# flying

SAFETY

MAY 1990

Preventing Hearing Loss

Four Keys to Night Flying

Weather Gets A Facelift

Magical Airspeeds

# THERE I WAS

■ I fly the A-10 as a mission support pilot, with a goal of accomplishing mission-ready, level A events. Sometimes those squares are hard to fill, especially night air refueling. I hadn't gotten one the previous training cycle, so when the opportunity arose to stay over at a Reserve unit after a 3-day training conference to do some night flying, I eagerly volunteered.

My first flight was scheduled to be a night air-to-air refueling the evening of the last day of the conference. It had been 3 weeks since my last flight, so the unit agreed to move my takeoff time up to allow a nondemanding day sortie prior to the night mission. The briefing started immediately after the conference and covered local area procedures and both missions. We finished with just enough time for a quick snack before stepping to the jets.

The first mission was uneventful, attaining a maximum altitude of 6,000 feet. We landed at a nearby AFB to await our night takeoff. As we waited, I noticed a little indigestion which I attributed to my hasty snack on top of a full day's work.

At sunset, we took off and climbed to rendezvous with the tanker in the MOA overhead the base. With a "tally ho," we initiated a turning rejoin on the tanker, joining a mile in trail at 10,000 feet. As we waited for the preceding flight to complete, I experienced a sharp pain in my upper abdomen. Through a little vigorous massage, I felt like I got the "gas bubble" to move, the pain dissipated, and we continued on to 12,000 feet and joined on the tanker. I didn't notice any more discomfort as we completed two refuelings, RTB, and individual instrument approaches and landing at our original departure base.

I had no further discomfort until during the mission debrief. Though not intense, the pain got my attention. I declined an invitation to join some of the guys for dinner, planning to go back to my hotel and take care of the "gas" problem. As the night progressed, so did the pain. It was now accompanied by chills, aches in my joints, and extreme tenderness in my abdomen. I imagined all sorts of horrible things, but knew I needed to see a flight surgeon the next day.

I went to the squadron early to take myself off the schedule and inquire about seeing a doctor. None of the Reserve flight surgeons were on station, and those in the local area couldn't see me until later in the day. So I chose the third option of going to the nearby AFB to see their flight surgeon. I chose to drive myself the 70 miles, and the roughness of the road aggravated my discomfort with every bump.

The doctor saw me almost immediately, and after a preliminary exam, sent me to the lab and X ray while he called Brooks about possible physiological symptoms. They had already discounted the bends due to the low altitude; then the lab reports were delivered to my doctor. An hour later, I was in surgery for removal of my perforated appendix.

As I lie here in the hospital recovering, I think about the big part luck played in this incident. Luck the refueling hadn't been at FL180. The difference in gas expansion from 10,000 feet to FL180 is significant and could have meant the difference between a slight tear in my appendix and a major rupture. Luck I was able to safely drive myself to the nearby AFB. The jostling of the open road could have further aggravated the appendix, with catastrophic results. And luck that I'll have another chance to see my family when I get out of here and back home.

If you have the choice, don't choose luck as your wingman or teammate. And, if you find yourself, by chance, paired with luck, don't depend on it. Choose the cautious approach. Know your limits, and live within them. No matter how important the training square, it can always be rescheduled. And no matter what you think, a PQI code change won't kill you. ■

UNITED STATES AIR FORCE **flying** SAFETY MAGAZINE

AIR FORCE SPECIAL PUBLICATION 127-2 | MAY 1990 | VOLUME 46, NUMBER 5



**CONTRIBUTIONS**

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

page 2

page 10

page 16

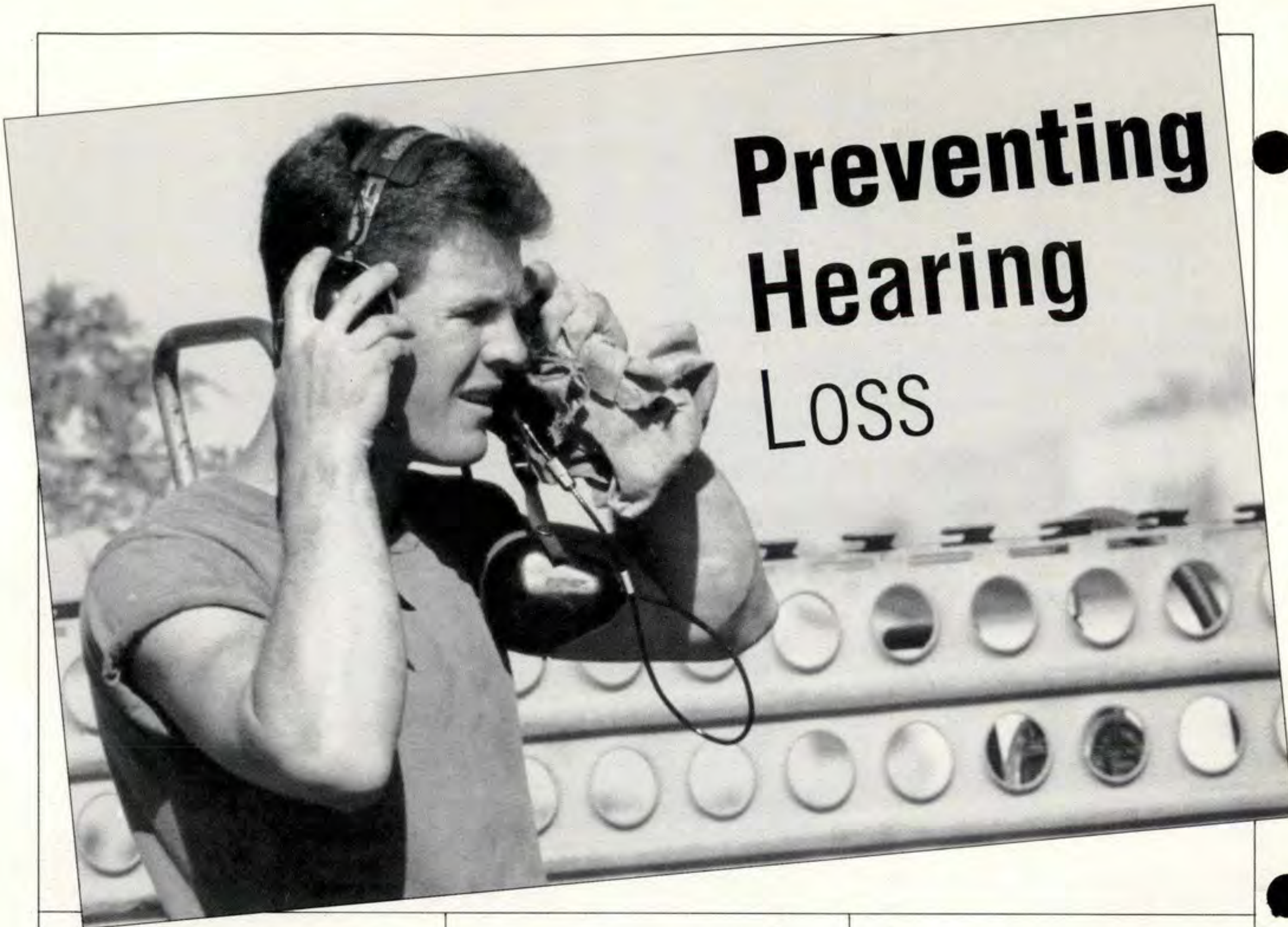
# SPECIAL FEATURES



# REGULAR FEATURES



**PURPOSE** — *Flying Safety* is published monthly to promote aircraft mishap prevention. Use of funds for printing the publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. Facts, testimony, and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. All names used in mishap stories are fictitious. The contents of this magazine are non-directive and should not be construed as regulations, technical orders, or directives unless so stated. **SUBSCRIPTIONS** — For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Changes in subscription mailings should be sent to the above address. No back copies of the magazine can be furnished. **REPRINTS** — Air Force organizations may reprint articles from *Flying Safety* without further authorization. Non- Air Force organizations must advise the Editor of the intended use of the material prior to reprinting. Such action will ensure complete accuracy of material amended in light of most recent developments. **DISTRIBUTION** — One copy for each six aircrew members. One copy for each 12 aircrew support and maintenance personnel. Air Force units must contact their base PDO to establish or change requirements. AFSP 127-2 is entered as a publication at the Second-Class rate (USPS No. 586-410) at San Bernardino Postal Service, 1900 W. Redlands Boulevard, Redlands, CA 92373 and additional entries.



# Preventing Hearing Loss

**CMSGT ROBERT T. HOLRITZ**
Technical Editor

■ The effect of noise on our environment has been the subject of constant research since the very beginning of the industrial revolution. The results of much of these studies remain inconclusive and controversial; however, most researchers agree noise affects our environment in three basic ways—loss of communication, stress, and loss of hearing.

Noise not only makes oral communication difficult and sometimes impossible, but it also creates a hazard because it tends to mask other sounds such as emergency warnings. Investigators concluded two people were killed when they were struck by a train because industrial noises from nearby factories masked the warning from the locomotive's whistle.

It has also been proven prolonged exposure to noise at high intensities and certain frequencies can cause stress in the human body which can lead to all kinds of mental and physical problems, including fatigue, high blood pressure, increased heart rate, and even mental depression.

But perhaps the most serious and widespread effect of prolonged exposure to hazardous noise is the permanent loss of hearing. Fortunately, loss of hearing due to noise is preventable, and the same methods that can prevent ear damage can also mitigate loss of communication and help prevent stress.

Environmentalists define noise simply as "unwanted sound." Noise (and all sound) is composed of three elements which have a combined effect on hearing. These are the intensity or pressure of the noise, the frequency, and the duration of the sound.

## Measuring Sound

The human ear is a miraculous organ. It can hear sound intensities of less than one ten-millionth of a watt per centimeter. This is the equivalent of the energy required to lift an eyelash approximately 1 foot per year. On the other end of the scale, it can also respond to the powerful roar of a jet engine. The sound from a J-79 in afterburner delivers about one-millionth of a watt per square inch. At this level, enough energy is expended to raise that same eyelash at an incredible rate of 30 feet per second!

Because of the tremendous range of energy to which the ear can respond (about a million units), researchers use logarithmic units called decibels (dB) to measure noise intensity to avoid using extremely long numbers in their calculations. For a comparison, the faintest perceptible sound is rated at 0 dB while ordinary conversation climbs to about 60 dB. At the top end of the range, a jet engine in afterburner can reach 130 to 140 dB.

At this level, most people will begin to experience pain.

To complicate matters further, the ear also responds differently to various frequencies. For example, its sensitivity to a 4,000-Hz tone is about 80 times greater than to a 20-Hz tone. To compensate for this, the intensity of a sound is quite often weighted according to its frequency. This is called the "A" weighted or dBA intensity of a sound. This number is of no use other than measuring the effect of sound on the ear.

### The Pathology

There is a rather common belief that hearing loss caused by exposure to hazardous noise is the result of damage to the eardrum. The fact is, prolonged exposure to noise has little effect on the function of the eardrum. However, extreme overpressures, such as those which result from an explosion, may rupture or tear the eardrum. But although a ruptured eardrum is extremely painful, it usually makes a quick and uneventful recovery, barring infection.

Hearing loss from hazardous noise actually takes place in a part of the ear called the cochlea. The cochlea is a snail-like tube located in the inner ear. The walls of the cochlea are lined with fine hairs connected at their base to the auditory nerve. Each of these hairs respond to a certain frequency, and when stimulated, they transmit sound through the auditory nerve to the brain.

As one might expect, the greater the intensity of the sound, the stronger the stimulation of the auditory hairs. It is the degree of stimulation that determines the loudness of the sound. After a period of intense stimulation, the hairs tend to fatigue and require greater sound intensity to be stimulated. This fatigue results in a rise in the hearing threshold. The threshold is the intensity of sound above 0 dBA that is required for the ear to hear a sound.

For example, if after a period of exposure to intense sound the ear is not able to hear sounds below 5 dBA, it can be said the auditory threshold has risen to 5 dBA. Fortunately, auditory fatigue is a temporary condition, and normal hearing usually recovers within a few hours. However, depending on the intensity, frequency, duration of the noise, and the individual's sensitivity to the noise, full recovery may take as long as several weeks!

For normal people, the threshold varies daily, and sometimes even hourly, depending on the ambient noise level. However, after prolonged exposure to hazardous noise, the auditory hairs can become damaged and will not recover no matter how long they are allowed to rest. In this case, the threshold will always remain above 0 dBA. A permanent threshold above 25 dBA is considered a hearing impairment, and a threshold above 92 dBA is considered the disabling hearing loss we commonly call deafness.

It is important to understand this kind of hearing loss is permanent. There is no surgery or medical tech-

continued

Regular audio examination can detect hearing loss before it becomes a serious disability.

nique which can restore the hairs' capability to stimulate the auditory nerve.

### The Symptoms

Generally, the first signs of hearing loss show up as an increase in the threshold at 4,000 Hz, the frequency to which the ear has the greatest sensitivity. The loss is insidious in that it is rarely noticed by the individual. In fact, at this stage, it is usually only detectable during a hearing examination by trained medical or bioenvironmental personnel. Fortunately, this loss is not incapacitating, but it does serve as an indication of an impending hearing problem and allows the appropriate preventative measures to be taken to prevent further hearing loss.

