis; findings are closely correlated with AMT results to provide a more realistic look at potential problem areas.

Experience has also been used to evaluate F100 engine problems. About a year ago, the Chief of Staff directed a reevaluation of the F100's structural integrity in view of the history of failures in the earlier TF30 engine. This evaluation is known as the Structural Durability and Damage Tolerance Assessment (SDADTA). To date, the team has looked at failures of other engines and selected areas within the F100 for detailed analysis. Seventy-seven components are being scrutinized, using analytical tools that were not available when the engine was designed. The goal of the team is to reevaluate and determine if redesign or early retirement of these components is required.

The net result of the above testing and analysis programs is that potential failures will have been pinpointed and fixes incorporated before the engines break in the field. We still have field failures; the fact is that no amount of AMT/Pacer Century type analysis can duplicate field experience. Because of these programs, however, you, the pilot, have been spared a lot of very real heartburn.

Unfortunately, when you've got heartburn today, it doesn't do

F100 is most advanced jet engine in USAF inventory, powering F-15 and F-16 fighters. Engine has presented problems but improvements and learning are improving performance.



much good to assure you that you won't have it next week, nor does it hack the program to say "Cheer up mate, it could have been a bleeding ulcer." Let's talk now about some of the actions taking place today to solve existing problems with the F100 engine.

First, let's look at turbine failures. In fighter pilot language, that's when the engine blows up. Turbine failures are a result of temperature distress in the hot section of the engine, which causes turbine blades to break off. Undetected malfunctions normally are the cause of these problems; for example, thermocouples reading the wrong temperature, stuck fuel nozzles creating a hot streak which literally melts away critical turbine vanes, combustion liners with undetected cracks. These malfunctions result in undetected overtemperatures which rob the life of the turbine blades.

Steps are being taken continuously to eliminate the bad actors that are causing the problems. Technical data have been revised for periodic resistance checks of thermocouples; filters have been added to fuel nozzles to keep debris from sticking a nozzle open, and aural tone warning for engine overtemperature will soon be retrofitted to the fleet. In addition, a new flexible borescope inspection device has been developed which allows inspection of second stage turbine blades and vanes while the engine is installed in the aircraft. The flexible borescope will be in the field in the summer of 1979; installed engines will undergo periodic inspeciton. With the above measures and others like them, the rate of F100 turbine failures is declining.

F100 engine stagnations have been a constant area of concern. Several hardware fixes are being developed to reduce the stagnation rate. All of these hardware changes are designed to smooth out pressure "spikes" within the engine (normally associated with augmentor selection) that cause a stall and subsequent stagnation. Engine trim and troubleshooting procedures are constantly being reviewed and changed as necessary to better ensure that your engine(s) are in peak condition. The result of the measures taken has been a steadily declining stagnation rate over the life of the system.

There are several things that you can do to prevent stagnations. First is to recognize that the F100 engine is, by design, operating on a slim stall margin. Any action on the part of the pilot that tends to create the pressure spikes we were talking about increases the probability of stall and/or stagnation. The effect of pressure spikes is greatest in the upper left-hand corner of the engine envelope, i.e., high altitude and slow airspeed. Examples of stall inducing actions in the upper left-hand corner include augmentor selection/deselection, rapid throttle movements, high AOA onset rates, and aircraft yaw. The engine may perceive any of the above actions as socially unacceptable behavior on your part and give up the ghost.

It is also important to recognize that the engine envelope in the Dash One is not necessarily the true envelope for a particular engine. The depicted envelope was based upon very early flight tests, and does not necessarily show accurately the effects of AOA, yaw, or rapid throttle movement. Also, the engine envelope is definitely affected by such things as engine trim and turbine blade wear. The point is, particularly when you are operating in the upper left-hand corner, that by treating the F100 with a little TLC, you will decrease your chance of a stall/stagnation.

The development and safety community will continue its efforts to prevent engine failures and stagnations through improved hardware and ongoing test programs. These efforts, along with your cooperation, should eventually reduce occurrences to a minimal level.

The bottom line is that we have the best engine technology can currently provide and one which will continue to improve as we gain experience. ■

# Doing what comes naturally

**MAJOR STAN SANTILLI**
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■ There is a movement underway (again) to tackle that elusive problem that has plagued aviation safety ever since Icarus flew too close to the sun and melted the wax on his wings. That elusive problem is the "pilot error" mishap. There have been continuing attempts in the past to get to the root of this problem but despite these attempts, "pilot error" consistently is indicated in over half of the Class "A" mishaps annually.

We have standardized, tested, briefed, regulated, and rebriefed crew members, all aimed at reducing "pilot error" mishaps and all to little avail. Perhaps our apparent inability to come to grips with this problem stems from a basic misunderstanding of its real source — normal human limitations. Such a misunderstanding could easily explain the relatively ineffectual remedial measures noted above, as well as the persistence in using the term "pilot error." This term is overused, misused, and fails on at least two counts in describing the cause of aircraft mishaps.

First, it points the finger at the pilot when, in fact, operator induced mishaps invariably consist of a long line of human errors, only the last of which was committed by the pilot. Secondly, the term "error" suggests that the pilot failed to perform to his capability or potential through some oversight or mistake on his part.

It is often true that the pilot fails to perform as expected; however, this cannot always be construed as an error on his part. More often than not, he has performed to his human design limitations, in which case we might attribute cause for the mishap to the designer. Or more realistically, we might attribute the cause of this type of mishap to our failure to recognize, anticipate and take into account these limitations. After all, we've at least notionally been aware of them for over a century. Let's take a look at these design deficiencies and see how they can limit our ability to perform to our full potential.

Man is, at his best, an imperfect processor of information. We learn about and attempt to modify the environment around us by means of a process which entails receiving stimuli, deciding what they mean and what to do about them, and then making a response. This response changes the environment; we perceive this change, and the process starts again. In the course of a mission, we make thousands of these mini-decisions which take seconds or less and a few larger ones

which may take minutes, if, in fact, a decision is made at all. Each step of this process though is limited in efficiency by built-in defects.

In the perception phase, we rely on our senses to provide us with accurate information on what's happening around us. This information isn't always reliable though. Each sense operates within generally prescribed thresholds. If the stimulus is outside these thresholds, we won't detect it. If it's too intense, it can be distracting if not painful. Furthermore, there are many stimuli coming in at the same time from several senses and the pilot has to determine which one or combination is giving him the most reliable or most important information.

To complicate matters, each of these senses can be easily fooled, depending on how the stimuli are presented. We call these illusions, one of the more common in flying being disturbance of the vestibular apparatus which can lead to spatial disorientation. To further complicate matters, fatigue and poor nutrition can narrow these thresholds and emotional stress can result in selectively perceiving the stimuli we want to, or "inventing" stimuli that aren't even there.

This whole area of sensation and perception is critical to this process, especially when you consider that we put a guy at 100' AGL doing 450 kts indicated, ask him to jink, maneuver, arm and fire weapons systems and still avoid driving his aerospace vehicle into the ground. That can be asking a lot.

The second phase of this process, that of processing and deciding what to do with this information, essentially consists of recognizing the stimuli, sorting them out, categorizing them and deciding what action to take, if any action is warranted.

We are all limited in this phase also, some more than others. Nevertheless, no one performs to the ideal potential. We have varying capacities for short- and long term recall; we have different levels of cognitive skill which limits our ability to categorize, abstract, and apply logic; some learn faster or better than others; some can concentrate for only several seconds, some for several minutes, and some can divide their attention between several tasks; some cannot. Furthermore, motivation and emotional stress can redirect or modify this phase so that the whole process is slowed down, sped up, or prevented altogether.

The last phase of this process, that of responding, is also inherently limited. We all have less than perfect basic motor skill abilities, and different individual requirements to practice those skills to keep them sharp. We are also limited by our physical capacity to respond. The human body is capable of only so much in terms of strength and endurance. Furthermore, it doesn't perform as well if it isn't well nourished and rested.

Finally, from both the physiological and psychological point of view, the glandular secretions accompanying emotional stress can, in and of themselves, determine a pilot's response.

This is to say that the results of these normal, built-in human design deficiencies are not errors; they are not even deficiencies, unless a pilot is thought of as a computer driven machine. They are basic human characteristics which must be recognized, anticipated, and compensated for when we design weapon systems and the tactics to employ them.

Making the environment more compatible with human limitations is only part of the solution. The real hope in mishap prevention lies in increasing the pilot's capacity to more effectively use the process described above in coping with environmental demands.

"Task saturation," "channelized attention," "distraction," "situational awareness," and "decision delay" are just labels for some of the failure modes in the process described. To increase the effectiveness of this process in pilots goes to the heart of the problem. We have the technology which permits us to understand the process. What we need is the methodology to implement meaningful programs and the perseverance to carry them through. This is hard, and the Air Force has been trying for some time to cope with the problem piecemeal with occasional success. If recent accident history tells us nothing else, however, it is crying out that the piecemeal approach is no longer sufficient.

