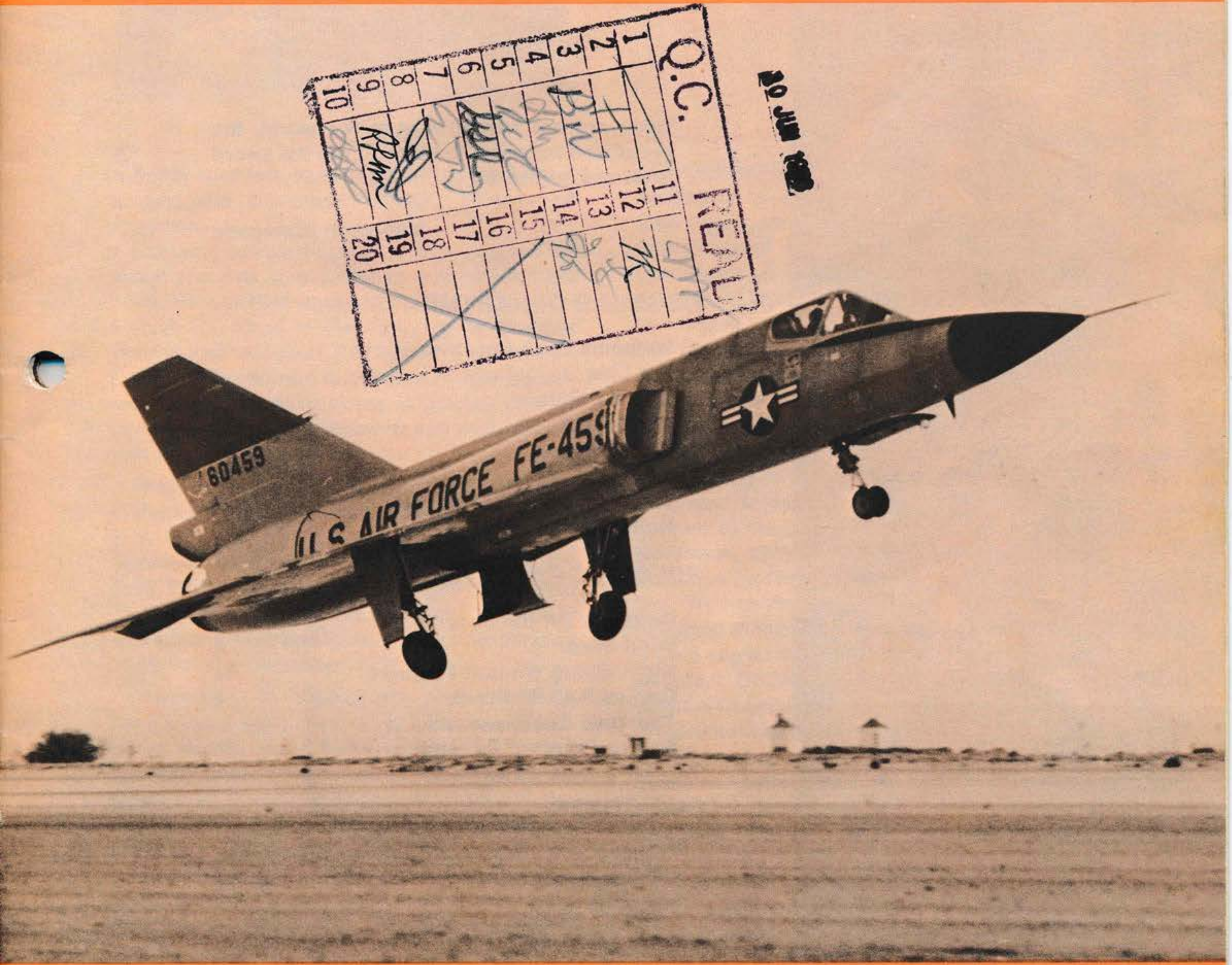
Interceptor

JUNE 1976



GETTING IT OFF THE GROUND . . . see page 5

Interceptor

FOR THE MEN AND WOMEN RESPONSIBLE FOR AEROSPACE DEFENSE

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Commander in Chief

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There are but two powers in the world, the sword and the mind. In the long run the sword is always beaten by the mind.

Napoleon Bonaparte

REGULAR DEPARTMENTS

SPECIAL FEATURES

OUR COVER

Proper use of your takeoff performance charts will ensure that you "get if off the ground" — see page 5.

**IN THE INTEREST OF SAFETY
PASS ME ALONG TO A FRIEND**

Welcome Back, Colonel Lang

Safety says hello to its new chief, Colonel Alfred E. Lang, who comes to us from ADCOM Plans and Programs.

Col Lang completed pilot training, received his wings and was commissioned a 2Lt in October 1949. He was then assigned to the 12th Tactical Fighter Squadron of the 18th Fighter Bomber Wing in the Philippines, first flying F-51s and then F-80s. He transferred to the 16th Fighter Squadron, 51st Fighter Wing, Korea, in October 1950. Lt Lang flew 100 combat missions and was credited with destroying a MIG 15.

Returning to the CONUS, Lt Lang was assigned to the 49th Fighter Interceptor Squadron (ADC), Dow AFB, Maine in August 1951. During this assignment, he flew F-80s and all models of the F-86. He then transferred to the 32d Air Division (ADC), Syracuse AFB, NY and performed duties as Fighter Officer and Plans Officer from January 1955 through December 1958.

Transferred to Misawa AB, Japan, Captain Lang's initial assignment was Operations Officer of the 4th FIS, flying F-86s and F-102s. He became the Chief of Flight Safety for the Tactical Air Division at Misawa and flew both F-100s in the tactical mission and F-102s in the air defense mission.

Returning to the CONUS in 1962 to Hamilton AFB, California, he was assigned as Chief, Flight Safety for the 28th Air Division. During this tour of duty he flew the F-101.

In January 1966, Lt Col Lang transferred to the Directorate of Nuclear Safety, Kirtland AFB, NM and remained in this positon until January 1967 at which time he entered F-4 RTU at George AFB, California. Upon completion of F-4 training, he was assigned as Operations Officer and then Commander of the 435th Tactical Fighter Squadron, Ubon, Thailand. Lt Col Lang completed his tour in April 1968 and was credited with destroying one MIG 21 aircraft. He then transferred to the ABCCC at Udorn AFB, Thailand, flying as capsule commander in C-130s for 3 months to complete his year overseas.

Lt Col Lang returned to HQ ADC as Chief of Flight Safety for one year, at which time he was promoted to colonel and became Director of Officer/Airman Assignments for ADC. In November, 1970, Col Lang was transferred to the Pentagon as Chief of Aerospace Defense matters, Plans and Policy under the DCS for Plans. He remained in this assignment until April 1972.

Col Lang returned to HQ ADC and became the Assistant DCS/Plans. Later, he assumed the duties of Director of Atmospheric Defense until the present transfer as Chief of Safety.

Col Lang has a bachelor and master's degree in Business Administration and has completed SOS and ICAF. His decorations include the Silver Star, DFC with 2 OLC, the Bronze Star and Air Medal with 16 OLC.

Expertise in Aerospace Defense Command fighters and flight safety are only part of a wealth of experience which Col Lang brings to the ADCOM Safety shop. With his leadership, we are certain to have an outstanding year in the accident prevention business.

HOT LINE

COULD HAVE BEEN MESSY! Recently a four ship was cleared for takeoff on a local training sortie. At about the same time, a slow-mover was cleared for an ILS approach to the same runway with instructions to contact the tower at the FAF. Communications with the tower were not established despite attempts by the tower on Guard frequency. The slow-mover continued his approach, breaking out of the clouds and arriving at mid-field at about the same time the second element in the four-ship neared lift-off. Tower directed 3 and 4 to abort. They did. The only loss was a blown tire and a lot of spent adrenalin. All the ingredients for an accident were present: (1) weather/IFR conditions, (2) takeoff/landing phase, (3) high performance and low speed aircraft and (4) communications problems. Without considering cause or effect of this specific occurrence, we still can extract some food for thought:

1. How often have you been in the local VFR/IFR pattern and had someone (or yourself) get lost on a frequency change?
2. How carefully do you make your intentions known to the tower or to approach control?
3. Do you call **at** the FAF or do you finish configuring, start down the chute and then call?
4. When you take the active, do you still clear final approach like they taught you in UPT?
5. After your line-up check, do you ever look **up** to check for that guy on a low approach?
6. How much attention do you pay to radio transmissions made to "the other guy?"
7. Have you ever tried to "squeeze into traffic?"

Let's keep them all in the "accident that almost happened" category.

LIGHTNING STRIKE. A flight of three F-4s from another command were descending through 9,000 feet when number two announced over the radio that he had experienced a lightning strike. The pilot lost power on one engine which he eventually got started, lost his ADI, his altimeter was erratic, his airspeed indicator read zero and his AOA guage was frozen. The pilot notified the flight that he was a lost wingman, declared an emergency and returned to his home station in VMC where his flight rejoined him and led him to a successful GCA. After engine shut down, it was discovered that the fiberglass tip of the vertical stabilizer was missing. All this in an area where no thunderstorms had been predicted, and aircraft radar in the flight did not show any weather returns. Do watch out, sport fans, the thunder and lightning gods can bite you when you least expect it.

LITHIUM BATTERIES — AFISC With the introduction of two lithium-type batteries into the life support equipment inventory, associated precautions in handling need to be discussed. The two batteries are used on the SDU-30/E strobelight marker and the LEU-10/P emergency light. An area of concern is the possible accidental release of sulfur dioxide (SO^2) from these batteries. Lithium batteries have a normal internal pressure of 50 psi and are designed to vent excess pressure above 300 psi. This venting process is a safeguard to prevent cell rupture and possible explosion. Venting SO^2 is readily noticeable by the strong pungent odor which can cause nausea and dizziness. Personnel required to handle these items should be aware of the possible hazards with lithium batteries and advised to take the following precautions:

- Avoid rough handling and always work in a well-ventilated area.
- Do not puncture, crush, or mutilate lithium batteries.
- Store batteries in a ventilated area at room temperature (50°-90° F) plus or minus 20° F.
- If battery vents, ventilate the area to remove any residual SO^2 and dispose of battery per TO. If any liquid spray hits body, wash area thoroughly with water. The liquid can cause minor burns and skin irritations.
- Do not electrically recharge lithium batteries.

Getting It Off the Ground

It's one of those hot, still summer days and you've finished your conference at the Headquarters. You're at Base Ops at Peterson AFB and getting ready to slip into your Lockeed Racer for the trip home. "What did that weatherman say the temp and pressure altitude were? I think he said 96° and 6300 feet. Oh, well, I've got 11,000 feet plus and even the old T-Bird can get off the ground in that. Notams — 'FIRST 500 ft of RWY 35 CLSD FOR CONST' — (Hmm, I've still got over ten thou) — no sweat! Boy it'll be good to get to altitude and get cooled off! Takeoff data? Damm! Left the checklist in the bird. I'll figure it when I get to the active. It'll be more current anyway! Jeese, it's hot taxiing all the way down to Runway 35 just because some guys are working in the overrun. What's that tower? Can I be ready for an immediate? You betcha!!! only 99% RPM . . . Well, that's close . . . ." Did you make it? The actual book figures for the above situation work out to a planned takeoff roll of over 9000 ft! (Note: If you try the 98% RPM Formation Chart, the figures go off the page.) Also, to add to your excitement on takeoff, the terrain off the end of Runway 35 at Pete rises steadily for several miles to the north.

The point! This jock was in a hurry and assumed that two miles of concrete ought to be enough to get anyone off the ground. Not true! This was an extreme, but not all that uncommon example. Most everyone turns on the "Auxillary Adrenalin Pump" prior to the pattern and usually puts some degree of figuring and planning into the approach/landing phase. But how often do we brush over the planning for takeoff?

There are a variety of factors that enter into the plan for coercing a heavier-than-air machine into the skies. If you always operate from a long, flat, cool airport near sea level with a 10-15 knot headwind, you can press on to other pages. Most of us don't, so let's take a moment for a quick refresher of factors affecting takeoff performance.

All takeoff planning and data should be updated and complete by this point.

THE AIRCRAFT

The most logical place to start is the machine. Performance and capability vary widely with different aircraft but the basic rule remains, "know thy machine." Spend some time in the books reviewing "Hot weather" procedures and performance data. Know and *adhere* to RPM and EGT limits for takeoff; until check speed, they are the only engine performance indications you have. Religiously figure *and* update your takeoff data for every flight. Have you ever planned on making a "minimum-run takoff" on an 11,000 foot runway? Might be worth considering if the conditions point toward a long ground run using normal techniques!

