

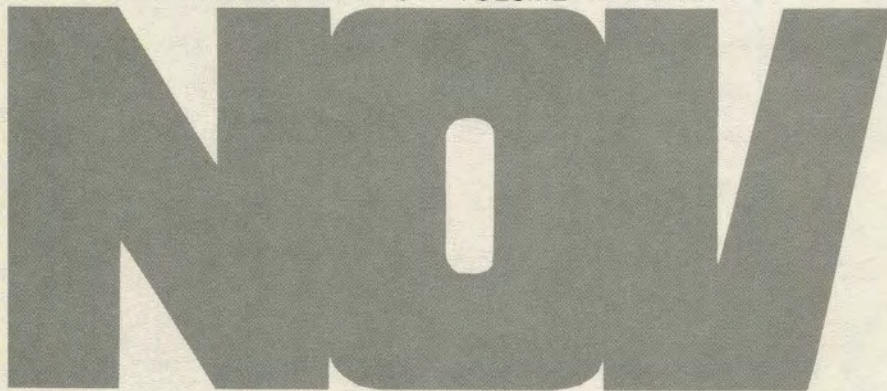
TAC ATTACK

TAC Attack

NOVEMBER 1978



CONTROL IS STILL
A GREEK NAMED ALPHA... Pg 4



READINESS IS OUR PROFESSION



TACTICAL AIR COMMAND

GENERAL W. L. CREECH
COMMANDER

LT GENERAL JAMES A. KNIGHT, JR.
VICE COMMANDER

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TACRP 127-1

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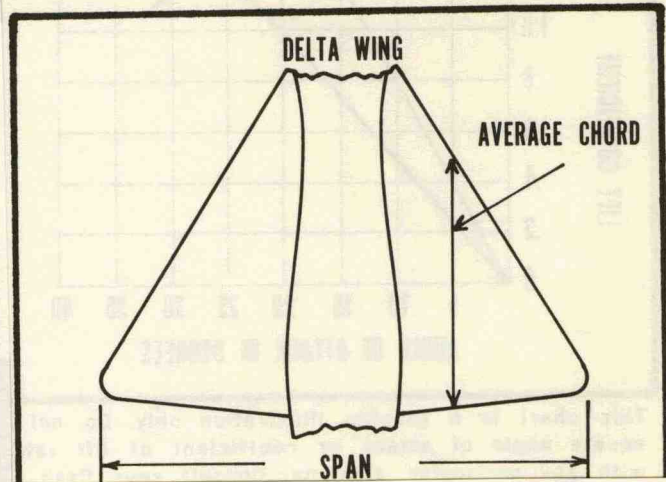


BASIC AIRCRAFT CONTROL

November 20th marks the 15th anniversary of the delivery of the F-4C to Tactical Air Command. Since 1963, TAC and TAC-gained F/RF-4 units have logged close to three million hours of flying time. This durable fighter has been the mainstay of not only our own tactical air forces, but it is also flown by many of our allies. The conversion of some aircraft to the F-4G Wild Weasel model and the transfer of other F-4s to the Air National Guard and Air Force Reserve emphasize the fact that the Phantom II will remain one of our important aircraft well into the 1980s.

From the time the F-4 was introduced to TAC, its unique characteristics in certain regimes of the flight envelope have been emphasized and reemphasized. The F-4 became known for its unpredictable nature when mishandled -- as our accident statistics have shown for many years. Although we have reduced departure and out-of-control mishaps in the F-4 and other airplanes, we have not succeeded in eliminating them. Loss-of-control continues to be a major cause in accidents.