We must look at man's involvement as a system and improve the system to optimize the ability of man to perform in the totality of the various subelements and tasks. Basically, that requires concurrent improvements in selection, initial training, aircrew utilization, human engineering, transition and continuation training, aircrew management, tactics development and even mishap investigation and analysis. It's going to be both hard and expensive, but as I see it, there's no other way. ■

# THE PROFESSIONAL APPROACH

Air Force Communications Service
Scott AFB, IL

■ "OK—let's wrap up this paperwork and get this show on the road. Flight plan ready? Check. Weather? Check. Weight & Balance? Check. NOTAMs? Check. Great, let's file and get going!"

An everyday occurrence around the world—just routine. We do it all the time—or do we? Flight plan, weather, weight & balance—all of that goes down on paper in black and white. Even NOTAMs get a check (√) on the DD Form 175. But do YOU really check NOTAMs properly and completely? What do YOU look for?

If you'd like to be sure you're looking for the right things, then read on. A little more knowledge of what the NOTAM system is all about will either confirm that you're on the right track, or give you the information you need to get you there. Either way, you win—so read on.

The heart of our NOTAM system is the Air Force Central NOTAM Facility (AFCNF) located at Carswell AFB, Texas. The AFCNF's responsibility is to provide current safety of flight NOTAM data for all Department of Defense (DOD) airfields of interest, worldwide. To effectively accomplish this task, data is exchanged daily with over 125 international NOTAM offices, 15 foreign military NOTAM offices, and over 300 DOD collection agencies and facilities. The personnel at the AFCNF handle over 60,000 messages each month. They translate, edit, compile and disseminate this information using several types of communications media. The Automated Weather Network provides NOTAM data directly to the flight planning environment, and is responsible for the majority of NOTAM traffic dissemination. Other media used include the Automatic Digital Network, the Aeronoautical Fixed Telecommunications Network, and the North American NOTAM Exchange Circuit. They all serve to transmit two basic NOTAM products—the daily summary and the hourly update.

The NOTAM summary is a cumulative listing of NOTAMs by state or country. Additionally, it includes a category of NOTAMs called Special Notices, which contain information covering such a broad area that it cannot be identified with any particular base or possibly any one state. The summary is compiled and published every 24 hours in the case of the North American and European summaries, and every 48 hours for Central and South America and the Pacific summaries. During low volume periods (usually Saturdays) the summary life may be extended for up to 48 or 72 hours.

The hourly update is a cumulative listing of all new, revised, and cancelled NOTAMs and Special Notices received at the AFCNF during the last hour or since the last summary was published. This information is published each hour, and keeps the summary current.

What should you look for when you check the NOTAMs? First, check to see that the summary you're looking at is current. The summary number and valid times are printed on the first page of each column. For example: NANSUM NR 2005 VALID FR 201730 THRU 221729 MAY. This is the North American Summary number 2005; it is valid from 1730Z on 20 May thru 1729Z on 22 May (this is a weekend summary, hence a 48-hour valid time). Next, look at the special notices for anything which will affect your flight. Then look in the geographical listings for NOTAMs at least for your departure, destination, and alternate airfields. (Absence of a listing means there are no NOTAMs for that base.) An additional examination of enroute facilities you intend to use is also recommended.

Now you must repeat the entire process with the hourly update. Check that the update identifies the correct summary number and that the valid time of the update has not expired. Remember—if you fail to include the update in your review of NOTAMs—YOU HAVE NOT CHECKED THE NOTAMS!! Any NOTAM on the summary may be cancelled or altered by the update, and new NOTAMs may be entered on the update. Therefore, neither the NOTAM display nor the information which you obtained from a summary can be considered current without a valid hourly update!

Occasionally, a portion of a summary or update may be missing or garbled in transmission. If it is part of the summary, then only that particular column will be removed from the display board. If the update is missing or garbled, the entire summary and update must be withheld from the display until a corrected copy can be transmitted. During the intervening time, all aircrews must contact the Base Ops dispatcher for assistance in obtaining NOTAMs.

Our NOTAM system—in particular the Air Force Central NOTAM Facility—has a tremendous job to perform. It's a continuous process, 24 hours a day, 7 days a week. The present system is limited by slow speed communications equipment and the tedious manual processing of all information. The future, however, holds some definite improvements which are being developed. An Automation Enhancement Program will eliminate much of the manual processing currently employed by the AFCNF and will result in a more current summary and hourly update product. It is expected to be installed in January 1982. Additionally, a request for Base Operation terminals to allow direct access to the AFCNF NOTAM data base is being processed. The combination of these two acquisitions will bring about a vastly improved NOTAM Automatic Response to Query system which will provide both real time information and personalized printed copies of NOTAMs for the aircrew. On the horizon, we see airborne terminals able to query real time NOTAM data while enroute.

So, hang in there with us—better NOTAM service is in the making. Until then, be sure you use the present system properly. At the very least, it can save you a little embarrassment. On the other hand, improper use of it could ruin your whole day. Why take a chance? Use the Professional Approach—CHECK THE NOTAMs! ■

# Letter To REX

■ Three cheers for the Rex Riley Program! Lajes has always been proud of our status as a recipient of the "Rex Riley Outstanding Transient Base Award" and we are always looking for ways to improve our facilities and service for transient crews. Your many recent Rex Riley articles have given us some good ideas to improve our services.

We feel that our base exceeds the Rex Riley standards and deserves to retain our award. Over 75% of all crews transiting Lajes have rated us as outstanding. We have included numerous examples of recent aircrew comments to aid in your evaluation of Lajes. In addition, we have some programs and ideas that we want to pass along to you.

Although we feel that our base continues to be outstanding, we are always looking for areas to improve. Lajes has initiated the following programs to improve our service to transient aircrews:

- Rex Riley Committee. The Rex Riley committee (chaired by the DO) was formed in order to evaluate our entire base program for handling transient aircrews. The committee meets each quarter and consists of representatives from the DO, Communications, Air Traffic Control, Weather, Base Operations, Supply, Maintenance, Transportation, Services, MWR, Safety, MAC Command Post, Billeting and the BX. We discuss the results of transient aircrew questionnaires (both laudatory and negative points), self-inspections, recent Rex Riley articles, and areas for improvement.
- Transient Aircrew Questionnaires. These short questionnaires are given to aircrews and provide feedback on our facilities and services.
- Local "crewmember self-inspection exercises." We found it useful to have one of our base personnel simulate an aircrew member who stays with a RON aircrew from block in to block out. Feedback from these "self-inspection exercises" is given at Rex Riley meetings.
- "One Stop Service." Base Operations, Command Post and Weather are co-located so that an aircrew can rapidly flight plan and outbrief. In addition, because many of the routes from Lajes to the CONUS or Europe are identical, we have made reprinted flight plans available to crews that fly these standard routes.

Col Kenneth S. Landon
1605 ABW/CV
Lajes Field, Azores
■

# Who's Flying The Airplane?

■ We have a good many mishaps each year with factors that are not directly controllable by the crews who end up in the mishap; we also have a good many more that they can control. In fact, these are preventible only by those who are flying the aircraft. Collisions with the ground where our investigators can find nothing wrong with the machine that would account for the mishap fall into the direct control category.

In the past 2½ years we have suffered 36 destroyed aircraft and 77 fatalities, where a sound aircraft plowed into the ground. We looked at these 36 mishaps in considerable detail in an attempt to find the common factors that are within our control and to provide this information to those of you who are out having at it.

All types of aircraft have shown up in this accident category – all of them. The majority, however, involve fighter/attack aircraft on low-level missions.

In 25 of the 36 mishaps, no matter what type aircraft was involved, the main element, or the last straw, if you want to call it that, was the fact that the crew, regardless of what else they were doing or trying to do, were not flying the airplane. You can call this distraction, inattention, channelized attention, task saturation, loss of situation awareness, or any other of those slick words that we have used. We are not really sure just what they were doing at the time of the mishap, but we know they weren't flying the airplane. We need to discuss some common elements that can distract a crew from flying the airplane at a critical time.

Fifteen of these mishaps occurred during formation flight, and it shouldn't surprise us that in 12 of the 15 it was a wingman that crashed. In two, when lead went in, the wingman did too. The wingman's problem is unique. He is attempting to maintain a tactical formation position, clear the flight, maintain his scheduled altitude above undulating terrain, and remain oriented. At the same time, he is also attempting to look as good as he possibly can. The majority of the people who had mishaps during formation activities probably hit the ground without having the slightest idea they were about to do so.

Eight of the 15 formation mishap pilots were doing the mission element, whatever it was, for the first time:

First time that low,

First time in that formation position,

First time on that range or training area,

First time under exercise conditions or

First time with a combination of the above.