### Age Takes Its Toll

The percentage of hearing loss caused by exposure to hazardous noise is difficult to measure. This is because a certain amount of hearing loss occurs as a person grows older, regardless of the person's history of exposure to noise. Typically, at 50 years, the average male will have gradually lost 10 to 15 percent of his hearing response. The effect is slightly less in women. This condition affects hearing in much the same manner as noise. That is, it also occurs in the cochlea and it, too, begins with a loss of response at the 4,000 Hz range. Like the effects of noise, the damage results in a permanent hearing loss. This loss is in addition to any incurred from noise injury.

### Prevention

Although hearing loss due to noise injury is permanent, it is preventable. There are three simple concepts for prevention. They are elimination, avoidance, and defense.

**Elimination** This concept is simply preventing the noise from occurring in the first place. This can be accomplished by using quieter equipment. In many cases, newer industrial equipment is designed to operate more efficiently and quieter. Keeping equipment in good repair by replacing noisy gears and worn drive belts and ensuring proper lubrication can eliminate much unwanted noise. It may also be possible to isolate the noise from the environment altogether, either by sound proofing or by physically removing the equipment to a remote location. These steps will not only help prevent hearing loss but they may also increase productivity by allowing better communication and lowering stress.

**Avoidance** Avoiding unnecessary noise is a very obvious, but effective, way to prevent hearing loss. If you work in a noisy environment, take frequent short breaks from the area. Avoid noise off duty as well. Several hours at the auto races can do as much, or more, damage to your hearing as a day on the flight line, especially if you don't wear ear protection. Abusive use of stereo equipment can also be detrimental. In fact, there is growing evidence that loud music has taken a heavy toll on the hearing of the rock fans of the sixties. Lowering the volume a few dBs may allow you to enjoy the music more, and hear better, in your later years.

**Defense** Unfortunately, prevention and avoidance are not always practical for many people, especially pilots and maintenance folks who spend a large part of their day working around jet engines and other noisy equipment. For many people, the only alternative is to use personal protective equipment.

Two basic types of hearing protection devices (HPD) are available —the earmuff and the insert or earplug. There are several schools of thought as to which of these provide the best protection. Generally, though, if you use them properly, either of these devices will provide about 20 dB of attenuation (protection). However, each of these have certain drawbacks. For example, the muff is cumbersome, and when

This close to a J-79 engine, an unprotected ear can receive permanent hearing loss within only a few minutes.

used by personnel wearing glasses, its effectiveness can be hampered by sound leaks around the seal caused by the eyeglass frames. When used around aircraft, they must be controlled the same as any other equipment to prevent a FOD hazard.

On the other hand, the insert type is convenient to carry and poses little FOD hazard. The newer type, which is in current use, is made of polymer foam and will fit virtually any ear. The possibility of infection is a drawback for the insert type HPD. However, if the device is properly cleaned before use, infection can be avoided. According to the manufacturer, even the foam type, which were generally designed for a one-time use, can be washed in soapy water and reused several times.

Some research indicates the earmuff attenuates sound more effectively at the lower frequencies (below 500 Hz) while the insert type is generally more effective at frequencies above 3,000 Hz. But the most important factor in the effectiveness of HPDs is not the type used but ensuring they are used properly. The muffs must be properly adjusted to prevent noise leaks, and plugs must be properly seated. In extremely noisy conditions, the use of the earmuff in conjunction with inserts provide the best protection.

EOR crews: It is important to don ear protection before the aircraft enter the EOR area.

### Evaluating the Hazard

Fortunately, not all noise is harmful. In fact, the human ear is very tolerant to noise below certain levels. Many prominent researchers on the subject agree noise levels below 84 dBA will not cause auditory damage. A good test for hazardous noise is if you must speak loudly at a distance of 1 foot or shout at a distance of 3 feet or less to be heard, you should wear ear protection.

As mentioned in the beginning of the article, the effect of noise to the ear is a function of the intensity, frequency, and the duration. The chart shows the duration of a sound at a particular weighted intensity or dBA that can be safely tolerated by the human ear. Clearly, this chart is only a guide because some people are more sensitive to noise than others. Therefore, it is not a good idea to use the chart as a substitute for HPDs.

**Figure 1.**
**Limiting Values for Total Unprotected Daily Exposure**

| Sound Level dB (A) | Maximum Time (Minutes) | Sound Level dB(A) | Maximum Time (Minutes) |
|---|---|---|---|
| Below 78 | No Limit | 97 | 50 |
| 78 | 1,358 | 98 | 42 |
| 79 | 1,142 | 99 | 36 |
| 80 | 960 | 100 | 30 |
| 81 | 807 | 101 | 25 |
| 82 | 679 | 102 | 21 |
| 83 | 571 | 103 | 18 |
| 84 | 480 | 104 | 15 |
| 85 | 404 | 105 | 13 |
| 86 | 339 | 106 | 11 |
| 87 | 285 | 107 | 9 |
| 88 | 240 | 108 | 8 |
| 89 | 202 | 109 | 6 |
| 90 | 170 | 110 | 5 |
| 91 | 143 | 111 | 4.5 |
| 92 | 120 | 112 | 3.8 |
| 93 | 101 | 113 | 3.2 |
| 94 | 85 | 114 | 2.7 |
| 95 | 71 | 115 | 2.2 |
| 96 | 60 | Above 115 Ear Protection Required | |

### We Are Doing It Right

The Air Force has been concerned with the effect of noise on the health of its people since the first jet aircraft came on line. As a result of continuous education and personal involvement, our programs have proven to be very effective. In fact, in spite of the extremely noisy environment peculiar to the Air Force population, a study of hearing levels of noise-exposed Air Force personnel compared to the total US population showed the hearing levels of Air Force people were significantly better than the civilian population.

### The Bottom Line

Noise pollution is as much a problem to our environment as smog or acid rain. The fact that industry has accepted the challenge is reflected in the design of new and quieter equipment. Modern jet engines are considerably quieter than those built in the sixties. Sound suppressors and hush houses have put a big dent in the ambient noise to which flight line personnel are exposed. But noise pollution in the work environment is still a problem. Understanding the nature of the beast and properly using ear protection can help prevent hearing loss. AFR 161-35, Hazardous Noise Exposure, provides valuable information and guidance on how to prevent hearing loss.

Hearing is a precious gift. Protect it! ■

# F-15 Overload Warning System (OWS) Revisted

**CMSGT JIM PAYNE**
HQ 3246 TESTW
Eglin AFB, Florida

■ "Over-G, Over-G," thundered through the intercom as the sleek F-15 Eagle soared effortlessly to the completion of its maneuver. The pilot glanced at his overload warning system (OWS) matrix. "One hundred twelve degrees at 8.4 Gs—no way!" he muttered to himself. His return to base was uneventful, and the pilot dutifully debriefed the "level 2" over-G.

This scenario is replayed throughout the F-15 community hundreds of times a year. As a matter of fact, over-Gs have reached epidemic proportions with 60 over-Gs recorded per 1,000 flying hours. In an operational wing, the pilot would eventually accept the idea he had erred and never known what really happened. Fortunately, this was the 3246th Test Wing, and the over-G occurred on an aircraft specially equipped with telemetry instrumentation. The mindset that OWS was omniscient and unerring was about to be shattered. Its Achilles' heel had been found.

Telemetry experts charted G force as a function of time in seconds with startling results. The maneuver in question was a sustained 7.3 G-turn while decelerating from .96 to .72 mach. The counter accelerometer unit (CAU) generated all the noise spikes which ride on the G force wave form. These noise spikes exacerbated the G input to the OWS and created an artificial over-G indication. Maintenance replaced the unit, and telemetry personnel recharted this maneuver. The noise spikes were gone, and only a slight difference between telemetry and normal accelerometer units was detected. A similar problem has been detected by the test wing on another specially equipped aircraft. This problem is inherent to both types of accelerometer units and all F-15s.

The anomaly is further complicated by inadequate procedures in the field to detect erratic CAUs. We have found the only indication to nontelemetry-equipped aircraft is a ground fluctuation (usually rapid) in "current Gs." The fluctuations may be so rapid, in fact, that only the VTR tape played in single frame advance may detect it. The ±.3 G fluctuation tolerance appears to be too generous and should be tightened. Both maintainers and operators alike need to be aware of this problem, aware of the possible ramifications, and pay special attention to any "current G" fluctuation. These defective accelerometer units make OWS oversensitive but do not pose a safety threat (unless, of course, the pilot considers it hazardous to his health explaining why he over-G'ed).

There are no quick, easy solutions for this OWS problem. Education is a start, and the technical order changes already in work will help some. It seems obvious a more reliable accelerometer unit is needed. The CAUs are already difficult to obtain and, most likely, will become more so. With all these problems, let's not lose sight of the fact OWS is still an excellent system. It allows us to fly the aircraft at its maximum capability with minimal maintenance down time. Just like any computer, though, OWS is only as good as its input, and, in this case, that input remains suspect. It is continued teamwork between maintainers and operators that will provide the shortest path to OWS reliability. ■

The overload warning system records F-15 over-Gs which occur 60 times per 1,000 hours.

# Four Keys To Night Flying Survival

1 LT LEE T. WIGHT
4 TFS/FSO
Hill AFB, Utah

■ Afraid of the dark? You bet I am! Especially when it comes to night flying. When you turn out the lights, even the most routine tasks seem to become much more difficult. Things you do easily and effortlessly during the day become time-consuming and laborious at night. Everything seems to be harder and take longer at night, and night flying is no exception.

Like most fighter pilots, I am a firm believer in the rule if you aren't wearing sunglasses to the jet, you don't need to be flying. However, wars don't stop when the sun goes down, and with the advent of LANTIRN (to deliver laser guided precision munitions and infrared mavericks), now, more than ever, weapons delivery options exist at night. Thus, like it or not, those of us in the democracy protection business are going to be doing an increasing amount of night flying. Because we at Hill AFB have been flying the electric jet at night quite a bit lately, I've developed four keys to night flying survival which can benefit all aviators venturing out at night. These four keys are *preparation, equipment, organization,* and *concentration.*



### Preparation

Preparation really starts before the briefing—when you see your name on the schedule for a night flight. Whether you believe in biorhythms or not, you can't help but be less alert and able to concentrate if you have spent a full day flying your desk prior to your night briefing. Don't come in to work at 0630 if you have a 1700 brief. Hopefully, your squadron programmers will help you out in this regard by giving you advance notice of upcoming night flying dates and by not scheduling early morning meetings on night flying days. Thus, you can help your body adjust to a later schedule so you can be fresh and alert when you'll need it most.

Because night flying is inherently more difficult, before the briefing, the flight lead should consider the recent night flying experience and capabilities of everyone in the flight and tailor the mission accordingly. Night flying is not the time to overtask an inexperienced wingman or try out your latest cosmic 2v2 intercept game plan. Although at Hill AFB we do practice 2v2 night intercepts, IMC intercepts, and lights-off intercepts, it all starts from a building-block approach and only after everyone has had an opportunity to get recent experience and be as comfortable as one can be at night flying.

Start slowly and emphasize the basics first when planning your night missions. Preparation continues in the briefing. Don't assume everyone knows the basics of night operations. Take time and discuss the night procedures which are peculiar to your area (i.e., taxi spacing, light drills, etc.). Furthermore, some pilots may need reminding what switches dim which lights and their recommended settings if it has been a while since their last night flight. Night, itself, makes the cockpit seem confusing enough. continued

# Four Keys to Night Flying Survival continued

Preparation includes a thorough knowledge of what mission elements you will perform so you aren't constantly having to reference your lineup card in flight. It also means studying the instrument approaches you plan to fly or may have to fly *before* stepping to the jet.

Pay particular attention to minimum safe altitudes and emergency safe altitudes. I treat night flying the same as IMC flying and prepare accordingly. I know before I take off I will probably experience some form of spatial disorientation and/or channelized attention. Therefore, I plan on flying off of, and believing, my instruments, no matter what my body is telling me.

Finally, the worst thing that can happen at night is to have something go wrong with the jet. Emergency procedures are confusing and stressful enough in the daytime. Now, add darkness, and they can become your worst nightmare. Preparation, though, can go a long way toward making things easier.

Your night briefing should include a thorough discussion of night-specific emergency procedures. Some decisions may be easier. I don't plan on trying a night flameout landing. Have you ever practiced one? Like most aircraft, in the F-16—other than losing your engine—the worst thing that can happen at night is losing your electrics. Make sure you discuss your plan for multiple-generator failure, generator failure, and assorted bus failures. Know what systems are affected, and have a general game plan without having to reference your checklist. Trying to fly a sick jet and read the fine print of your checklist by flashlight—if you brought it—will be challenging, to say the least.

Many emergency procedures become more complex at night. What if you go NORDO? What if any of these emergencies occur and you are IMC as well? Don't forget to discuss divert bases and what their approach lighting will look like at night, as well as how to activate that lighting if it is pilot controlled.


### Equipment

Preparation doesn't stop with the briefing but continues with your equipment as you step to fly. Preflight procedures will take more time than normal, so plan accordingly. An operable flashlight is mandatory equipment at night, as is a filter for your radar display to help keep the canopy glare to a minimum. Bird strikes still happen at night, so don't forget a clear visor either. Your crew chief has as much difficulty seeing clearly at night as you do and is more likely than normal to miss something wrong with the aircraft. His biorhythm has been disrupted also, so take your time and closely inspect your preflight items with a flashlight.


