TAC ATTACK

SEPTEMBER 1976

LOW LEVEL
WIND SHEAR...Page 4

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TAC ATTACK SEPTEMBER 1976 VOLUME 16 NUMBER 9

SEP

FOR EFFICIENT TACTICAL AIR POWER

FEATURES

DEPARTMENTS

Angle of ATTACK

YOU MUST GET OUT...

You are flying a ground attack mission. The file is low-level ingress, then a pop-up to 00 feet AGL for a 15-degree high drag delivery. you approach your apex altitude, you begin your pull-down and roll-out to the final attack heading. Suddenly, the nose of the aircraft yaws opposite to the direction of roll, and the aircraft shudders violently. What are you going to do? Attempt a recovery or eject. . . now? Time available to make the decision is very short. In fact, you should have made that kind of decision before you took off. You must consider the possibility of losing control at low altitude, the time available for a recovery attempt, and your ejection system's capability . . . or you might not make it. Let's take a look at TAC's recent experience.

Through the first seven months of 1976, TAC regular and reserve forces experienced 24 major aircraft accidents. The most distressing factor about this figure is the number of aircrew fatalities . . . 13. Two of these fatalities were caused by inadvertent ejections; something the aircrew had no control over. The others? Seven aircrews made no attempt to get out of the aircraft; the other five made their attempt too late... out of the envelope.

Why are aircrews staying with an aircraft ch is out of control? To answer this question, 18 major aircraft accidents in which the aircrew ejected or should have ejected were analyzed. Nine PILOT-INDUCED accidents resulted in a crash fatality or an ejection attempt. Nine lives were lost. There were nine NONPILOT-INDUCED accidents which resulted in a crash fatality or an ejection attempt. In these accidents, only three lives were lost. Put another way, the chances of surviving such circumstances were three times greater when the pilot was not the driving factor in the situation that caused the accident. When the pilots sensed they were responsible for the impending crash, it appeared they either failed to eject, or stayed with the aircraft too long . . . they lost their lives trying to save the aircraft.

The aircrew's records were reviewed for total time and time in their respective aircraft. There was no significant correlation . . . no one was immune, old heads or new guys . . . they made the same mistakes.

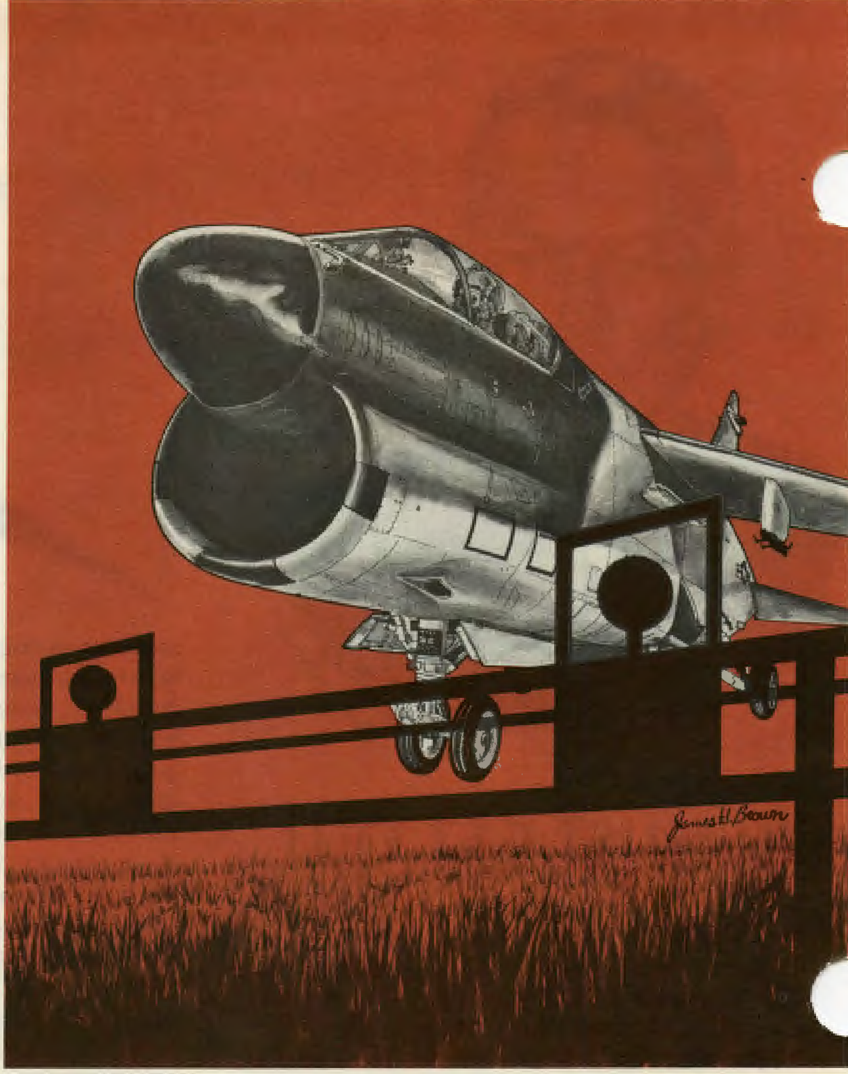
Our conclusion is that most of the fatalities were pilot induced. A fighter pilot doesn't hesitate to jettison an aircraft that is mechanically unsound. But if he suspects he failed in some way, the chances are that he will kill himself in a futile attempt to save an aircraft.

The next question to be answered is "Why do aircrews make futile attempts to save an aircraft and how do we prevent it from recurring?" The reasons may be varied and personal. Whatever the reason, it does not make sense for a pilot to stay with a doomed aircraft ... for any reason. Each one of you must make the decision to eject when the situation goes out of control at low altitude ... no matter what the cause. Let's reverse those grim ejection statistics ... now.

George M. Sauls

GEORGE M. SAULS, Colonel, USAF
Chief of Safety

LOW-LEVEL WIND SHEAR



Major Shirley M. Carpenter
702d MAS
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The history of aviation is one continuous story of man's triumphs over the elements of Mother Nature. Man does not feel secure operating in an environment of unknowns. Therefore, the ancient flying fears of weather, mountain waves, thunderstorms, etc., have been conquered through learning and improved technology. However, at times, Mother Nature refuses to expose all of her secrets and continues to maintain the upper hand. Low-level wind shear is a prime example of a meteorological phenomenon which has repeatedly lured aviators into situations from which they were unable to recover. Previous aircraft accidents verify this fact.

On 27 November 1973, Delta Airlines Flight 516 was flying an Instrument Landing System (ILS) approach to Chattanooga, Tennessee, Municipal Airport when it hit an approach light 1,600 feet short of the runway, struck a flood control dike and finally came to rest. The National Transportation Safety Board (NTSB) concluded that the cause of the accident was an "excessive rate of descent initiated by a wind shear condition which existed in the lower levels of the approach path."

On 17 December 1973, an Iberian Airlines DC-10 struck the approach lights 500 feet short of the runway while flying an ILS approach to Boston's Logan International Airport. The aircraft then hit an embankment and sheared off its right main landing gear. The DC-10 skidded to a stop about 3,000 feet beyond the threshold of the active runway. The Flight Data Recorder (FDR) revealed that the DC-10 was exposed to a severe wind shear on final approach when it descended through 500 feet.

On 24 June 1975, an EAL 737 jet plunged to a fiery end while attempting to land at New York's Kennedy International Airport. The cras[h] proved to be the worst single-plane disaster [in] U.S. history -- claiming 114 lives. As on[e] azine article stated, "The crash was blamed strange phenomenon called wind shear."

Low-level wind shear certainly is not a new phenomenon. It has been around for years and is of vital importance in the field of aviation. Unfortunately, wind shear has been neglected until just recently. Perhaps wind shear have been neglected due to higher priorities which has been placed on other meteorological conditions such as clear air turbulence (CAT), and wake vortex turbulence. Suddenly, it is being labeled a "strange phenomenon."

The word "strange" is perhaps an understatement of the true nature of wind shear. Few meteorologists or pilots thoroughly understand its causes and effects. The National Center for Atmospheric Research (NCAR) just completed two low-level experimental flights and discovered winds which changed 180 degrees in direction with a corresponding change in speed as high as 30 knots within a period of 20 seconds. This is representative of the types of wind shear situations which pilots must face during the most critical phase of flight: on final approach, close to the ground, in a high drag configuration, and low power condition. ever, flights cannot simply be diverted or celed every time a storm comes up or the possibility of shear exists. The problem is what steps need to be taken to furnish pilots with adequate information and guidance to allow them to safely cope with low-level wind shear during approach and landing.

This article will only deal with low-level wind shear even though it can occur at any altitude from the surface up through the high altitude jet streams. At high altitudes, an aircraft's IAS is well above the stall speed and there is plenty of room to recover if necessary; the effects of wind shear may be no more than turbulence. But wind shear close to the ground, while the aircraft is fully configured for landing, does not allow much room for error; worst of all, there may be little, if any warning. Although wind shear can be a serious problem during departures and approaches, approximately 70 percent of all major accidents occur during landing. Therefore, this series is only concerned with low-level wind shear during the final approach and landing phase of flight. It can trap a pilot just as surely as if he forgot his gear, flaps, or spoilers.

ne first step in approaching the problem is to erstand the phenomenon. Part One of this three-part series will deal with the characteristics of wind shear and the different types of meteorological conditions which can produce it. If a pilot understands the determinants and nature of wind shear, he can perhaps minimize its effects and overcome the associated hazards. Part Two will give details on how wind shear can affect an aircraft during approach and landing. Its effects on aircraft performance must be thoroughly understood in order to cope with the problem. Part Three will discuss the present procedures utilized for dealing with wind shear and the new systems under consideration to enhance a pilot's capability to effectively handle a wind shear situation.

SOURCES OF WIND SHEAR AND ITS CHARACTERISTICS

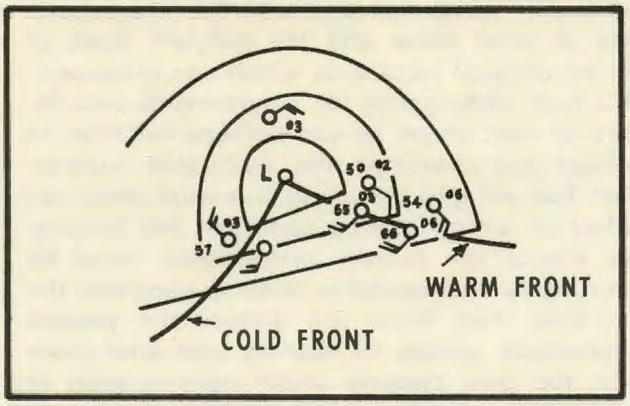
For a person to have a thorough understanding of wind shear and its dangerous characteristics, it is essential to be knowledgeable about how it is produced. By being familiar with the sources of wind shear, a pilot will know under what conditions to expect it and the possible severity of the shear to be encountered. Even more important, through proper analysis he can determine in advance how to minimize the effects of known or suspected wind shear.