A good many of these aircraft were multi-crewed. Two-thirds of the aircraft which flew into the ground while in formation had two-or-more people in them. Twenty-three of the 36 aircraft that crashed into the ground during all mission activities were multi-crewed aircraft. That simply means that everybody was looking at something else or perhaps the same thing, and nobody was flying the airplane.

Another common factor that we found was the fact that, in 22 of the 36 mishaps, the aircraft were on special missions of some sort. The exercise or special mission seems to play a factor in two major respects. The first is that oftentimes exercise conditions and special mission requirements are not duplicated in the normal training scenario, in terms of tactics, altitude, and the area over which they are conducted. The differences may be only slight, but it takes some small additional percentage of the crew's attention away from flying the aircraft.

The second factor is that exercises, or the special mission environment, seem to generate a feeling that winning, or mission success, becomes increasingly important. This results in pressing beyond limits, beyond capabilities, in discipline breakdowns where the

rules are stretched or disregarded; and it also creates a highly competitive environment for the supervisors who want to look as good and they can.

But these are good problems – we want our folks to try and try hard – and our exercises and special missions are really the only way we can measure our readiness and simulate realism. But it is painfully clear that many of our crews are caught up in exercise activities to the point that they forgot the good, solid procedures they learned in their normal training. They paid dearly for those mistakes and we must learn from them. The principal element to learn is that the location of the ground and its hardness does not change a bit under exercise conditions and still merits the same healthy respect you gave it during normal training missions.

The good procedures you have learned and the tactics that you have practiced are the same ones to use under exercise conditions. The differences and the newness of a specific exercise condition or tactic must be recognized before-the-fact. They must then be accommodated, without distraction, to your primary, principal, mandatory job of flying the machine.

There were a half dozen mishaps in which the crews were simply maxed out; and these mainly occur in the low-level mission environment. We have heard a lot about 100 ft., and that is low in anybody's book, but the facts are that in only about 15 percent of the mishaps we're talking about did the mission call for less than 300 ft. The majority were being attempted at 500 ft. So another problem is simply that of being maxed out momentarily in a critical situation.

If you are flying at low altitude, and we are suggesting that anything below 1,000 ft. is low, over undulating terrain and 480 to 500 knots, you must make your critical judgment on action to take as far away as a mile to a mile-and-a-half. Then you count on updates as you fly along to shade the initial judgment, while at the same time making another longer term decision about terrain and the distance.

You are splitting your attention between a formation position and a leader who is changing course; between maintaining visual contact with target or navigation point and the critical updates that you needed to avoid terrain that is changing. If you look at the wrong place at the wrong time, or too long, or get priorities mixed up as to what to look at, when, then you become highly susceptible to a collision with the ground.

In summary, our reports tell us that low-level missions at 100, 500, or 1,000 ft. require priority attention on flying the airplane – all of the time.

- They tell us that in almost every case where the aircraft is flown into the ground, the pilot and his crew are all looking too long at the wrong place at the wrong time.
- They tell us that when the pilot is distracted or has channelized his attention, if it is a multi-crewed airplane, everyone else is looking at the same thing he is and the advantages of a multi-crew aircraft, in effect, are totally negated.
- Formation flying at low level, regardless of how the formation is spread, is an activity that is apt to channelize attention away from flying the aircraft.
- Our reports tell us that special missions, including exercises, deployments, etc., result in our crews pressing harder. Discipline breakdowns occur where rules are stretched and procedures ignored. They also result in supervisory personnel becoming more enthusiastic about mission accomplishment and winning.
- The exercise and special mission activity can be conducted with new ground rules over unfamiliar territory, using ad hoc tactics, each in itself requiring more attention away from flying the aircraft – more than required during the normal training mission. When it is a "first time" mission of any kind, your distraction quotient increases substantially.
- And finally, these costly mishaps tell us that good procedural habits and tactics, along with good crew coordination habits, will tend to require less attention away from flying the aircraft than the extemporaneous approach.

There are other aspects of collisions with the ground at the periphery of the problem, but what we have discussed here focuses on the center of the action – where the majority of our mishaps occur. ■

# CROSS COUNTRY NOTES

■ The "Rex Checkers" traveled around the good old U.S. of A. again and picked up a few pointers worth passing on:

TO THE BOSSES We've noticed a trend (especially in one MAJCOM) toward the "non-mission" flight line folks being overextended and undermanned. Base Ops seems to get tapped often for personnel reductions, squadron details and base extra duty. Transient alert (or maintenance) sections also seem to fall prey to personnel slot stealing more often and yet the workload doesn't get any less!

Commanders—take a hard look at your flight line transient operation. Not only is this the front door of your house for visitors, but it is also one of the most mishap-vulnerable areas of your air patch. Two bases we recently visited didn't have enough people manning TA to legally follow the tech data for the refueling or towing of certain aircraft. This is not the area for slot cuts or the dumping of duties. Ops and TA need to be fully manned by sharp, conscientious, motivated professionals! If not, a transient aircrew may die!

TO THE CREWS Transient service is a two-way street! Nobody owes you a good turn if you surprise them without so much as an inbound call. Most installations I've visited would understand and work hard to help you after a tough weather divert. I can't blame them, however, for being a little miffed when you drop in unannounced with two aluminum overcasts or a covey of fighters when you could have called.

A related item worth mentioning is the calling of off-times to FSS when you depart a civilian field. Several airfield ops types mentioned on the last trip that they had received surprise visitors in this manner. Don't forget that a base won't get an inbound on you unless you call flight service after departing a civilian field. By the same token, you may beat your inbound to a base if you have a 30-minute or less leg and changed centers several times. Moral—call ahead if you have a short leg. That way your destination can be ready for you!

Another item that crops up in debriefs with airfield managers is that many crews are not reading the books. When you plan (or divert) into an airdrome, it is your responsibility to read the IFR supp and check the NOTAMs for the destination. I personally ran into a crew that was hassling a dispatcher over a PPR number. I questioned if they had checked the IFR supp and they sheepishly admitted they had not. Part of being a professional aviator is checking all sources of info about your destination. Good transient service is a two-way street.

**RETAINED AWARDS**

CARSWELL AFB Somewhat limited transient services hours, but who hasn't anymore. Quarters are good, food available and approach service super. TA will work hard to give you a good turn. Their PPR status is only to sequence and prevent traffic saturation, not to keep people out. They say "y'all come."

TINKER AFB Some problems relating to transport and their downtown contract quarters, so best bet is to make reservations ahead. Other than that, the Tinker folks will give you good service and a helpful welcome. Ramp's getting a little crowded, so if you're leading a flock or drivin' a many-wheeler, warn 'em!

GRIFFISS AFB A good turn. Single runway and some local operational considerations should jog your thinking toward having a


THE

## REX RILEY *Transient Services Award*

hippocket alternate — even VFR. All of the folks do good work for transients.

TYNDALL AFB Still the best TA operation I think I've seen thus far. Hard work, conscientious training and new ideas make the Tyndall transient a truly professional group. Good quarters, food and friendly folks continue to make Tyndall a good stopover.

**NEW ADDITIONS**

MCGUIRE AFB Outstanding visit. A beautiful Base Ops facility, really top-notch billets and clubs make McGuire a good stopping place. BEWARE — vis is typically bad, and the traffic around the area is murderous. Eyes out and know the low and hi procedures. Stop in and visit.

WESTOVER AFB This trip's best kept secret. The TA and Ops folks are top-notch. Quarters good and a terrific consolidated club. "Q" reservations are a good idea and you might call Base Ops if you have a bunch of airplanes or a large machine. AFRES has really done a good job at Westover.

**QUICKIES**

We often transit a base and don't have time to give the entire operation a thorough evaluation. Despite the short stop, we want to pass on good comments regarding service.

OFFUTT AFB Still a good turn. Watch the X-winds and heavies in the pattern.

MAXWELL AFB Super TA folks changed a T-39 main tire and turned us in 40 minutes chock-to-chock. Only 7,000 feet of runway. Needs close planning on hot days.

ANDREWS AFB Good service! Base Ops has a new face-lift inside and the facility is much more aircrew oriented. Special passenger and area problems require some empathy from crews. Plan your arrival and call ahead.

WRIGHT-PATTERSON AFB Also good service. No complaints during a 30-minute turn!

BUCKLEY ANGB Super service, but really watch that Rocky Mountain summer weather. High altitude will getcha!

KIRTLAND AFB Another high altitude airfield with some wicked winds and TRW at times. TA and Base Ops are both working hard at good service — and succeeding!

PETERSON AFB A busy place with lots of above-ground activity in all directions and mucho ramp construction make this a place for vigilance. Good service, billets and eating facilities! A third place to watch high altitude performance and summer Rocky Mountain weather phenomena.