GROSS WEIGHT

It's pretty obvious that the heavier the equipment, the longer you're going to spend on the ground. That statement brings back memories of hot days in SEA with all kinds of garbage hung on the bird. We seemed to roll forever! Our birds in ADCOM have a generally less complicated weight problem than other aircraft since we usually only deal with two basic configurations; therefore weights. Weight, however, does change, and the factor still needs to be figured in your takeoff computation.

PILOT TECHNIQUE

This is a biggee! All of the Dash 1 performance data is based on Dash 1 recommended takeoff techniques. Your flaps must be set as required, boards up, power within limits, elevator pressure and rotation must all be accomplished as recommended or you have introduced uncalculatable errors into your performance computations. Again, the word is "read and heed." Know the proper techniques and procedures and follow them! Don't waste concrete turning wide onto the active. Use it all! Once it's behind you, it's no good to you! Questions: How much braking do you use to keep lined up at the beginning of your roll? How long do you delay lighting the burner after brake release? The answer to those questions may or may not add unnecessary feet to your ground roll!

THE RUNWAY

Obviously the major consideration here is the runway length! Again, make sure you have enough and use it all. Consider also the slope. In the example at the beginning of the article the 1.2% uphill slope on runway 35 at Pete added approximately 900-1000 ft to the calculated takeoff roll. Definitely a significant factor. Many times in and out of strange places we tend to ignore or forget about runway slope. In the summer months you needn't worry too much about slush or snow, but standing water puddles can cut acceleration and give you directional surprises on takeoff roll.

WIND

How much attention do you really pay to the guy that tells you the winds just before takeoff? In the situation presented earlier, our friend took off with a 5 knot tailwind on Runway 35. That five knots added 400-500 feet to his takeoff roll. Could make a difference! You might also remember that you generally hold the bird on the ground longer with a crosswind and that may add feet to the roll.

TEMPERATURE

The temperature of the air makes a lot of difference as to the amount of cement that passes under your wheels. *All other factors being the same,* the jock at the beginning of this article would have had almost a 2600 ft shorter roll if the temperature was +50°F instead of +96°F. Another item to tuck away for rememberance is the actual temperature of the ramp and runway. If you have to abort on the 96° day, the tires are probably extremely hot because the actual ramp and runway temperatures could approach 120-125 degrees. That could easily mean a blown tire or hot brake if an abort develops.

PRESSURE ALTITUDE

This is the factor that really could have ruined our friend's day. If his runway had been at sea level instead of 6300 ft (all other factors being equal), his takeoff roll would have been cut almost in half!

It may not come to pass that any one of the above factors will transfer your aircraft from a flying machine into a bulldozer, but all or a combination of several may definitely cause you to become a statistic. Don't brush over your takeoff performance just because you have a two-mile runway, a burner, or a clean bird! Get and remain in the habit of figuring takeoff data like you need every foot of the runway. You may! ★

The final product - a safe takeoff - depends on consideration of all factors.

WIND SHEAR

The Mystery of the Vanishing Airspeed

by CAPT BARRY SCHIFF, TWA

On June 24, 1975, an Eastern Airlines Boeing 727 crashed on short final approach to New York's JFK International Airport. More than 100 passengers perished, making this one of the worst air disasters in U.S. history.

Based on the initially available facts, it appears that wind shear was an influential factor in the accident, if not the primary cause.

Because of this accident's spectacular nature, considerable attention is suddenly being focused on wind shear. It is almost shameful that a disaster of this magnitude was required to attract industry-wide attention to a phenomenon with which pilots have always had to cope.

Air carrier aircraft, of course, are not the exclusive victims of this invisible hazard. General aviation aircraft also fall prey to this misunderstood, underestimated menace. Hundreds, if not thousands, of accidents presumably caused by pilot error were direct or indirect results of wind-shear encounters. It is imperative, therefore, that pilots become familiar with the potentially lethal effects of wind shear and the various conditions during which these effects are most likely to occur.

Simply stated, wind shear is a variation in wind velocity (speed and/or irection) that occurs over a relatively short distance. *Airspeed is affected* when an airplane is flown from one wind condition — through a wind shear — into another wind condition in less time than *ground speed* can adjust to the new environment. The consequences can range from annoying power and attitude corrections to complete loss of control.

Wind shear is a unique hazard not only because it is frequently undetectable, but because so many pilots are unable to acknowledge the threat. They consider it incredible that a change in wind velocity can alter airspeed; it is contrary to their earliest lessons in flight.

"Airspeed," they were taught, "is determined solely by variations in aircraft attitude, configuration and power setting; wind affects only track and ground speed."

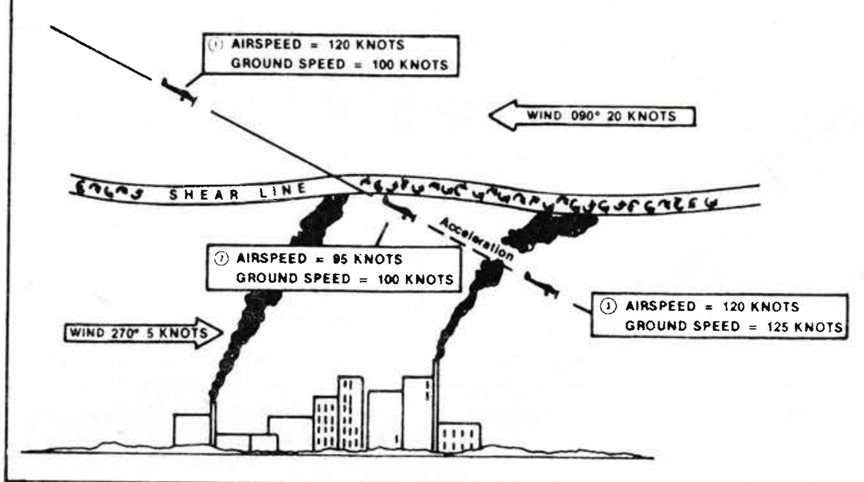
Unfortunately, this simplistic xiom is but the tip of another iceberg and applies only when the wind is constant or changes gradually. Unless a pilot examines what lies beneath the surface, he is liable to fly unwittingly into the jaws of what is coming to be regarded as one of aviation's most insidious killers.

The subject is seldom taught in ground school because instructors either don't want to complicate a student pilot's comprehension of the basic airspeed/ground-speed relationship or don't fully comprehend wind-shear fundamentals.

To understand wind shear is to recognize that an airplane has inertia and as a result resists a change in ground speed. This is best stated by paraphrasing Sir Issac Newton, the brilliant English physicist who developed the inescapable laws of motion: An aircraft in flight at a given ground speed tends to remain at the same ground speed unless acted upon by an exterior force.

An application of this is illustrated in Figure 1. A temperature inversion overlies a coastal city from the ground to 2,000 feet. Within the inversion, the wind is westerly at 5 knots. Immediately above, the wind is easterly at 20 knots (not an unusual situation). The narrow band separating the two "air masses" is called a "shear line."

Figure 1



An aircraft descending toward the shear has an airspeed of 120 knots; its ground speed is obviously 100 knots. This ground speed represents aircraft momentum with respect to the earth and, according to Newton's First Law of Physics, is the quantity that resists change.

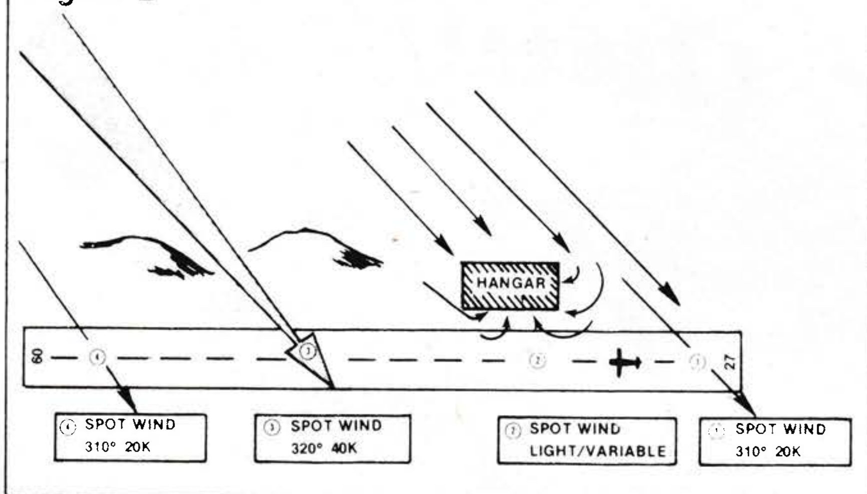
As the aircraft penetrates the shear line and enters the inversion, ground speed will increase, but not instantly. Because of aircraft inertia, ground speed after crossing the narrow shear line is very nearly what it was earlier, 100 knots.

But since the aircraft is now under the influence of a 5-knot tailwind, something has to give. That something, unfortunately, is airspeed, which reduces from 120 knots (above the shear line) to 95 knots (below the shear line), a net and rapid airspeed loss of 25 knots. Notice that the theoretical airspeed loss (25 knots) is equal to the difference between the headwind and tailwind components above and below the shear line.

The reduced airspeed, of course, results in reduced drag. Assuming that neither attitude nor power is changed, the aircraft accelerates to its original trimmed airspeed (120 knots), at which thrust and drag are again in balance. But because of inertia, this acceleration takes time; lost airspeed cannot be recaptured instantly.

Just how long it takes to recover lost airspeed was dramatized in a USAF report by Major C. L. Hazeltine. He demonstrated that if a given aircraft, maintaining a constant altitude and power setting, encounters an abrupt 20-knot loss (due to wind shear), recovery of only 10 knots would require 78 seconds; recovery of 16 knots would require 176 seconds. Adding power and/or sacrificing altitude reduces recovery time significantly and points out the alarming need for pilots to be particularly alert for a low-level wind shear when on final approach or when climbing out at marginal air-

Figure 2



speeds. The problem of airspeed recovery is critical if the airspeed loss results in the drag rise associated with flight behind the power curve, when required power and altitude may not be available.

(In reality, the airspeed loss is not quite as large as shown in Figure 1 because some acceleration occurs while the aircraft crosses the shear line, depending on the line's width.)

Would the pilot in Figure 1 have any warning about the impending airspeed loss? In this case, yes. When two opposing air currents rub shoulders, there is bound to be some frictional turbulence. The degree of turbulence increases in proportion to the change in wind velocity and decreases in proportion to the width of the shear line. For similar reasons, the air surrounding a jet stream is often turbulent, even though a smooth ride can be had within the core.

The aircraft in Figure 1 encountered a rapidly decreasing headwind, which has the same effect as an increasing tailwind: an airspeed loss. If the direction of the aircraft is reversed, so that it flies into an increasing headwind (or decreasing tailwind), airspeed will *increase* when the shear line is crossed. The theoretical gain is 25 knots.

The effect of wind shear is similar to what happens to a hobo who jumps from a bridge, to the top of an express train passing below. As the man leaves the bridge, his ground speed (forward motion) is nil. The train, however, is clipping along at 60 mph. When the hitchhiker first touches down, it should be obvious that he cannot remain on the roof at the point of initial contact. His inertia prevents him from being accelerated so rapidly, from 0 mph to 60 mph. Instead, the hapless hobo will fall and roll backward with respect to the train. Eventually, the friction of the train acting on his body will accelerate him to 60 mph. Whether he survives to realize this is questionable.

If the unfortunate chap were to misjudge and jump immediately in front of the train, the locomotive would force his body to adapt quite rapidly to the speed of the train. But the acceleration would exert such overwhelming and crushing G-loads that the hobo would instantly regret not having purchased a ticket and boarded the train under more comfortable circumstances.

For those who cannot correlate the hobo and the train with an aircraft in flight, consider this extreme, but illustrative, example. A Cessna 150 is cruising at an airspeed of 100 knots, directly into the teeth of a 100-knot headwind. The 150's ground speed is obviously nil. Assume also that the headwind disappears, suddely and without warning.

The pilot — just as suddenly — finds himself high and dry without any airspeed whatsoever. The beleaguered 150 pitches down rapidly and loses considerable altitude before the combined effects of diving and power can accelerate the aircraft from a standstill to an airspeed/ground speed of 100 knots in the calm air.