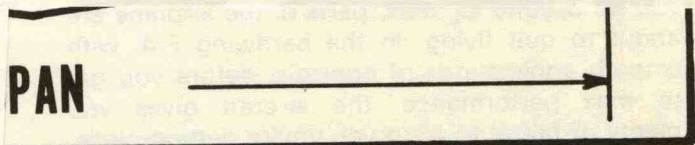
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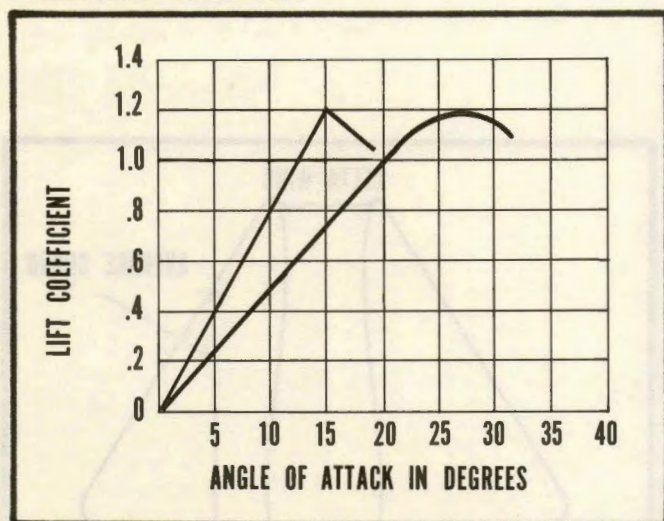
While isolated materiel and system failures contribute to loss of aircraft control, the major cause of these mishaps is still the pilot, who through a lack of understanding or skill causes his aircraft to depart from controlled flight. Education and training of our aircrews are the only ways we can assure that we reduce and eliminate these mishaps.

From the first day an individual enters training as a TAC aircrewmember, the emphasis must be on basic aircraft control -- in every phase of flight -- instruments, contact, and tactics -- from engine start to engine shutdown. This type of training begins in basic conversion units and continues long after an individual becomes operational. Any substandard performance must be corrected immediately. This principle is applicable to everyone and doesn't just concern the F-4, but all other aircraft as well.

Every aircraft in our inventory possesses its own unique flying characteristics -- good and bad. I challenge you to know as much as possible about your aircraft and to use that knowledge in your daily operations. To do less is to invite disaster. ➤



CONTROL IS STILL A GREEK NAMED ALPHA



This chart is a graphic illustration only. Do not equate angle of attack or coefficient of lift values with any particular airplane. Consult your Dash 1 for all aerodynamic information.

reaches its maximum lift earlier, and the wing stalls (ceases producing lift) rapidly, resulting in a clean stall. The delta wing, however, reaches its C_L max at higher angles of attack and continues producing lift after C_L max. Why? Because the whole wing doesn't stall at once. The difference in chord length throughout the wing results in different C_L max values for various parts of the wing. In the delta wing, the wingtip stalls first, and the stall gradually proceeds to the wing root as angle of attack is increased.

"Fantastic," you say. Well, every silver lining has its cloud, so don't become overjoyed yet. The delta wing has its cost in terms of stall characteristics and induced drag. Let's talk about drag first. The delta wing produces more than double the induced drag of a conventional wing because of the large surface at high angles of attack. Induced drag is directly proportional to lift ... so when you're producing all that extra lift with your aircraft, you're producing gobs and gobs of drag. This results in a tremendous energy bleed-off at high angles of attack, especially for the intrepid aviator who insists on flying at max performance from takeoff to landing.

Let's hit the stall characteristics next. Once you go beyond C_L max, parts of the airplane are about to quit flying. In the hardwing F-4, with smooth applications of controls, before you get to max performance, the aircraft gives you plenty of buffet to warn you you're getting close.

Once you get beyond C_L max, you will experience some lateral instability, wing rock, etc. Whether you got there by accident or on purpose, if you insist upon staying there, one or both wings will cry uncle and you'll end up in a



OK, let's jettison the drag chute, RTB, clean out our flight suits, and talk about it. Now, we're getting to the real point of the article ... who said it's about time?

Everything your aircraft does in the air is related to one overall factor -- angle of attack. You can call it AOA, alpha, α , or whatever, the meaning's the same. Your aircraft takes off and lands at a given AOA, cruises at another AOA. Maximum performance (C_L max) is at a certain AOA, as is optimum performance; and as we have already discussed, the aircraft stalls and may eventually depart in the region beyond C_L max. But who is in control of this all-important factor? You, the stick actuators, are the folks in charge of the whole operation.