**OVERALL . . .**

We've noticed some real improvements at several locations. "Rex Riley" committees and workshops are springing up to get agencies at bases to talk together. That's the name of the game — attitude and communication! Good or bad comments . . . write Rex Riley, AFISC/SEDAK, Norton AFB, CA 92409. ■

| | |
|---|---|
| **LORING AFB** | Limestone, ME |
| **McCLELLAN AFB** | Sacramento, CA |
| **MAXWELL AFB** | Montgomery, AL |
| **SCOTT AFB** | Belleville, IL |
| **McCHORD AFB** | Tacoma, WA |
| **MYRTLE BEACH AFB** | Myrtle Beach, SC |
| **MATHER AFB** | Sacramento, CA |
| **LAJES FIELD** | Azores |
| **SHEPPARD AFB** | Wichita Falls, TX |
| **MARCH AFB** | Riverside, CA |
| **GRISSOM AFB** | Peru, IN |
| **CANNON AFB** | Clovis, NM |
| **LUKE AFB** | Phoenix, AZ |
| **RANDOLPH AFB** | San Antonio, TX |
| **ROBINS AFB** | Warner Robins, GA |
| **HILL AFB** | Ogden, UT |
| **YOKOTA AB** | Japan |
| **SEYMOUR JOHNSON AFB** | Goldsboro, NC |
| **KADENA AB** | Okinawa |
| **ELMENDORF AFB** | Anchorage, AK |
| **PETERSON AFB** | Colorado Springs, CO |
| **RAMSTEIN AB** | Germany |
| **SHAW AFB** | Sumter, SC |
| **LITTLE ROCK AFB** | Jacksonville, AR |
| **TORREJON AB** | Spain |
| **TYNDALL AFB** | Panama City, FL |
| **OFFUTT AFB** | Omaha, NE |
| **NORTON AFB** | San Bernardino, CA |
| **BARKSDALE AFB** | Shreveport, LA |
| **KIRTLAND AFB** | Albuquerque, NM |
| **BUCKLEY ANG BASE** | Aurora, CO |
| **RAF MILDENHALL** | UK |
| **WRIGHT-PATTERSON AFB** | Fairborn, OH |
| **CARSWELL AFB** | Ft. Worth, TX |
| **HOMESTEAD AFB** | Homestead, FL |
| **POPE AFB** | Fayetteville, NC |
| **TINKER AFB** | Oklahoma City, OK |
| **DOVER AFB** | Dover, DE |
| **GRIFFISS AFB** | Rome, NY |
| **KI SAWYER AFB** | Gwinn, MI |
| **REESE AFB** | Lubbock, TX |
| **VANCE AFB** | Enid, OK |
| **LAUGHLIN AFB** | Del Rio, TX |
| **FAIRCHILD AFB** | Spokane, WA |
| **MINOT AFB** | Minot, ND |
| **VANDENBERG AFB** | Lompoc, CA |
| **ANDREWS AFB** | Camp Springs, MD |
| **PLATTSBURGH AFB** | Plattsburgh, NY |
| **MACDILL AFB** | Tampa, FL |
| **COLUMBUS AFB** | Columbus, MS |
| **PATRICK AFB** | Cocoa Beach, FL |
| **ALTUS AFB** | Altus, OK |
| **WURTSMITH AFB** | Oscoda, MI |
| **WILLIAMS AFB** | Chandler, AZ |
| **WESTOVER AFB** | Chicopee Falls, MA |
| **McGUIRE AFB** | Wrightstown, NJ |

# FLIGHT PLANS FLIGHT PLANS FLIGHT PLANS

**CMSGT DENNIS D. EMMONS**
HQ MAC
Systems Management Division
Scott AFB, IL

■ As every aviator flying in the CONUS knows, the completion of a flight plan (DD Form 175) is the primary method of communicating a proposed route of flight to the Air Route Controller. The flight plan must be accomplished in a manner that has the pilot, Base Operations and Air Traffic Controller all communicating in the same language. This communication effort frequently fails when a stopover or delay en route flight plan is involved. The next few paragraphs will deal with these, and other types of flight plans, and hopefully will clarify some misunderstood areas.

According to current rules, a stopover flight plan must include the proposed departure time, departure location, airspeed, altitude and route for each leg of flight after the initial leg. In parentheses, after each leg of flight, the hours of fuel on board, alternate, and ETE to alternate, if appropriate, are included. Here is an example.

| IFR | VFR | ROUTE OF FLIGHT | TO | ETE |
|---|---|---|---|---|
| X | | PSB, J59, SYR, J29, PLB, VAL172015 | PBG | 1+10 |
| X | | P1520, PBG, 460, 290, PLB, J29, PQI, AWD (2+02) | LIZ | 0+45 |
| X | | P1720, LIZ, 460, 310, PQI, J29, BGR, J79, SCUPP (4+00) | BOS | 0+45 |

If, because of weather or other problems, you start getting behind and are going to miss one of your proposed departure times, you should notify a Flight Service Station and request a new ETD. A revised estimate is also in order if you are going to arrive early at one of your stops and will be requesting a clearance more than 30 minutes in advance of your original estimate. These actions shouldn't bother you since AFR 60-16 requires that ETA changes of more than 30 Minutes (15 for jets) be submitted to flight service. If you fail to revise your estimates, you may find that no clearance is available at some downstream station. Here's another Stopover example right out of the FLIP.

| IFR | VFR | ROUTE OF FLIGHT | TO | ETE |
|---|---|---|---|---|
| X | | V100, SUX, V175, V52, STL, BLV180015 | BLV | 2+15 |
| | X | P1545, BLV, 300, 125, FAM, ARG (3+30) | LRF | 1+05 |
| X | | P1700, LRF, 360, 150, LIT, V124, HOT, V71, SPARO, V16, TXK, V278, BUJ, BUJ5 (2+10 FWH 0+10) | DFW | 1+00 |
| X | | P1820, DFW, 440, 350, GWS, J4, ABI, J50, EWN, SSO076094, AR323, SSO265096 PHX, J65, SAC, ILA (6+10) (9+00 MCC 0+20) | SUU | 4+30 |

The delay en route flight plan is another problem. Except for IR routes and air refueling missions, a flight plan indicating a delay is filed in a manner similar to a Stopover. In the following example the flight plan specifies an IFR route of flight from Scott to the Capitol VORTAC, a 30-minute delay at Capitol and the route back to Scott.

| IFR | VFR | ROUTE OF FLIGHT | TO | ETE |
|---|---|---|---|---|
| X | | ENL, V313, DEC, CAP ® D0+30 CAP BLV | | 0+35 |
| X | | P1700, CAP, 250, 50, DEC V313 ENL BLV | BLV | 0+40 |

Notice that the remarks (®) go directly under the route of flight. The remarks include the delay time, delay location and final destination. The final destination is required in case of radio failure. All remarks are forwarded to the ARTCC as part of the flight plan. The "To" column is left blank for the first leg since an entry indicates a full stop landing. One more example, again right out of the FLIP document.

| IFR | VFR | ROUTE OF FLIGHT | TO | ETE |
|---|---|---|---|---|
| X | | J72, ABQ, ABQ233029 ® D0+30 ABQ REE | | 0+35 |
| X | | P1405, ABQ, 450, 270, J72, TXO, AMA, DHT, DHT280044 ® D0+15 UTE MOA REE | | 0+50 |
| | X | P1510 DHT280044, 450, 10 DHT255046, R5105 ® D0+15 R5105 REE | | 1+00 |
| X | | P1610, TXO270075, 390, 190 TXO RUU250035 | REE | 0+10 |

As previously mentioned, remarks indicate duration of delay, location of delay and final destination. The "TO" column is blank except for the full stop at REE.

Flights along Military Training Routes have their own set of rules. Flight plans must be filed well in advance of the estimated departure time (see FLIP AP1B) because more coordination is required when Military Training Routes are involved. When filing an IR route it is not necessary to break your route into segments (unless of course you have other types of delays before or after the IR portion). The following is a sample flight plan indicating the use of an IR route.

| IFR | VFR | ROUTE OF FLIGHT | TO | ETE |
|---|---|---|---|---|
| X | | BLD, EED, IR287, BTY108039, LSV345031 LSV | LSV | 1+05 |

Remarks (in the Flight Plan remarks block):
E2250SNX2305100LC130

The remarks here need some clarification:

E2250 —is the estimated route entry time.
SN —indicate the type mission, in this case Systems navigation.
X2305 —route exit time.
100 —requested altitude after exiting the route.
LC130 —lost communications altitude. This is the altitude the pilot will climb or descend to after exiting the route in event communications are lost after route entry.