Conversely, had the 100-knot airplane been flying with a 100-knot tailwind, the ground speed would have been 200 knots. The sudden disappearance of this wind would cause an immediate pitch-up, a healthy increase in airspeed (theoretically to 200 knots), and a substantial gain in altitude.

In the foregoing examples, the pitching is a result of longitudinal stability, the designed-in characteristic of an airplane by which it automatically seeks its original trimmed airspeed.

All pilots have encountered some form of wind shear without realizing it. Perhaps, after a period of smooth flight, a pilot runs into a patch of light chop, followed by more smooth air. A comparison of ground speed/drift before and after turbulence might reveal a wind-velocity change. Airspeed fluctuations under these conditions are rarely perceptible, however. The shear line is usually wide, allowing ample time fo ground speed to adjust to the new wind condition.

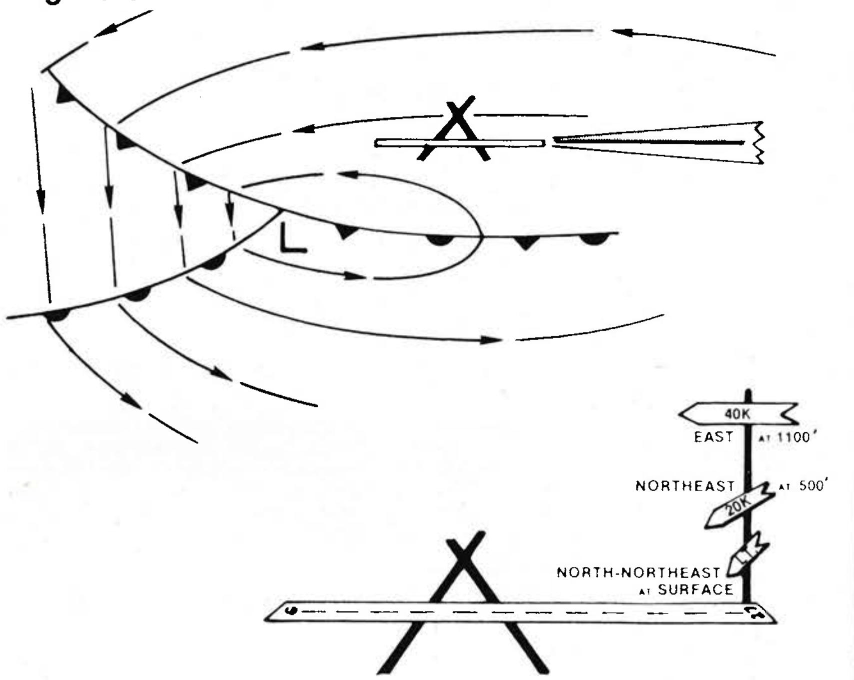
Whenever an approach to landing is made on a gusty day, the pilot is actually encountering numerous wind shears. Every gust of air causes extremely localized shearing. Carefully monitor the indicated airspeed during such an approach and notice how the needle shifts rapidly above and below target airspeed. Some of this erratic needle movement is caused by gusts punching the pitot tube at oblique angles, but, for the most part, actual airspeed varies every time a gust is encountered or left behind.

Curiously, an approach or departure in gusty air is not normally as dangerous as flying through a strong, smooth shear. This is because gusts provide a seat-of-the-pants warning of possible hazards. A pilot is more alert to needed power and attitude corrections. Also, most pilots use slightly higher approach speeds in gusty air to maintain controllability. This also provides a hedge against higher, G-load induced stall speeds and possible airspeed losses due to wind shear.

An excellent rule of thumb suggests that at least half the gust factor be added to normal approach speeds. For example, if the surface wind is reported at 22 knots, gusting to 38, the gust factor is 16 knots. At least 8 knots (half the gust factor) should be added to the normal approach speed.

This rule provides ample protection except when the turbulence is caused by nearby thunderstorms. The only protection against this type of severity is to avoid any well-developed cell by at least 10 miles, especially when taking off or landing. A healthy gust in advance of an approaching thunderstorm can quickly steal 20 to 30 knots of airspeed (or more).

Figure 3



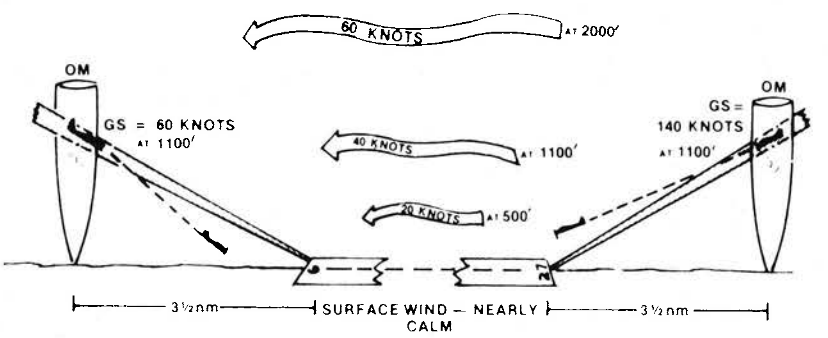
Pilots should also be on the alert for local obstacles, on or near the airport, that can disrupt the flow of a reportedly smooth, strong breeze. Figure 2 shows an aircraft about to touch down into a strong, quartering headwind. As the aircraft begins to flare downwind of the large hangar, the headwind component all but disappears, leaving the pilot insufficient airspeed to avoid the impending plop. Numerous hard landings (or worse) can be traced to similar circumstances.

Two small hills are situated farther down the same runway and form a venturi-like constriction. This can change normal wind flow into a river of high-speed air that squirts across the runway from between the hills. Entering such a localized condition could lead a departing pilot to believe that he has sufficient airspeed to fly. But not for long. When this "river of air" has been crossed, the resultant shear causes an airspeed loss that could be sufficient to force the aircraft back to the runway.

When the wind is strong, local velocities are easily affected by topographical features. It is not unusual for windsocks at opposite ends of a runway to point in opposite directions and indicate different wind speeds. A wind shear lies somewhere in between.

Considering the widespread use of sophisticated wind-measuring devices (anemometers), the windsock is somewhat of an anachronism. Unfortunately, however, the wind at the approach end of a runway on a windy day is frequently different from that measured from the roof of a distant, lofty control tower. A few large, brightly colored windsocks strung along the edge of a runway can be more valuable to a pilot than the wind observed by a tower operator. Windsocks allow a

Figure 4



(1) A "decreasing headwind" gradient can cause (a) an airspeed loss, (b) increased sink rate, (c) possible pitch-down. The result is a tendency to sink beneath the glideslope and a possible undershoot.

(2) A "decreasing tailwind" gradient can cause (a) an airspeed gain, (b) a decreased sink rate, (c) possible pitch-up. The result is a tendency to float above the glideslope and a possible overshoot.

pilot to judge the nature and variation of the wind, something a tower report often cannot provide.

The type of wind shear that seems to catch most pilots off guard is the wind gradient, a condition where wind-velocity changes are somewhat more gradual. Although airspeed changes are not as abrupt as in the case of a narrow shear line, the final results have spectacular potential. Gradients are particularly hazardous because flight conditions can be deceivingly smooth; pilots are lulled into a sense of complacency and frequently are *unable* to determine that something is amiss until it is too late.

Figure 3 depicts a wind pattern overlying relatively flat terrain. Near the surface, the wind is light, flowing directly from high to low pressure. But as altitude is gained, the frictional effects of the ground are reduced and the influence of the earth's rotation (Coriolis force) increases. This causes wind speed to increase and wind direction to shift clockwise (in the Northern Hemisphere) so that above the ground the winds are considerably stronger than at the surface and flow approximately parallel to the isobars.

Figure 4 illustrates the problems encountered when approaching the ILS runway from either the east or the west. Assume that in each case an approach speed of 100 knots is used, and the wind velocity over each outer marker (at glide-slope-intercept altitude) is from the east at 40 knots.

When the aircraft is approaching from the east, ground speed over the OM is 140 knots. Over the runway threshold, where the wind is essentially calm, ground speed should be only 100 knots if the target airspeed has been maintained during the approach. During the approach, therefore, ground speed must be reduced from 140 to 100 knots, a deceleration rate of 23 knots per minute.

But if the pilot is unaware of the strong tailwind over the OM, he won't anticipate the need to decelerate. This is the crux of the problem. When a tailwind decreases faster than ground speed is reduced, airspeed is forced to rise. The excess airspeed results in a tendency to rise above the glideslope (either visual or electronic) and, to compound the confusion, a possible pitch-up. Unless judicious control and power adjustments are made during the descent, the aircraft will wind up over the approach lights with excessive altitude and airspeed. The diminishing tailwind (or increasing headwind) approach has been responsible for innumerable overshoot incidents.

If the pilot executing this approach doesn't know why he is experiencing excessive airspeed and why he keeps "floating" above the glideslope, there is yet another clue (in this case) to warn him of the presence of a wind shear. As the descent continues, the counterclockwise shifting of the wind necessitates a constantly changing crab angle if the aircraft is to remain on the localizer.

This example utilizes a wind gradient of 40 knots per 1,100 feet, or 3.6 knots per 100 feet. During wind-shear studies in Florida and Texas, this has been found to be an *average* gradient. Low-level wind shears ten times this magnitude (35 knots per 100 feet) have been observed. A gradient of 10-15 knots per 100 feet is not considered unusual.

When the pilot in Figure 4 is approaching the runway from the west, conditions are reversed. Ground speed during the approach must be increased from 60 to 100 knots. If this is not done, airspeed will decay in proportion to the headwind loss that occurs during the descent.

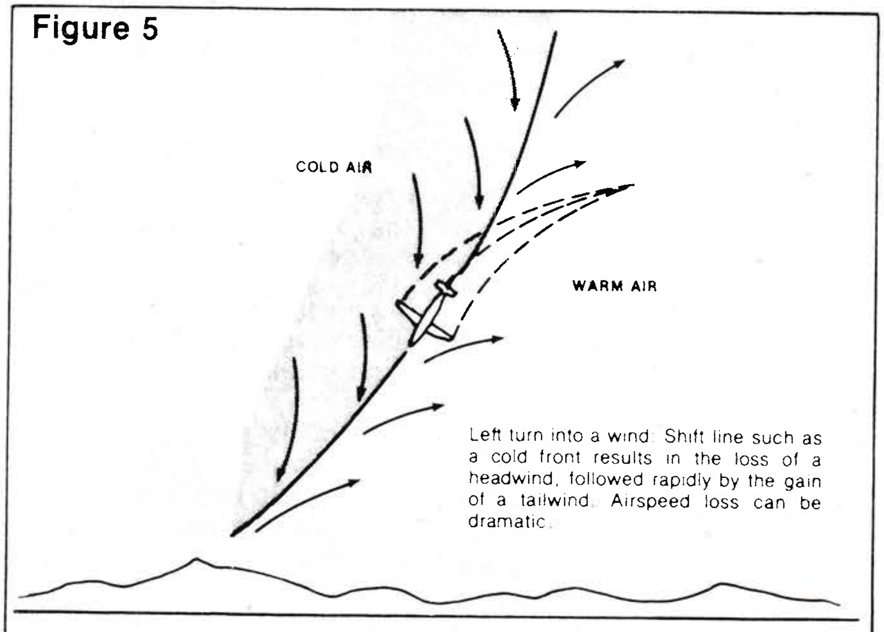
To avoid sinking below the glideslope, losing critical airspeed and encountering a possible pitch-down, considerable and seemingly excessive power must be applied during the descent. This poses another threat, since less reserve power is available for a pullup and missed approach. Such a loss of headwind requires considerable pilot attention and action to avoid the potential undershoot. During such conditions, aircraft have developed high sink rates and contacted the approach lights with all engines developing full power. Similarly, aircraft *departing* into an area of either an increasing tailwind or a decreasing headwind have settled into the ground, also with engines developing full power.

When a pilot finds himself nearing the ground while having difficulty maintaining a safe airspeed/ sink-rate combination, he must execute a missed approach and either try again, wait for the wind shear to subside, or divert to another airport.

Anyone who is under the mistaken notion that wind gradients cannot affect him in this manner should be interested in what happened at JFK one day in April 1971. Aircraft approaching the airport encountered a decrease in tailwind of 20 knots per 1,000 feet, and during a two-hour period nine professional pilots executed missed appraoches (some diverted to other airports) even though the surface wind was light and the ceiling was 700 feet with adequate visibility below.