While AOA is related to gross weight, indicated airspeed, and G loading, it can be controlled, regardless of attitude or available thrust, down to very low airspeeds. As long as there is sufficient airflow over the stabilator, the AOA can be controlled. A definition of what is "sufficient" will vary from pilot to pilot, so I won't attempt to define the term. Now, where does this all leave us? Hopefully, I've convinced you that control of AOA is paramount. What happens if you don't control AOA and end up stalled or out of control? Number one, to regain control of your aircraft, you should follow your flight manual procedures -- that should enable you to get the AOA back under control. If you can't get your AOA back, you aren't going to recover the aircraft. Above all, if you pass through minimum uncontrollable ejection altitude -- don't wait. That's why it's called the minimum ejection altitude.

• • •

Hopefully, you've gained a little more respect for angle of attack. Proper control of AOA can eliminate departure and loss of control mishaps. It's up to the operators to realize that one simple fact.



AIRCREW of DISTINCTION

On 28 June 1978, Captain Mastascusa and Captain Johnson were returning from a low-level navigation/air-to-ground training mission on the Nellis range complex. Immediately after touch-down from a single-ship VFR straight-in approach, the right wing dropped; and the aircraft entered a severe uncontrollable drift toward the right edge of the runway. Captain Mastascusa applied full left rudder and aileron while simultaneously adding full afterburner thrust for go-around. These corrective actions arrested the aircraft's drift toward the GCA facility although the aircraft departed the runway surface and continued on the hard packed sand infield for approximately 1,000 ft before becoming airborne. A chase aircraft informed the crew that the right main wheel was missing as well as the aft section of the right external fuel tank.

The crew quickly analyzed their alternatives (fuel supply was critically low) and elected to execute a gear-up, cable arrested landing. They retracted the gear, jettisoned their centerline SUU-23 gun pod in the published jettison area, and reviewed gear-up landing procedures with the SOF. Meanwhile, the base fire department foamed the first 3,000 ft of the runway.

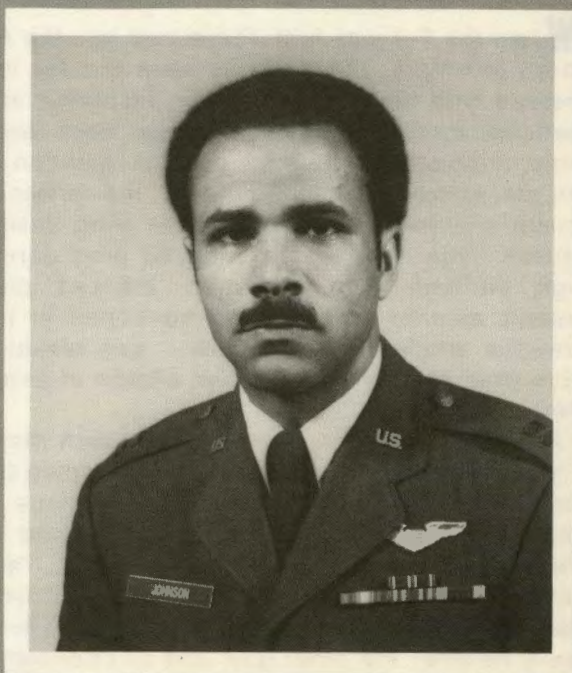
With only 1,000 lbs of fuel remaining, the crew performed a controllability check while maneuvering for a straight-in approach. The crew performed a perfect gear-up cable arrestment; the only damage incurred was to the two external wing tanks.

Postflight inspection revealed that the right main gear strut cylinder fork had failed at touch-down. Had Capt Mastascusa attempted to stop the aircraft, or had he failed to maintain full left aileron during the go-around, the strut stub might have dug into the ground with catastrophic results.

The crew's instantaneous reaction to a critical emergency and their subsequent superior airmanship, crew coordination, and sound judgment saved a valuable aircraft and averted almost certain injury or loss of life. This singular feat of professional airmanship qualifies Capt Mastascusa and Capt Johnson as Tactical Air Command Aircrew of Distinction.