IR routes are always flown IFR. VR and SR routes are filed IFR to the route and then VFR. Here is an example of a flight plan filed on an SR (Slow Route).

| IFR | VFR | ROUTE OF FLIGHT | TO | ETE |
|---|---|---|---|---|
| X | | V188, ALD V37, NORMS, CHS298042, VAN112017 SR166 ® D0+25 SR166 CHS | | 0+30 |
| X | | P0400, XNO, 270, 50, NORMS, V18, CHS | CHS | 0+35 |

This flight plan is again prepared similar to a Stop over. The first leg shows the aircraft delaying on SR166 for 25 minutes. The second leg indicates the location where IFR will be resumed as well as time, airspeed, altitude, and route to destination.

In effect, the requirement in all the above examples is a separate entry for each route segment when a full stop landing or delay en route is involved (as indicated previously separate entries are not required for delays on Air Refueling or IR Routes). Base Operations Flight Data personnel handle each flight plan entry separately and send individual messages either by voice or teletype to the appropriate FAA facility.

While there are numerous and varied types of flight plans, the examples discussed above are currently causing most of the problems. We will continue to provide articles to *Aerospace Safety* advertising, discussing and analyzing flight plans. The goal is better and safer communication among all concerned. ■

# What a THUNDERSTORM is NOT

**MAJOR GARRY S. MUELLER**
Langley AFB, VA

■ The weather phenomenon known as a thunderstorm has been the subject of an infinite number of articles in almost as many magazines. Because of two recent accidents, I would like to discuss what a thunderstorm is not.

The first accident happened late last year and was unfortunately, fatal to the crew. After entering an area of heavy precipitation, they encountered turbulence, lightning, and all the other adverse characteristics associated with thunderstorms. Before they could fly through the heavy rain, the aircraft was hit by lightning. The strike ignited a residual fuel-air mixture in a wing tank and caused a low order explosion strong enough to cause catastrophic failure of the left wing. The aircraft went out-of-control and crashed. This accident had all the weather factors of what we know as a thunderstorm.

The second, and very recent, accident was also caused by lightning. It is the accident which resulted from what a thunderstorm is not. The scenario is almost identical to the other mishap. Again, the flight was being conducted in an area of heavy precipitation. Here is where the similarities temporarily end. There was no turbulence, heavy hail, etc., commonly associated with thunderbumpers. Since the aircrew had not received any weather advisories warning them of thunderstorms, they thought they were encountering a local heavy rainshower. They also were hit by lightning, causing a wing tank fuel-air mixture explosion and catastrophic failure of a significant portion of the left wing. Thanks to the aircrew's superior handling of this emergency, the aircraft was safely landed. This accident was caused by what a thunderstorm is not.

A thunderstorm is not always the big black cloud with an anvil top, turbulence, heavy hail, etc., that comes to mind when a weather forecaster mentions that one word. Thunderstorms have different characteristics and often vary, depending on the geographical location, time of year, and many other factors. The absence of typical thunderstorm phenomena does not mean no thunderstorm – it may be what a thunderstorm is not.

Current Air Weather Service policy requires weather forecasters to use the term "thunderstorm" when referring to any cumulonimbus cloud. Weather briefs which predict, and I emphasize predict, thunderstorms are often overly pessimistic because cell buildups and exact locations are tough to forecast. As we all know, the buildups often do not even happen. The key point is that the prediction is advisory in nature and should not be ignored.

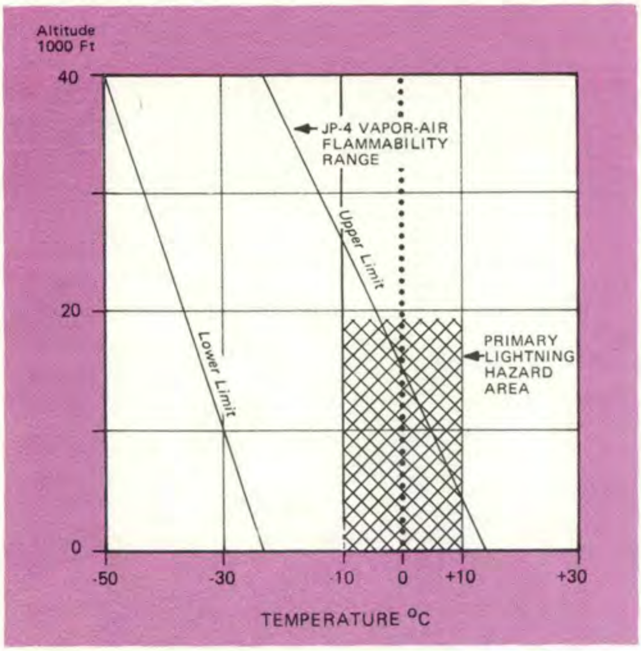
A recent study revealed that 80 percent of reported lightning strikes occurred when aircraft were in clouds, with rain, some turbulence and an outside air temperature within 8°C of the freezing temperature. The remaining 20 percent is the category the last accident fits into because of what a thunderstorm is not. Lightning is basically an atmospheric electrical discharge process which often travels for several miles. The electrical current can be as much as 200,000 amps but is normally in the range of 20,000 to 30,000 amps.

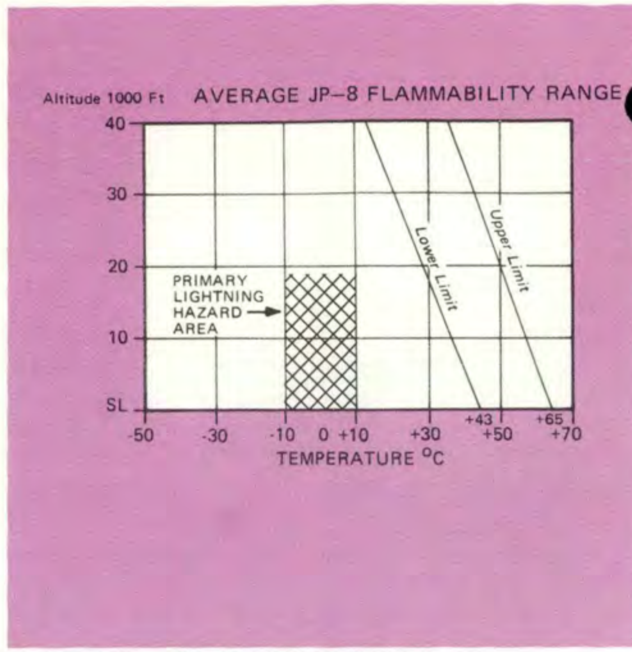
Clouds become charged by vertical movement of water droplets and ice crystals within the clouds. This movement causes either a positive or negative charge center to develop. The primary negative charge center will be near the −5°C level; the main positive charge will be near the −20°C level. A secondary positive charge is also centered near the 0°C level. Simply stated, the intense negative charge is at the cloud base and the primary positive charge is somewhere in the upper half of the cloud. The intense negative charge in the area of heaviest precipitation is so strong that it also induces a positive charge in the normally negatively charged earth's surface. The region of heaviest rain is normally near the negative charge or cloud base.

Extremely high electric potentials (voltages) result from the charge distributions. When the voltages reach a critical value, the atmosphere begins to ionize between the charge centers. (In dry air, the critical value is 300,000 volts for each meter between the charge centers.) The resultant electrical discharge from the negative center towards the positive center travels by a path of least resistance. As this streamer approaches within 10-50 meters of the positive charge, a positive streamer reaches out to meet it, creating an ionized path between the two unlike centers. The positive charge moves supersonically along the ionized channel creating the successive flashes and bangs we know as lightning.

It has not been determined whether or not an aircraft will trigger a lightning discharge. How they become involved also has several theories. The metal skin of an aircraft is more conductive than the atmosphere. As the initial negative charge travels the path of least resistance, it may go through the aircraft and continue into the atmosphere.

It is also possible that an aircraft may generate positive streamers which link to the negative one. The charge then follows through the aircraft and continues into the atmosphere. Either way, the aircraft actually becomes a link in the electrical




circuit. There is always a point of entry and exit from the airframe.

Figure 1 shows that JP-4 is well within its flammability range most of the time the aircraft is in the temperature and altitude regime conducive to a lightning strike. (As shown in Figure 2, JP-8 has a flammability range well outside the primary lightning hazard area.) Lightning can ignite fuel vapor by burning through the tank skin and arcing into a tank. It can also explode a tank by inducing overvoltages in fuel level probes or heating the skin of the aircraft to a point temperature above the fuel's flash point.

Lightning can cause other hazardous airborne emergencies. Radomes have been disintegrated by the explosive expansion of air inside as the stroke seeks the metallic radar disk. Popped circuit breakers, blown fuses, burned wiring, or total electrical failure can result if the electrical system is hit. Indirect effects include magnetization of ferrous metals around navigation systems, causing unreliable compasses. Effects to the aircrew can be mild shocks to temporary blindness, in addition to the initial reaction of "severe apprehension." However, electrocution is normally a very minute possibility.