The effect of penetrating a squall line, front, or sharp pressure trough (Figure 5) during a left turn deserves particular emphasis. This is uniquely dangerous because an aircraft could simultaneously encounter a rapid airspeed loss because of an increasing tailwind component, a sudden increase in bank angle caused by the side component of the tailwind acting on wing dihedral, a severe downdraft localized at the leading edge of the

Figure 5



Left turn into a wind. Shift line such as a cold front results in the loss of a headwind, followed rapidly by the gain of a tailwind. Airspeed loss can be dramatic.

shear, and turbulence of moderate or greater intensity. Several fatal approach and departure accidents have been traced to these causes.

When you turn away from a squall line (or any severe weather condition), do so with a right turn, not a left one (in the Northern Hemisphere).

With respect to fronts, low-level wind shear can be expected during frontal penetration when the system has a speed of 30 knots (or more) or when the temperature difference across the front is 10° F (or more).

Presently, the pilot's only weapons against wind shear are caution, conservatism, wit, and attention to the elements. But the future may offer some help of a more scientific nature.

NASA and other agencies are working on methods of measuring low-level wind shear. Someday, laser and/or acoustic/Doppler devices may be installed adjacent to some runways and will accurately measure the actual wind profile throughout the approach and climb-out corridors. But since wind shear is extremely dynamic and localized, such systems would be required for all runways, something not economically feasible.

Another weakness of a ground-based system is that the necessary data regarding the changing characteristics of a given wind-shear condition cannot be passed on quickly enough to the pilot, who most urgently needs the information. The Air Line Pilots Assn. (ALPA) is pressing for the development of on-board wind-shear sensors, to which pilots could refer during an approach or a departure.

In the meantime — and probably in the future — the general aviation pilot is left to his own devices. He must learn to recognize the existence of wind shear, understand how it can affect his very survival, and, above all, obey one of aviation's most golden rules: "Maintain thy airspeed lest the earth shall arise and smite thee — mightily."

Thanks to AOPA Pilot!

NIGHT FLYING

Without Feathers

by Capt. Glenn Wendt 119th FIS, NJANG

The truth is we are not designed to fly at night. Consider, the best vision you can expect on any night with less than bright moonlight is 20/200 to 20/400 with little definition and no color; in most states that's legal blindness, you couldn't drive a car let alone fly a plane. For this marginal sight you must adapt to the existing dark for twenty minutes to an hour, and then only a brief exposure will send you back to the starting point. Your eye was designed to view things in the center of the retina; you have an involuntary reflex that tries to fixate everything there. But the center is blind to dimly lighted objects. To see in the dark you must use your peripheral vision and scan continually, both actions unnatural and tiring. Night vision is difficult, tedious, fragile, marginal, and conditional. But not impossible.

To understand the problem we ought to understand the equipment. The nerve endings in the retina responsible for sight are the rods and cones. The cones provide color and detail; they are scattered throughout the retina. Rods are responsible for low light vision. They are scattered throughout the retina also, but there are no rods in the very center. There are relatively few cones in the periphery. Besides the difference in shape their names imply, each has a unique photochemical make-up. In the rods the chemical is extremely sensitive to light, but requires a relatively long time to regenerate. In the cones the chemical is less light sensitive, but faster regenerating. Light bleaches either photochemical releasing an electrical impulse. The impulse must be strong enough to overcome the resistance in the nerve path to the brain. In the rod free center each cone is linked by its own path to the brain; outside this special area many nerves share the same pathway, and it's the sum of their impulses that travels the link to the brain. As a result peripheral vision is a thousand times more sensitive to light than the fovial or center vision.

The amount of time it takes to regenerate exposed photo-chemical and adapt to low light is obviously important. Because of the difference in the chemicals of the two cells the regeneration-adaptation time is different. The cones take about eight minutes to fully adapt. The rods about thirty. The time can be increased, or decreased to a point, depending on the level of light you are going from and the lack of light you are going to.

Other things affect your regeneration time and night vision in general. Your physical condition is important. A healthy well-rested body that hasn't been smoking will give you the best results. Remember, smoking reduces the amount of oxygen the blood can carry, and the eye is one of the first organs affected by an oxygen reduction. A lack of vitamin A can degrade your night vision, but a massive dose prior to flying won't help. With any reasonable American diet it is impossible to suffer a shortage of vitamin A.

Okay, we gather in the briefing room an hour or two before takeoff. Fifteen minutes later the briefing's over, everyone lights up and heads for the latrine. Any time left before preflight is spent in the lounge, the briefing room, or the mess if you are lucky. We head for the machines around thirty minutes prior to takeoff. Maintenance had done everything possible to make the area around the planes as well lit as the latrine or lounge. We crank, taxi out, go through last chance, and takeoff. Where did any of us get a half hour of dark adaptation? Exercises are worse. Besides being tired (nobody ever gets enought rest before those things), a five minute scramble is no way to foster dark adaptation. There isn't a pilot alive who doesn't know what taxiing between flood lights at last chance is not what he should be doing just before leaping off into the murk. Red light is the answer. Rods have little or no sensitivity to red light. The cones provide vison under red light, while the rods remain unaffected, ready to see in the dark. But since we've survived this long without red light and/or goggles in our ground environment we are not about to get them now.

About here all the airline pilots in the Guard are going to say that the airlines have proven red light "don't make a rats," they have been using white lighted instruments for years. It's true they have been using white light, but from that you can't infer that it will have no effect on your night vision.* Any exposure to white light will destroy some of your totally dark adapted vision.

If we've gotten by this long why worry now? My own answer is the increase in private flying. My squadron works out of a civilian field. It's not unusual for light planes to suddenly show up over the field or VOR totally unannounced. It's not unusual to hear the tower operator ask a private pilot to describe what he or she sees on the ground so the guy in the tower can tell the pilot where he is and how to get to the field. If that doesn't scare you, you have no imagination. If you can't see after takeoff you have to rely on being seen, and that's the shakiest part of a system that gives aviation several mid-airs a year.

The system may not work for you, but you can keep it from working against you. Get everybody thinking about your problem, after all *you* are why they are there. Turn down the lights in the locker room, latrine, P.E., briefing room, and mess. The briefing officer doesn't need all that light, and you need all that dark. Slide briefings may "wow" the people from headquarters, but they don't do anything for your night vision. Stay out of brightly lit areas altogether. If you could get the lights in the squadron turned down, preflighting prior to briefing would be the thing to do. Then maintenance could turn down the ramp lights when you reappeared to crank. Sitting at the end of the runway for ten minutes or more won't hurt you, but it will help. Insist on clean canopies, wind screens, and visors; you'll help eliminate glare and diffusion.

Your eyes can do things to you as well. For example, when you are staring aimlessly out the canopy your eyes are rapidly changing their focal length. If you ask them to stop suddenly and focus, as in the recovery from an unusual attitude, you are going to have to wait. Your eyes can't do it as quickly as you would like it done. They will react, but undershoot the correct focal length at first. If you don't allow an extra "one chimpanzee" for your eyes to give you a clear picture of what's happening, the least you can expect is confusion and increased recovery time.

Speaking of recovery time, flash blindness is a potential problem, especially during landing. Those strobe lights that helped you find the center line throught the clouds obscure it once you break out by flash blinding you. Effectively they reduce the ceiling and/or visibility since you are continuing down the glide path without reference to the runway. The length of the effect can be reduced by turning up your cockpit lights as bright as comfortable before penetrating.

There are a couple of other little known and possibly useful facts you might want to tuck away. When you have to use your flashlight or the map light, hold your fingers over the lens and let out only as much light as you need to get the job done. Remember the brilliance of the light and the length of exposure work together in damaging your night vision: a dim light over a long time will be as damaging as a bright light over a short time. At night we see by contrast; if the object you are trying to see is the same shade as its background it will be invisible to you. If you are trying to eyeball a target, your best chance of getting contrast into the picture is to look up, silhouetting him against any clouds, or down contrasting him against the ground if possible. Altitude separation will help in another way. Your rod vision is a gross kind of vision, it sees only relatively large objects. Getting above or below the target will give you a bigger cross sectional area to look at.

The dark adaptation process is independent in each eye. If you have to expose your adapted eyes, shut one eye. Then keep exposing the same eye each time you have to: flood lights on the ramp, the lights at last chance, landing and taxi lights, map lights in the cockpit, etc. However, until both eyes are equally adapted they will see things differently, there is some chance of disorientation.

We should talk about scanning. We scan for several different reasons. One, it's the best way to overcome the unconscious reflex to focus everything in the center of the retina. That night blind spot is about 105 feet in diameter at 1000 yards, and at min-range on an ID pass it's about 53 feet across. That's quite a bit of blindness at some pretty important points. Two, at night, especially when the light is near the rod's threshold, peripheral images can disappear in a matter of seconds without scanning. The rods are most dense about five degrees off the center, which is where your best night vision is, so keep your eyes moving through about ten degrees of the visual field at intervals of less than three seconds.

That's about the bulk of it. We are ill-equipped to fly at night, and some of our present practices aren't helping our equipment. But since we have to fly at night we can do it safer than we are now if we ask people in the system to help a little and remember our problems. We must also remember not to ask more of our eyes than they are capable of giving. Personally I think that if we were supposed to fly at night we'd all have feathers, big eyes, and hoot. ⋆

* *Using white light instead of red at equal levels of illumination has the effect of reducing your dark adaptation from a level of 28 minutes to 22 1/2 minutes. That's insignificant — until you are trying to ID a blacked out Bear 200 miles out over the dark Atlantic.*

CURTISS P-40 WARHAWK. Early in WWII, the American Volunteer Group (AVG), then part of the Chinese Air Force, became the 23d Fighter Group of the USAAF. The P-40E featured here was flown by Col Robert L. Scott, a former AVG and 23d Fighter Group Commander, who became Top ranking USAAF "Ace" of the time with 13 victories. The P-40 was the only relatively modern fighter available to the USAAF when it went to war. It was capable of absorbing much damage and was produced in various models until Dec 1944. The P-40E Warhawk was powered by a 1150 hp, V-12 liquid cooled engine which gave it a maximum speed of 354 mph at 15,000 ft, initial climb rate of 2,050 fpm, a 29,000 ft service ceiling and a range of 650 mi clean. The P-40 had a 37 ft 4 in wing span, was 31 ft 2 in long, weighed 5,970 lb empty and 7,740 lb loaded. Armament consisted of six .50 caliber machine guns.