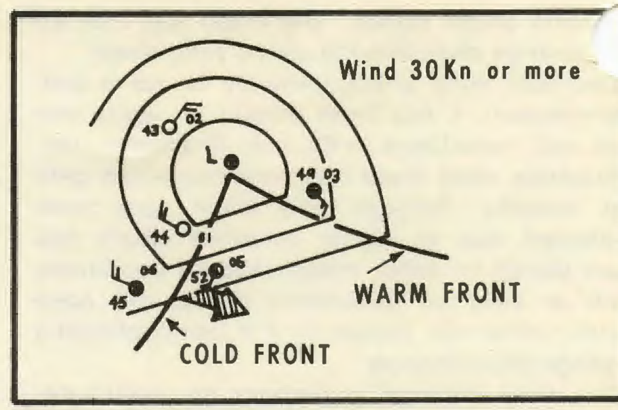
Low-level wind shear is basically induced by four sources: frontal activity, temperature inversions, thunderstorms, and surface obstructions.

FRONTAL WIND SHEAR

Wind shear is sometimes associated with certain types of cold and warm fronts. However, just because a front contains gusty winds does not necessarily mean it will produce significant wind shear. As a matter of fact, most fronts have shallow wind gradients which contain gradual changes in wind direction and velocity. Sometimes, though, certain cold and warm fronts do have steep wind gradients which produce severe amounts of wind shear. A natural question is how does a pilot tell the "good guys" from the "bad guys"? This is not easy. However, with a few rules of thumb, a pilot can make an intelligent guess.

A front (warm or cold) will contain significant wind shear if it meets one, or both, of the following criteria: (1) the temperature differential across the front at the surface is 10 degrees F (5 degrees C) or higher (Figure 1), (2) the front is moving at 30 knots or faster (Figure 2).





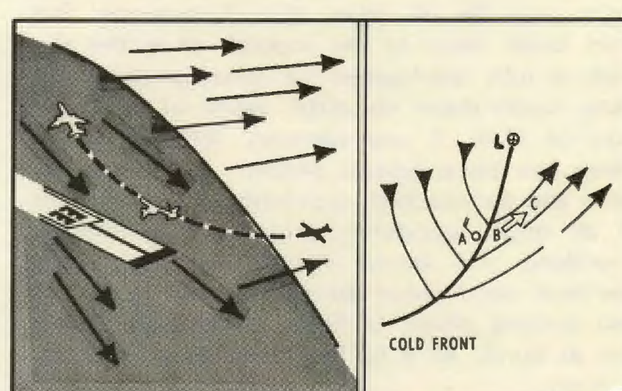
Of course, it does not do a pilot much good if he only knows that a particular front contains wind shear. He should be able to analyze the frontal activity and at least determine the effects of wind shear on the performance of the aircraft for his direction of flight.

At a given power setting, an airplane in stable flight will seek a certain IAS. For example, during an approach in a stable configuration, assume that a given power setting will sustain an IAS of 130 knots in a rate of descent of 500 fpm, while flying into a 20-knot head wind. If the head wind gradually drops to 15 knots, a well trimmed airplane, if left alone, would increase its rate of descent until it again attained 130 knots. Therefore, to prevent a possible short landing, the pilot must take immediate corrective action by adding power and carefully increasing the angle of attack.

With a sufficient understanding of the effects of wind shear on aircraft performance, a pilot can minimize the dangers of frontal activity. For example, if a pilot flies through a frontal surface into a strong head wind, the IAS will increase, causing an increase in lift and the airplane will climb rapidly. The worse situation would be in flying from a head wind into a strong tail wind. In this case, the airspeed would rapidly deteriorate with a corresponding loss of lift; and the pilot might have difficulty recovering. Therefore, to properly analyze a frontal system and determine the severity of wind shear, it is important to know wind direction and velocity on both sides of the frontal surface.

If a pilot carefully studies a surface weather map, he can determine the direction of the wind above and below a frontal system. For example, the cold front in Figure 3 meets the low-level wind shear criteria. The surface winds at Airport A are below the front. To determine the wind direction above the front, interpret the isobars in the warm sector immediately ahead of the cold front. In the example, the winds below the front are from 320 degrees and the winds above the front are shown by the arrow BC, or from 220 degrees. Therefore, an aircraft flying an approach to runway 33 (depicted in the picture) would be transitioning from a 110 degree left quartering tail wind to a head wind. Of course, the aircraft would experience a sudden increase in IAS and lift which would initially tend to make it rise high on the glide path.

An approach to a northeast runway under the conditions in Figure 3 creates another problem. The wind above the front, being a direct tail wind, produces high ground speed. This approach would require a high rate of descent and the IAS would have a tendency to increase even with the throttles in idle. As the aircraft penetrates the frontal surface in a direct left crosswind, the IAS will increase even more, causing a corresponding increase in lift with the aircraft having a tendency to rise high on the glide path.



A significant shear can also occur across a front simply with a sudden change in wind velocity without a change in wind direction. Usually this occurs in warm fronts which have large temperature differences and move slowly. Actually, data compiled on low-level shear indicates that warm fronts produce more severe shear than cold fronts.

THUNDERSTORMS

All pilots realize that thunderstorms can produce wind shear. At cruise altitudes, many pilots will change course and literally go hundreds of miles out of their way to avoid the possibility of tangling with one. However, during the approach phase, the average pilot does not always totally respect the wide field of dangers associated with thunderstorms.

A thunderstorm can cause violent and unpredictable winds. It can produce intense wind shear in all quadrants of an airfield, up to 10 miles in front of its line of movement. The velocity of the gust associated with a thunderstorm is the sum of the thunderstorm's downdraft speed, plus the storm's forward motion. Because of outward flow of air as the downdraft hits the ground, it is impossible to fly through the base of a thunderstorm without first encountering an increasing head wind, which rapidly deteriorates in velocity and changes into a strong increasing tail wind.

The initial positive effect of the head wind creates a cushion in IAS, but this rapidly changes to a strong negative effect as the wind shifts to a tail wind which can easily exceed the aircraft's capability.

However, it would be misleading to leave the impression that if a pilot simply avoids flying through the base of a thunderstorm, he is free of wind shear. On the contrary, as a thunderstorm approaches an airfield, it is the "first gust" of wind which produces the most violent shear. This gust can change the direction of the prevailing wind up to 90 degrees, attain a velocity as high as 100 knots, and affect an airplane from the surface up to 6,500 feet.

SURFACE OBSTRUCTIONS

The fourth source of low-level shear is produced when strong surface winds are deflected by buildings, hangars, or factories near the runway. Normally, pilots are alerted to possible encounters with such shear by airfield notices or controlling agencies. Since the magnitude and severity of the shear can constantly fluctuate, it is totally unpredictable. This type of shear, however, should be well respected by pilots since it can occur over the threshold or in the flare at a very critical time when the throttles are close to the idle range.

TYPES OF WIND SHEAR

Wind shear can appear in a horizontal or vertical plane. It is possible for an aircraft to encounter shear in both planes simultaneously, but, for the sake of simplicity, each type of shear will be discussed separately.

Horizontal shear occurs when the flight path of an airplane passes through a wind-shift line. Figure 4 illustrates a wind-shift line that might be found locally along a cold front. The aircraft is leaving the cold side of the front where there is a northerly wind and penetrating into the warm area which has a southwesterly wind.

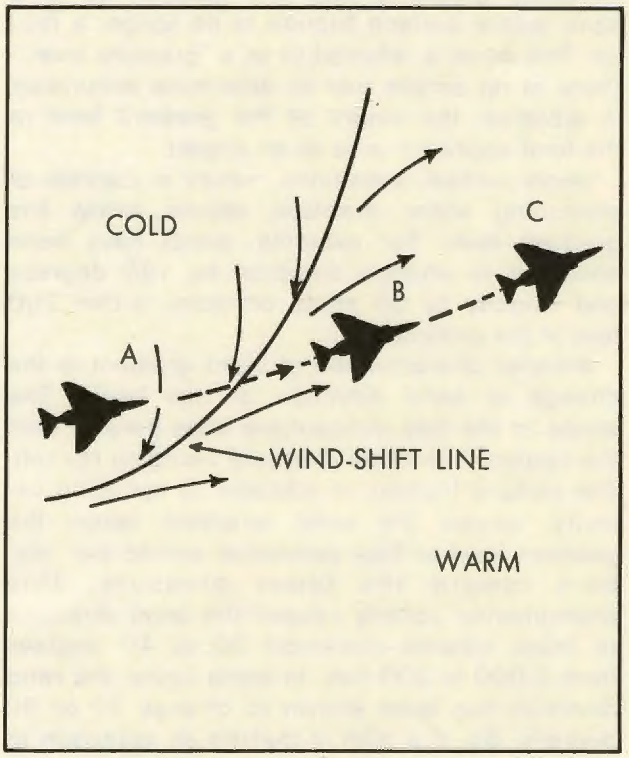


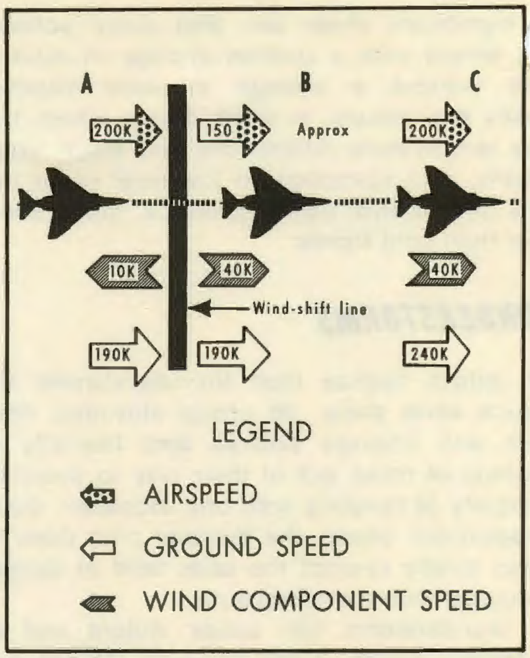
Figure 5 is a profile view of an aircraft flying through a wind-shift line and depicts how the shear temporarily affects the plane's airspeed and ground speed. The IAS at point B would instantly drop to 150 knots because the net change along the flight path is 50 knots (+10 to -40).

In reality, the airspeed would not decrease to quite 150 knots at Point B because some acceleration would occur while traversing through the wind-shift line, but it can be assumed that due to inertia of the mass, there will be a change in IAS whenever an aircraft suddenly encounters a different wind direction or speed. Therefore, the IAS will increase whenever the head wind component increases and decrease whenever the head wind component decreases or shifts to a tail wind.

Vertical wind shear is more common during the approach phase of flight than horizontal shear. Vertical wind shear is normally present near the ground where pilots are making their last minute maneuvers for landing. Wind velocities in the lower layer of the atmosphere are reduced by surface friction such as trees, buildings, and terrain features. Wind speed normally increases gradually from the ground, up to a point where surface friction is no longer a factor. This point is referred to as a "gradient level." There is no simple rule to determine accurately in advance, the height of the gradient level in the final approach area to an airport.