### Organization

Organization starts as you strap in and set up your cockpit equipment. First, ensure all the cockpit lighting you will need to safely complete the mission is operational, in addition to required external lighting (consider what your wingman will have to look at on your jet as well as what you will need). I recommend digging out the utility light from behind the seat and setting it up where you can use it, if necessary.

Dim all the cockpit lights to a setting that won't blind you if you have to turn them on in flight. Don't forget the seldom-used ones that

can suddenly blind you, like the IFF reply light, marker beacon light in some jets, or the AOA indicators and other glareshield lights. Continue setting up the cockpit so you don't have to fumble for things when you need them.

Have the approach plates out, and open them to the pages you will need. Same goes for your checklist. Trying to dig your checklist out of your G-suit pocket and open it to the correct page in the dark with an emergency is not my idea of organization or fun!

Organization continues as you taxi out. Pay particular attention to checklist discipline as night operations are just different enough to break normal habit patterns and cause you to overlook essential items like arming your ejection seat. Additionally, as you taxi out, continue to adjust your body to the dark by gradually dimming the cockpit lighting to an expected inflight setting. And since night is like IMC, don't forget a good instrument cockpit check.


**Concentration**

Once you take off, you should have prepared, equipped, and organized yourself for a night flight. Now it's all concentration. Once again, treat the night like IMC. Visual illusions can all too easily occur, so rely on, and trust, your systems. Night is not the time to demonstrate your "Thunderbird" fingertip formation or how quickly you can rejoin. Make everything pointedly slower, smoother, and more controlled at night. Concentration and good instrument cross-check continue with the tactical elements of your night mission.

Since visual cues are reduced, available cockpit information becomes essential. Constantly crosscheck your radar altimeter, if you are so lucky as to have one. Or, if you are doing night intercepts, remember to check target altitude (so you don't inadvertently intercept an airliner), target heading, and airspeed (to prevent the big, embarrassing overshoot). If night intercepts are your thing, remember to solve your hot intercepts with geometry and not by applying the Gs. Four to five Gs are about all anyone is comfortable with at night. Accept the overshoot instead of squaring the corner. If night bombing is your game, concentrate especially on parameters. There is no excuse for pressing at night, and airscoring bombs is an invitation for disaster.

Don't forget the basics of instrument flying. It is easy to have the wrong TACAN station selected or have the wrong course dialed in and not notice it in the reduced lighting.

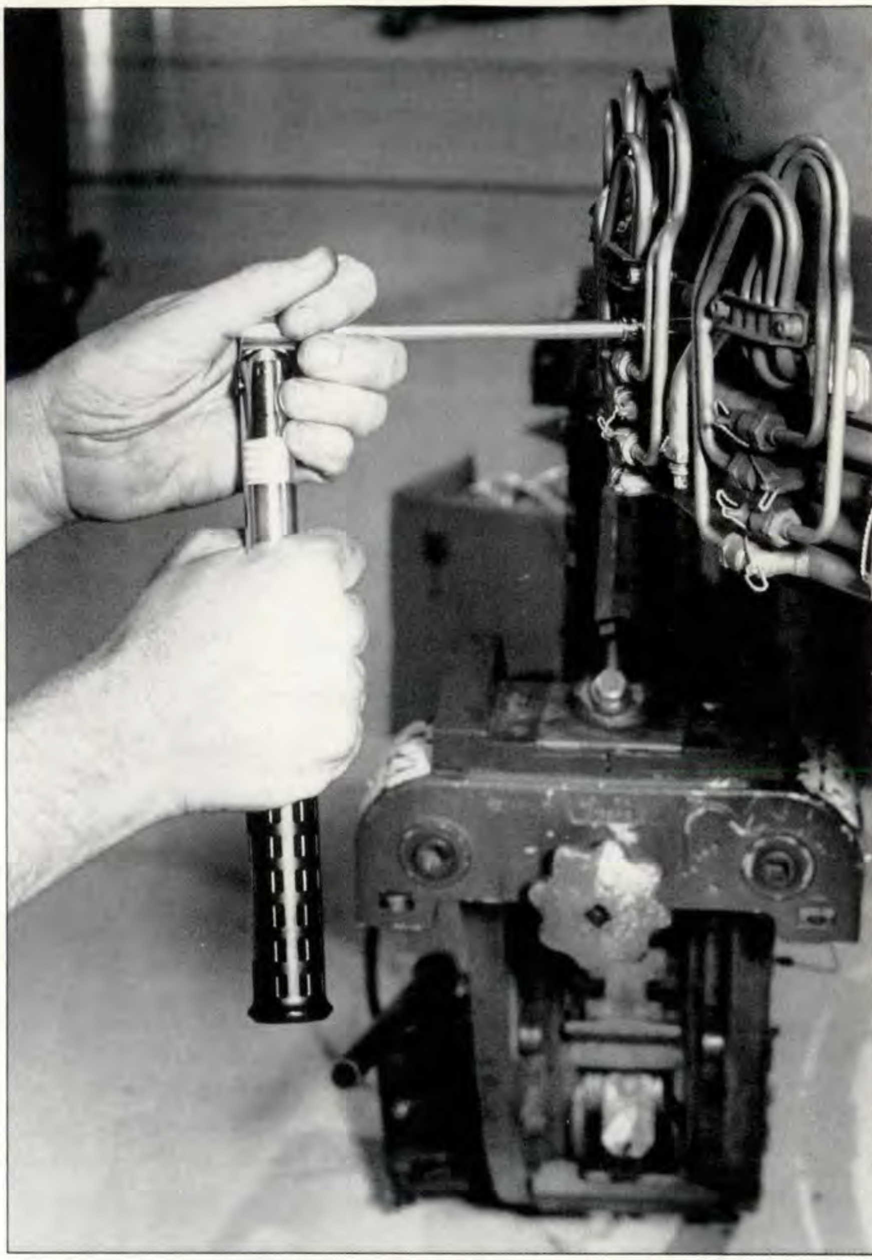
Finally, no night flight is done until the jet is in the chocks. Concentration is the key all the way into the chocks.

I know, after reading this, you still probably aren't going to be a volunteer to go night fly. But since the mission dictates when we fly, hopefully the four keys to night flying survival can keep your next night mission from becoming a real disaster. Maybe you can wear those sunglasses to your jet anyway! Let's see now . . . preparing my night vision . . . ■

# NUTS

CMSGT ROBERT T. HOLRITZ
Technical Editor

■ Hardly a day goes by that an aircraft technician doesn't have to spin a few machine nuts. This isn't too surprising since aircraft are full of the things. But what is surprising is how little maintainers know about these fasteners that literally hold an aircraft together. Because the proper installation of nuts is a critical part of aircraft maintenance, it is important for maintainers to have at least a basic knowledge of the design and mechanics of machine nuts.



Torque wrenches are designed to be grasped by the center of the grip. This technician will not achieve the correct torque value.

### The Right Choice

Choosing the correct nut is critical to the proper installation of an aircraft component. In fact, installing the wrong type nut is a major cause of both nut and bolt failure. The Air Force uses hundreds of different kinds of nuts in its aircraft. While many nuts appear to be suitable for the job, looks can be deceiving. They are designed for a specific purpose and to function within certain parameters. For example, each nut is manufactured to a precise hardness, usually slightly less than that of the bolt for which it is intended to be used. A nut that is too soft may fail or strip during installation. One that is too hard may damage the threads of the bolt.

The temperature operating limit of a nut is also critical because exceeding it can (and usually does) cause the nut to fail. The design of nuts differs significantly according to their temperature rating. For example, those designed to operate at temperatures below 450 degrees may have a nonmetallic locking mechanism. Those designed to operate at higher temperatures will generally be made of corrosion and heat resistant steel, and the threads are usually silver or cadmium plated to prevent seizing due to heat or corrosion.

Fortunately, choosing the correct nut is usually a fairly simple task. In most cases, the research has been done for you by the design engineers, and the correct part number can be found in the applicable Illustrated Parts Breakdown (IPB).

Unfortunately, many maintainers use another method to find a replacement nut. They simply take the old one to the local bench stock and swap it for an identical item. This method is usually faster and a little less complicated than looking the part number up in the TO. The problem with this method is the technician must assume the old nut was the correct type. The fact is, the nut may have failed because it was not the proper type.

Consider the mechanic who found a worn nut was the cause of a Phantom's slat problem. He quickly replaced the defective part with one from the bench stock. Several days later, the problem recurred. After the nut failed the third time, the mechanic initiated a materiel deficiency report. Looking through the IPB in the process of filing the report, the mechanic found the original nut which failed was not the correct one to begin with, and he had replaced it twice with the same incorrect type of nut!

### Torque Is Critical

Improper preloading is another major cause of machine nut failure. The word "preloading" is foreign to most maintenance people. It is an engineering term which, in maintenance language, means simply "to tighten or clamp." Torquing, a term more familiar to maintainers, is therefore the act of preloading a fastener (nut) to a specific value, usually measured in inch- or foot-pounds.

Insufficient torquing or clamping force causes fastener failure (usually the bolt) by allowing movement within the assembly. However slight, this movement applies cyclic stress to the bolt causing fatigue and eventually failure to either the nut or the bolt. In fact, this kind of stress accounts for about 75 percent of all fastener problems (including screw and rivet failure).

Excessive torque can also cause problems. It is not a case of "if sufficient torque is good, more is better." A little extra torque for good measure can be as damaging as not enough. Too much torque can damage the fastener, cause binding in moving parts, and may also result in warping of panels and surfaces. The latter is especially critical when working with the new composite components.

Because there are so many variables, applying the correct torque is not always as easy as one might think. Variations in applied torque can occur because of differences in thread hardness, roughness, plating, wear, and torque wrench error. To allow for these inconsistencies, most tech data prescribes a minimum and a maximum allowable torque. These variations may be anywhere from 5 percent to as much as 30 percent.

Logically, the first step in proper preloading is to find correct torque value. Generally, this is provided in the TO or job guide which covers the specific maintenance task. However, in some cases, the specified torque value can be found only in the general or basic maintenance technical manual. For example, the torque value for a certain kind of "B" nut to be used in the T-38 is found in the 1T-38A-2-1, T-38 General Airplane, not in the job guides for specific maintenance tasks.

It is important to note that while all nuts are not required by the TO to be torqued to a certain specification, there is a "preferred" torque value for every nut and bolt in the Air Force inventory. The preferred torque value can be found in TO 1-1A-8, Aircraft and Missile Structural Hardware.

It is not uncommon to find inconsistencies in torque values among these publications. When there is a disparity, the specific task or job guide takes preference over the general (-2) tech data, and the preferred value takes the lowest priority.

As mentioned previously, torque wrench error is a variable which must be considered when applying torque. To minimize error, it is best to choose a torque wrench with a midrange at, or near, the desired torque. For example, if the required torque is 50- to 60-inch-pounds, a wrench that has an operating range of 5- to 100-inch-pounds would be most suitable for the job. This is because most torque wrenches are more accurate toward the middle of their operating range.

When using an adapter which changes the distance from the torque wrench drive to the adapter, it is necessary to recalculate the required torque value. The figure shows the formula used to compute the changes in torque wrench setting. Notice the longer the extension, the lower the torque setting.

| | |
|---|---|
| S | equals Handle Setting |
| T | equals Torque Applied at End of Adapter |
| $L_a$ | equals Length of Handle in inches |
| $E_a$ | equals Length of Extension in Inches |

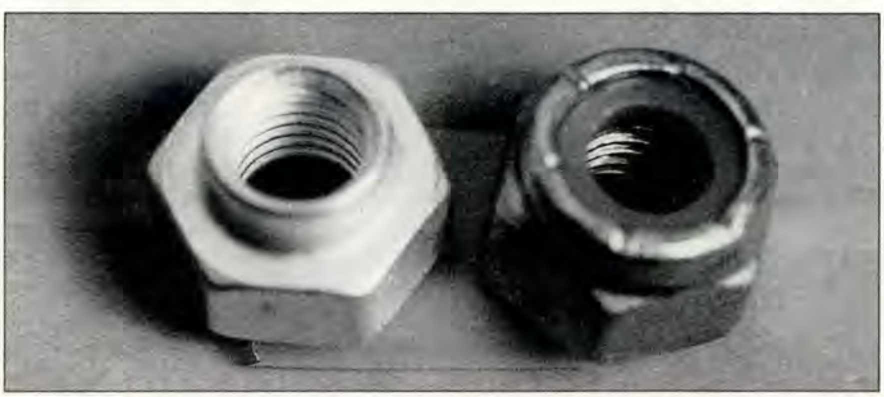
For example, if it is desired to exert 100 inch-pounds at the end of the wrench and extension, when $L_a$ equals 12 inches and $E_a$ equals 6 inches, it is possible to determine the handle setting by making the following calculation:

$$S = \frac{T \times L_a}{L_a + E_a}$$

$$S = \frac{100 \times 12}{(12 + 6)}$$

As one might expect, the process of tightening the nut is critical to achieving the correct torque. The correct procedure requires the nut to be turned until it is about one turn from engaging the surface. Then slowly, with steady pulling