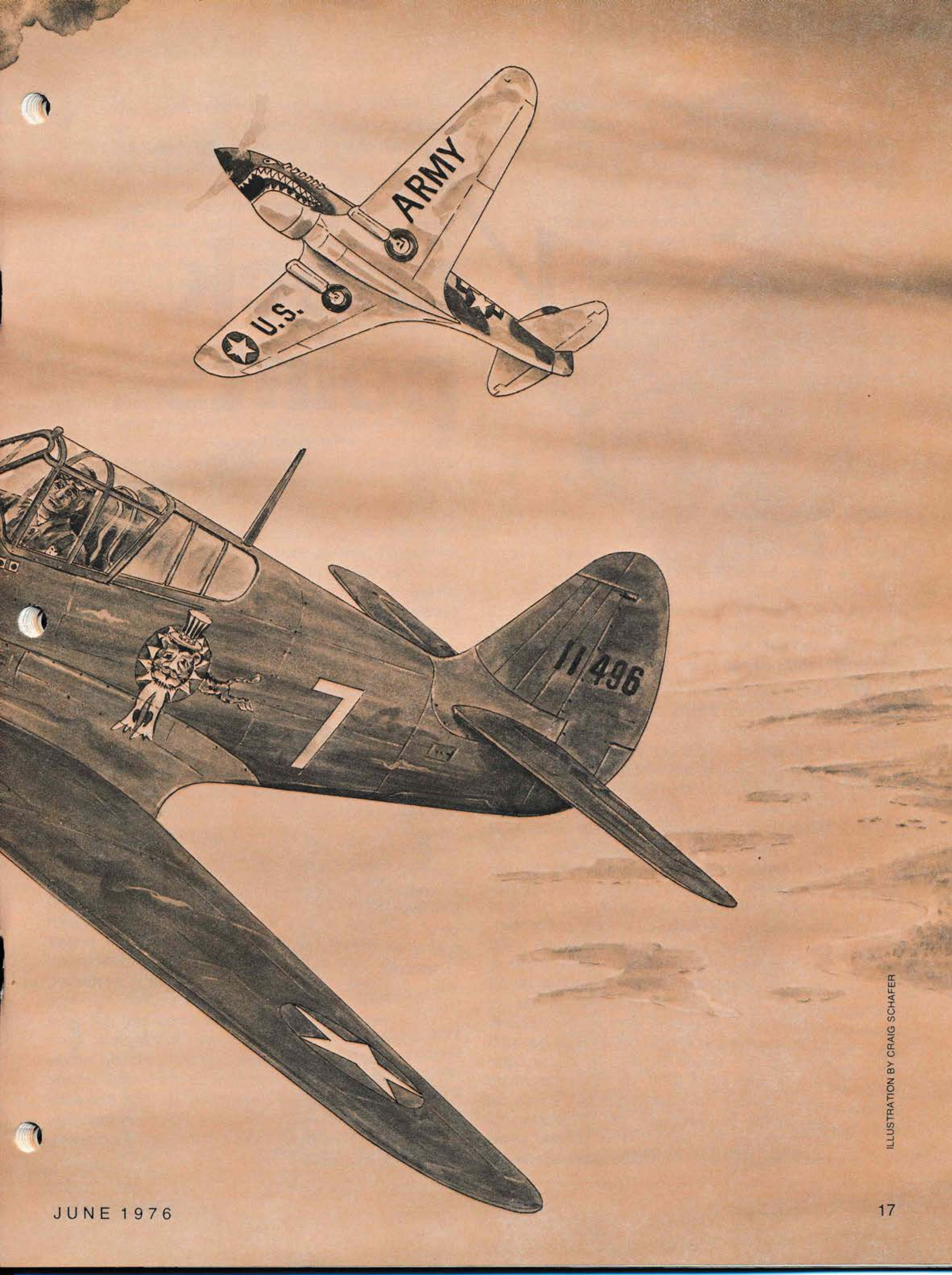


ILLUSTRATION BY CRAIG SCHAFER

check points

'Unclear'clear zone — AFISC. An aircraft on final approach struck a roadway traffic sign. The 9-foot high sign was located 385 feet short of the approach end of the runway. Along with some flying errors, the investigators of this incident found that the sign was only one of several obstacles located in the runway approach "clear zone." This clear zone is defined in AFM 86-8, "Airfield and Airspace Criteria," as an area immediately adjacent to the ends of a runway which has been cleared of all aboveground obstructions and graded to minimize the damage to aircraft that undershoot or overrun the runway. The clear zone extends 1,000 feet from the end of the runway, unless a waiver has been granted under the provisions of the manual. In the mishap cited above, the requirements of AFM 86-8 were clearly violated. Each commander should have his or her staff examine the airfield facilities to insure compliance with AFM 86-8. In those instances where waivers have been granted, it may be appropriate to reevaluate the circumstances which led to the waiver. This review, when combined with a survey of the approach areas, may reveal some surprising oversights and provide for the removal of airfield hazards. A good chance to check those taxiway and hangar clearances again, too. A taxi accident with an obstacle is really a waste! (TIG Brief/SED)

Airfield facilities. A transient aircraft recently made a night takeoff from a TAC base. Only one minor problem — it took off from a closed runway which was aligned 45 degrees from the active runway! Among other mistakes the pilot had failed to check his compasses for proper runway alignment prior to takeoff. Investigation of this incident revealed some other interesting facts. Runway-taxiway intersection markings were confusing, obsolete lines had not been removed and lighting was inadequate. Let's make sure our operations don't include factors which could contribute to personnel errors. Regular airfield inspections are only one solution — everyone who sees a problem should let someone know about it — it makes good sense. (TAC/SED)

The yellow brick road may spell problems. Unless your name is Dorothy and you're traveling in a land of fantasy, beware of the temptation to blindly follow yellow brick roads . . . or taxiways with which you're unfamiliar. A C-130 pilot fought down such a temptation and was glad he did. He was religiously stalking a follow-me vehicle when he saw something he didn't like. Another C-130, already parked, seemed to be a bit close to his proposed path. He brought the Herk to a halt and deplaned his crew chief. His ground observer confirmed his suspicions — 15 feet of wing overlap! The crew chief then marshalled the bird around the obstruction. The moral of this oft-told tale is "never assume anything." Cues from follow-me vehicles or yellow taxi lines are not always good one, particularly at a field that was not designed for your aircraft. Your last line of defense in such a case is usually your own thinking machine. (MAC/SED)

Rushed preflight. It was a day like any other day. The briefing had run overtime, the student couldn't find his gloves, and the line at the dispatch counter looked like the checkout counter at the commissary on pay day. On the positive side, the weather was CAVU and the mission was a C-1. "Just relax son, and watch your old, gray-haired instructor introduce you to the wild blue." The trusty T-41 awaited us in all its streamlined, mach .15 glory. "Well son, our takeoff time is fast approaching. Better climb in and get comfortable while I get the preflight. Time's a wastin' and we can go through the preflight together later." By engine start, the student had managed to buckle his belt and adjust his seat. While taxiing out of the chocks, a distinctive THUNK type sound came from the bottom of the aircraft. "No sweat son, we'll just shut down and call maintenance. Some wrench bender probably forgot to put a cotter pin in a widget or something." "What's that Chief? You say the aircraft taxies better AFTER the ground wire is removed. Oh — okay. Gee. Wonder if I forgot anything else?" (ATC/SED)

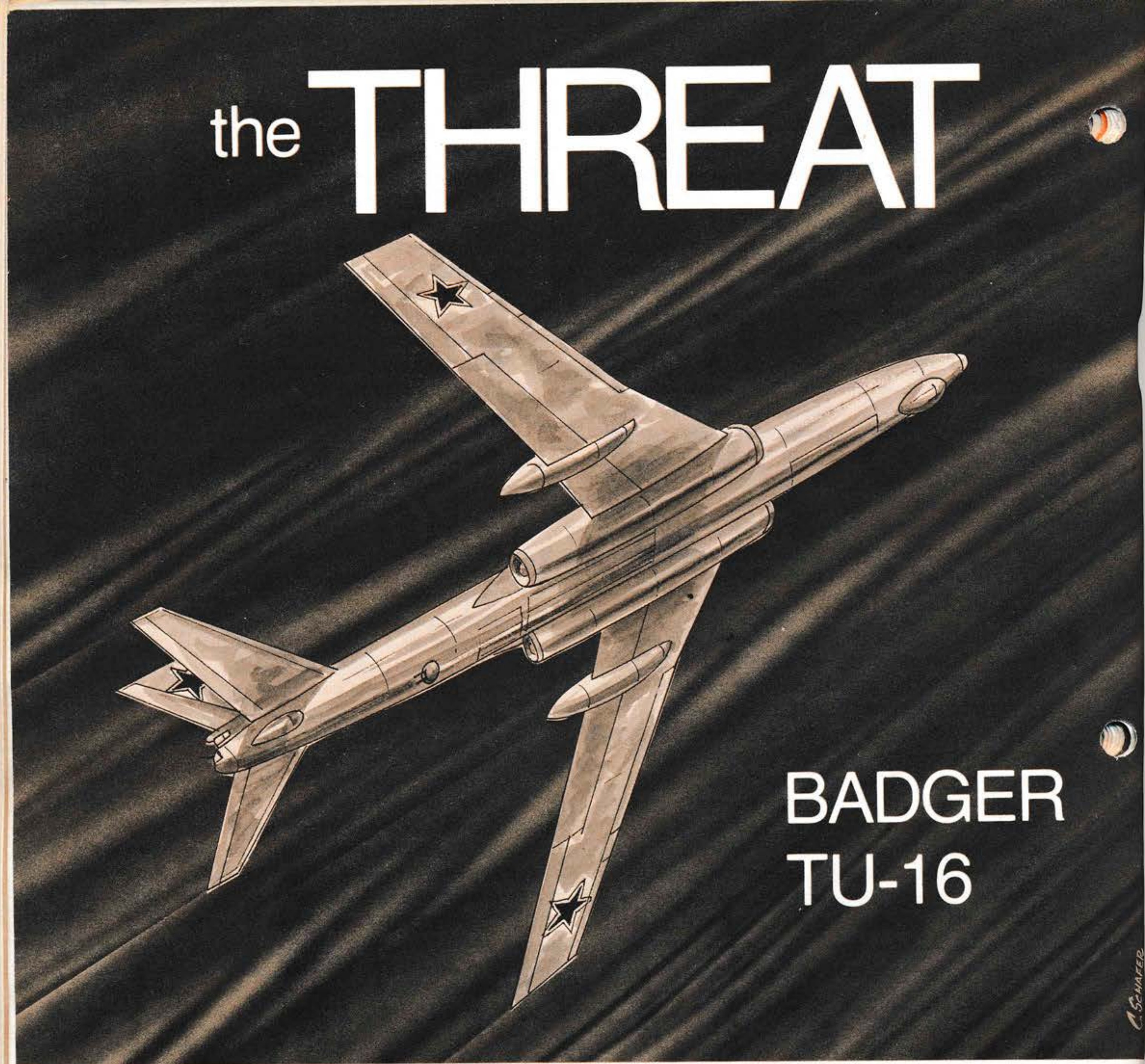
Bogey at 12 o'clock — no joy! A recent near miss again brings to light one of our greatest hazards — flying at low altitude in VMC conditions. A T-37 was descending through 2500 ft MSL enroute to the radar entry point for the home drome. The T-37 was on an IFR clearance in VMC conditions and was receiving radar vectors from RAPCON. The RAPCON controller called traffic at 12 o'clock at three miles and again at one mile. The crew acknowledged both traffic calls, but did not request avoidance vectors. A Cessna 150 was finally sighted at 10 o'clock at 1/2 mile. The T-37 crew initiated an immediate left descending steep banked turn passing on the right side of the Cessna 150. Missed distance was estimated at 300 ft. Another point to ponder is that the near miss was not declared with RAPCON. The pilot did not notify the appropriate personnel until after landing. This eliminated the possibility of tracking the aircraft in an attempt to identify the civilian and of making him aware of our military operations. (ATC/SED)

You could lose your pants! A T-Bird was returning from a cross-country mission. As the speed brakes were lowered to descend to pattern altitude, an unusual noise was heard accompanied by a thump underneath the aircraft. Pilots were unable to determine the nature of the problem until a fly-by of the tower revealed the travel pod door was open. Fuel was burned down in the local area and an uneventful landing was made. The culprit: the rubber seal around the travel pod door had become loose and dislodged from its proper place. When the speed brakes were lowered, the additional turbulence in the travel pod area caused the door to vibrate open even though the closing latches were locked. Some time after the travel pod door opened, the nose portion cracked. (This most likely occurred in touchdown.) A good item for an extra look by all Lockheed Racer drivers on preflight before a X-country or target mission. (SED)

Are you at six thousand? The C-130 was cleared to climb to 6,000 feet but about four minutes after level off, the crew heard approach control ask a commercial flight if it was at 6,000. Simultaneously, the MAC left-seater saw an airliner pass under him in a shallow, descending turn. The commercial jock advised the controlling agency that he was taking evasive action to prevent a mid-air. Both aircraft were operating under IFR under the control of the same agency. This one occurred in the northeastern United States. No sermon here — just a reaffirmation that radar contact does not mean that you're home free. (MAC/SED)

the THREAT

BADGER TU-16



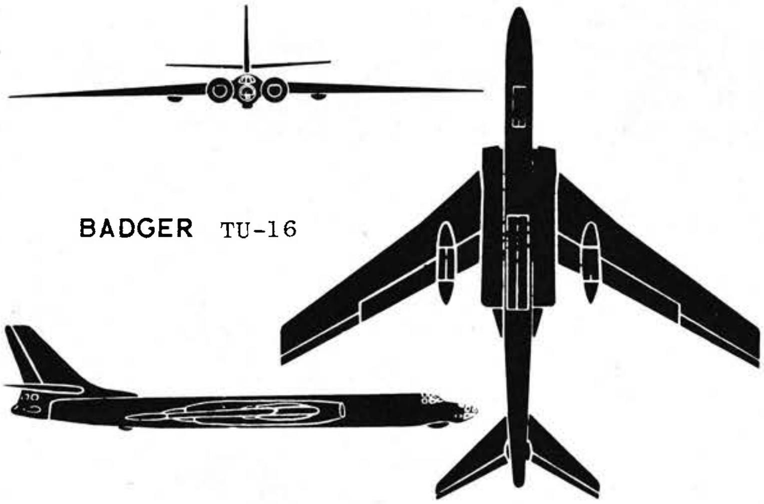
The effect of a weapon, like the venom of a deadly snake, does not necessarily become less lethal with age.