Under certain conditions, nature is capable of producing some dramatic shears below the gradient level. For example, winds have been observed to change direction by 180 degrees and velocity by 50 knots or more, within 200 feet of the ground.

Another characteristic of wind gradient is the change in wind direction at low levels. The winds in the free atmosphere blow parallel with the isobars, the lower pressure being to the left. The surface friction, in addition to reducing velocity, causes the wind direction below the gradient level to flow somewhat across the isobars toward the lower pressure. This phenomenon usually causes the wind direction to move counter-clockwise 20 to 40 degrees from 3,000 to 300 feet. In some cases, the wind direction has been known to change 70 to 90 degrees. So, if a pilot is making an approach to a runway with a right crosswind or a slight right quartering tail wind, he should be on guard for a



MAJ SHIRLEY M. CARPENTER is this month's Fleagle T-shirt winner

stronger tail wind component at altitude!

In conclusion, several key points should be emphasized which are important in understanding the effects of wind shear. An aircraft flying an approach will frequently experience a gradual decreasing head/tail wind component. Therefore, the IAS will have a tendency to decrease/increase respectively. This is perfectly normal and recommended flight procedures will handle such a situation. However, an aircraft in one wind condition can, in a matter of seconds, descend into a zone where wind direction/speed is substantially different. Due to the inertia of the aircraft, the pilot may not be able to accelerate or decelerate it rapidly enough to prevent a substantial effect on aircraft performance. A successful recovery may range from being physically impossible to highly dependent upon immediate corrective action by the pilot. The magnitude of wind shear gradient, the altitude at which it is encountered, and the pilot's analysis and recovery techniques are the key factors in determining success or failure.

NEXT MONTH: Wind Shear on Final Appr

AIRCREWMEN of DISTINCTION

Captain Robert G. Downs
336th TFS, 4th TFW
Seymour Johnson AFB, NC

Captain Robert S. Coombs
336th TFS, 4th TFW
Seymour Johnson AFB, NC

Captain Downs and Captain Coombs were number two in a flight of three F-4Es scheduled for an AGM-65 (Maverick) training mission. During an IFR penetration enroute to the bombing range, the aircrews heard two loud "cracks" and observed a bright flash - an apparent lightning strike or massive static discharge. No thunderstorms were forecast for the area and no evidence of heavy precipitation was observed on the airborne radar scopes.

Captain Downs' aircraft experienced a large roll and yaw transient. Although he was in the weather, he was able to maintain formation. He disengaged his stability augmentation system, checked his engine instruments, and he checked his attitude indicators. However, all three systems were in total disagreement and the associated heading systems were spinning. At this time, he was unable to maintain his formation position and executed the lost wingman procedures. While rechecking his engine instruments, he noted the right engine unwinding to 60% RPM. Airspeed read zero, vertical velocity frozen at minus 500 FPM, the altimeter stuck at 6,000 feet, and AOA indicator frozen at 9 units.

After two airstart attempts, the right engine finally recovered. Captain Downs selected afterburner, centered the turn needle and ball, and started what he believed was a climb to VMC. The VVI still read minus 500 FPM, but the altimeter began to increase erratically. The rear ADI was close to being logical, but still could not be trusted.

Finding a small break in the clouds, Captain Downs began to orbit for a rejoin. However, he could not maintain VMC. Afterburner was selected once more and another "seat of the pants" climb was initiated. At this time, with help from Cherry Point MCAS approach control, lead acquired a radar contact and was able to confirm Captain Downs' airspeed and heading from a 10-mile trail position. Following a rejoin in VFR conditions, lead advised Captain Downs that an eight inch by four feet piece was missing from the top of the vertical stabilizer, but otherwise his aircraft appeared undamaged.

Captain Downs accomplished the penetration and approach on the leader's wing with a drop off on short final for a single-ship landing at Seymour Johnson AFB.

Captain Downs and Captain Coombs demonstrated professional airmanship and outstanding crew coordination. Their combined efforts saved a valuable weapons system and prevented possible injury or loss of life. Their skillful and immediate actions during this critical emergency qualify them as the Tactical Air Command Aircrewmen of Distinction. ➔

NOTICE: Our August issue indicated the Aircrewmen of Distinction were from the 17th TFW vice 27th TFW. This was a printing error. Our apologies to the entire 27th TFW.

OVERCONTROL: commanded or

Recent F-4 accidents and incidents have caused us to again focus on the Phantom's flight control system. Questions and misconceptions arise and often are not satisfactorily answered unless access to a flight control engineering specialist is readily available. Some of the questions are: What is the overbalance weight and what does it really do? How serious is a bellows system leak, and how can I tell if I have one? How can I tell a bellows leak from an aft C.G. condition?

To answer these questions, we need to consider three areas: The 16-pound overbalance weight, bellows system leaks, and aft C.G. conditions. Due to the broad topic involved in the complete flight control system, I will confine this article to these three aspects as related to pitch control.

THE 16-POUND OVERBALANCE WEIGHT. To begin with, we must make a distinction. The term "bobweight" has been associated with the Phantom for years. The overbalance weight (sometimes called imbalance weight or counter balance weight) is not a bobweight. The 3-pounds per G bobweights, overbalance weight, and the bellows are all part of the artificial pitch-feel system. The bobweights are located under the rear cockpit control stick where it attaches to the torque tube. The overbalance weight is located in the tail of the aircraft mounted on the longitudinal trim actuator.

Let's briefly cover the history that led to the present system. Originally, the pitch-feel system included two 17-pound downsprings, a viscous damper and the bellows. The downsprings made the stick very stiff and required a lot of trim with airspeed changes. The Air Force removed the stiff downsprings and installed the 5-pounds per G bobweights very early in the F-4 history, prior to the F-4E. With the 5-pound bobweights, the

Uncommanded ?

By Col Neil L. Eddins
Comdr, 388th TFW
Hill AFB, UT

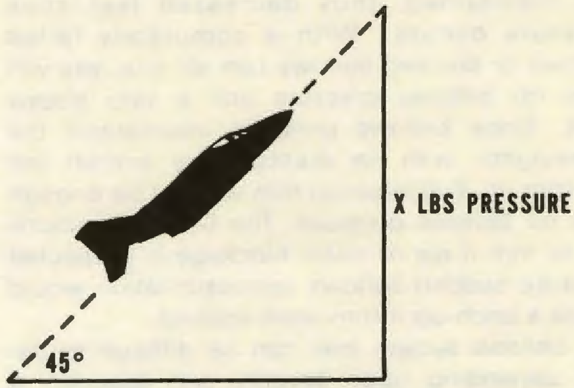
pitch-feel was improved. However, a longitudinal imbalance existed. With the 5-pound bobweights, the stick force per G was fairly high.

The next step was TCTO 1F-4-831 which replaced the 5-pound bobweights with 3-pound bobweights, redesigned the damper links, and replaced the viscous damper with a mechanical stop. These changes improved longitudinal stability approximately four percent. The imbalance was still there, only it was not as severe. During tests at Edwards Air Force Base in early 1969, the Air Force Flight Test Center found that the control system of the F-4 would produce an aft stick force when the airplane was at a pitch attitude above level flight. In effect, as angle of attack was increased, the weight of the control system itself was contributing to the nose-up motion by tending to move the stick aft. At high pitch attitudes, increasing angle of attack or acceleration, the weight of the pitch trim motor, and the stabilator trim actuator produced an aft stick force. This imbalance contributes to stick force lightening characteristics during subsonic maneuvering and overcontrol or G overshoot with a rapid application of aft stick.

To compensate for this imbalance, the 16-pound overbalance weight was added. This greatly improved stick forces and stick force gradients during aft C.G. loading, high stability index numbers, high angle of attack maneuvering, and power approach configurations. It tends to offset the weight of the pitch trim motor and stabilator trim actuator and can provide as much as 6 pounds of positive stick force, thus decreasing stick lightening at higher units AOA. In level unaccelerated flight, it has no effect. Only when pitch attitude or angle of attack begins to increase does it come into play by applying forward pressure on the stick or providing greater stick force per G. This stick force is in addition to the stick pressure from the 3-pounds per G bobweights and the bellows pressure. On the takeoff roll, the overbalance weight comes into effect applying forward pressure on the stick as the aircraft rotates giving a more positive feel.

In essence, the total artificial pitch-feel is a combination of the bellows pressure, the 3-pounds per G bobweights, and the overbalance weight. The number of pounds of stick pressure varies with airspeed, pitch attitude, angle of attack, and acceleration/deceleration forces.

To calculate the amount of stick force supplied by the overbalance weight, you must add the pitch angle to the angle of attack. Then, take the sine of the resulting angle times 6 pounds (see diagram 1). In an unloaded 45-degree climb, the overbalance weight provides 4.24 pounds of stick pressure.



SIN 0 × 6 LBS = X LBS PRESSURE
SIN 45° × 6 LBS = X LBS PRESSURE
.707 × 6 LBS = 4.24 LBS

diagram 1

What the overbalance weight means to the pilot is less tendency to overcontrol or over-G the aircraft, less stick lightening at high subsonic speeds, better control of airspeed and angle of attack during an approach, and increased stick force on takeoff. The aircraft has a better feel and an increased longitudinal stability.

Most of the F-4s in the Air Force inventory have been modified; however, there are still a few around that haven't been. Unmodified TAC aircraft should have a note in the 781 saying, "TO 1F-4C-978 not complied with." Check it when you go fly.

BELLOWS SYSTEM LEAKS. As discussed before, the bellows system is a very important part of the total pitch-feel. Simply stated, it

OVERCONTROL: commanded or uncommanded ?

consists of a bellows inlet probe, bellows venturi, and the bellows itself. The system works like this. Air flowing through the bellows inlet probe into the bellows creates a force that can be felt on the control stick. The bellows venturi provides a choking effect so that at high airspeeds, excessive pressure is not generated in the bellows and it provides a fairly constant air flow. The bellows also has a vent hole calibrated to provide a consistent feel.

The bellows system properly pressurized provides the proper stick feel. When a leak occurs in the system, proper bellows pressure is not maintained, thus decreased feel/stick pressure occurs.. With a completely failed bellows or blocked bellows ram air line, you will have no bellows pressure and a very sloppy stick. Since bellows pressure counteracts the bobweights, with no pressure the aircraft will not trim up. Full nose-up trim will not be enough with no bellows pressure. The Dash-1 cautions not to trim if ice or water blockage is suspected because sudden bellows repressurization would cause a pitch-up if trim were applied.

A bellows system leak can be difficult to detect depending upon severity and location. A leak will cause low bellows pressure. Low bellows pressure gives you less longitudinal stability and you may have a tendency to overcontrol. It may feel like an aft C.G. or a lack of the overbalance weight. Low bellows pressure demands more nose-up trim, so check your trim indicator if you suspect a leak.