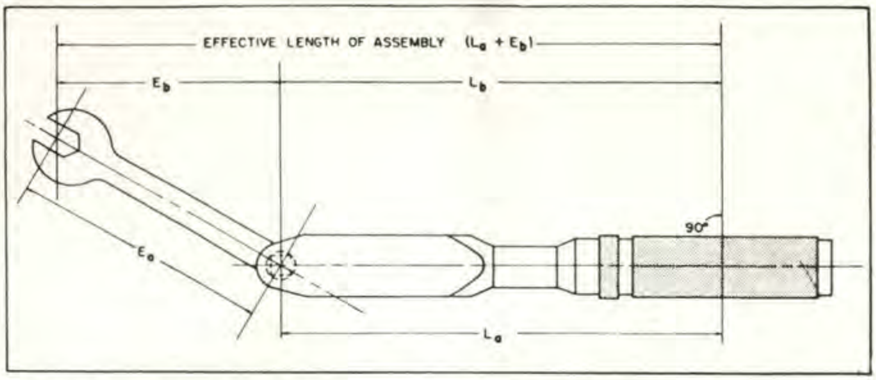
continued



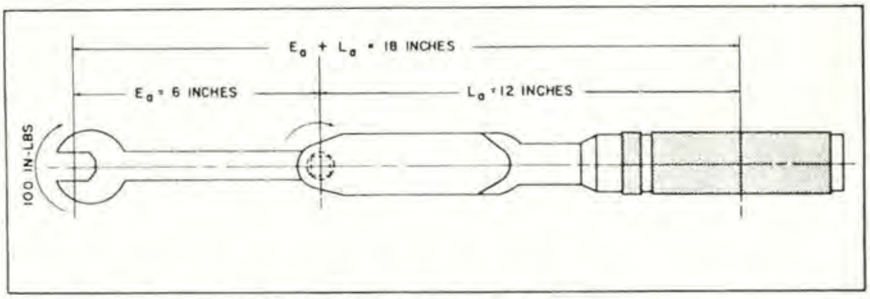
While both of these self-locking nuts will fit the same size bolt and have similar load capacities, only the one on the left is designed for use in high temperatures.

# NUTS continued

force, turn the wrench until it is seated and tightened to the proper torque. Another look at the figure shows the position of your hand also affects the applied torque because it changes the value of "L" in the formula.




Typical torque wrench with typical extension attached at an angle.




Typical torque wrench with typical extension attached in line.

### Prevailing Torque

There are two major types of self-locking nuts—the free-spinning and the prevailing torque. As its name indicates, the free-spinning type turns freely until it is seated. The prevailing torque nut, however, requires wrenching the entire cycle after the self-locking mechanism engages the threads of the bolt. The procedures for torquing free-spinning, self-locking nuts are the same as for any conventional nonlocking type, but because of their wrenching characteristics, the torquing procedure for prevailing torque self-locking nuts is quite different.

The prevailing torque is the amount of torque required to turn a nut after the locking mechanism has fully engaged the threads of the bolt. Each time a prevailing nut torque is reused, this value decreases, creating a variation which must be considered to apply the correct torque. To compensate for the prevailing torque, it is necessary to turn the nut until it is within one turn from being seated. Then, using a dial torque wrench, measure the prevailing torque. If the prevailing torque is less than one-third of the required torque, it should be completely disregarded. However, if it is more than one-third of the required torque, the prevailing torque should be added to the required torque. For example, if the required torque is 70- to 80-inch-pounds, and the prevailing torque is 40-inch-pounds, then the torque wrench should be set to 110- to 120-inch-pounds.

Note there is a minimum allowable prevailing torque below which a locknut must be replaced. The minimum prevailing torque can be found in TO 1-1A-8. However, the "finger tight method" is a quick check for the minimum prevailing value for nuts 3/8 inch or smaller. If the nut can be moved with the fingers after the locking mechanism is fully engaged with the threads of the bolt, then the nut must be replaced. There is an important caution that must be followed when using self-locking nuts. A *new* self-locking nut must be used each time components are installed in critical areas such as flight control systems and in and around aircraft engines, especially if they are where they may be sucked into the intake.

### Castellated Nuts

Self-locking castellated nuts were designed to meet critical design parameters and provide an extra margin of safety in areas such as flight control systems and engines. They are torqued in the same manner as other prevailing torque self-locking nuts, except after the proper torque has been applied, one of the slots must be aligned with a hole in the bolt to allow a cotter pin or safety wire to be inserted. This can be achieved by applying the minimum allowable torque and gradually increasing the torque until the holes are aligned. The important thing is not to overtorque or back off a nut to align the hole. If the nut will not line up with the hole within proper torque parameters, replace it with a new one.

### Thread Protrusion

A nut is designed to sustain a certain load. To meet this demand, it must fully engage the threads of the bolt. To help prevent cross-threading, the first two threads of most bolts are chamfered. Since these two threads do not engage the threads of the nut, they do not bear any load. For this reason, it is necessary to ensure at least two threads of the bolt protrude through the nut when applying torque.

### TLC

Failing machine nuts are a major cause of aircraft component failure and a frequent source of FOD. In spite of our efforts, it is doubtful this will cease to be a problem. But with a little TLC and following the guidelines in this article and the basic TO, a large number of nut-related aircraft problems can be avoided. This article only touches the tip of the iceberg. More detailed and valuable information on fasteners can be found in the 1-1A-xx series tech orders. ■

# WEATHER GETS A FACELIFT


CAPTAIN GEORGES KLEINBAUM
HQ Air Weather Service
Scott AFB, Illinois


*There's certainly nothing unusual about filing a flight plan. First, you've got to pay a visit to the weather station. Standing by the counter, you inspect the wall of meteorological charts and listen to the forecaster tell you good news or bad. Finish this little exercise with a look at another wall of paperwork for a quick note or two on the NOTAMs which apply to your trip, deliver your paperwork to base ops, and off you go. It's a routine done many times and not particularly noted for its extraordinary differences from base to base. But the Air Force is always looking for better methods, and changes are on their way.*

■ Brace yourself because the future begins tomorrow! Imagine we're at base ops on McGuire AFB, New Jersey, late in 1990. This weather station looks very, very different. For one thing, the piles of weather charts nailed to the walls are gone. Step right up to the counter, and take a good look at the color monitor. You'll still get your briefing all right, but the weather will be shown to you on a screen in glorious Technicolor. Your questions will be readily answered as the briefer calls up on the monitor the specific information you need to know. On top of all that, if one of the weather products shown is of particular use to you, ask for it. You can have a paper copy of anything.

With that done, your search for the wall of NOTAMs will take you directly to a little computer terminal in the base ops area. This part is particularly simple. Aircrews will enter the four letter ICAO identifier for the airfields they're going to, and the desired NOTAMs will either show up on the screen or get printed. If you need the NOTAMs, the hard copy is for you to take along. A little hard to picture? Below is a picture of one contractor's proposal of both the NOTAM and aircrew briefing terminals of the system officially called the *Automated Weather Distribution System,* but everyone simply refers to it as AWDS (a'wids).

Like flying, weather forecasting and observing are skills which need to be exercised. And like anyone else trying to improve their ability at a specific job, forecasters and observers want more time to work at their art and less time handling the volumes of paperwork that come with the business. In an attempt to simplify their lives, a complete change in the method of obtaining, analyzing, and disseminating data for the meteorologist was devised. AWDS is the result.

### How It Works

AWDS is divided into functional areas. These areas will be installed in different locations and are specifically designed to meet unique mission requirements. AWDS receives digitized data transmitted from several locations to the Communications/Data Management (C/DM) area, the heart of AWDS. The C/DM area is the central processor of each AWDS unit. The forecaster sitting at the base

continued

As the Automated Weather Distribution System (AWDS) is brought on line, aircrews will find more information is available with less effort and more accuracy than ever before. One terminal provides all current NOTAMs, and another displays weather information in color.

# Weather Gets A Facelift continued

weather station area can access from the AWDS data base any of the meteorological products they may want. Not only that, but different products can automatically be superimposed upon each other to produce a huge variety of useful information which forecasters today just don't have time to prepare. Since AWDS incorporates alphanumerics, NOTAMs can be received and stored in the NOTAM area until someone needs the information. Updates are automatic. As AWDS has hardcopy capability, there's no need to write down the information—just take it with you.

In fact, AWDS will be quite evident throughout the flying community. For one thing, you can kiss your autowriter goodbye. That particular piece of ancient technology is no match for the Flight Control Facility (FCF) area. There will be two types of FCF areas: One for Flight Operations and one for Air Traffic Control.

The Flight Operations FCF which will sit in your unit will be a small, tabletop monitor which can store and display the latest local observations and forecasts, the latest weather warning, up to 10 weather advisories, NOTAMs, airfield advisories, and up to 10 PIREPs. The base weather station will enter this data for your base. But the Flight Operations FCF can also display data for up to five other preselected airfields. It receives automatic updates from these fields. If you need any of this data, you can access it directly from your FCF independently of any other on base. Keep in mind the categories listed above are not displayed simultaneously, so to catch your attention, the FCF area will automatically give a visual and audible alarm if something is changed or added.

All the information the Flight Operations FCF receives will also be sent to the Air Traffic Control FCF with one major addition. It will receive and continually display air traffic control information entered by the watch supervisor. There are a few hardware differences, but these are relatively minor and are geared to the needs of an air traffic controller.

With AWDS, the way we get our weather will be completely different—a new format on a new medium. While the coming of AWDS will mean major changes for aircrews, it's nothing compared to what it means to weather personnel. For them, it's long overdue. The current method of briefing pilots has been in effect since someone first thought those intrepid aviators needed to know the weather. There have been changes and upgrades in equipment through the years, but they've been few and far between. In fact, the type of equipment now in use has been around for 30 years, and it's time for a change.

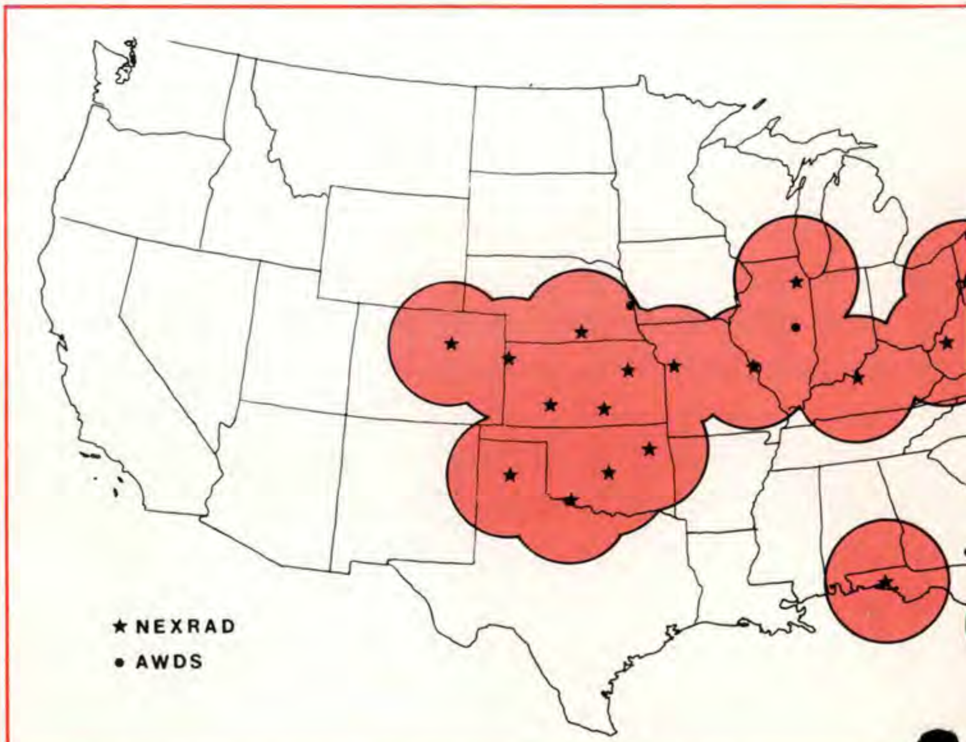
### A Powerful Tool

In the hands of a forecaster, AWDS is a powerful tool to improve the quality and responsiveness of weather services for everyone. Obviously, an increase in the efficiency of a weather station will directly affect the safety of the flying community. The ultimate result of such an upgrade is more time for our forecasters to work on the weather. More time to digest the available weather data and monitor changing weather conditions should result in better weather support for everyone.

By 1995, there will be over 180 AWDSs worldwide. The location of the first 20 units is shown in the map by the small dots. (The dots don't add up to 20 because some units are too close together to be shown.) The implementation of AWDS will bring the military forecaster into the 1990's.

### NEXRAD

The weather radars currently used by meteorologists have been in use for a very long time. These radars measure only the reflected energy of precipitation and some cloud types. The limited nature of current radar information requires a lot of interpretation learned from years of careful study of reflectivities and a knowledge of meteorology. With the advent of NEXRAD, meteorologists will have the ability to "see" the motion of the air itself, even what we normally



think of as "clear air." NEXRAD will do this by picking up airborne particles, like dust and ice, and even insects and birds. This is accomplished by having NEXRAD placed in what is called the clear air mode. This mode scans the air at a slow rate to detect very small targets. During severe weather, NEXRAD will be placed in the storm mode, which scans the air faster and is better suited to detect conditions associated with inclement weather.