Author Unknown

An elder member of the Soviet bomber fleet, the Badger (TU-16), first came on the scene over twenty years ago. In 1955, fifty-four of the aircraft performed a fly-by during the Aviation Day display in Moscow. Since that time, it is believed that approximately 2,000 have been built. About 500 of those are thought to be still in service with the medium-range squadrons of the Soviet Air Force, as well as 400 used by the Soviet Naval Air Force for maritime reconnaissance and attack. In addition, it's estimated that about 60 of the Badger aircraft were built in China, where production began in 1968. The aircraft has also been exported by the Soviet Union to Egypt, Iraq and the Indonesian Air Force. Six of the seven production versions of the Badger are still in service. The different versions are the Badger A thru G models. The Badger A was the first Soviet long-range strategic jet bomber. The B, C, and G models are all variations of the Badger A with pylons to permit the carrying of stand-off air-to-ground missiles of various types. The Badger G is the updated version of the "B" and was used by Egypt to launch about 25 "Kelt" missiles against Israeli targets during the October 1973 war. The Israelies claimed that only five of the missiles penetrated their defenses to hit two radar sites and a supply dump in the Sinai.

The D, E, and F versions of the TU-16 appear to be reconnaissance or electronics models with bomb bay cameras or electronics pods depending upon mission requirements. Some Badgers have also been utilized as inflight tankers.

The basic aircraft is of swept-wing design with two large turbojet engines (approximately 21,000 lbs of thrust each) located internally at the wing root position on each side of the fuselage. A stepped-up cockpit houses the two pilots directly above a "chin-type" radome. This radome is enlarged in reconnaissance versions and some models have also been observed with external fuel tanks for an increased range capability. The Badger has a manned tail gunner position which is similar to the same position in older model B-52s. In addition to the gunner's position, there are observation blisters toward the rear of the aircraft underneath the tail planes. Typical Tupolev-type landing gear pods house the two quad-wheel main gear which are retracted into the wings.



BADGER TU-16

The Badger is generally comparable to the Boeing B-47 in specifications (size, speed, range, etc.). The normal Badger crew is composed of five to seven people whereas the B-47 had only three crewmembers. The B-47 primarily carried internal weapons; the Badger has the capability of carrying internal weapons and external air-to-ground missiles. The Badger has only two engines compared to the six of a B-47, but the total thrust of the two aircraft is approximately the same.

The Badger's seven versions have been extensively utilized in a variety of roles by the Soviet Union. Often, the Badger in a photo or electronic configuration is seen overflying U.S. and NATO forces at sea in the Atlantic or Pacific. The aircraft may be old, but should certainly not be forgotten. NEXT: THE BISON.★

AC / INFO	BOEING	BOEING	GENERAL DYNAMICS	ROCKWELL	TUPOLEV TU-(?)	TUPOLEV TU-22	TUPOLEV TU-16	TUPOLEV TU-95	MYASISHCHEV M-4
DESIG	B-47	B-52	FB-111	B-1	BACKFIRE	BLINDER	BADGER		
WING SPAN	116'	185'	70' (34')	137' (78')	113' (90')	80'	110'	COMING NEXT	
LENGTH	107'	157.5'	73.5'	151'	139'	110'	120'		
SPEED	528 mph	660 mph 20,000	mach 2.5 36,000'	mach 2.2 50,000'	mach 2.0	1.4 40,000'	587 mph 35,000'		
RANGE	4,340 mi	10,000 mi	4100 mi	6100 mi	3,570 mi	1,400 mi	3,975 mi		
GROSS WEIGHT	133,000 lb	480,000 lb	100,000 lb	350,000-400,000 lb	272,000 lb	185, 000 lb	150,000 lb		
CEILING	39,000'	55,000'	60,000' +		60,000'	60,000'	42,650'		
CREW	3	6	2	4	3	3	7		

GHOST WRITERS

IN DISGUISE

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PREFLIGHT — PREFLIGHT — PREFLIGHT

It was a beautiful Sunday morning in Anchorage Alaska. Terry called and informed me that a private citizen, down on the Kenia penninsula had called him to donate some WWII Civil Defense radio equipment to the Civil Air Patrol. CAP was my hobby at the time, in addition to my desk and military flying duties.

Terry asked if I would fly down the Kenia to a place called Bear Cove and help him fly the equipment back. I said sure. We met at Merrill Field a half hour later. He was to fly his own super cub and I was to take the CAP super cub. The plan was to fly to Homer Alaska, refuel, then across the bay to Bear Cove, pickup the equipment and return to Merrill.

I began the preflight check on the aircraft — kick tires, check oil, wet finger test for gas, etc. (those etc's can be murder). The engine ran somewhat rough in idle but I figured I had overprimed it and it would smooth out on runup. I followed Terry out to takeoff position, checked mags — 75 rpm drop on left and 50 on right — no sweat. Upon idling back, the roughness continued. Not having any idea of the cause I decided to circle the field twice and see what happened. Things went well so we headed for Homer.

An hour or so later we landed at Homer and refueled. Same rough idle but nothing else. I followed Terry to Bear Creek, east of Seldovia, watched him descend but could see no landing strip. He was now making what appeared to be a downwind leg to the front yard of the only house in sight. Sure enough he made his 180 and came to stop in front of the house. Not being used to "front yard" landings I elected a low pass before landing. What I saw

I gave immediate vent to one single mental remark — "you've got to be kidding." Touchdown could only be done in one direction regardless of wind. The far end of the runway was bordered by a large "green house"; the left side was stacked with what appeared to be about 50 cords of firewood and on the right was the house. The front yard was not wide enough to let two cubs pass each other.

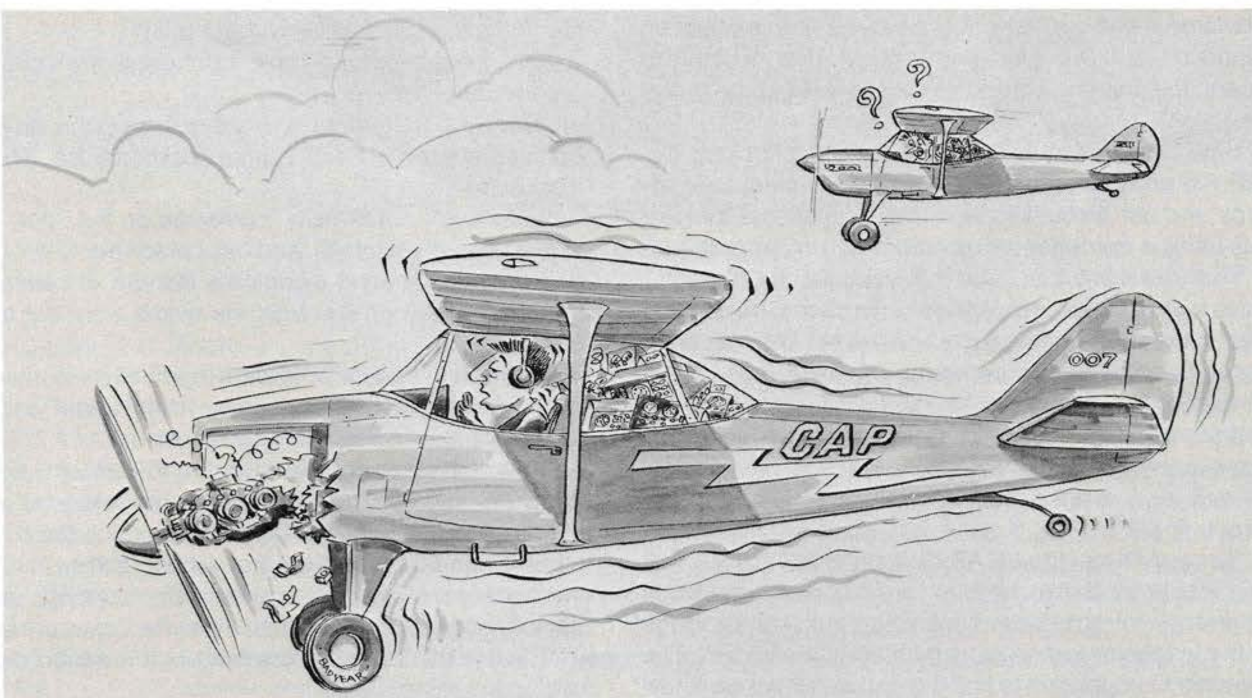
I made a very wide 360 to the left, after the low approach, and lined up on final about two miles out. In addition to the other things, the approach end of the area was a sheer 50 foot drop to Bear Creek — no landing short. I coaxed the Cub, about two knots above stalling, to the edge of the brink and cut throttle. I was stopped in about 200 feet in front of the house — no sweat.

We loaded radio equipment into the two Cubs until I thought we'd never get off the ground. Just for curiosity's sake I paced off the "front yard". It measured 300 of my approximately three foot paces (900 feet). We had lunch and prepared for takeoff. The rough idling continued. I taxied to the far end of the area for takeoff in the opposite direction. To get every inch of ground between me and the cliff, at the other end, I practically put my tail in the greenhouse door. Mags OK, max break, full throttle until RPM stabilized . . . release brakes and roll. To my utter amazement I was off in about 600 feet.

The flight back to Merrill was uneventful; however, again, at engine shutdown, the cowling shook so bad I thought it would come off. I had radioed ahead, while 30 minutes out of Merrill, for a maintenance man to meet me and take a look at the aircraft. He ran out to meet me and I explained what had been happening. I finished the briefing by adding that I thought the bloody thing was about to come apart — I was so right. An inspection of the engine compartment revealed one engine mount completely broken (you could see daylight through it) and the mount directly below it, cracked three quarters of the way through. A Super Cub has a total of four engine mounts. The mech was kind to me:

"You should have caught that break and crack on preflight, good thing you didn't try any high performance stuff."

Preflight item #1: CHECK ENGINE MOUNTS...... ★



"Hey Terry, I think I heard something, does everything look OK to you?"

ORI

OPERATIONAL READINESS INSPECTION TEAM

HQ, ADCOM

CONDITION, CAUSE, EFFECT AND . . . .

There have been some substantial changes in IG philosophy lately. A conversation on one of our recent trips gave us the idea for the following exchange. It should reveal to you how these new concepts affect an inspection and will give you a good idea of what to expect from our inspectors the next time we come to see you.

"Hey, Sarge, why is the IG inspector checking our HRP roster against the 286 file, security clearance records and our disqualification file? You told us that the IG is using a management problem-solving approach."

"Yeah, I did say that, Joe. But, you see, the inspector has to look at some compliance items so that he can find out if our management procedures work. The Inspector General of the Air Force wants to make inspections more effective. Therefore, his policy is for inspectors to emphasize assistance and show us how to do things better as he inspects."

"Well, how in the world does the management approach fit in?"

"General Nunn, the USAF IG, said in *TIG BRIEF* that if an inspector thinks he has found a problem that is important enough to write up, then it's important enough for the inspector to find out why there's a problem. The inspector is supposed to find the cause. When we know the cause of a problem, we can fix it once and for all. For example, suppose an inspector wrote us up for having a guy in a critical HRP position without his having a background investigation? How would you fix that?"

"I guess I'd get the guy to fill out a BI request then have the security police initiate the BI."

"You're right; but how would you prevent somebody else from being certified without a BI?"

"Oh, I see; I would have to change my screening procedures."

"Now you're getting it. Find out why the guy was certified improperly and you've got the cause. Then fix the cause."

"Let's see . . . OK then, 'corrected on the spot,' 'individual was counseled,' and 'all personnel briefed' are only ways of treating symptoms instead of causes."

"Great thinking! You took the words right out of *TIG Brief*."

"I see the reason for identifying causes, Sarge, but why does the IG tell the whole world about our mistakes?"