The location of the leak is a factor. A leak prior to the bellows venturi is less critical than a leak below the venturi or in the bellows itself. The present leak check allows a certain amount of leakage. To check the system for a leak, the bellows vent hole is plugged and the system is pressurized to eight PSI. Each junction is to be checked by hand feel; and if any leakage is detected, it is to be corrected prior to performing an overall system leakage drop check. When pressurized, the system must not drop below .25 PSI within 6 seconds. If pressure drops below .25 PSI in less than 6 seconds, the system leak is out of tolerance and must be fixed.

AFT C.G. CONDITIONS. The last area we will consider is an aft C.G. condition. An aft C.G. condition is another area that will decrease longitudinal stability. Since most fighter pilots are not weight and balance specialists, it is wise to have the C.G. for your normal loads and configurations precomputed and posted in your flight planning room. It is then a simple matter to add up the stability index number and go to the aft C.G. limits chart in the Dash-1 and see if you are in the normal (green) or caution (yellow) area (see diagram 2). You should never fall in

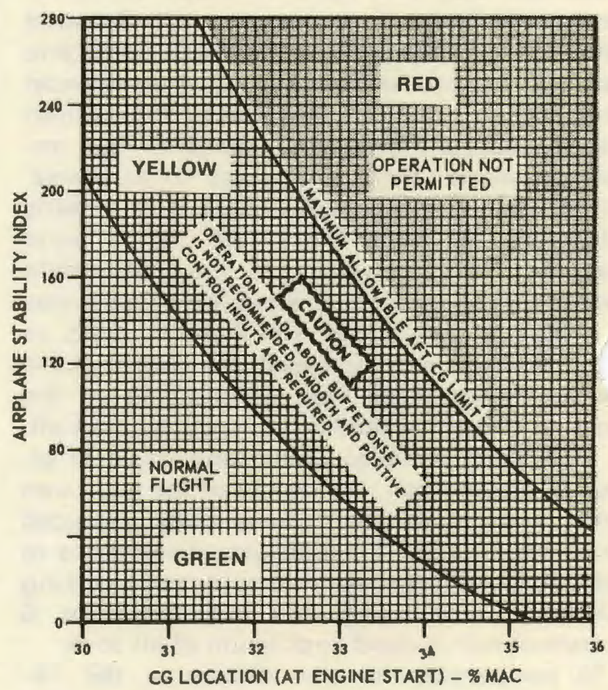


diagram 2

the prohibited (red) area. If you have a heavy load and happen to fall in the caution area, smooth and positive control inputs are required.

Your worst aft C.G. condition for each mission will normally be at engine start or after air refueling, unless you dump your internal wing fuel. If you dump your internal wing fuel while the fuselage is still full, your C.G. can shift aft as much as 1.4 percent. During normal fuel transfer, your C.G. does not change very much until the external tanks go dry and the intern wings start feeding. As the internal wings an cells 5 and 6 feed, the C.G. shifts forward rapidly (see diagram 3).

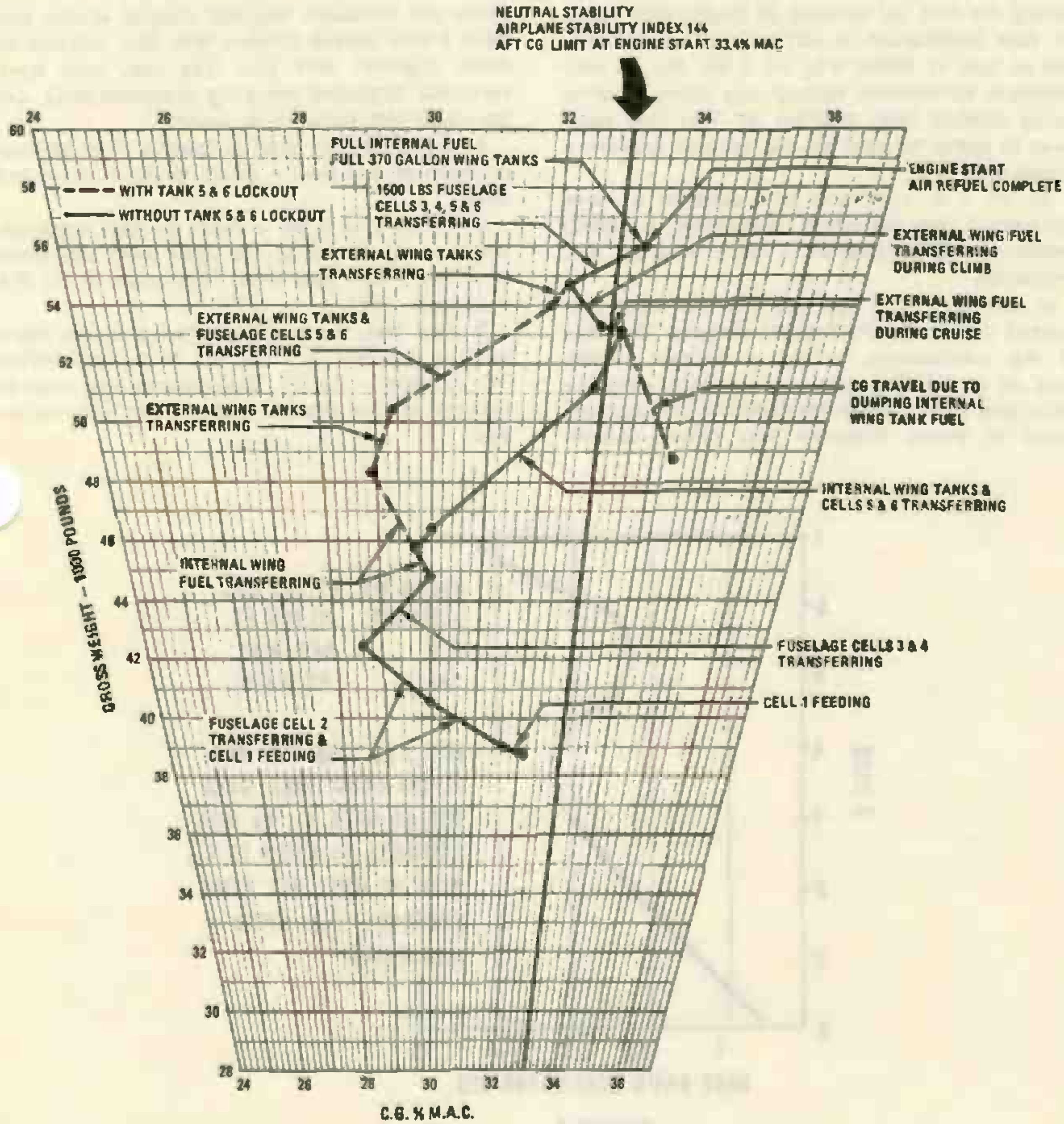


diagram 3

OVERCONTROL:
commanded or uncommanded ?

Even with a normal loading (including external wing tanks) and the C.G. within limits, you will probably notice some longitudinal instability during the first 30 minutes of flight. With rapid aft stick application, it will be easy to overcontrol or over-G. When you hit 4 Gs, the Gs may continue to increase without any more aft stick being applied (see diagram 4). You may even have to come forward on the stick to prevent a G overshoot.

An aft C.G. condition will demand a more nose-down trim indication. Remember, a leaking bellows system demands a more nose-up trim indication.

In summary, you can see that the areas discussed all affect longitudinal stability. The lack of the overbalance weight, a bellows system leak, or an aft C.G. can cause a light, sensitive stick and increase the tendency to overcontrol. None of these, however, will cause uncommanded pitch inputs. They make the stick more sensitive, but overcontrol inputs must still be commanded inputs. Taken separately, none of these will seriously degrade control unless you have a very severe bellows leak. But, put two or more together and you may very well have seriously degraded handling characteristics. Let me close with these three points:

1. If you have or even suspect a flight control problem of any kind -- abort. Bring it home and land.

2. When you make a flight control write-up, follow it up. Check to see what work was done and how it flew next time. Time spent doing this may save a life.

3. And last, if you experience a severe flight control problem and go out of control below 10,000 feet -- EJECT. Too many people tried to recover at low altitude and are not with us today.