The advantage of all this is immediately apparent when used to alert an aircraft about wind shear in the area of their route of flight. While there is nothing visible to the naked eye, NEXRAD, in the clear air mode, will produce a display of the motion of the air with different colors assigned to different velocities. A meteorologist can interpret such a display and find extensive areas of significant wind shear. If that isn't enough, the NEXRAD unit itself can be programmed to sound an alarm should any of 25 specific weather parameters be exceeded. Aviation weather hazards can then be relayed to any aircraft in the area in the same manner they are today. Likewise, the ability to detect and accurately pinpoint tornadoes in the formative stage will have an immediate impact. In fact, NEXRAD, in the storm mode, will be able to detect tornadoes up to 20 minutes before they touch down! Capabilities such as this will save lives and other resources almost as soon as the system becomes operational.

There are some other less obvious advantages to this new system. For one thing, several customers can receive information from a single radar dish. While the radar continuously gathers and processes weather data, each user can request different products independently. One customer may call up one piece of data while another might request totally different information. Each radar unit can simultaneously handle up to 20 different customer requests. To top it all off, each one of these users can call up the data from any other NEXRAD unit in the country and display what's going on in another part of the nation.

A prototype NEXRAD has already been built and tested. The plan calls for over 130 USAF units to be located all over the country. Production is scheduled to begin in early 1991. The first operational unit will soon be installed in Oklahoma and will be on line by spring 1991. Figure 2 shows the area of coverage at 10,000 feet by the first 20 or so NEXRADs. The stars represent the specific site locations. What may appear to be an excessive number of units in the Midwest is due to the fact this area experiences some of the most severe weather in the world. When the project is complete, the entire country will be amply covered by NEXRAD units. The entire system, both the nationwide radar network and those found at American bases overseas, will be complete by 1995.

The majority of the first 20 or so NEXRAD sites will be located in areas which historically have severe weather. Eventually, NEXRADs will cover the country.

### An Important Step Forward

Technological advances eventually reach us all. AWDS and NEXRAD are major advancements in the field of meteorology and, when they are fully deployed, weather forecasting will take an important step forward. ■

## DOPPLER RADAR

■ While AWDS is coming out, right alongside it will be a source of new information in the form of Doppler weather radar. This Next Generation Weather Radar is called (not surprisingly) NEXRAD.

The principle on which Doppler radar is based is not new. The Doppler effect was first described in the mid-1800's by an Austrian physicist named Johann Christian Doppler. The Doppler effect results from the fact waves traveling towards you are apparently shortened, and waves traveling away from you appear to be lengthened. Once the appropriate hardware is built to measure this effect, velocities of the objects toward and away from you can be determined. Astronomers have used this technique for many years to determine the velocities of stars and galaxies and to measure the rate of expansion of the universe. It's a hand-held Doppler radar that tells a police officer whether you're speeding or not.

The application of the Doppler effect on the field of meteorology will have far-reaching consequences. The potential of the system to better detect hazardous weather, while at the same time reduce false alarm rates, has enough impact on our forecasting abilities that three government agencies are involved in sponsoring the project: Department of Defense, Federal Aviation Administration, and the National Weather Service. ■

# MAGICAL AIRSPEEDS


**Helicopters are apparently designed by magicians, but like any other aircraft, there's really nothing "magical" about learning the proper airspeeds to fly. The steps taken here to analyze the available information can be used by pilots of any aircraft.**

**CAPTAIN R. E. "BUCK" JOSLIN**
Aviation Safety Programs
Naval Postgraduate School
Monterey, California

■ Two recent mishap investigations involving gear box failures addressed the selection of the optimum airspeed in cases of impending catastrophic component failure while flying over water or hostile territory. Operator manuals generally are pretty vague in specifying the desired flight profile in this situation; however, at least one mishap investigation report suggested possibly the best airspeed would be that which demands the lowest power requirements, hence the smallest load, on the malfunctioning transmission or gear box components, thereby delaying their failure.

If we look at a generic power required versus airspeed curve (figure 1) for a conventional helicopter flying straight and level, we see there is a dip or "bucket" in the curve, delineating the point of lowest power requirements which occurs at a particular airspeed. This would be the most desirable airspeed to maximize the longevity of the mechanical load-bearing components. But is it a reasonable airspeed to ensure a survivable rate of descent once failure occurs? What if we need to climb to gain better radio and navigation reception? Is this airspeed conducive to an effective rate of climb?

As it turns out, this "bucket" airspeed, denoting minimum power required, also is the airspeed for maximum rate of climb by virtue of being the point of maximum excess power (figure 1), which is the difference between the power available and power required. A valid assumption (for the relatively low airspeeds achieved by current conventional helicopters) is that power available is independent of airspeed. This same point, where power requirements are minimized, corresponds to the airspeed for minimum rate of descent in a power-off situation. Power requirements are also directly proportional to fuel flow; therefore, we can relabel the vertical axis as fuel flow and find the point of minimum fuel flow. This also corresponds to the aforementioned "bucket" airspeed and is called the airspeed for maximum endurance/loiter time.

Therefore, for a given gross weight and altitude, this single airspeed allows us to climb at the best rate to enhance communication and navigation reception, minimizes our fuel flow if we choose to loiter until assistance arrives or a positive fix is obtained, affords us a minimum rate of descent, thereby maximizing our survivability in the event of a complete power loss and subsequent ditching, and minimizes the mechanical loads on the failing components to the point of possibly delaying their demise long enough to reach some suitable landing site.

The "bucket" shifts a little with changes in gross weight (e.g., fuel burnoff) and altitude and accounts for the difference between airspeeds when listed explicitly in the text of the operator's manual. Actually, there is only one "bucket" airspeed for each gross weight and altitude combination, but, in some cases, we have adopted the terminology of "best," which implies some average value over the normal gross weight and altitude operating ranges.

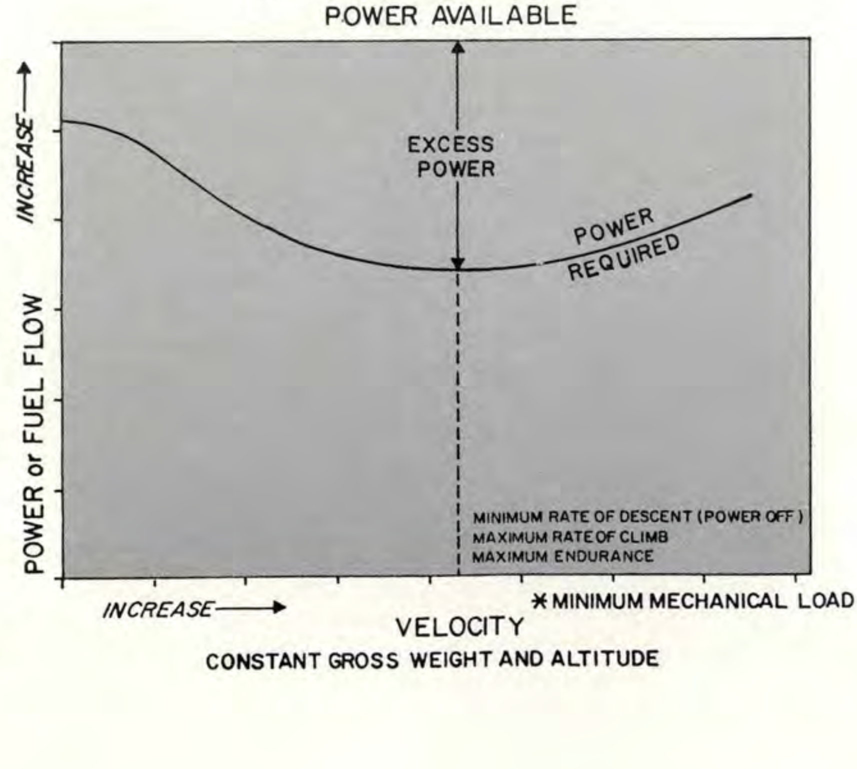
Some operators' manuals have a power-versus-velocity curve plotted clearly, while others have them cleverly disguised by reversing the axes, or imbedding them in some multivariable chart. Nevertheless, the target airspeed that minimizes transmission and gearbox loads, delaying catastrophic component failure, can normally be extracted either from the text or off a chart in the operator's manual and probably could be more clearly addressed in the emergency procedures section. Figure 2 lists estimated "bucket" airspeeds over typical operating gross weights for various helicopters at sea level. The premise of this whole emergency situation is we are over water or hostile territory and, therefore, are unable to land as soon as possible.

Of course, nothing supersedes sound judgment and good headwork in adjusting to a particular emergency situation. Selection of the most favorable airspeed can depend on meteorological conditions, maximum range requirements, or other considerations once catastrophic failure is imminent. However, in the absence of any better guidance, you might consider pulling the *magical airspeed* out of your bag of tricks! ■

**Figure 2**
**Minimum power required airspeed at std. sea level**
**(Estimated visual interpolation error ± 2 knots)**

| AIRCRAFT (With current engines) | GROSS WEIGHT (X 1,000 lbs) | IAS (KNOTS) (Minimum power required) |
|---|---|---|
| H-1 | 8-10 | 57-62 |
| H-3 | 16-20 | 65-70 |
| H-53 | 38-42 | 78-83 |
| H-60 | 17-21 | 62-70 |

**Figure 1**
**Power/Fuel Flow Versus Airspeed**
**(Constant gross weight and altitude)**




Captain "Buck" Joslin is a Marine helicopter pilot with a Master of Science in Aeronautical Engineering and is currently assigned as the helicopter aerodynamics instructor for the Aviation Safety School located at the Naval Postgraduate School, Monterey, California.

# IFC APPROACH

# My Instrument Question Is:

THE IFC STAFF
USAF Instrument Flight Center
Randolph AFB, Texas 78148-5001

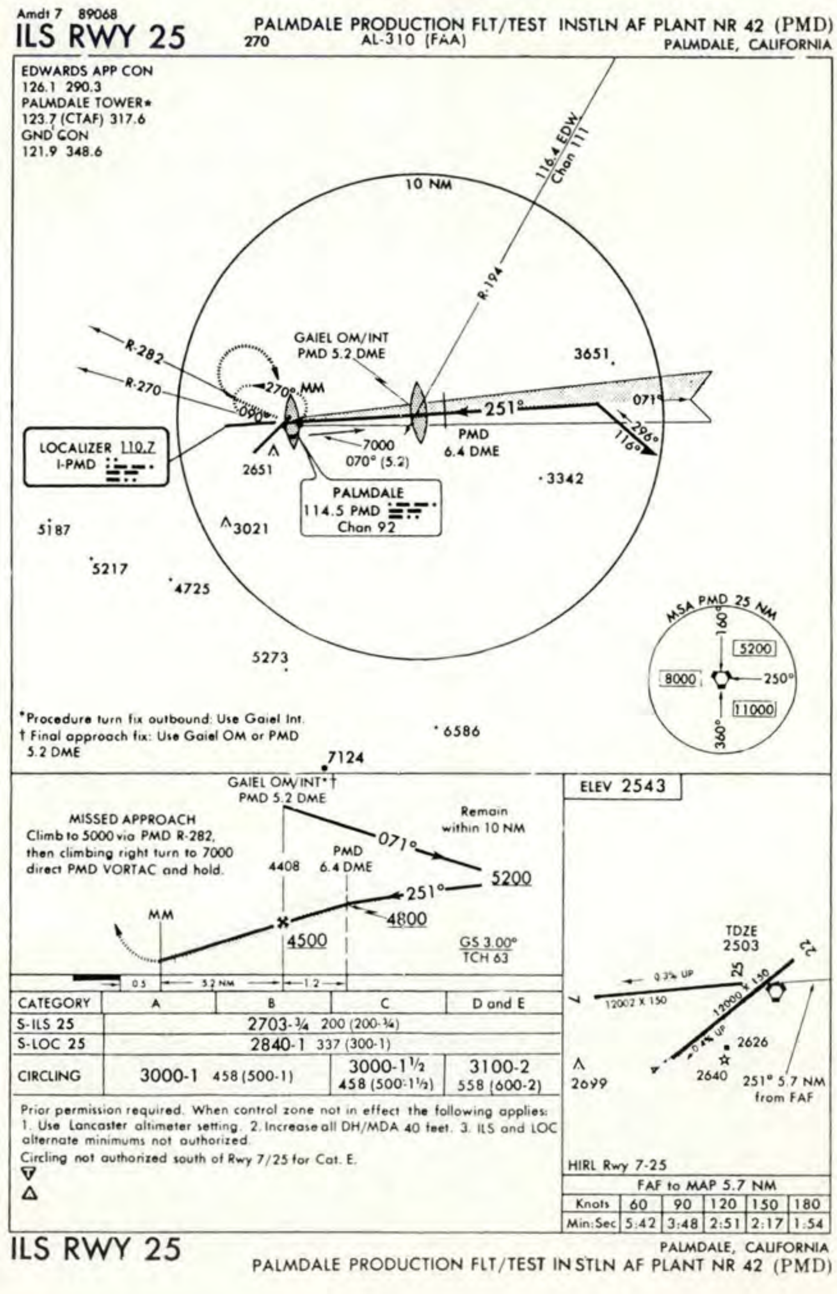
■ As the focal point for Air Force instrument flight procedures, the Instrument Flight Center has received numerous inquiries on instrument-related topics. We have published the following most frequently asked questions in the hope this information will increase your understanding of instrument procedures and techniques.