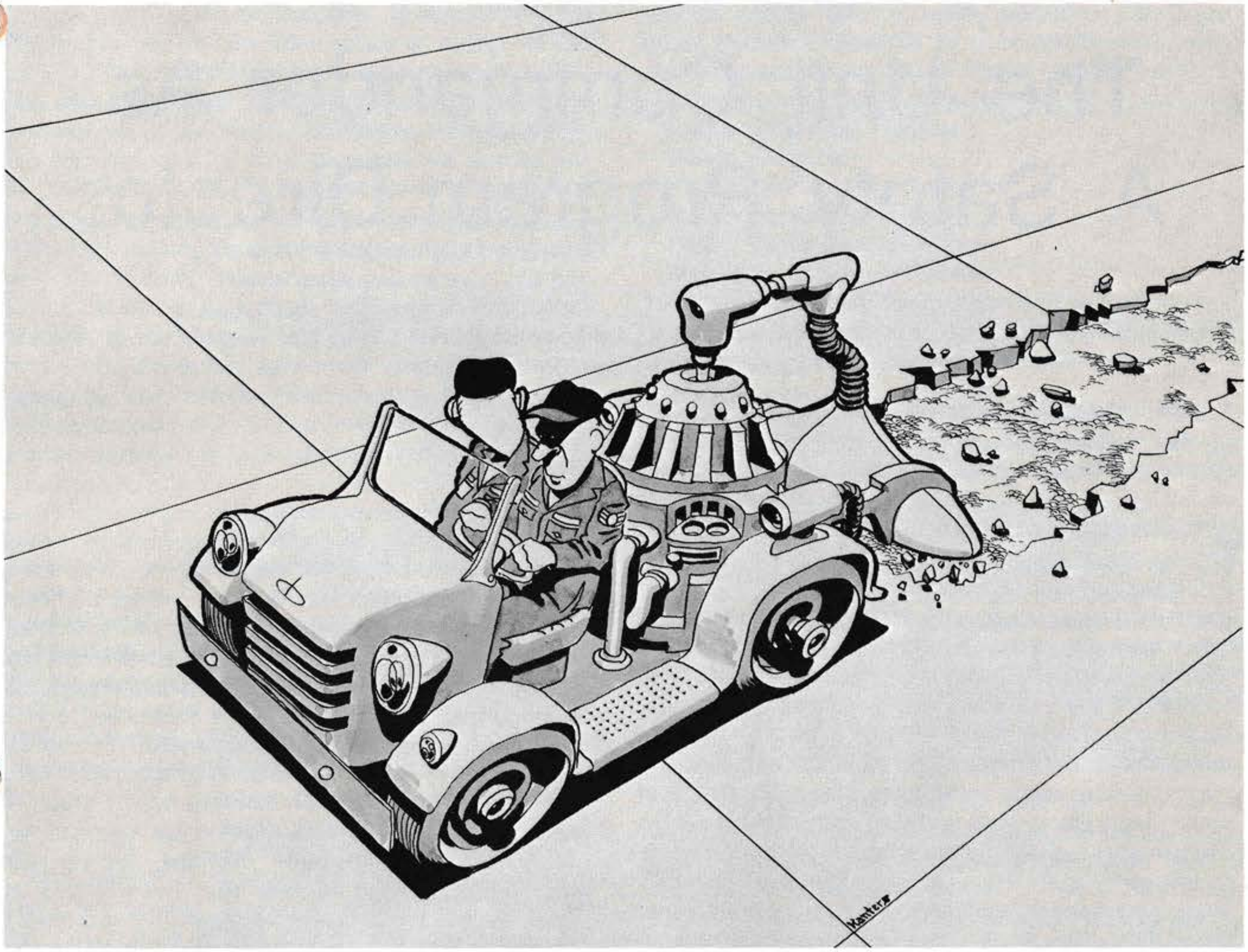
"The reason is right here in the *TIG Brief* 'Lessons Learned' column. The IG is trying to prevent a recycle of old problems. If our problems are put in the Gold Book, other managers can learn from them. If they discover the same problem in their shop, they have our experience to go by. In other words, it's a management tool."

"Excuse me a minute, the inspector is waiting to see us."

"I've finished my inspection and would like to brief you on my findings."

"OK, Captain, what do you have?"

"I'll read my report so you know exactly what I'm going



"Hey Sarge, can we turn the vacuume down on this thing?"

to put in the Gold Book.

"First, here's the CONDITION that I found. The Human Reliability Program was well managed. Next the CAUSE. The monitor and his assistant were identifying significant problems in screening and certification actions and were promptly reporting deficiencies to the commander. And the EFFECT. These actions, coupled with supervisory actions, resulted in the commander acting swiftly. In these cases, the commander prevented uncertified personnel from performing nuclear weapon duties. And finally, the RECOMMENDATION. That the unit HRP monitor and commander prepare an article to describe their procedures. That this article be forwarded to the AD and ADCOM Director of Personnel for publication in their bulletins and in the USAF Nuclear Safety Officer's study kit.

"That's the report. Now I'd like to give you some ideas from other units that I've inspected. Here are a couple of squadron operating instructions that I've collected. You have good procedures, but maybe these OIs will show you how to do the same thing in less time. Look them over. I'll be available tomorrow at 1300 if you need more information or have questions. Do you have any questions now? No? OK; see you tomorrow. Thanks for the cooperation."

"Wow, Sarge, Can I take the rest of the day off?"

"Not yet. Read these OIs first. Then we'll ....

KENNETH W. OHLINGER, Colonel, USAF
Director of Inspections

The Unit Commander As A Safety Program Director

by LT COL ALAN D. MIEDRICH
Chief, Safety Operations Division
HQ ADCOM

The unit commander's personal example, participation, and demonstrated standards set the tone for every aspect for the unit's mission effort. Under his direction the many elements of the unit function through the management efforts of key staff heads performing dual roles as primary line managers and functional staff heads. How a commander can direct one aspect of his command, the safety program and its functional manager, the unit chief of safety, is the subject here. The results of some recent inspections and staff visits indicate such a discussion is in order. Safety program direction seems to frequently suffer from a fundamental pitfall which every commander, particularly the new commander, faces. This is the simple observed tendency of middle- and upper-level managers (commanders included) to become overly involved in the functional area in which they have the greatest expertise and to avoid the functional areas with which they are less familiar. The key to successful command direction of the safety program is involvement. When the commander is visibly and personally interested in safety, everyone is aware of it. The result is increased safety awareness on and off the job.

Before we discuss the how of getting "involved" in safety program direction, bear with me through a little management theory because success, like it or not, lies in the application of some fundamental management principles. There are many principles and schools of management, but two which should be thoroughly integrated into the safety program by the commander are "management by exception" and "management by objectives." Let me clarify these.

Management by exception is a means of control which identifies the exceptional, good or bad, for management attention. In safety this is frequently associated with the bad; the accident or serious mishap. After a lengthy report with findings and recommendations, the end result is sometimes a patchwork of corrective actions to cover every possible causal factor in an attempt to prevent that accident from happening again. Management by exception, if not controlled, tends to degenerate into "band-aid management." It's after-the-fact and too late. Have no misunderstanding however, management by exception certainly has its place in a safety program. We use it when we conduct self-inspections, report hazards, mishaps, nuclear AIDs, and so on. Trending analysis from these reports provides much of the data which supports Management by Objectives (MBO) in providing many intermediate goals in safety programs.

Management by objectives requires PLANNING and generally consists of setting goals, the achievement of which should lead to the successful attainment of pre-established objectives. Maintenance and aircrew scheduling, for example, are activities which establish goals directed at completing the aircraft flying hour and aircrew training requirements and, in turn, lead to the primary objective: mission readiness. A well-thought out and developed accident prevention program supports these goals and the primary objective: mission readiness.

Let's return to the initial question: How does a commander achieve involvement and active participation in directing a safety program? To begin with, consider some management functions which are relative to the subject and which can be applied:

Planning is essentially choosing a means or method of attacking a problem or exerting influence to achieve some objective or intermediate goal. It is an on-going process which, at the working level, is constantly being adjusted based on new information. In safety, AFISC and ADCOM provide a generalized accident prevention plan which identifies "safety program elements." Experience has shown that the successful implementation and administration of these elements will usually provide the most successful accident prevention program. The basic objectives are set; conserve mission capability by not breaking equipment and injuring/killing people. Your aircrews, maintenance personnel . . . all personnel, all of the equipment, and time are resources essential to the mission. Injury, loss of life and equipment damaged or lost as a result of mishaps are lost resources. The time required to retrain, heal, repair or replace is a lost resource. Certainly the financial loss is a critical resource loss. Accident prevention conserves resources for mission effectiveness. Your planning task as the commander should include direction to the safety staff in determining how the safety program elements cited above will be implemented as objectives in your safety program. It may involve the conduct of on-the-job safety training, determining how important mishap experience will be communicated to interested personnel and supervisors, identifying procedures for reviewing safety and quality control inspections and hazard reports, and so on. The list is extensive. The point is you must take part in determining how these elements are integrated into your command structure and implemented by your safety staff.

Organization. Frequent inspection checklist items in safety are worded "Does the safety officer report directly to or work for the commander?" And, ". . . are additional duty safety personnel appointed in writing?" These are significant trends representing a degree of your involvement in your safety program. Your attention to the organization of the safety function in your unit to include staffing with competent, trained personnel is indicative of your interest and involvement in the safety function and a measure of its success.

Controlling. A feedback loop in any management program is essential to maintaining control of its progress and direction. Your direction of the unit's safety program has its origin in your feedback systems. A clear statement of policy by objectives and the development of integrated safety and quality control reporting and self-inspection procedures supported by the safety council are the tools of successful control ——use them effectively.

Directing your safety program. In ADCOM we provide the division and unit safety staffs with the program elements of AFR 122 and 127 series directives and provide ADCR 127-1 to define additional safety program elements essential to a comprehensive, well-defined prevention program. These elements are:

Commander's Policy on Safety
Safety Education/Training
Safety Councils
Hazard Identification Reporting
Safety Inspection Program
Safety Tasks Responsibilities
Mishap Investigation Planning

In terms of controlling the program and thus providing it and the safety staff with direction, the following elements *must* receive your personal attention:

Mishap Reporting. Require your safety officer to supervise the investigation of each mishap with the assistance of appropriate quality control and aircrew standardization personnel. Personally review the reports and ensure the causes are, in fact, causes and not effects. Where recommendations are made, monitor their evaluation by the responsible functional staff and insist that action be taken to eliminate the root cause. Demand reporting integrity. Not enough can be said about this. If you back down here, the message is clear — the boss will hide mistakes. If you conceal mistakes you must tolerate them too! Your interest and involvement must be visible, persistent, and documented.

Hazard Reporting (HR). An effective HR program requires the participation of your people. Demonstrate your interest, involvement, and appreciation through recognition and participation. Review each one. Evaluate the adequacy and quality of the response by the functional OPR. Don't allow the reply to insult the concern and intelligence of the submitter. The message is two-directional. Reports are wanted and appreciated, and people will participate; OPRs will recognize your no-nonsense approach and investigate the hazard and remove it. In effect, you will become the person to be answered, not the submitter. Leave the program participation and coordination at the safety officer level and people will see safety as once removed from the mainstream of command interest and mission effectiveness. Safety awareness will wane.

Self-inspection Program. This is where your safety officer becomes your eyes and ears. You, however, must hear and see what he identifies as hazards: conditions, nonstandard procedures, and noncompliance to name a few and you must provide support. He *is not,* in most cases, the corrective action agency. You must review the reports and direct the corrective action with a suspense, under your signature, to the functional OPR. Replies should be reviewed for completeness and lasting corrective action. Management by exception is effective only when the correction applied to an adverse exception removes the *underlying* cause, not merely the existing condition created by an underlying cause and discovered in the inspection. Your involvement and concern are again evident — to the safety staff, the responsible OPR, and your unit personnel.

Safety Councils. This is where it all comes together. Where required, ADCOM unit councils meet quarterly. In some units they are effective and some complain that's too often. The ADWC council meets monthly and is most productive. In this meeting you bring together the major functional areas of the organization and the safety staff. An agenda should be provided in advance. Comprehensive minutes clearly defining each problem, designating action OPRs, and suspensing replies must be published. Old business is reviewed and held open until effectively resolved and closed. The safety council on the staff meeting as appropriate, is the place to review selected HRs, mishap reports, and reports of self-inspections. Trends may be identified and corrected. The safety council is the focal point for keying your day-to-day emphasis on safety as an INTEGRAL PART of the unit's daily activities. Attendance and the degree of involvement by your staff will be determined by *your* attendance and participation. When your attendance drops, your senior staff members will follow. In terms of making your involvement and interest in the program visible:

— *Attend* and *participate* in the flying safety meetings your safety officer conducts. Work with him in the planning stages of the meeting.

— Devote a part of each commander's call to instilling *your* safety policy into the personnel in your unit. Don't play it down. It's your unit, and the people in it look to you for guidelines in many varied ways.