→

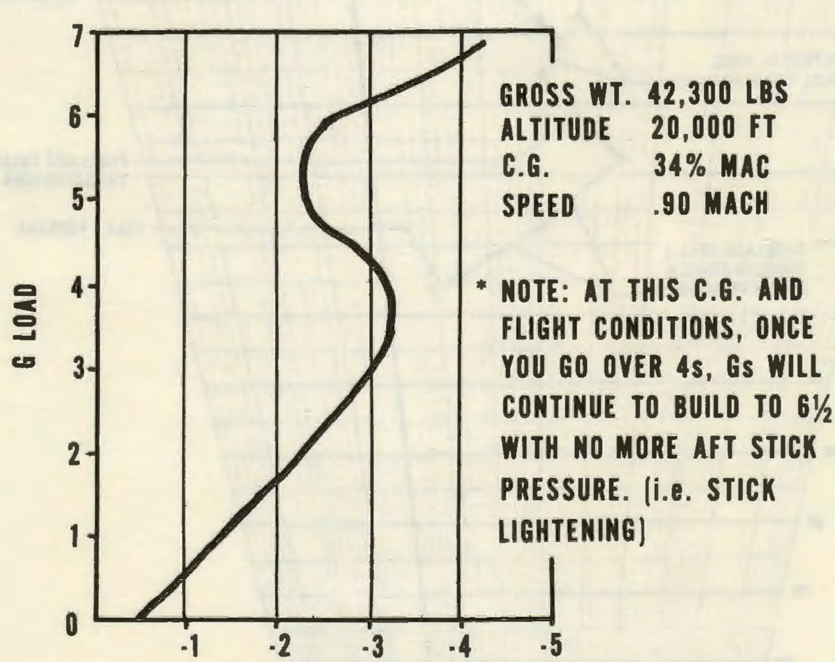


diagram 4

TAC
SAFETY AWARDS

Crew Chief Safety Award

Sgt William R. Harrison

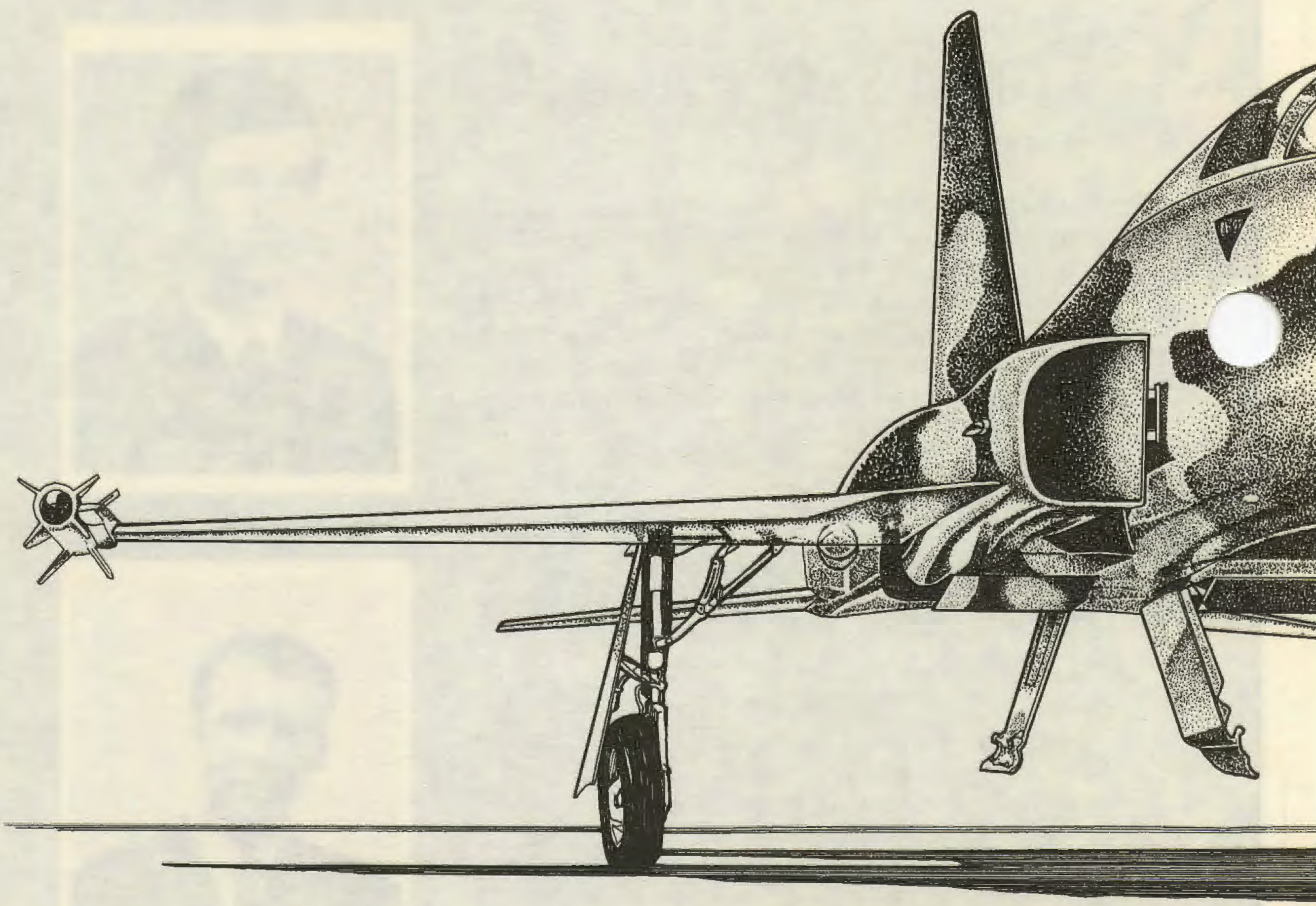
Sergeant William R. Harrison, 33d Organizational Maintenance Squadron, 33d Tactical Fighter Wing, Eglin Air Force Base, Florida, has been selected to receive the Tactical Air Command Crew Chief Safety Award for this month. Sergeant Harrison will receive a certificate and letter of appreciation from the Vice Commander, Tactical Air Command.

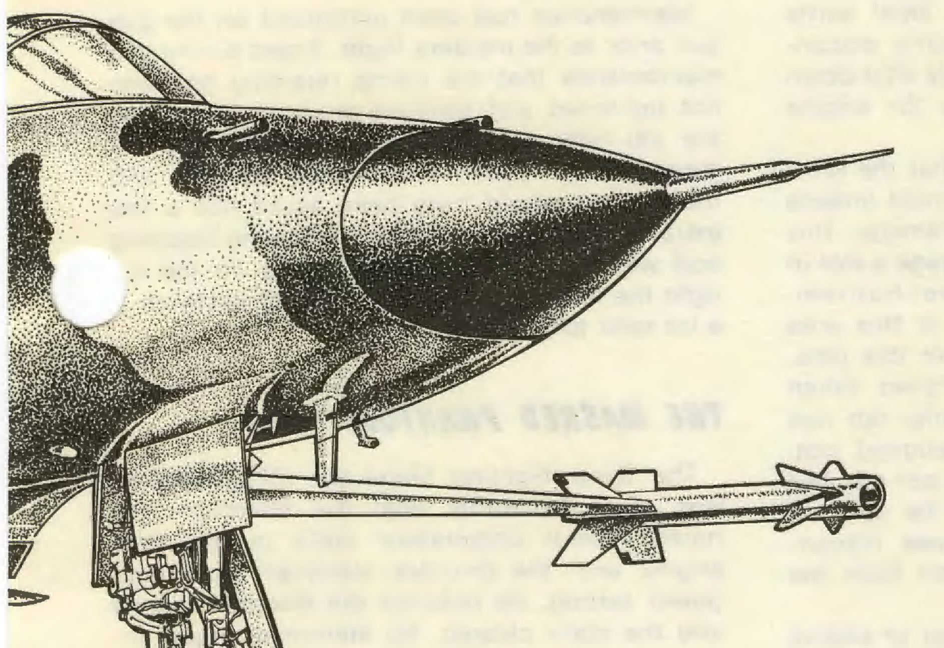
Maintenance Safety Award

TSgt John R. Nelson

Technical Sergeant John R. Nelson, 31st Munitions Maintenance Squadron, 31st Tactical Fighter Wing, Homestead Air Force Base, Florida, has been selected to receive the Tactical Air Command Maintenance Safety Award for this month. Sergeant Nelson will receive a certificate and letter of appreciation from the Vice Commander, Tactical Air Command.

F-5E TIGER II





James H. Brown

chock talk

...incidents and incidentals with a maintenance slant.

DISCONNECTED GO-FAST LEVER

Recently, an F-5E was flying a local sortie when the left engine throttle became disconnected. The engine was subsequently shut down to facilitate gear lowering because the engine was stuck at 100 percent RPM.

Postflight investigation revealed that the locking key washer in the quick disconnect linkage had a "mashed" tab on the inner diameter. This tab is normally raised slightly to engage a slot in a portion of the adjusting mechanism. Maintenance had been performed in this area two months prior to the incident. At this time, the washer tab was probably misaligned. When the pin nut was tightened, the washer tab was mashed and did not engage its designed slot. The washer was safety-wired to the jam nut, but due to the tab slot misalignment, the jam nut and washer were able to vibrate loose, disconnecting the left engine throttle cable from the throttle.

Throttle rigging is an important part of engine installation. All procedures listed in the tech data must be closely followed. If they aren't, the pilot can lose an engine, an aircraft ... even his life. Do the job right - he's depending on you.

THUD LOSES MUZZLE

During the aircrew's damage check after gunnery range departure, two small holes were noted in the F-105's gun port blast tube assemblies. After-landing check revealed that the M-61 muzzle clamp assembly was missing - blast tubes were damaged as rotation forces and 20mm/TPD impacts drove the muzzle clamp forward and off the barrels. The aft section of the clamp and retaining bolt were found just short of the strafe target. The retaining bolt was examined and there was an absence of carbon buildup on the first one-half inch of the bolt. This indicated the bolt and retainer had not been properly secured to the muzzle clamp which allowed it to back off. The muzzle assembly was then free to slide forward under rotational forces.

Maintenance had been performed on the gun just prior to the incident flight. It was during this maintenance that the clamp retaining bolt was not tightened and torqued properly. Not doing the job right cost us almost $9,000 and 106 manhours to repair. Think of all the time and money that would have been saved had a few extra minutes been taken to ensure the retaining bolt was tight. It's a lot simpler to do the job right the first time than to repair old mistakes ... a lot safer too.

THE MASKED PHANTOM

The Basic Fighting Maneuver (BFM) mission was going smoothly until the Phantom jock noted several compressor stalls in the right engine with the throttles stationary at a high power setting. He reduced the throttles slightly and the stalls cleared. No abnormal engine indications were observed, and the F-4 was recovered without further problems.

Postflight investigation revealed that the static port for the engine bellmouth system, located in the right engine intake, was covered with masking tape. Since the F-4 was recently received from the factory, it is believed the static port had been taped prior to painting and never removed. As a result, improper bellmouth scheduling produced the compressor stalls.

Don't take forgranted something was done right - whether by the factory, PDM, or your buddy who worked the last shift. Good Q.C. depends on a critical (and often skeptical) attitude while working on aircraft.

TAC
GROUND SAFETY
AWARD

Technical Sergeant Clarence W. Smart, 354th Civil Engineering Squadron, 354th Tactical Fighter Wing, Myrtle Beach Air Force Base, South Carolina, has been selected to receive the Tactical Air Command Ground Safety Award for the second quarter 1976. Sergeant Smart will receive a certificate and letter of appreciation from the Vice Commander, Tactical Air Command.

TSgt Clarence W. Smart

Staff Sergeant William A. Murphy, 729th Tactical Control Squadron, 507th Tactical Control Group, MacDill Air Force Base, Florida, has been selected to receive the Tactical Air Command Ground Safety Award for the second quarter 1976. Sergeant Murphy will receive a certificate and letter of appreciation from the Vice Commander, Tactical Air Command.

SSgt William A. Murphy

anatomy

"Make your signature a written guarantee to the pilot that the aircraft has been inspected/maintained using the highest professional standards"

By Capt Marty Steere

There seems to be a trend developing in TAC ... a dangerous trend. Over the last 3 to 4 months, there have been more incident reports, from flight control malfunctions to dropped objects, with the same trademark ... the work wasn't accomplished although the aircraft records indicate it was. In our July 1976 issue, we highlighted a flight control malfunction. When the pilot had lowered the flaps, the aircraft rolled into a 65-degree bank. Fortunately, the aircraft was recovered. The cause was a broken left flap actuator rod end. TCTO 1F-4-1011 required modified flap actuator rod ends be installed. The aircraft records indicated this TCTO had been complied with ... but it wasn't.

"So what. The pilot doesn't really need to know what TCTOs have been accomplished. It's not going to affect how he flies the aircraft. Right?" ... Wrong! It just may affect how the pilot flies his aircraft. Let me show you how, by giving a little history on a TCTO that is in effect in the F-4 ... TCTO 1F-4-978.

Originally, the F-4 pitch-feel system included two 17-pound down-springs, a viscous damper and the bellows. Because the downsprings made the stick stiff and required a lot of trim with airspeed changes, the Air Force removed them and installed 5-pound per G bobweights. This improved the pitch-feel; however, a longitudinal imbalance existed. With the 5-pound bobweights, the stick force per-G was fairly high.

The next step was TCTO 1F-4-831. This replaced the 5-pound bobweights with 3-pound

# of a tcto

bobweights, redesigned the damper links and replaced the viscous damper with a mechanical stop. This improved the longitudinal stability of the F-4. It was noted, however, that at high pitch attitudes, increasing angles of attack (AOA), or acceleration produced an aft stick force due to the weight of the pitch trim motor and the stabilator trim actuator. What this meant to the pilot was that it didn't take as much "pull" force on the stick to get the desired amount of "G" ... it was easier to over-control and over- "G" the aircraft.

Because of this, TCTO 1F-4-978 was instituted. This added a 16-pound overbalance weight to the pitch-feel trim system and provided more positive stick forces or "feel" during maneuvering flight ... it made control easier, and we had fewer problems with over- "G-ing" the jet.