**QUESTION:** *Now that a pilot is no longer required to file to a fix in the event of radio failure, what does the pilot do at the destination if he filed to a facility at his destination airport?*

**ANSWER**: According to the Flight Information Handbook, page A-8, you should delay at the filed facility until your expected further clearance (EFC) time and then proceed to the IAF. If you have not received an EFC, you should delay at this facility so you can arrive at a suitable fix to start an approach as close as possible to your estimated time of arrival (ETA). Normally, you will arrive at the filed facility close to your ETA and proceed immediately to an IAF and accomplish the approach.

**QUESTION:** *In AFM 51-37,* Instrument Flying, *Attachment 4, para A4-2, NOTE: It states the ICAO course reversal maneuvers described "apply only in airspace not under FAA control." However, para 371 (procedure turn) in the AIM*

Figure 1



*states "the type, rate of turn, and point at which the turn is begun is left to the discretion of the pilot." This statement seems to say you can fly the ICAO course reversal maneuvers (45/180, 80/260, base turn, race track) in FAA controlled airspace as long as the pilot remains within the depicted airspace. Is there a contradiction between AIM and AFM 51-37?*

**ANSWER:** The ICAO course reversal maneuvers are included in AFM 51-37 so pilots flying in countries that use ICAO procedures will know how to complete the procedure properly. However, according to TERPs criteria, the pilot can fly the ICAO procedures in CONUS as long as their MAJCOM approves. Some commands do not want their pilots to fly the 80/260 maneuver because they feel the pilot may become disoriented by the constant turn and turn reversal.

The following rule of thumb works well: Use US procedures when in FAA-controlled airspace and at NATO military fields. NATO military fields use the APATC-1 (Criteria for the Preparation of Instrument Approach and Departure Procedures) which essentially is the TERPs manual rewritten to allow for military criteria. The easiest thing to do is simply fly ICAO procedures whenever outside FAA-controlled airspace. From a TERPs point of view, this will always keep you safe.

**QUESTION**: *Reference Palmdale ILS RWY 25 (figure 1). Can the PMD VOR be used to fly the procedure turn prior to the FAF?*

**ANSWER:** No. Without a radial drawn from the PMD VORTAC, it cannot be used for the approach procedure. The localizer must be used for both the outbound and inbound course guidance. The FAF is defined by either the localizer 5.2 DME from PMD, the intersection of the localizer and the EDW R-194, or the outer marker.

**QUESTION:** *Are the feeder routings on the HI IAPs flown the same as on the low?*

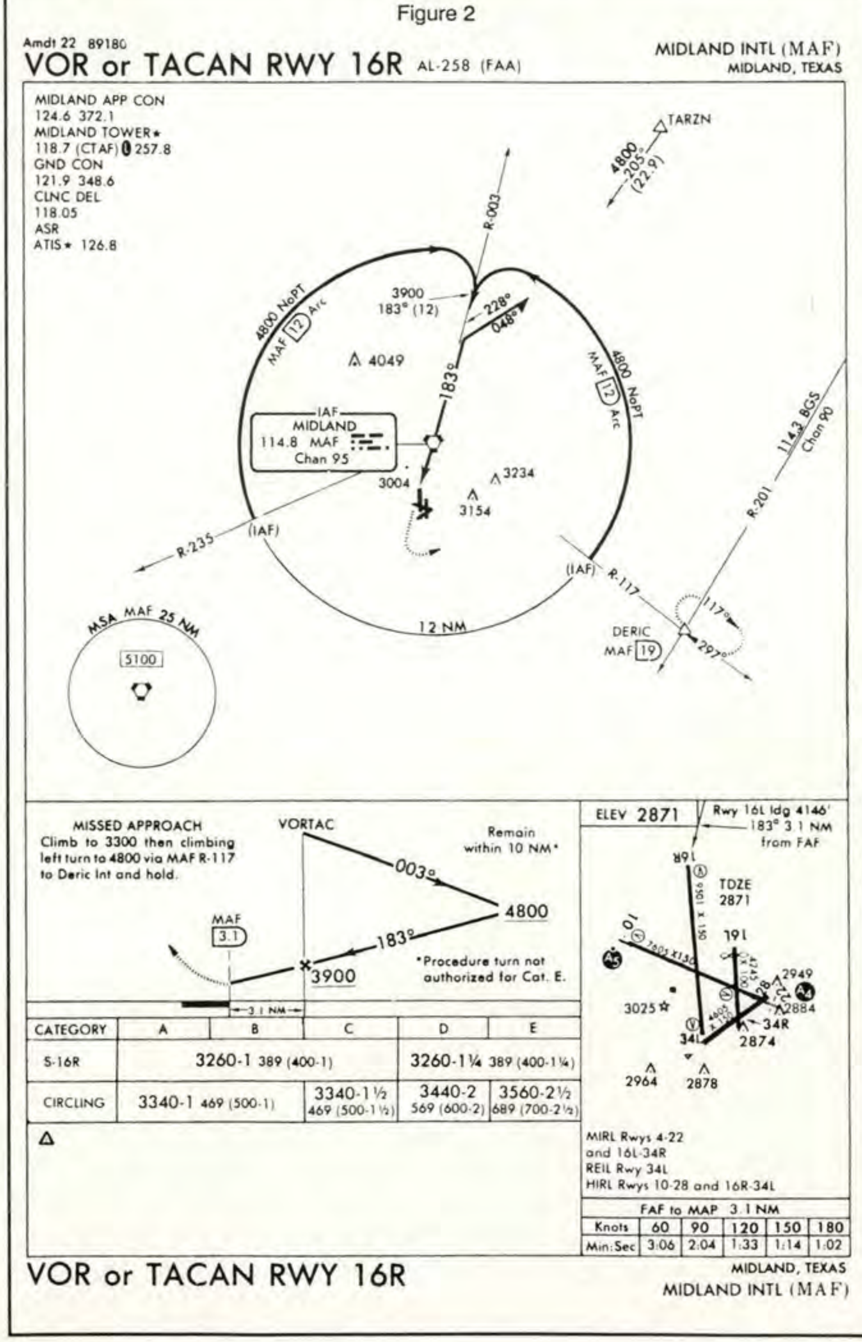
**ANSWER:** No. Once cleared for an approach, you are expected to descend on published routing or when established on a segment of the IAP. Published routing is a route for which an IFR altitude has been established and published. HI IAPs should not have altitudes associated with them and are not flown the same as the low feeder routings.

**QUESTION:** *Why is the MDA for the VOR or TACAN RWY 16R at Midland, Texas (figure 2), 80 feet higher than the HI-VOR/DME or TACAN RWY 16R?*

**ANSWER:** There was a breakdown in communication. The FAA changed the low IAP and did not inform the military agency responsible for the high IAP. Pilots should cross-check the NOTAMs for the low IAP equivalents of the high IAP at civil fields. If there are changes, the pilot should use the

continued

Figure 2




| CATEGORY | A | B | C | D | E |
|---|---|---|---|---|---|
| S-16R | 3260-1 389 (400-1) | | | 3260-1¼ 389 (400-1¼) | |
| CIRCLING | 3340-1 469 (500-1) | | 3340-1½ 469 (500-1½) | 3440-2 569 (600-2) | 3560-2½ 689 (700-2½) |

| FAF to MAP 3.1 NM | | | | | |
|---|---|---|---|---|---|
| Knots | 60 | 90 | 120 | 150 | 180 |
| Min:Sec | 3:06 | 2:04 | 1:33 | 1:14 | 1:02 |

high IAP at civil fields. If there are changes, the pilot should use the most conservative altitudes and notify somebody (USAF IFC) to get it changed.

**QUESTION:** *You are established in holding and have rolled out on downwind when ATC clears you for the approach. Are you expected to proceed direct to the IAF, or is it permissible to complete the holding pattern?*

**ANSWER:** Most pilots will turn immediately toward the IAF and penetrate. However, when established in the holding pattern and subsequently cleared for the approach, you are allowed to complete that holding pattern before starting the approach. Once you reach the IAF, you must penetrate or request clearance for further holding.

**QUESTION:** *AFR 60-16, Table 6-1, Oxygen Procedures for Pressurized Aircraft, where it says the requirement is "O," does this mean the regulator must be set to 100 percent?*

**ANSWER:** No. The regulator is designed to supply you with a required amount of oxygen for different altitudes in the normal position. Having the diluter lever in 100 percent will give you 100 percent oxygen all the time.

**QUESTION:** *AFM 51-37, para 9-9, states the "minimum holding altitude is the same as the IAF altitude for holding patterns where the holding fix is also the IAF unless otherwise depicted or noted." HI-ILS RWY 4 Amarillo Intl depicts a holding pattern where the IAF and holding fix are not collocated, but the IAF is in the holding pattern. The published IAF altitude is 18,000.*

*Can I descend to this altitude after being cleared for the approach or must I maintain the last assigned altitude until established on a segment of the approach?*

**ANSWER:** This approach is a special case which is not clearly covered by AFM 51-37. Because the IAF is overflown when established in the holding pattern, the intent of AFM 51-37 is to permit the pilot to descend to the IAF altitude in TERPs-protected airspace after being cleared for the approach. To ensure there is no misunderstanding, confirm with ATC you are descending to FL 180.

**QUESTION:** *What does "climb and maintain" mean in relation to a SID?*

**ANSWER:** AFM 51-37, para 8-7, states you may disregard the SID altitude restrictions "once initial clearance is received" (the one you receive in the chocks) if you are told to "climb and maintain" or "maintain" a specific altitude, unless the controller specifically includes other altitude restrictions in that clearance. This paragraph comes from FAAH 7110.65, para 4-14, Clearances: Route or Altitude Amendments. Restating a previously issued altitude to "maintain" is an AMENDED clearance. If the altitude to "maintain" is changed or restated, whether prior to departure or airborne, and previously issued altitude restrictions are omitted, altitude restrictions are canceled including those on the SID. This does not affect climb gradients for obstacles, because only altitudes are deleted, not gradients.

**QUESTION:** *What are the allowable speeds on VR routes?*

**ANSWER:** FLIP AP 1B, para 1, says VRs are developed for military operations that cannot comply with FAR 91.70 speed requirements. They allow a waiver of the 250 KIAS below 10,000 MSL rule to enable you to fly faster if there is a need. However, a later paragraph (V3) says operations must be conducted at the minimum speed compatible with the mission. There is no minimum speed to fly.

**QUESTION:** *AFR 60-16, para 8-2e, says you must be under IFR when "operating on point-to-point flights in fixed wing aircraft where the primary purpose is training, logistics, or admin support." What is meant by the phrase "point-to-point"?*

**ANSWER:** It refers to the use of RNAV systems when not flying published airways. It also includes TACAN/VOR when proceeding from one facility to another which is not part of the airway structure or fix-to-fix navigation using available NAVAIDS.

**QUESTION:** *Does the 200/156 KIAS max airspeed within an airport traffic area apply within a TCA?*

**ANSWER:** FAR 91.70 says this airspeed does not apply within the limits of a TCA, even though it has an ATA.

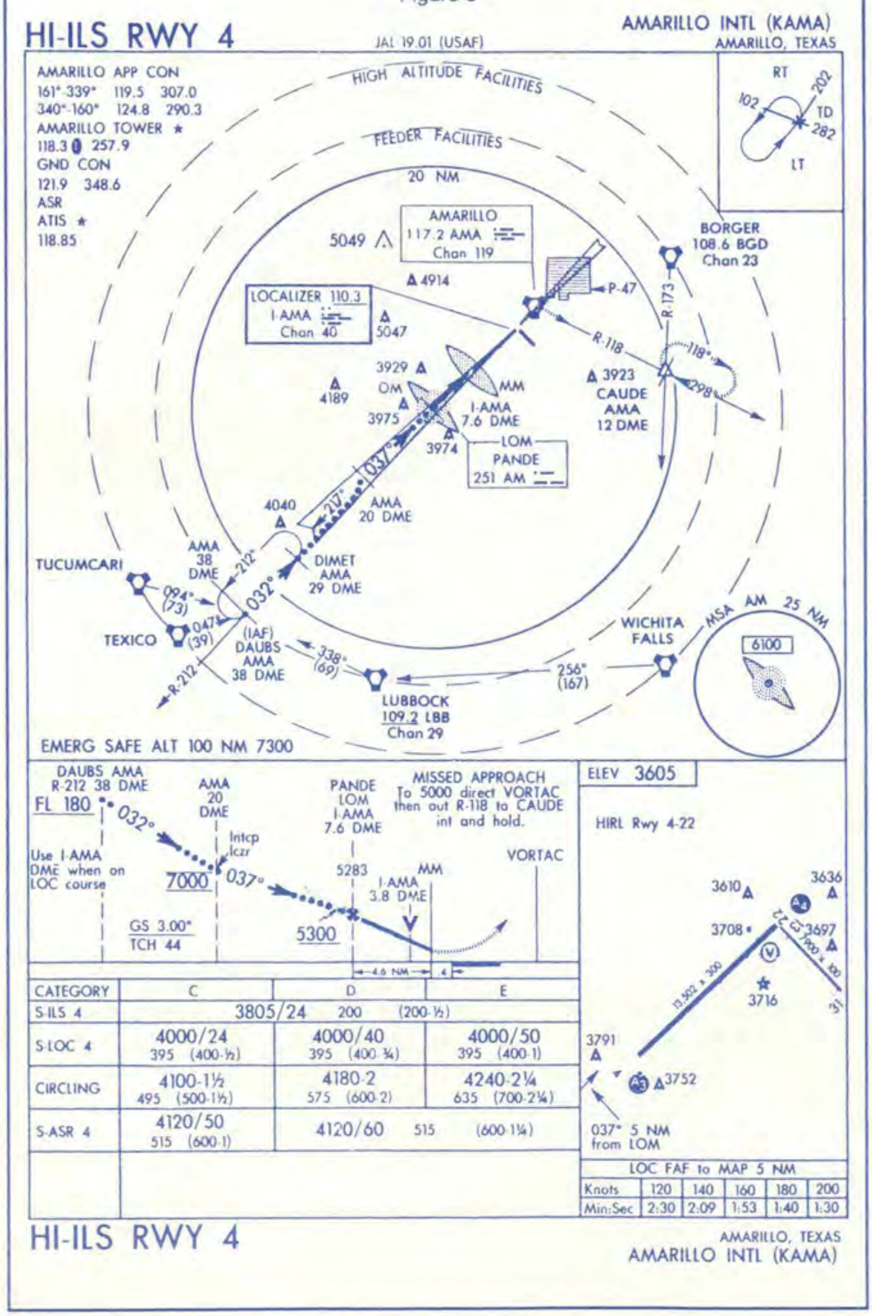
**QUESTION:** *Can a tower controller clear you into an ARSA?*