Using an airborne radar to detect and avoid all buildups can add to a false sense of security in areas of heavy rainfall. The National Severe Storms Laboratory has determined that the relationship between turbulence and radar reflectivity of echoes (rainfall rates) is poor. Radar detection of thunderstorms is possible only because the precipitation droplets of the storm reflect the radar beam back to the receiving antenna. There is no absolute way to determine on a nondoppler radar the difference between a heavy rainshower and a thunderstorm. Therefore, although the use of airborne radar is an effective means of painting areas of bad weather, it is not foolproof.

Heavy precipitation is the process which creates the charge distribution required for lightning. Aircrews can reduce the probability of a lightning strike by avoiding the prime strike temperature and altitude regimes. Any cumulonimbus cloud should be treated as a thunderstorm.

It may be what a thunderstorm is not. ■

*The author acknowledges the professional and comprehensive investigation of a recent SAC KC-135 lighting strike and a similar article recently published in* The MAC Flyer.

# NEWS FOR CREWS

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

**LT COL BEN GANN** • Chief Bomber/Tanker Career Management Section

■ For those of you who are serving, or will serve, a tour as a B-52/KC-135 crew member at one of SAC's "northern tier" bases, some interesting events have occurred over the past 18 months. When polled, the majority of people in the USAF consider SAC's northern tier bases (Malstrom, Minot, Grand Forks, K I Sawyer, Wurtsmith and Loring AFBs) as the least desirable stateside assignments. Although that reputation is not necessarily justified, it has been perpetuated by "old wives' tales" about the snow and the cold.

Regardless of the validity of those "old wives' tales," the perceptions do exist. To dispel rumors and clarify questions posed to him on a recent trip to Grand Forks and Minot AFBs, General Ellis, CINCSAC, directed a study to determine how long aircrew personnel were spending at the northern tier bases. That study revealed an often valid perception among "Northern tier" aircrews that their counterparts in other career fields were spending shorter tours in the "cold country" than they were.

To increase overall aircrew retention and simultaneously boost morale at the "northern tier bases, the assignment folks at SAC and AFMPC worked out an extensive agreement to ensure a "light at the end of the tunnel" for those actively maintaining SIOP/EWO currency and pulling aircrew alert duty.

In essence, the agreement contains three key elements for crew members at northern tier bases. First, a maximum time on station (TOS) has been established at the three-year point for reassignment consideration originally established at four years but subsequently lowered to three years). Secondly, because individual crew members can now determine firm departure dates, they can make more definitive career plans. Lastly, and probably most important, you will be personally contacted by SAC and AFMPC to give you a more active role in your reassignment following your current northern tier assignment.

The mechanics of the program were designed so that each crew member at a northern base will be initially contacted by a SAC rated officer assignments representative prior to reaching three years TOS. You then have the option to either move or remain for an additional year. If you decide to move, you should update your AF Form 90 (Career Objective Statement) and send copies to SAC and AFMPC to give us your most current preferences. Additionally, we'll contact your Wing Commander or DO for comments on the impact of your loss to the unit — there are some cases that may require short delays due to unit requirements or manning. Any delay would normally be no longer than two months.

After coordination is complete, we'll search for an assignment that matches an Air Force requirement to your personal desires. Some assignments can be found at the Air Staff, MAJCOMS, or overseas (accompanied or unaccompanied), but the majority of your assignments will be to rated positions in other SAC wings in the CONUS. Once we obtain a list of your assignment preferences, we'll contact you to determine if you want one of the available assignments. If we can't satisfy your desires at that time, we'll continue to try — with a guarantee that you'll be contacted again within a year. You may continue to decline until your desired assignment is available or until becoming the most eligible for PCS, at which time different criteria apply.

Since implementation of the northern tier rotation program, 482 crew members have been contacted and 126 have requested reassignment. Of those requesting to move, 120 (95%) have received one of their first three choices listed on their Forms 90. (The majority of those desiring to remain on station do so to upgrade in their aircraft or move into the wing staff to enhance their positions for future assignments.)

Wing staff personnel are not currently included in this program, but their average TOS at the northern tier bases has been about four and one-half years. Staff members at northern bases are worked for assignments in the same manner as individuals at non-northern tier bases. Again, your most important contribution to this process is a current Form 90.

For those who are not currently stationed at a northern tier base, we realize that most of you are concerned about what your chances are of being reassigned to the "cold country." Less than 25 percent of SAC's rated positions are at the northern bases; however, because we do not reassign anyone to one of the six northern tier locations for a second tour unless he/she is a volunteer, probabilities increase to something greater than one in four, but remain at less than 50 percent.

Historically, our crew members have completely omitted listing any northern bases on their Form 90s. Although you may not want to go, it may be your turn. Please help us by at least listing the northern tier bases in order of preference in the remarks section of your Form 90. That will at least give you a greater opportunity of being assigned to a northern base you prefer, if selected for such assignment.

You may not know it, but there are some advantages in being assigned to a northern tier base. Climate and lo-

continued on page 25

# OPS topics





## WRITER-EDITOR

If you are an experienced writer, or have some talent for writing, we would like to talk to you.

The deal is this: *Aerospace Safety* has a vacancy for an assistant editor. The ideally qualified person would have a degree in one of the language arts, be a rated pilot, captain, and have a strong desire to prevent aircraft accidents. If you are interested in this position but lack any of the qualifications, we'd be glad to talk to you and review your resume.

This prestige position is with the Directorate of Aerospace Safety, in the world's finest Air Force. The person selected can expect to become editor in about two years.

Please call or send your resume to:

**Editor**
**Aerospace Safety Magazine**
**Norton AFB, CA 92409**
**AUTOVON: 876-2633**

## TANGO IN TRAFFIC

Here was the situation: Aircraft A on short final; B on three mile final; C directed by tower to extend downwind to follow B as number 3. C saw A on short final, mistook it for B and turned final in front of B who then had to take evasive action to avoid C. This episode once again reminds us you can't take anything for granted. Both pilots and controllers must be sure as to identification of aircraft in the pattern. Don't relax until you've put out the fire.

## BINDING THROTTLES

A pilot returning an F-4D from installation facility for TCTO 1F4-1056, VOR/ILS modification reported throttles binding in flight. Crew chief at Nellis AFB attempted to clear the problem, but could not, and asked for a quality control inspection. Panel 9L was removed adjacent to the throttle quadrant area. Four plastic wire bundle ties were found wrapped around the VOR/ILS wires and the throttle cable. Movement and operation of the cable was hampered by the ties. Removal of the ties solved the throttle binding.

## CREDIT THE CONTROLLER

The usual near midair collision summary reads something like this: "Pilot saw other aircraft and took immediate evasive action. Miss distance estimated at 200 feet . . . Light plane did not show on radar." Every day controllers help by warning of traffic, but they don't get a lot of credit. In a couple of situations recently, the pilots of a T-38 and a T-37 credited controllers with preventing an accident. Apparently, in neither case did the pilot of the other aircraft see the Air Force birds. Keep it up, folks.

## O-2 PROP LOSS

It was a four-ship combat mission profile for O-2s, one of which worked as a FAC and the other three as fighters. After pulling off an attack, the pilot of one of the *fighters* felt a loud thump and a loss of thrust. The rear propeller had separated, striking the left boom and tearing a large hole. It also severed an elevator and a rudder cable. The pilot shut down the engine and got enough elevator with trim to maintain flight, although the bird wouldn't hold level above 2,000 ft. – 500-800 AGL. Flight to a small airport was uneventful until about 25 feet AGL on final when the bird pitched up. Control was maintained, but another pitch at touchdown wiped out the nose gear. The aircraft was stopped after a skid off the runway and the pilot walked away unhurt. Nice work.




## FUMES IN CREW COMPARTMENT

About an hour after a B-52 took off, the heating element in the copilot's windscreen shorted and the pane shattered. The pilot declared an emergency and descended to 10,000 ft. on the way back to base. Later, fumes were detected so the crew chief investigated. The crew was on 100 percent oxygen, and the chief occasionally removed one side of his mask. Finally he removed the mask. A few minutes later he was found unconscious. 100 percent oxygen brought him around. Apparently fatigue, 24 hours with no sleep, and carbon monoxide caused the loss of consciousness. The unit recommended a T.O. change to ensure oxygen is used in the presence of noxious fumes.

## GETTING THE ACT TOGETHER

Referencing an airline crash attributed to the captain as the most probable cause and two other crew members as contributors, the NTSB recommended to the FAA:

"Issue an operations bulletin to all air carrier operations inspectors directing them to urge their assigned operators to ensure that their flightcrews are indoctrinated in principles of flight deck resource management, with particular emphasis on the merits of participative management for captains and assertiveness training for other cockpit members."