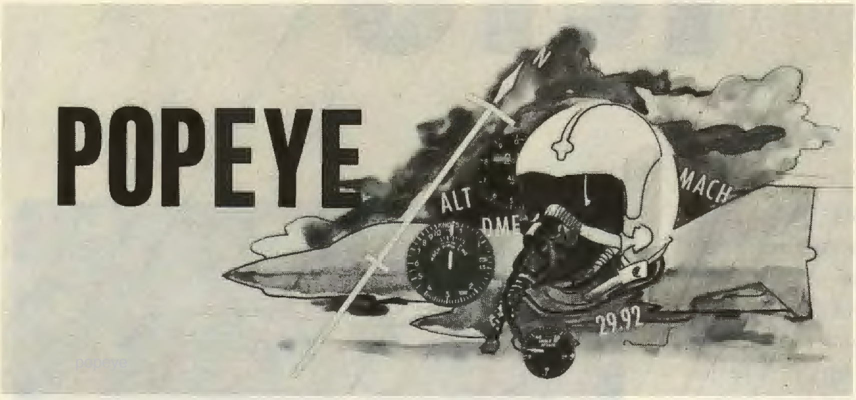
Now let's see what can happen if the TCTO is signed off as being complete ... but really isn't.

Captain Murry Stickbender has been flying Phantoms equipped with the 16-pound counterbalance for a few years. Murry is the aggressive type and has a habit of jerking the stick abruptly when pulling off a dive bomb pass. Nothing has ever happened because the 16-pound counterbalance prevented him from over controlling. Now he straps on an aircraft that supposedly has a 16-pound counterbalance and goes out to the gunnery range to drop a few bombs. On one of his bomb passes, he makes an abrupt, rapid aft-stick movement ... the stick comes back faster than he's used to and the aircraft stalls. Hopefully, old Murry had time to recover or punch out.

OK, now you know what can happen and why a pilot needs to know about the TCTOs that affect his aircraft. The big thing to remember is that when you perform any maintenance, from an aircraft preflight to a Phase inspection, make sure you complete all required actions before you put your "John Hancock" on those forms. If you're a supervisor, don't just take someone's word that an inspection was completed or that a bolt was installed properly ... check it out personally ... before you sign the forms. Make your signature a written guarantee to the pilot that the aircraft has been inspected/maintained using the highest professional standards.

Don't say "things like that just don't happen." They do. Just last year, a Phantom caught on fire because of a defective fuel tank. The aircraft records indicated a leak check had been performed. Guess what? It really hadn't. The forms had been signed off before the job was completed. Only problem was a shift change. The new man thought the work really had been done and released the aircraft. Things like this are very hard to explain to a commander.

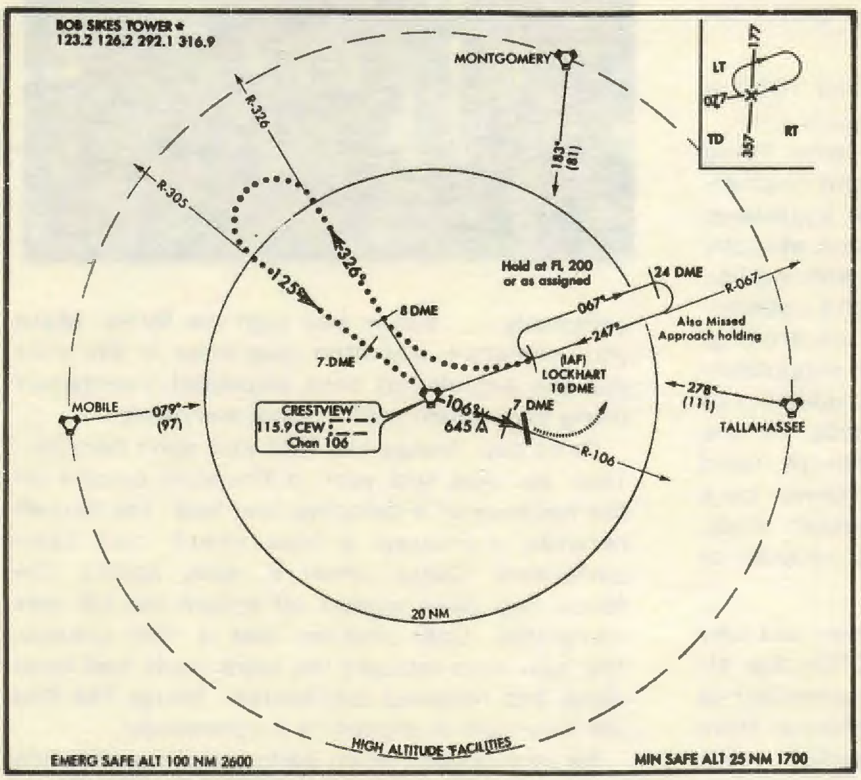
All your actions when performing maintenance on an aircraft, no matter how small, can affect a pilot ... and you. They can contribute to, or prevent, an accident or incident. Take pride in your work, take pride in TAC ... we're depending on you.



THE ANALYTICAL APPROACH

By Capt M. C. Kostelnik
4485th Test Squadron
Eglin AFB FL

QUESTION: Am I required to initiate a turn at the IAF (Lockhart) to intercept the 326° radial as depicted in the Hi-TACAN approach to Bob Sikes airport?



ANSWER: No, not necessarily. Remember that approach depictions are designed for use by all types of aircraft. Airspeeds and angles of bank peculiar to individual aircraft may require that published flight path depictions be modified slightly to allow for the turn radius of the aircraft. Unlik Procedural Tracks where specific flight path is required, the dot depiction does allow the option of using leadpoints to improve the precision of TACAN course interceptions.

The Bob Sikes approach is a good example where preflight planning will greatly improve your inflight precision. You should determine the leadpoint required to intercept the 326° radial for your particular aircraft and start the turn when this leadpoint is reached. It may, indeed, work out that for your particular aircraft, a turn at the IAF will roll you out on the desired radial, but, generally, do not assume that the depiction shown will work precisely for your particular aircraft. An F-4 type aircraft at 300 KIAS, using 30° of bank, for example, would grossly undershoot the desired radial the turn was started at 1 DME. In order to roll out on or very near the 326° radial, an F-4 would have to start its turn closer to 5 DME.

QUESTION: What techniques can I use to plan TACAN approach course interceptions such as the initial turn at Bob Sikes prior to flight?

ANSWER: Disregarding the effect of wind, our leadpoint will be a function of aircraft turn radius and the angle of intercept; and the turn radius is a function of true airspeed and angle of bank. In order to illustrate the planning process let's look at a sample aircraft such as the F-4. Remember, however, that the same analytical process will apply to your aircraft when you use your own approach airspeed and angle of bank. First, determine the turn radius in nautical mil for the planned airspeed a angle of bank. An F-4 maneuvering at 300 KIAS using 30° of bank could use the following data. Since the turn radius is a function of TAS, we must first convert 300 KIAS into an equivalent TAS. A simple formula which will provide satisfactory results and is relatively easy to compute may be expressed as follows. Increase your IAS by 2% per thousand feet of altitude to obtain TAS.

TAS = IAS + (Altitude (Thousand feet) X .02 X IAS)

At Bob Sikes, the altitude is 20 thousand feet, and for an F-4, the indicated airspeed is 300 Kts.

TAS = 300 + (20 X .02 X 300)
300 + 120 420 KTAS

Converting this value to nautical miles per minute, we arrive at 7.

NMPM = TAS ÷ 60 = 420 ÷ 60 = 7 NMPM

We can now use this value in a similar way to the MACH-2 formula to obtain an estimate for the turn radius of the aircraft in nautical miles.

Approx Turn Radius = (NM) = NMPM - 2 = 7 - 2 = 5 NM

Evaluating the accuracy of this technique by reference to an F-4 performance manual and the turn radius graph in AFM 51-37, the actual turn radius on a standard day would be 4.3 NM. Our technique is not exact, but the error is acceptable and our estimated value will provide satisfactory results for inflight use. Now that we have a value for the expected turn radius (which is actually our desired leadpoint for a 90° angle of intercept), we must adjust this value for the actual intercept angle at Bob Sikes. From AFM 51-37, the intercept angle is the difference between the desired course and the aircraft heading or 79° (326° - 247) at Bob Sikes.

Refer to the graph of the effect of intercept angle on leadpoint and notice that for angles less than 90°, the leadpoint must be decreased. For the Bob Sikes approach, we should only use about 3/4 of our planned leadpoint - 3/4 of 5 NM rounded off to the nearest mile would make our adjusted leadpoint 4 NM. Notice also that, generally speaking, for intercept angles of 50°, 45°, and 30° respectively, you should use a leadpoint which is 1/2, 1/3, or 1/6 of the leadpoint you would use for a 90° intercept. Since we have determined our leadpoint in NM, it only remains to determine our start turn point in DME. As the approach is started at FL 200 (which is approximately 3 NM), we may assume that when we are directly over the TACAN station, the DME should read approximately 3 DME. In flight this estimated start-turn point provides useful results on no-wind days. The analytical approach is not an instrument necessity, nor is it intended for every day use, but for the unusual or especially complicated approaches, it may save you some unwanted surprises in flight!

Adding our computed leadpoint of 4 NM to the altitude in nautical miles and subtracting 2 will give us our start-turn point of 5 DME. In general, to convert our leadpoint in nautical miles to a start-turn point in DME, you can use the following formula:

START-TURN POINT = (DME) (ALTITUDE (NM) + LEAD POINT NM) - 2.

In the example above, start-turn point = (3+4) - 2 5 DME.