**ANSWER:** A tower controller can clear you into the airspace he has control of, namely the inner core of the ARSA where the ATA exists. The FAA says to check the chart to find out which agencies to contact for entry into an ARSA.

**QUESTION:** *Using the HI ILS RWY 4 at Amarillo (figure 3), must you dial in the ILS DME (Chan 40) to fly the final approach segment?*

**ANSWER:** The title of the approach refers to the final approach segment and is labeled ILS, not ILS/DME. The final approach can safely be flown without using ILS DME. Glideslope intercept is the FAF or PFAF (precision FAF) as the FAA calls it, and decision height is the missed approach point. However, even though the DME is "not required," the smart instrument pilot uses all available NAVAIDS to stay position oriented. You are counting on the LOM to work for backup timing, and your position orientation may become distorted if you have selected the AMA DME (Chan 119).

Figure 3




**QUESTION:** *Can USAF aircraft fly SIDs RNAV?*

**ANSWER:** No. The SID is considered part of the terminal area. USAF has not yet certified its aircraft for RNAV operations in the terminal area. Even if a civil field has RNAV SIDs, your RNAV aircraft is not certified to fly them. However, the Air Force TERPs people are told to put geographic points at the IAF and departure termination point to facilitate en route RNAV operations. AFR 60-27, Instrument Procedures, para 14c, covers this. It states that only procedures designed IAW FAA AC 90-45 will be identified as RNAV appropriate procedures.

**QUESTION:** *What does the reverse symbology A followed by NA mean?*

**ANSWER:** Civilians have their own requirements for what qualifies an airfield as an alternate. When an individual airfield has alternate mins, as indicated by the reverse symbology A, these are published in front of the civilian IAPs. The Air Force uses its own minimums in AFR 60-16 to determine an alternate, so we don't need to know the civilian minimums. The NA indicates the airfield cannot be used by the civilians as an alternate because it does not have a weather reporting service or has unmonitored facilities (NAVAIDS). When a pilot flies his government issued aircraft, he must not use an airfield as an alternate if the facility is unmonitored or there is no airfield specific weather forecast. A general area forecast does not meet this requirement. ■

*Most of us have the basic belief that the odds are against it happening to me, BUT*


# ...It DID Happen To Me

**CAPTAIN MICHAEL R. STOCKWELL**
HQ Aeronautical Systems Division
Wright-Patterson AFB, Ohio

■ Being an Air Force pilot and having been formally trained in both rotary-wing and fixed-wing aircraft, I have always been a positive thinker about attaining just about anything I put my mind on doing. I have also been under the illogical notion that "it can't happen to me." I've probably been living the good life too long.

I remember attending Life Support Officer School in the summer of 1984. During the final days of the course, the director looked at the class and said, "Within 6 months, one of you will be the Life Support Officer on a Class A mishap for a safety investigation board."

What did I say to myself in that class of many? "There are too many other people here. It can't happen to me." It did, in fact, happen to me! Within 6 months, I found myself examining the remains of my close flying buddies to confirm they had properly worn their life support gear (mainly LPUs) even though they didn't have the opportunity to use that gear.

I made it through that experience in life nurturing the attitude, "Boy, I've been close to a major aircraft mishap. My close friends lost their lives. In fact, I've been so close it can't possibly happen to me. Everyone knows lightning never strikes twice in the same place."

Well, guess what, folks? In the fall of 1986, I was intimately involved in a helicopter crash. In fact, I was one of the pilots. It was one of those "routine" flights over the Utah Test Training Range. The right seater had previously landed at that very site on top of the mountain that was our destination.

Everything was going as we planned—or so we thought—until on short final to our intended landing spot, the "bottom" dropped out of the helicopter, and we all knew what was about to happen. We impacted so hard the rotor blades lopped off the top of the cockpit and continued with a glancing blow to the top of my helmet. I'm so glad I had taken the time to put both visors down on my 39P that day as hundreds of little pieces of metal and Plexiglas went flying through the cockpit (from right to left, of course).

Well, the tail rotor pylon finally dug in after breaking off (ultimately stopping us from rolling backwards down the hill). We egressed the helicopter and made a mad dash to the top of the mountain amidst flying debris as the helicopter tore itself to pieces and then burned to the ground.

One thing, in particular, I will never forget was the fact I wanted to egress quickly from the helicopter. As all "53" drivers know, the pilot's window is only 6 inches away when you're strapped in. But something deep inside the old nerve center told me I couldn't egress through my emergency window because it wasn't there anymore. I was sitting inside a convertible H-53, with nothing above the glare shield but blue sky, and deduced I couldn't get out without going back through the cabin. I can only look back and wonder why the "old noggin" came up with that idea.

Although the landing site is a routine training site, a minor malfunction could result in a cold night's stay on a barren mountain.

### Preparing for Self-Preservation

Another area we sometimes fail to consider is the idea of actually having to take charge of a situation and use our best judgment to get us through. Most of us are well trained in what to do in a survival situation, but when it gets right down to the basics of self-preservation, we find we can never be overprepared.

These are questions to think about:

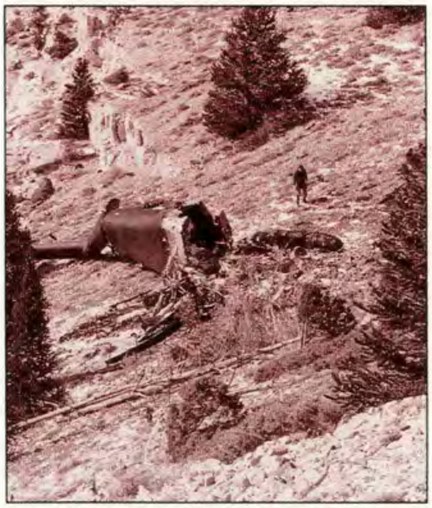
- How does your PRC-90 radio *really* work?
- Will you have to spend the night on top of a mountain—with no gear other than what is on your body—because you don't have the proper gear to descend down the mountain?
- Are people out there who know of your situation trying to find you? The questions never end.

Well, we all healed up just fine. Life moved along, and I said to myself, "I've just been through the ultimate. I don't think anything worse could ever happen in my Air Force flying career to top what I've already been through."

I'm a dedicated officer and a good pilot, and I always put down "Excellent" in the health block of my annual flight physical. (Everybody knows we have minor headaches, warts, and stiff joints, but they don't count.) Nonetheless, we all consider ourselves, for the most part, to be in pretty good health. Well, the ultimate "It can't happen to me" has happened to me. As of July 1989, I became medically grounded. Needless to say, I have changed the words "Flying Career" to "Air Force Career"—probably what I should have been calling it all along anyway. I don't say "it can't happen to me" anymore. I really don't need any more major surprises.

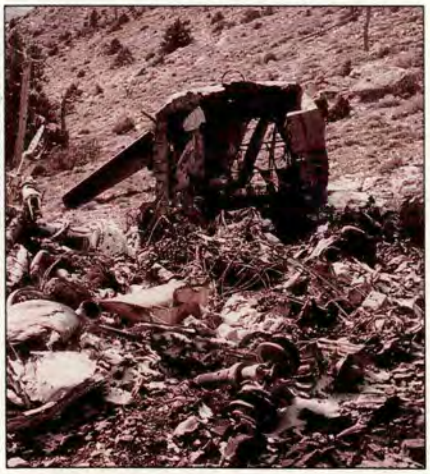
The lesson in all this is the thought that no matter what we do in the Air Force, Murphy is in the next office, or in the back of the truck, or in the cargo compartment, ready to prove to us that "it CAN happen." Are you prepared? ■

Despite the damage to the aircraft, a properly worn helmet with visors in place enabled the flight crew to escape uninjured.



Without effective *flight following*, forced landings in remote locations may easily go undetected by search and rescue crews.

Looking at the wreckage, it's hard to believe we all came out alive. We beat Murphy.



# Once Again, Thanks For Your Support!

AND THE WINNER
FOR THE JANUARY 1990
DUMB CAPTION CONTEST
IS...

**MSgt Marvin R. Huntley**
175 TFG Martin State Airport
Balto, Maryland


If you listen intently, you can probably hear the gnashing of teeth, the groans, the wails, and the complete unexpurgated list of curses coming from our dumb caption writers' cages. Yes, friends, you've done it once more: You have beaten the pros at their own game. Congratulations go out to the winner, MSgt Marvin R. Huntley. You may now take a bow! Your cheap little prize will soon be on its way.

Not only did Marvin beat our dumb caption writers, but even the honorable mention entries (below) were better, too. Check them out. If you would care to test your own talents at this worthy effort and perhaps win the legendary cheap little prize in the process, take a gander at the latest contest on the back cover. It's a dirty little job, but...well...you know!!

## Honorable Mentions

**1. Trenchly! You need to work on your low level navigation! The BASH Report identified the bird as a penguin!**
Submitter unknown

**2. When I snap my fingers three times, you will awake completely refreshed, no longer fearing the Dumb Caption Contest Thing!**
1Lt John Mark Shields, PAANG, 112 TCS, 661 Bigler Road Extension, State College, Pennsylvania

**3. Smedley, it just isn't that tough! Block one says "Print Name"...**
Capt Jim Weber, 608 CAMS/MAS, APO New York 09094

**4. "You with the 'pop' can. Look at me when I talk to you!"**
Lt Col "Bud" Opitz, 142 MSS/CC, Oregon ANG, PIA Portland, Oregon

**5. No, it's in my other hand. Want to try again?**
SSgt Henry R. Harlow, USAFR, 907 CAMS/MAAA, Rickenbacker ANGB, Ohio

**6. I don't care how far behind we are in the flying schedule. Nobody leaves unless they come up with a winning entry for the Dumb Caption Contest!**
TSgt Al Drabnis, 170 AREFG/DOXI, NJANG, McGuire AFB, New Jersey

**7. Today's briefing is on not getting distracted. Hey, you in the middle!!**
SSgt Henry R. Harlow, USAFR, 907 CAMS/MAAA, Rickenbacker ANGB, Ohio

**8. ...and when I snap my fingers, you will all forget about the "little incident" I had while we flew in formation.**
Sgt Ayo Olanlpekin, 31 CRS/Photo Shop, Homestead AFB, Florida

**9. "Smedley, guess what's gonna fit right here in my hand the next time I catch you daydreamin' about your 'good ol' MAC days?!!**
Capt Jim Weber, 608 CAMS/MAS, APO New York 09094

**10. Look, just because I'm your flight examiner doesn't mean you have to write down everything I say!**
SSgt John Loyd, 172 MAG, MS ANG, Jackson, Mississippi

# OPS TOPICS


### Near Midground Collisions

■ Recently, two aircraft at different locations experienced a near mid*ground* collision. As both crews discovered, you never really "own" the runway.

In the first incident, the crew was on short final for the active runway when they, and tower, spotted a large, blue van on the approach end. The aircraft did a go-around while the van driver found the nearest exit.

The pilot of the second aircraft had a bigger scare. While decelerating during the landing roll, the pilot focused on a vehicle near the centerline, 2,500 feet ahead. A heavy application of brakes prevented the aircraft from catching up with the vehicle before they both reached the end of the runway.

"Cleared to land" means your aircraft is cleared to land, but it doesn't relieve you of the responsibility to ensure the landing area is clear. See-and-avoid can prevent most near midground collisions as well.