In case you have trouble with that, they are talking about crew coordination and they cited five other airline accidents to support their position.

Let's take a lesson from that, whether our crew consists of two in a fighter or as many as six in a many motor. We have had several examples during the past year where better crew coordination could have prevented the mishap. 'nuff said.

## BIRDSTRIKE

A 3-5 lb. turkey buzzard tried to stop an F-4C. The bird lost, but. . . . It struck the aircraft just below the right hand windshield, smashed the right quarter-panel and entered the front cockpit. Bird remains struck the pilot in the helmet and right arm and broke his visor, which was in the down position, directly in front of his right eye. The WSO was struck on the right side of his neck by flying glass and bird remains. Due to the *stunned* state of the aircraft commander, the WSO began a climb and flew the aircraft until they got things sorted out. Although their viz and comm weren't too good, they made a wing approach to a safe landing. Post strike assessment revealed extensive damage in the front cockpit to the instrument panel, right quarter panel, and canopy. Neither crew member was seriously injured – a case for visors down and excellent crew coordination.

## NEWS FOR CREWS continued

tion aside, morale is higher than most expect due to the camaraderie within the squadrons and the outstanding leadership apparent at those particular bases. Additionally, a somewhat lower rank structure has resulted in more rapid career progression throughout the wing with attendant increased responsibility.

Those who have not had the "opportunity" to serve at Minot, Loring, etc., can expect to serve at least one tour, voluntarily or otherwise. Accepting the fact that northern assignments are inevitable, we hope that the personalized attention you receive will be viewed as steps in the right direction toward making northern tier assignment more acceptable.

If you have additional questions, please contact HQ AFMPC/MPCROR3, AUTOVON 487, extensions 6256/6378 (Lt Col Ben Gann).

**ABOUT THE AUTHOR,**
Lt Col Gann is currently assigned to AFMPC as Chief of the Bomber/Tanker Career Management Section. He is a command pilot whose background includes flying tours in T-37, O-2 and B-52 aircraft and duty as maintenance supervisor/squadron commander in the 19th Bomb Wing at Robins AFB, GA. ■

## F-102 PILOTS REUNION

A reunion is planned for November 9th and 10th at Sheppard AFB, TX, in conjunction with dedication of a pedestal mounted F-102 aircraft. All interested F-102 pilots contact:

**Col John M. Franklin**
**4300 Shady Lane**
**Wichita Falls, TX 76309**
**Phone (817) 692-6081** ■

# HEADS UP & OUT

Radar is a security blanket that we can't let lure us into a false sense of security.

**CAPTAIN GENE MILLER**
1868th Facility Checking Squadron
Rhein-Main Air Base, Germany

■ We are all told quite often to keep our heads out of the cockpit and look for other aircraft. But, still, here we are being vectored around the pattern or just have been handed off to approach control and are in radar contact. The fact that someone is watching us can lull us into a false sense of security. We continue to follow our headings and altitudes and occasionally find the traffic that was pointed out to us.

Most of the articles we read about near misses and constant vigilance on our part stress the pilot-controller combination — the human aspect. This article will point out some of the lesser known reasons for why radar doesn't identify all targets.

Radar contact with any aircraft is dependent on one primary factor and that is having a radar signal return strong enough so that it will be displayed on the controller's scope. Controllable factors in this process are transmitted power, sensitivity of the equipment and antenna design. Uncontrollable factors are target range and target size.

A radar pulse transmitted from an antenna would tend to travel away from the source in a spherical shape. The area of the sphere is proportional to the square of the distance from the antenna. This gives us the familiar inverse square law of radiation. Now imagine an aircraft that reflects part of that energy back toward the antenna. It too follows the inverse square law. The net result is that the radar signal reaching the antenna is now proportional to the transmitted power divided by the distance to the *fourth* power!

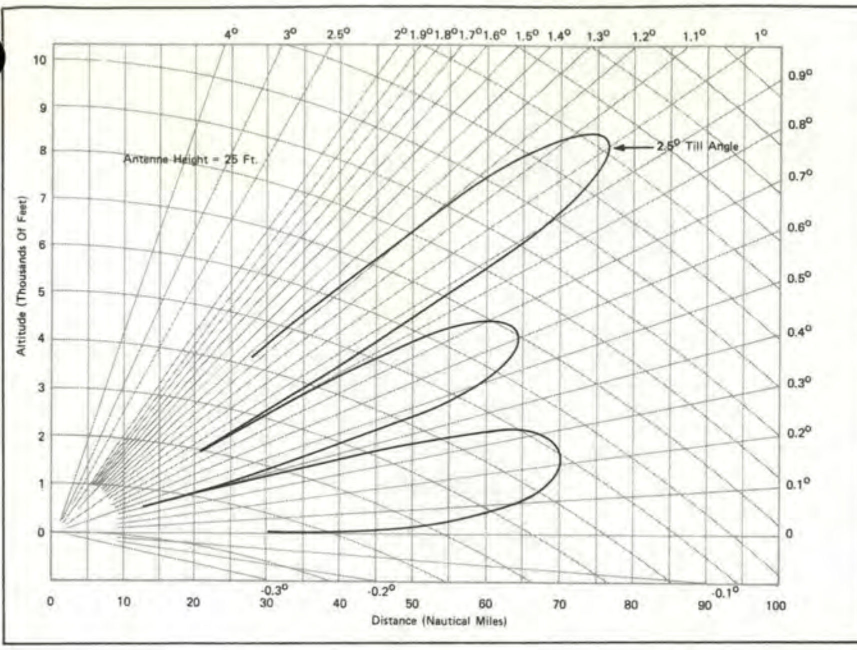
The point here is that a lot of power is necessary for a radar unit to see an aircraft. Typical values of power for the average approach radar would be near one-half million watts transmitted as a pulse for a millionth of a second. The focusing action of the antenna also contributes by increasing the intensity of the wave about one or two thousand times. Receivers are also very sensitive. The minimum discernible signal is near one millionth of a millionth of a watt ($10^{-13}$).

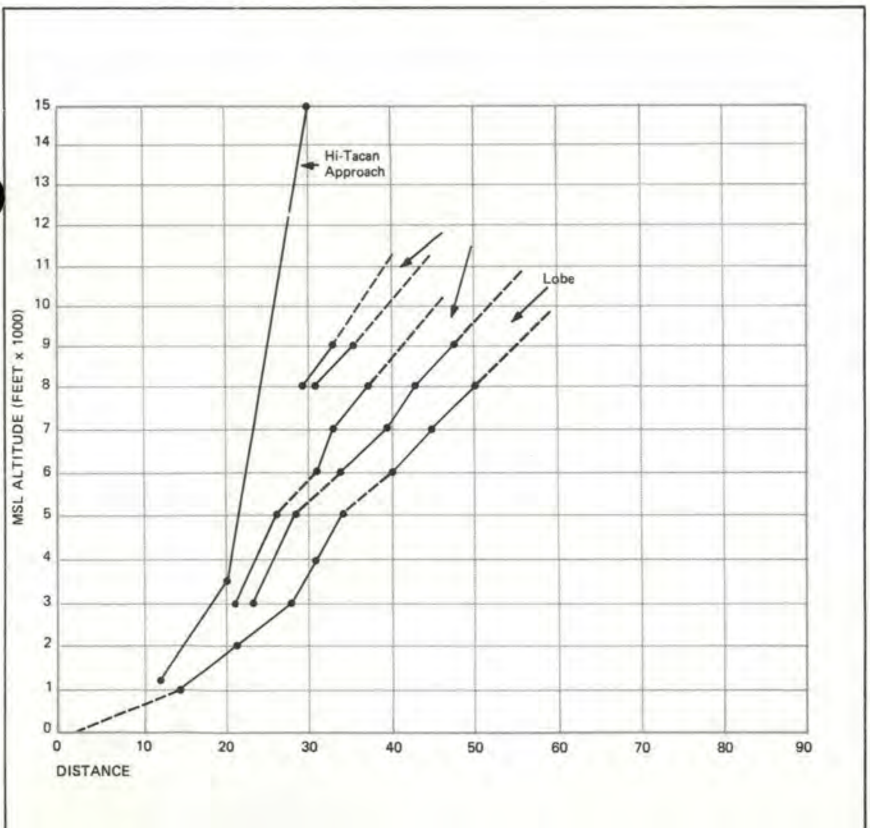
Thus the radar is operating with both very large and very small amounts of energy caused by aircraft range and size decreasing the signal. For example, at 10,000 feet the F-4 should be visible at 47 miles, but the KC-135 would appear at 58 miles. The practical application is that while you may be visible to the controller, the light aircraft that just about ran into you may not be. And no one can do anything about it.

Now you say that the closer you come to the base, the more aircraft the controller can see and the less risk of collision. Generally this is true except for environmental limitations.