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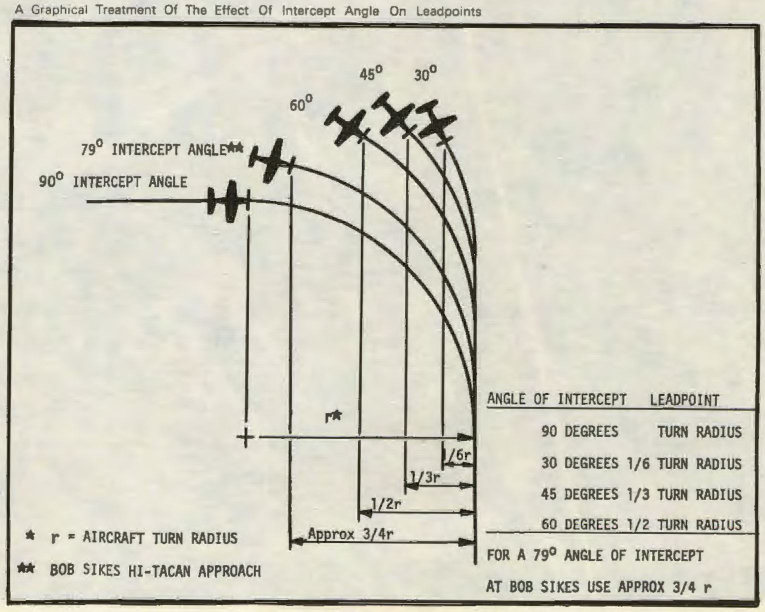
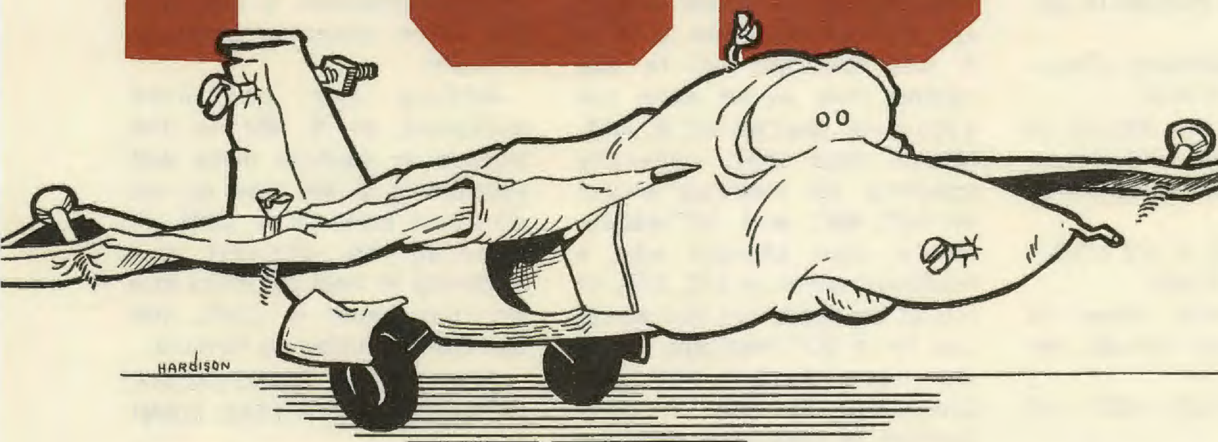
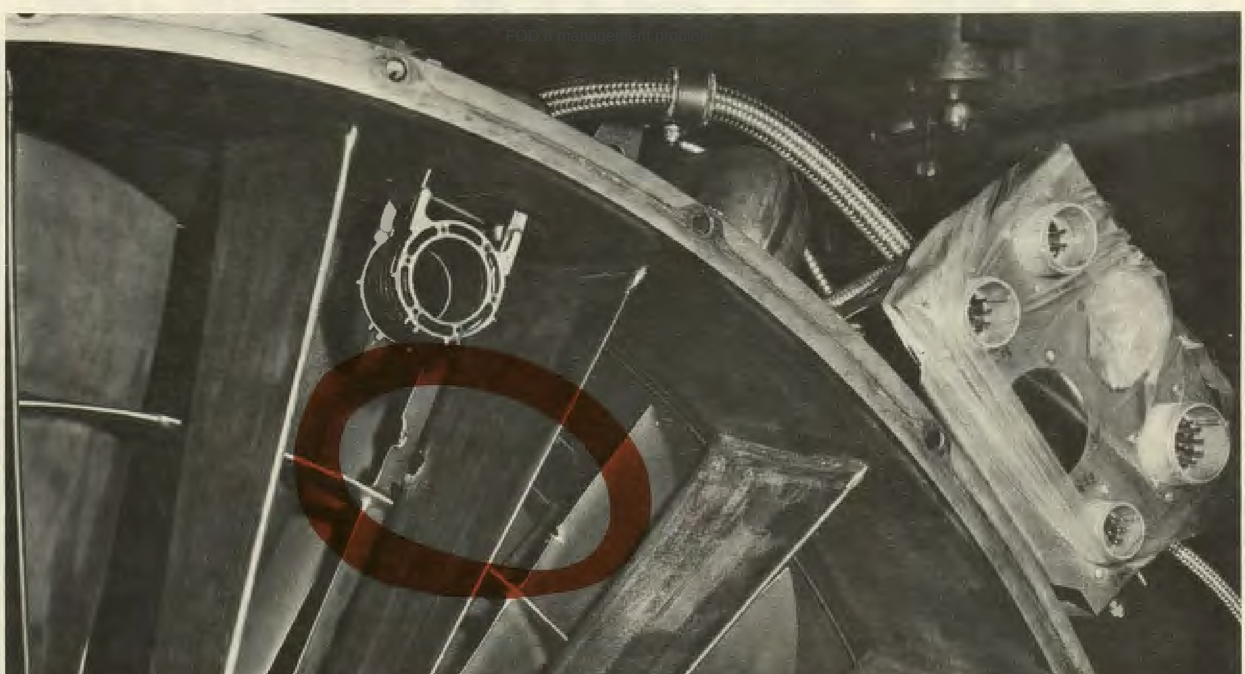
A Graphical Treatment Of The Effect Of Intercept Angle On Leadpoints



FOD a management problem





By Col Samuel Huser
Comdr, 366th TFW
Mountain Home AFB, ID

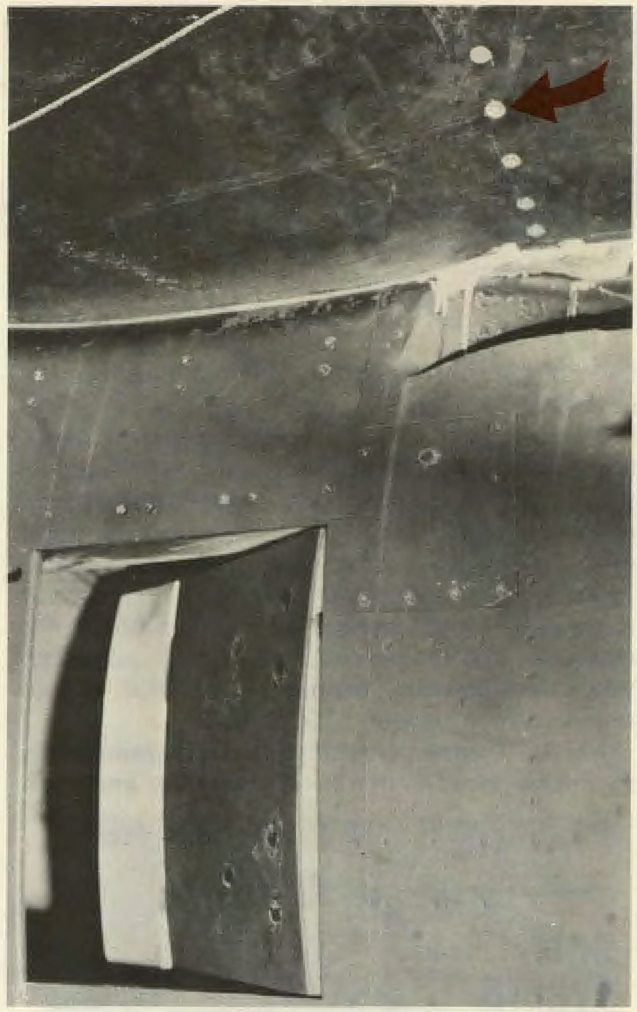
During an F-111 engine run in May of this year, the number two engine sustained foreign object damage (FOD) costing $165,000. The origin of the foreign object was not difficult to trace ... a fastening bolt was missing from the aft lower glove fairing cover (panel 3328) located just above the engine blow-in door (photo 1). The nose cone of the heavily damaged engine had the imprint of a bolt 4/16 inches shorter than the one required for the empty hole (photo 2).

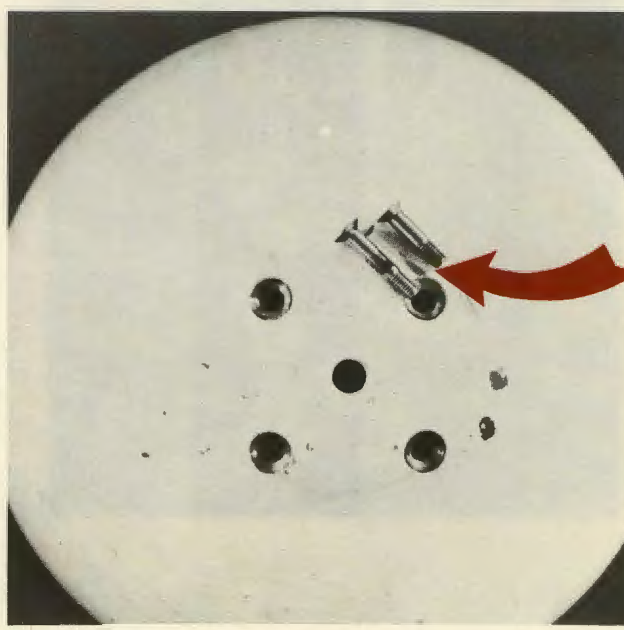
How did the wrong bolt get installed? Failure to use tech data? A matter of discipline? Investigation of this accident revealed more than incorrect installation of the bolt ... it revealed a management problem.

During the investigation, the six remaining fasteners in the panel were removed. Four of these bolts were also too short ... but only by 2/16 inches. It was discovered that the wrong bolts could be installed and their threads would engage the self-locking nut plate. They could also be torqued to the proper value. However, they would not secure the panel. A one-time, fleetwide inspection revealed nearly all F-111s to have some incorrectly sized bolts installed in panel 3328. How could this happen? The reasons were tech order deficiencies and conflicts, not understanding "grip-length," and training inadequacies.

TO 1F-111F-2-2-1, which was used during panel installation, was in conflict with the parts list tech order on the type of bolt required. TO 1F-111F-2-2-1 listed bolts which had inadequate thread length required to ensure proper engagement of the self-locking nut plate. TO 1F-111F-4-1, the parts list tech order, did not list this type of bolt, making it an unacceptable substitute.

What's "grip-length"? It is really bolt length, and is measured from the top of the head to the





FOD - a management problem

beginning of the bevel just prior to the threads - in sixteenths of an inch (photo 3). The mechanic's problem is how to determine which bolt has the proper grip length for the holes. To compound the problem, the proper size bolts do not have their grip length stamped on the head of each bolt. A special tool is required to determine the exact length. In a survey of mechanics of all grades, 95 percent could not measure the length of these bolts correctly. Why? No previous training. This skill is not taught in tech school, FTD, or OJT.

The immediate solution to these problems was to inform people of the deficiencies and then

train maintenance personnel in the nomenclature and measuring of fasteners, while establishing training requirements for tech schools, FTD, and OJT programs. A local checklist on panels and fasteners was expanded to include all of the 34 engine FOD-critical panels and their 1,318 fasteners, including 21 different types and 18 substitutes (photo 4). We established a checklist presentation on each panel that includes life-size photographs of each required fastener so that superimposing the fasteners should result in correct sizing. To further insure that correct type, size and length fastener is determined, a special grip-length tool is attached to each checklist. Intermediate actions include revising, correcting, and improving tech data so that local checklists are not necessary. An engineering study has been instituted to determine if gr length can be imprinted on the fastener hea The best long range solution is to design aircraft that require a minimum of different size fasteners with only one size panel. Of course, the fastener problem is not unique to the panels in the F-111 - to a different extent, it applies to all TAC and USAF aircraft.