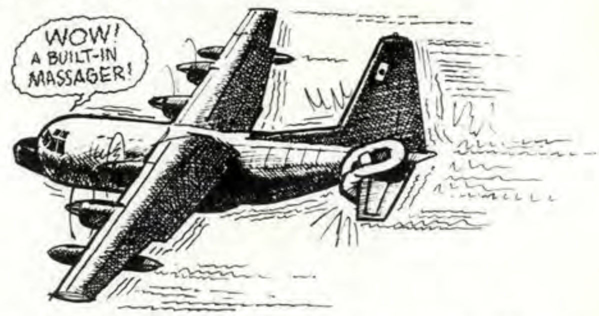

### $H_2O$/Fuel

The pilot of a high-wing light airplane thought he was completely safe when he discovered water in the fuel sample during his walkaround.

He continued to drain fuel until no more appeared in the sample, and then departed on his cross-country flight. Two hundred feet in the air on takeoff leg, the engine quit—completely.

What the pilot failed to consider was the possibility of trapped water due to the shape of the fuel bladders or the slope of the parking ramp. His unplanned "landing" in the mud at the end of the runway convinced him he needed to do more.

From now on, whenever he finds water in the fuel sample, he will "rock" the aircraft to ensure trapped water can reach the fuel drains. Finding water in the fuel sample is one thing—eliminating it is quite another.




### C-130 Drag Chute

The venerable C-130 has been configured many different ways. One "Herc" even made a successful carrier landing. But the recent announcement by the crash rescue folks that the C-130 on landing rollout had just dropped the drag chute came as a surprise to the crew.

They already knew something was wrong, but weren't sure exactly what. On climbout through 19,000 feet MSL, they heard a loud bang and subsequently felt buffeting and an uncommanded pitch down. A visual inspection and controllability check revealed a safe landing could be made despite the continuing buffeting.

For a moment during the landing roll, the crew wondered, "what drag chute?" and then realized it could only be the inboard liferaft. It had inadvertently inflated in flight, departed the aircraft, and wrapped around the horizontal tail, causing the airframe buffeting and the handling problems.

This half-hour of nonstandard excitement was the result of a piece of copper safety wire installed incorrectly on the $CO_2$ bottle. The wrong length of wire allowed a pin to vibrate out and inflate the liferaft. Sometimes it may seem like a drag to work through a TO, but chances are, it's better than the drag the crew will feel. ■

# MAINTENANCE MATTERS


## Plan Ahead

■ The KC-135 was parked in the hangar for extensive fuel system maintenance. A number of system components were removed, and the appropriate entries were documented in the forms. The assistant crew chief ensured AFTO Forms 1492, "Danger Tags," were attached to the single-point refueling control box, fuel management panel, and the circuit breaker panel. In the process of performing maintenance, it was necessary to apply power to the aircraft. First, the maintenance folks reviewed the forms and found no restrictions for applying external power to the aircraft.

Shortly after power was applied, a massive fuel leak occurred from the forward fuselage area. One technician immediately shut off the power and unplugged the power cart. Another summoned the fire department. At the same time, workers opened the hangar doors and placed containers under the aircraft to capture the leaking fuel. A tow vehicle was attached to the emergency snatch cables, and the aircraft was removed from the hangar. More maintenance personnel arrived with a tug and tow bar and moved the aircraft to a safe area. An investigation revealed one or more of the fuel valve control switches was not fully in the off position.

The above mishap is a perfect example of how a hazardous situation can develop in spite of a conscientious effort to follow established procedures. In this case, a disaster was prevented only because personnel responded to a previously established plan. Many of us work in a potentially hazardous environment. We follow established procedures to prevent the potential from becoming an actual mishap. Yet Murphy is alive and well, and mishaps do happen—usually when we least expect them!

Take some time to look around your work area. Is there a potential for a mishap? Have emergency procedures been established to handle the mishap? If the answer to both of these questions is "yes," you're on the right track. But, for a plan to be effective, people must be aware of it. They must know what they are expected to do should a mishap occur. Periodic briefings and practice exercises will not only provide people with training but may also bring out any glitches in the plan. The old boy scout motto still holds true. "Be prepared!"

## Finger Figure

The good news in flight line safety is that within the last 2 fiscal years, there have been no reportable injuries caused by wearing finger rings while working on or around aircraft. This is a strong indicator that maintenance folks are not wearing finger rings on the flight line.

On the other hand (pun intended), the number of serious injuries caused by wearing rings Air Force-wide has remained about the same.

Let's take a look at the statistics for the past 2 fiscal years. During this period, Air Force personnel have had 39 reportable on-duty injuries as a result of wearing rings. Of these, 30 resulted in one or more fingers being lost. It seems that the truck has taken the place of the aircraft as the main contributor to these mishaps. Motor vehicles were involved in 19 of the injuries, and 17 mishaps resulted in amputation of part or all of the finger.

A typical example was a worker who was tasked to load supplies on a stake bed truck. As he jumped off the back of the truck, his ring caught on the wooden railing, stripping the skin from his ring finger. The skin was reattached. However, the finger had to be amputated 3 weeks later.

Materiel handling was a common denominator in 10 of the mishaps. Many of these incidents happened in some very unlikely places. Consider the pharmacy technician who was standing on a stepstool pulling some boxes of medicine off the shelf. When the phone rang, she jumped down to answer it. As she did, the ring on her right hand caught on the shelf. She was lucky. Although her finger was broken and severely lacerated, it did not have to be amputated.

Attachment 1 to AFOSH Standard 127-66, General Industrial Operations, gives detailed guidance on the wearing of finger rings and other jewelry. It specifically prohibits wearing finger rings while descending from vehicles and performing most material-handling operations. However, it does not cover every situation where the wearing of finger rings is hazardous. In fact, if you really think about it, wearing rings can be hazardous in almost any situation.

For example, a hospital worker, in a hurry to attend a meeting, slipped on a wet floor. As she was falling, she reached out, and the ring on her finger caught on the doorjamb, tearing the flesh from the bone. In another case, an unfortunate civilian employee was painfully injured when he extended his hand to wave at a friend who was driving a government vehicle. The hand came in contact with the mirror of the vehicle. His wedding ring caught on a protruding screw on the rear of the mirror, pulling him to the ground and tearing the skin from his ring finger.

What is a finger worth? The Air Force estimates the cost of a lost finger to be in the neighborhood of $115,000. But when you consider the pain and disability from this loss, it is hard to put a price on a finger. Think about it!

### From the FAA

According to the FAA, an American turbine manufacturer published a service letter cautioning maintenance people against wrapping steel tube assemblies with chloride-based materials (such as neoprene tubing and fiberglass tape) to prevent chafing because it can cause premature failure of the tubing. The manufacturer found the chlorine-based material breaks down in the presence of high temperatures and attracts moisture. This results in the formation of salts, which are highly corrosive to stainless steel tubing. After a period of time, stress cracks develop, causing failure of the tubes. Additional investigation by a foreign, engine manufacturer revealed titanium is also affected by the chemical reaction between chloride-based materials when operating at temperatures above 302 degrees Fahrenheit.

The FAA also warns against using chloride-based packaging material, such as PVC sheeting (plasticized polyvinyl chloride). This is because chloride-based residue may be left on the component and lead to its failure as described above. *FAA Advisory Circular no. 43-16.*


### Off the Shelf

Returning from an air combat mission, the Eagle was marshaled into the combat turn area to get loaded and fueled for the next mission. The operation was uneventful until the APG member climbed out of the no. 2 intake with two 6-volt flashlights. The problem was, he had only one light when he entered. He found the other jammed against the inlet guide vanes. The light was almost intact except for the plastic lens, reflector, and bulb. Not too bad considering the light had just flown a 1.1 hour mission.

The flashlight was left on the intake by the crew chief who forgot it after he was distracted by the pilot during the walkaround. Miraculously, the Eagle's engine received only minor damage and required only a few hours of maintenance.

Another crew chief and a Falcon pilot were not as lucky. During his walkaround, the pilot placed his VTR tape on the lip of the F-16's intake. Because of the noise from a nearby aircraft, the crew chief did not hear the pilot when he said, "Here's my VTR." The pilot "assumed" (a nasty word in aviation safety) the crew chief had installed the tape, and the crew chief "assumed" (see what I mean!) the pilot had installed it. Shortly after the pilot fired up the motor, the crew chief in the next parking spot saw sparks coming from the F-16's exhaust. He alerted the crew chief who told the pilot to shut down.

How many maintainers and pilots can say they have not used an aircraft intake as a shelf for a part, tool, or checklist? And yet few of us would argue it is a very foolish thing to do. The cost to fix the F-16 motor—nearly $150,000! ■

UNITED STATES AIR FORCE

# Well Done Award

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

STAFF SERGEANT

## John L. Beukman

**36th Tactical Fighter Wing**
**Bitburg Air Base, Germany**

■ SSgt John L. Beukman distinguished himself by expertly extinguishing a fire on an F-15C aircraft. During a deployment to Decimomannu Air Base, Italy, he served as a fire guard for aircraft launches. On one particular launch, an F-15C was beginning its second sortie of the day and had approximately 14,000 pounds of JP-8 on board. The launch sequence began uneventfully. After starting the right engine, the pilot began the start sequence for the left engine. After the engine reached 27 percent rpm, the jet fuel starter (JFS) exploded and caught fire. The pilot quickly shut the aircraft down and ground personnel responded.

Sergeant Beukman was the first to respond. As an engine technician, intimately familiar with the start sequence of the engine, he knew at once the explosion stemmed from the JFS. Flames shot out and black smoke thickened around the aircraft. Sergeant Beukman grabbed a nearby fire extinguisher and jammed it up into the JFS inlet duct. He worked relentlessly despite the increasing flame and thickening smoke surrounding the aircraft.

Furthermore, the nozzle to the fire extinguisher separated from its nose creating an almost unmanageable fire fighting position. Halon was everywhere and he could hardly breathe. He grabbed a second fire extinguisher and sprayed through the aircraft mounted accessory drive (AMAD) panels. He and three others emptied five fire extinguishers before the fire department arrived to finish the job.

Sergeant Beukman was rushed to the hospital after suffering Halon inhalation and severe burns to his right hand. His actions were courageous! By aggressively and correctly fighting this aircraft fire—risking his life and suffering injury to himself—he saved a multimillion dollar aircraft and averted certain injury to the pilot and other ground personnel.

WELL DONE! ■

☆ US GOVERNMENT PRINTING OFFICE: 1990:779-017/20012

UNITED STATES AIR FORCE

*Well Done Award*

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

CAPTAIN

## Ricky A. Davis

**47th Tactical Fighter Wing**
**Nellis AFB, Nevada**

■ Captain Ricky A. Davis took off from Nellis AFB leading a two- ship of F-16s, BUBBA 3/4, on a night instrument training sortie to Palmdale Airport, California. At Palmdale, the flight completed two instrument approaches and began a climbout to return to Nellis. Four miles north of Palmdale Airport, at 10,000 feet MSL, Capt Davis experienced a violent compressor stall and rpm rollback while operating near mil power.

Capt Davis immediately retarded the throttle to idle to clear the stall and started a right turn toward Palmdale Airport. At idle, the engine recovered, but with severe vibrations. Capt Davis informed BUBBA 4 of the problem, who then informed Capt Davis he had fire and flaming debris coming from his engine. Capt Davis confirmed the fire light was out and noted his FTIT at 550 degrees centigrade. As he selected 100 percent oxygen, Capt Davis made a call on Guard telling Palmdale Tower he would be landing with an emergency.

Setting the throttle at 80 percent rpm, Capt Davis managed to fly directly over the runway despite its obscuration by the Palmdale production plant's lighting. Approximately 100 degrees through the SFO pattern, the hydraulic/oil pressure warning light illuminated. Because of the glare from the production plant's lighting, Capt Davis used a hand-held flashlight and found his oil pressure gauge was reading zero. At the 180 degree point, and at 300 KIAS, Capt Davis retarded the throttle to idle, opened the speedbrakes, and lowered the gear. The SFO, an emergency procedure never practiced at night, was successfully completed as the aircraft landed 1,000 feet down the runway. Five thousand feet later, the aircraft stopped. Capt Davis emergency ground egressed, and the fire department extinguished the engine fire.

Capt Davis' superior airmanship and skillful handling of this emergency saved a valuable combat aircraft. WELL DONE! ■

# Write A Dumb Caption Contest Thing


It's not fair what you folks are doing to our professional dumb caption writers. They have worked hard to establish themselves as recognized leaders of their field only to be topped each month by your entries. (Check out the current winner on page 24.) But who cares. We also think they're an arrogant bunch with few to no redeeming values anyway. Besides, your entries are better than their dumb captions.

So here's your chance to stick it to them again and perhaps win our internationally coveted, cheap little prize. That should forever prove your wonderfulness to all your friends (and enemies, too). What a concept!!

Write your captions on a slip of paper and tape it on a photocopy of this page. DO NOT SEND US THE MAGAZINE PAGE. Use "balloon" captions for each person in the photo or use a caption under the entire page. Entries will be judged by a panel of experts on humor and the winner announced in September '90. All decisions are open to bribes.

Send your entries to: "**Dumb Caption Contest Thing**" • *Flying Safety Magazine* • HQ AFISC/SEPP, Norton AFB, CA 92409-7001