The most insidious effect of radar coverage is a phenomenon variously called lobing or multipath propogation. A portion of any transmitted energy will be reflected from the earth in the vicinity of the antenna. When this reflected wave and the direct wave recombine, the actual received energy will be more or less than the original direct wave, depending on the geometry involved. The result is a fingered lobing pattern similar to Figure 1.

Obviously, the effects of lobing




can be detrimental. One aircraft can be in a weak area, or null, and remain invisible to the controller until much closer than predicted by the coverage indicator. Thus you can see how you can be in the strong area (lobe) while the aircraft above you can be invisible because it is in null. For example, a T-39 can be seen as far out as 60 miles while in the lobe but can be invisible as close as 20 miles when in the null.

One obvious correction factor is to destroy the smooth ground around the antenna that produces the reflection. But that can't be done in the vicinity of the runway. Another complicating factor is the atmosphere and nearby obstructions. The atmosphere guides the radar wave in a path depending on the conditions at the time. This causes the lobes and nulls to change position. If conditions are severe enough, atmospheric holes can develop. Of course, nearby obstacles like trees or hangars on the horizon can hide an aircraft until it is above the line of sight.

An actual radar coverage pattern is a combination of all these factors. Figure 2 is an actual coverage pattern obtained with a T-39. The lobes and nulls are obvious and lead to gaps in coverage of several miles. A tree line on the horizon limited the low altitude coverage. Normally, with no obstructions, an aircraft should be visible down to 260 feet at 20 miles. Also evident is the shift in the pattern produced by the atmosphere. The lower half of the pattern was measured in the evening and the upper half on the next morning.

Radar or no, you still have a good reason for looking around. Radar is an aid. Like aircraft, it has limitations, and understanding these limitations help you fly safer. ■


FIRST LIEUTENANT

## Coleman Hampton

**355th Tactical Fighter Squadron**
**Myrtle Beach Air Force Base, South Carolina**

■ On 5 October 1978 Lieutenant Hampton was flying an A-10 Thunderbolt II as a wingman in a two-ship flight. He had made a 100-foot AGL ingress and a simulated strafe attack then jinked off the target into a narrow, upward-sloping valley. When he attempted to pull up, he found the stick restricted fore and aft with little elevator authority. Dangerously low, he made a "knock-it-off" call and cleared the valley trees by only a few feet. Lieutenant Hampton declared an emergency and maintained a shallow climb to 5,000 feet AGL where his flight lead/chase confirmed the restricted elevator travel. He performed a controllability check which indicated some pitch control as slow as a 130-knot landing speed. As the gear raised, the control stick froze with the aircraft nose in a shallow descent. Switching to manual reversion flight control and slowing the aircraft, he used both hands on the stick to stop the descent. With the aircraft recovered, he reengaged normal flight controls and flew 120 miles to Fort Campbell, KY. During this entire flight, Lieutenant Hampton had to use both hands and considerable effort to maintain a level flight attitude. Approaching the landing field, he made another controllability check before attempting to land. As he lowered the gear, the nose of the A-10 suddenly fell over in a moderate descent. Before preparing to eject from the aircraft, Lieutenant Hampton stood on the rudder pedals and used both hands to exert maximum physical pressure on the stick. The control stick suddenly broke free, and he executed a normal straight-in approach and landing. Investigation of the aircraft revealed that a nonissue wrench had been left in the control cable area of the aircraft. Lieutenant Hampton's skillful reaction to a serious emergency resulted in the safe recovery of this aircraft. WELL DONE! ■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UNITED STATES AIR FORCE

# Well Done Award

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

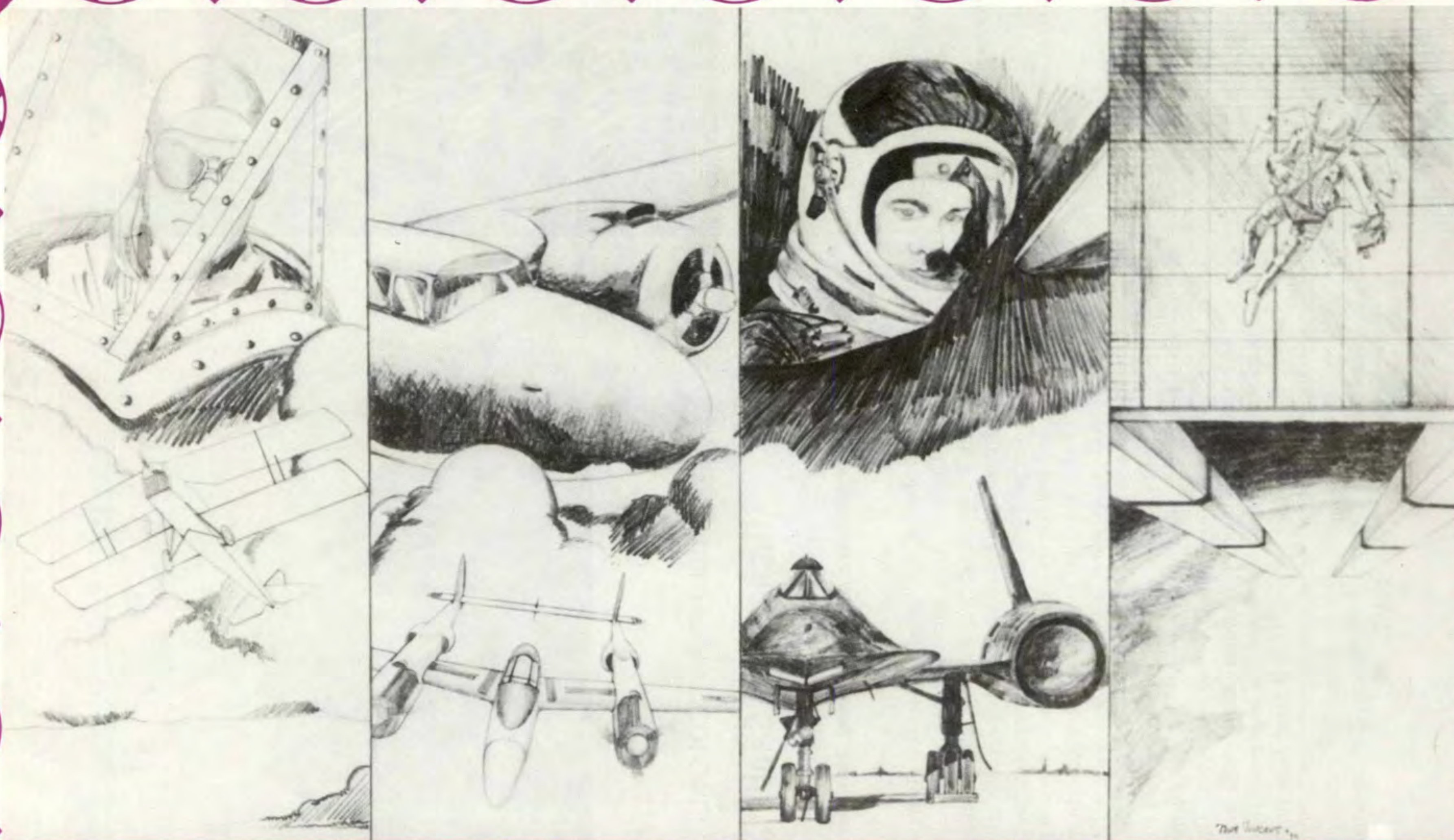
LIEUTENANT COLONEL

## Richard M. Sanders

**108th Tactical Fighter Wing**
**McGuire Air Force Base, New Jersey**

■ On 15 November 1978, Colonel Sanders was flying an F-105B as number one in a flight of six. After post-strike refueling, the flight climbed to FL 270 for RTB. Approximately 5 minutes after level off, Colonel Sanders heard a loud double explosion and compressor stalls. He retarded the throttle to idle and was told that he had fire coming from the tail pipe; however, it was confirmed the fire was coincidental with the compressor stall and that the aircraft was not on fire. Evaluation of engine instruments indicated engine problems: Oil pressure was low, and compressor stalls and heavy vibration were experienced when the throttle was advanced above 84 percent rpm. This power setting was incapable of supporting level flight. Colonel Sanders was advised the closest emergency airfield was 40 miles away. An emergency fuel system was selected but was ineffective. The throttle setting was too low to initiate minimum/extended afterburner, and Colonel Sanders felt ejection was inevitable. He sighted the emergency field at approximately 8 miles and maneuvered his aircraft to a short final approach. A bailout area was also selected in the event of an ejection. At 2,000 feet AGL, he elected to go for the field, configured the aircraft for landing on a ½-mile final and landed on the first 200 feet of the runway. Colonel Sanders' outstanding airmanship warrants a WELL DONE! ■

Our thanks to A1C Tony Vincent, 336 TFW/AGS



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