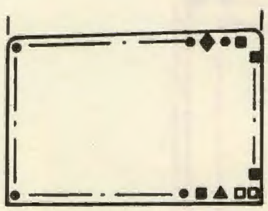
Making fastener type, size, and length easy to determine is only part of the battle. Providing the proper tools and training is another. However, it's still up to the person with the wrench to have the integrity and initiative to do the job right. Be aware of the pitfalls. The solution is to be vigilant ... put the right fastener in the right hole, and torque it properly. Your vigilance in doing the job right will save Uncle Sam a lot of money and will keep our combat aircraft ready to do the job. ➤

Editor's Note

The root cause of this failure may not have been detected except for a couple of NCOs who exercised their professional integrity. Integrity and honesty in all accident investigations help to get at the cause, find the proper fix, and in the long run, give the taxpayer more combat c pability for his money.

LCL 366TFW 10-8
11 June 1976

3325 (12B101) LOWER AFT SECTION FUSELAGE COVER



♦C792-4-6 SCREW (1), See FIG. 2-2 for Torque

•C792-4-5 SCREW (49), See FIG. 2-2 for Torque

■C792-4-7 SCREW (15), See FIG. 2-2 for Torque

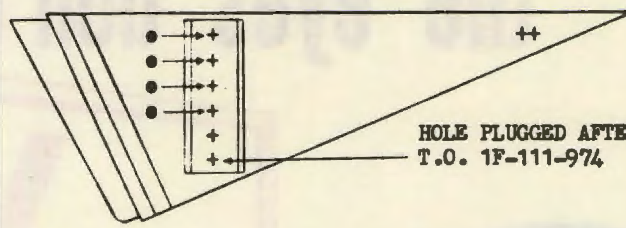
□C792-4-10 SCREW (2), See FIG. 2-2 for Torque

▲C792-4-9 SCREW (1), See FIG. 2-2 for Torque

FIGURE 3-14

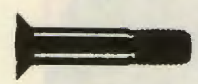
LCL 366TFW 10-8
18 June 1976

3327 (12B5880) - AFT LOWER GLOVE FAIRING COVER (LH)
3328 (12B5880) - AFT LOWER GLOVE FAIRING COVER (RH)

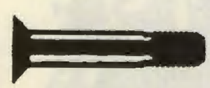


NOTE:

+ 64228V4-12 BOLT (8) - PRIOR TO T.O. 1F-111-974
• 64228V4-14 BOLT (4) - AFTER T.O. 1F-111-974
+ 64228V4-12 BOLT (3) - AFTER T.O. 1F-111-974



+ 64228V4-12
AUTHORIZED SUBSTUTIONS:
VT1040-4-12
CS664-12
AIC792-4-12



• 64228V4-14
AUTHORIZED SUBSTUTIONS:
VT1040-4-14
CS664-14
AIC792-4-14

TORQUE ALL BOLTS TO 50-100 IN-LBS WITH WINGS AT 16°.

FIGURE 3-15

PHYZ-BIZ

the eyes don't have it

By Lt Col Harold Andersen
HQ TAC Physiological Training Coordinat

"Seeing is believing" is an old adage to which most people can subscribe. Generally, it's true, but we can all remember times when our eyes "fooled" us. The magician who demonstrated that the "hand is quicker than the eye," and the so-called "optical illusions" presented in the comics are good examples. If you think back to the Spatial Disorientation lecture given during your last Physiological Training Course, you probably remember the instructor urging you to "rely on your eyes rather than other senses." He was talking about using your eyes to interpret the aircraft instruments and, in that context, the eyes are the most important and reliable of the senses. However, statements used out of context may lead to improper or dangerous actions.

Case: During a low altitude terrain following radar (TFR) navigation mission with low ceilings, fading light and snow showers, the aircraft crashed on a mountain ridge.

Most Probable Cause: Attempted VFR flight in adverse weather conditions.

Case: During cross-country flight, number two of a flight of two lost visual contact with le while flying in weather. He was subsequen cleared to lower altitude, which placed him VMC between layers. However, in an attempt to maintain visual contact with the ground, pilot descended below assigned IFR altitude and crashed into a cloud covered moutain top.

Probable Cause: Pilot attempted to maintain VFR in IFR conditions.

And so on .... There is no shortage of cases to illustrate this misuse of the visual sense. Likewise, there are numerous examples of problems caused by visual illusions related to runway characteristics, runway lighting, visibility restrictions, runway contrast, etc. Here, we have reference to such things as the slope characteristics of the runway which requires the pilot to land either up slope or down slope, and the condition of the approach terrain, either up slope or down slope to the runway (which may have no slope, or up or down slope). A few examples of the visual illusions caused by the physical characteristics are:

1. Runway Up Slope: Normal glide path seems too steep, pilot tends to fly what appears to be a more normal approach which actually is a low, flat approach which may cause landing short of the runway.

2. Runway Down Slope: Normal glide path looks flat to the pilot; alteration to a more normal looking approach causes the tendency to overshoot.

3. Terrain Up Slope: Up slope of terrain in the approach zone causes pilot to believe that the aircraft is above the normal glide path.

4. Terrain Down Slope: Down slope in the approach zone causes pilot to perceive the aircraft to be in a low, flat approach; improper correction of this perception may cause overshoot.

Runway width is a characteristic which also gives rise to visual illusions. A narrow runway may appear to be longer, or farther away, and so produce a feeling of being too low, thereby increasing overshoot possibilities. The opposite is true of a wide runway, which may appear to be closer and shorter, giving the pilot the perception of being too high and possibly causing an undershoot. Another troublesome visual illusion is the "humped" runway which, because it appears to be short (the far end may be out of sight), may produce heavy braking, blown tires and/or loss of directional control.

Problems of an illusory nature are also caused by lack of running contrast with the surrounding terrain: a macadam runway surrounded by dark foliage, a snow covered runway, a concrete runway on a sand terrain may all fail to provide sufficient contrast for good depth perception. Results: Possible overshoot or undershoot, hard landings, etc.

Runway lighting can play tricks on your eyes: dimly lit runways appear to be farther away than they really are, brightly lit runways appear closer, both of which can (and do) cause problems.

Conditions of restricted visibility from rain or snow, fog, haze, smoke, dust, glare or darkness can reduce or eliminate visual cues required for proper perception. The pilot may perceive the aircraft to be higher than it actually is, when landing under conditions of haze, smoke, dust, glare and darkness. Conditions which result in the absence of shadows become important because shadows are, for the pilot, an important factor in depth perception. He tends to interpret his altitude as being higher than it really is when shadows are absent. Water on the windshield not only restricts visibility, but may also bend the light rays as they pass through and thus cause "off glide path" type illusions.

The best, and maybe the only, way to handle these problems is through increased awareness. Reliance on your instruments, even though they tend to present different information than your eye perceives, may be the alpha and the omega of corrective procedures. The probability of instrument error is much less than perception errors. A good rule of thumb: "Don't believe everything you hear and only half of what you see."

TAC TIPS

interest items, mishaps with morals, for the TAC aircrewman

> The human being is incapable of errorless performance
> Jumbo Wray, Fighter Pilot

HAWK BITES DRAGONFLY

Two A-37s were flying a ground attack mission on a published low-level route when number two received a bird strike. The pilot *saw* what appeared to *be a* hawk just prior to impact and was unable to avoid it. The bird was performing its "last-ditch" falling maneuver, with wings folded, in an attempt to avoid the Dragonfly. Impacting the left front inverter door, the bird slid up *the aircraft's* nose and windscreen, and over the top of the canopy. The nose doors were dented and slight damage was sustained by the windscreen bulkhead.

If you are wearing a helmet that isn't equipped with a dual visor and you fly *a lot of* low level missions, you might consider switching. That extra piece of plastic gives quite a bit of protection. If you have a dual visor .. use both of them when flying day low-levels - it may save you from getting the beak.

HUN EATS THE BIRDS

Two F-100s ran up their engines in unison ... gauges checked good ... lead dropped *his head* ... brakes released and burners lit. The Super Sabres rolled down the runway in formation and rotated. At liftoff, number two's engine compressor *stalled*.

The pilot retarded the throttle toward the minimum afterburner range as the aircraft again touched down on the runway. The stall cleared immediately and no other abnormalities *were* noted. The jock *elected* to continue the takeoff because of the short runway distance remaining to the final barrier cable. Maximum power was maintained until a safe ejection altitude was reached. An emergency was declared and a straight-in landing was *accomplished* without further incident.

Postflight investigation revealed the Hun had swallowed two each "Killdees" at liftoff which caused the moderate compressor stalls.

This pilot did a good job. *He maintained aircraft control*, analyzed the situation, and took the proper action. Emergencies on takeoff leave little time for conscious thinking. Actions have to be planned ahead. Know what you're going to do before the emergency ... have a *plan. Be* prepared for *the worst*; it'll pay off if anything does go wrong.

TAC TALLY

	TAC JULY	TAC thru JUL 1976	TAC thru JUL 1975	ANG JULY	ANG thru JUL 1976	ANG thru JUL 1975	AFRES JULY	AFRES thru JUL 1976	AFRES thru JUL 1975
TOTAL ACFT. ACCIDENTS	0	19	16	0	6	10	0	2	0
MAJOR ACFT. ACCIDENTS	0	18	14	0	5	9	0	1	0
AIRCREW FATALITIES	0	9	14	0	2	6	0	1	0
TOTAL EJECTIONS	0	15	9	0	2	4	0	1	0
SUCCESSFUL EJECTIONS	0	11	6	0	2	2	0	0	0

FIGHTER/RECCE WINGS

ACCIDENT FREE MONTHS	Unit		Command
86	33	TFW	TAC
52	127	TFW	ANG
28	67	TRW	TAC
20	123	TRW	ANG
20	132	TFW	ANG

OTHER UNITS

ACCIDENT FREE MONTHS	Unit		Command
88	135	TASGP	ANG
84	182	TASGP	ANG
80	507	TAIRCG	TAC
77	193	TEWG	ANG
75	602	TASG	ANG

MAJOR ACCIDENT COMPARISON RATE 75/76

(BASED ON ACCIDENTS PER 100,000 HOURS FLYING TIME)

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAC	75	7.9	5.4	3.6	2.6	3.1	3.5	5.3	6.4	6.0	6.6	6.3	6.1
	76	2.9	8.6	9.0	7.3	8.0	8.1	6.9					
ANG	75	5.3	2.8	5.3	3.7	4.7	6.8	5.8	5.1	5.1	5.5	5.4	5.4
	76	10.5	5.0	6.5	4.8	3.8	3.9	3.3					
AFRES	75	0	0	0	0	0	0	0	0	0	0	0	4.9
	76	0	0	11.3	8.1	6.1	4.9	4.1					

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FLEAGLE
... MEANEST SON-OF-A-FINCH IN THE VALLEY ...
POP!
HARDISON
GOTTA GET OUT !!
WOOSH!
AN OSTRICH ?
NO, LATE EJECTION.
© Stan Hardison, 1976