— *Don't miss* an opportunity to recognize success or accomplishment by a unit member in some area reflecting safety awareness or effort.

The other elements of the program should be under your surveillance, but their conduct and administration can be more freely delegated to the safety staff.

In conclusion, your emphasis should be on personal, visible participation and involvement. If you haven't been associated with safety before, it's time to get vitally interested. Learn the duties of the safety officer and the essential elements of the program. Don't make your safety officer the action agency for correcting deficiencies in functional areas. He is the central coordinator for staffing and following up. He is the safety program manager. Your functional area managers and supervisors promulgate your standards, insure by-the-book activities, and develop safety awareness. You are the safety program director. ★

ABOUT THE AUTHOR

Lt Col Alan D. Miedrich came to ADCOM Safety in June of 1973. His extensive safety background as well as his interceptor and tactical experience (F-89, F-102, F-101, RB-66 and RF-4C) have provided the needed basis for developing many safety programs. During this assignment, he has served as the F-101, T-33, and F-4 project officer and is currently Chief, Safety Operations Division. Prior to his ADCOM assignment, he served on the staff and faculty of the Army Command and Staff College, Fort Leavenworth, Kansas. He is a command pilot with 4,000 hours and holds a MBA in management from Auburn University.

THE WAY THE BALL Bounces

ACCIDENT RATE

	ADC	ANG
1 Jan - 30 Apr 76	8.6	12.9

ON TOP OF THE HEAP

MO	ADC	MO	ANG	MO	ANG
59	318 FIS McChord	78	141 FIG Spokane	33	107 FIG Niagara Falls
45	84 FIS Castle	57	144 FIG Fresno	26	102 FIG Otis
39	57 FIS Keflavik	40	142 FIG Portland	23	120 FIG Great Falls
28	48 FIS Langley	37	119 FIG Hector	22	177 FIG Atlantic City

ACCIDENT FREE

CUMULATIVE RATE

ACCIDENTS FOR APR / CUM TOTAL

BOX SCORE

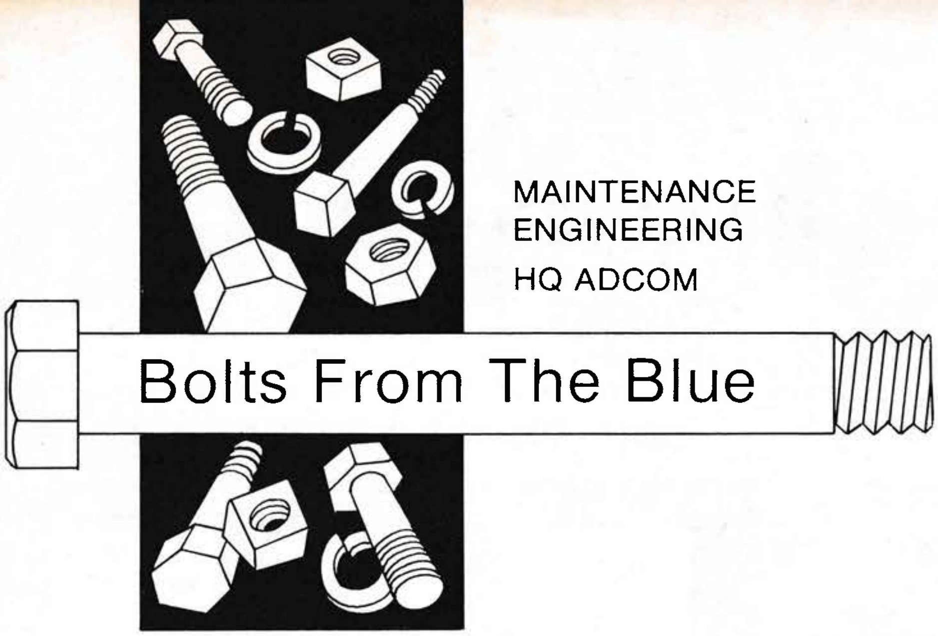
RATE = MAJOR ACCIDENTS PER 100,000 FLYING HOURS

ALL RATES ESTIMATED

MINOR ACCIDENTS THIS PERIOD — 0

MINOR ACCIDENTS CUMULATIVE — 0

	ADC	ANG	20 AD	21 AD	23 AD	24 AD	25 AD	26 AD	ADWC	AFI	46	ANG
JET	9.1	13.6										
CONV	0	0										
F-101	81.3	0							/1			
F-106	7.0	11.3				1/1						/1
F-4	0											
T-33	8.8	30.6							1/1			/1
T-37	0											
B-57	0	48.6										/1
EC-121	0											
OTHER	0	0										



MAINTENANCE
ENGINEERING

HQ ADCOM

Bolts From The Blue

Effects of Change on the Maintenance Plan

Every month the unit aircraft maintenance function publishes a monthly maintenance plan, distributes it to all local unit functions, and then attempts to live with it. The plan is further refined into a weekly maintenance plan and is then put into execution in the daily maintenance efforts. The aircraft maintenance profession has, as its sole purpose for existence, the production of safe, quality aircraft. Years of past maintenance experience have proven that the basis for getting from one point to another is to have a plan. Ideally, the motto should be "Plan your work, then work your plan." In a nutshell, this is the basic reason behind the existence of the maintenance plan.

The maintenance plan is the "score card" against which our daily maintenance efforts are calculated and there is an enormous amount of effort expended on building the plan. In fact, it is often amazing how so much effort can be expended in developing the plan and yet how quickly it can be wiped out — often in just a matter of minutes. As most of us know, changes which exceed the capability of maintenance have a significant impact on our maintenance efforts, and can quickly deteriorate our safety standards.

For a few moments, let's look at the ingredients of a sound maintenance plan as it should be developed. The flying program, which is the basis for the maintenance plan, is initiated with the allocation of flying hours by the Air Staff. This is distributed down the MAJCOMs and then further allocated to the flying units. These requirements are to be provided to the maintenance activity, not later than 25 days before the beginning of the quarter. The Deputy Commander for Maintenance then reviews these requirements, projects his capability to support them, and notifies the operations function when limitations exist. Ideally, everybody agrees upon the program at the monthly operations and maintenance scheduling meeting which precedes the quarter being planned.

Before the end of the third week of the month preceding the affected month, the information relating to the utilization of aircraft, the maintenance requirements, and maintenance capability required to support the mission, are reviewed. When the lack of projected capability appears to prevent adequate mission accomplishment, the commander will make the decision as to what portions of the mission can be supported and to what degree.

An attrition factor is also agreed upon and added to the contract to insure fulfillment of the contract requirement. The attrition requirement is based on factors effecting scheduling effectiveness, such as nonavailability of equipment, air and ground abort rates, mission success data and weather. However, caution must be exercised to insure that the attrition factor is reasonable and required for the maintenance effort. The contract figure plus the attrition factor thereby provides the basis for the development of the monthly maintenance plan and operation schedule.

Then, the weekly meeting is held by maintenance and operations to review the past week's accomplishments and note required changes to the next week's schedule. Once published, the weekly schedule should provide the final planning guide for both operations and maintenance. Moreover, this also provides the "score sheet" applied against the criteria in ADCOMR 66-260 and AFM 66-1 to determine how effective maintenance was in aircraft and equipment scheduling effectiveness. So, the weekly maintenance plan becomes an extremely critical document in determining "how goes it" and additional required scheduling actions.

Finally, we arrive at the daily requirements. The daily maintenance planning is necessary to incorporate unscheduled maintenance requirements. Most of these unscheduled requirements are identified through the debriefing process, delayed discrepancies, and the routine call in of maintenance requirements to job control These requirements are then balanced against the specialist availability and shop production requirements through the daily planning meeting and the plans and scheduling actions on preplanned and debriefing identified requirements.

We get many of our initial scheduling changes at the daily maintenance meeting and if we fully realize the effect that changes have on scheduled maintenance requirements, we attempt to keep the schedule changes to an absolute minimum.

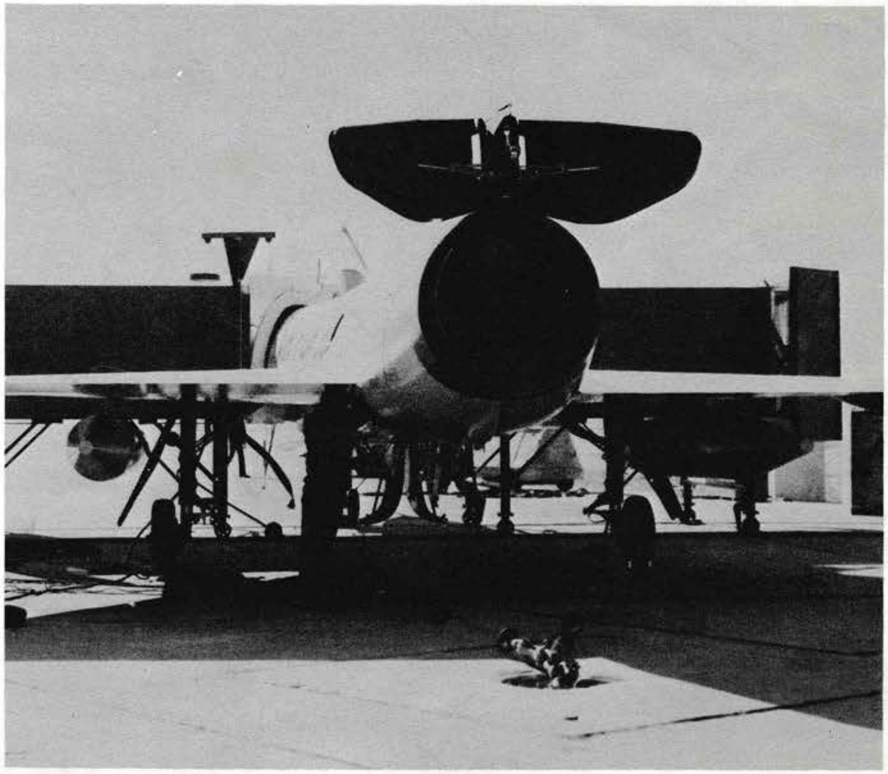
Well, just what effect do these changes have on maintenance??? The basic problem is that aircraft tail number changes result in aircraft being used for purposes other than what was scheduled. Frequently, this results in aircraft not being available, as planned, for purposes such as weapons load training, routine maintenance, corrosion control, 45/90 day fault detection tests, etc. (By the way, that scheduled routine maintenance period is the time when we try to get ahead on some of our aircraft delayed discrepancies — so let's use it.) Any delay of scheduled maintenance actions has a rapid cumulative effect. If we deviate in one area, something else has to be rescheduled.

Of course, some changes to our schedule are a result of aborts or sorties not provided. This is where the operations scheduler and the maintenance control officer really earn their pay. "Do we 'plug the hole' and use another unscheduled tail number or absorb the abort and make up the sortie later?" But the cost of plugging holes in the schedule can really get excessive because plugging holes can quickly lead to the famous "rush job". Then preflight inspections have to be completed more rapidly, aircraft must be "buttoned up" and maintenance actions are delayed. We usually end up boring holes in the sky due to the substandard quality of the aircraft instead of obtaining an effective training sortie. But even more important, the "rush job" quickly leads itself to that bear trap — maintenance error. Haste in performing our maintenance requirements will usually result in compromise of our safety standards.

Another criterion for the decision to "plug the hole" should be: "Do we have the maintenance reliability built into our aircraft to be able to absorb an abort/no provide, or do we need to provide a spare aircraft for the sortie?" That certainly is a judgement call, isn't it??? However, the answer to it can often provide the key indicator as to how many changes we can absorb.

Our schedule cannot be excessively rigid — we need some flexibility. Our first job is to support the flying program within our capability. But when the changes to our maintenance plans are kept to an absolute minimum, we can really achieve the objective of our efforts — a safe, quality aircraft.

JAMES S. MEADOR, Col, USAF
Director Maintenance Engineering



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Say hi to Rhonda, our new Miss Interceptor for the remainder of 1976. Rhonda is an Airman First Class working as a Material Facilities Specialist with the 84th Fighter Interceptor Squadron, Castle AFB, CA. A native of Fayette, New York, Rhonda has adopted the California coastline with special favorite areas being Carmel and Monterey. Our 5 foot 2 inch blond beauty has a variety of interests including swimming, sewing, dancing, tennis and gardening. Safety is an important topic with this lissome lass and she is looking forward to sharing monthly safety messages with our readers.

PHOTO BY RICHARD HASKELL