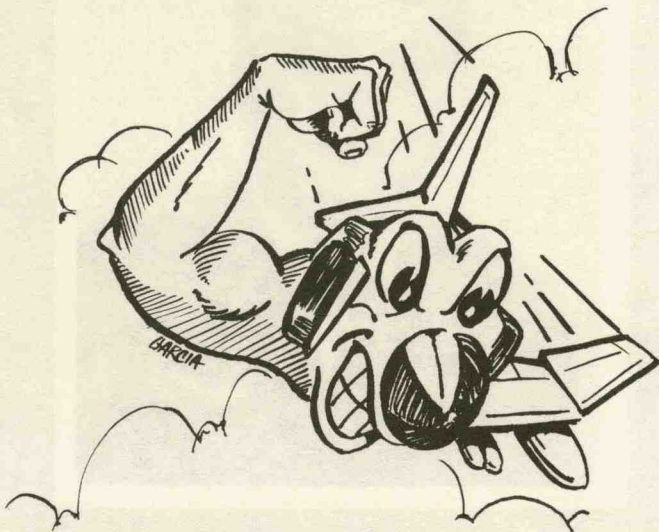


Capt Joseph J. Mastascusa
429 TFS/474 TFW
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Capt Wendell Johnson
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the Hardwing F-4

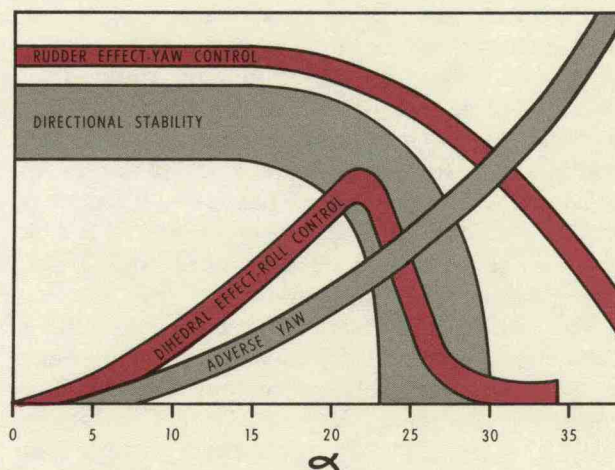


By Capt Pete Abler
Editor

When the F-4 was first introduced into the Air Force inventory, the aircrews were quickly impressed with the aircraft's power, response, and maneuverability. Soon after, they were even more impressed with the post-stall gyration -- the departure. As mentioned in the previous article, the low aspect ratio, delta wing design caused large increases in induced drag during high lift/high AOA operation. Induced drag creates another problem not mentioned in the previous article -- adverse yaw -- yaw resulting from drag caused by the down aileron in asymmetrical flight.

Although the adverse yaw problem with the F-4 was well-known before the USAF adopted the aircraft -- many pilots chose, and continue to choose, to demonstrate the phenomenon to themselves for their own enlightenment -- and enlightened they become! A lot of F-4 drivers had their personal "There I was about ready to really hammer the other guy, and all I needed to do was to pull a little harder and ease over a bit; and the next thing I knew I had the chute out" story. Maybe we ought to talk a little bit about the F-4 hardwing flying characteristics.

The following graph is taken from "Keep the Sharp End Pointed Forward," USAF FIGHTER WEAPONS REVIEW, Summer 74. It displays the deterioration in aircraft handling qualities with increasing angle of attack for the hardwing F-4.



The graph is unscaled, so it should not be interpreted to be completely a linear relationship. The concept is more important. Note that at 20 units while rudder effectiveness and dihedral effect are quite high, adverse yaw is rising and directional stability is decreasing. Moving toward 30 units, note that rudder effect is the only positive characteristic remaining. Adverse yaw is high, while dihedral effect and directional stability are minimal. Only a highly skilled pilot is capable of positive directional control in this high alpha region. The relatively unskilled pilot will most certainly stall and depart the aircraft if he attempts to maneuver the aircraft in this envelope.

So, let's go back to square one and talk a bit on how to fly the hardwing F-4. In case you haven't opened up your Dash One to Section VI since your last qual check, we'll review a few points. Maneuvering at angles of attack up to 15 units will produce normal response to control inputs. That's assuming symmetrical flight.

Asymmetrical effects will be covered in a later article. Above 15 units, flight characteristics change considerably. Rudder inputs have a double effect -- roll due to dihedral effect is evident, and AOA also increases. Aileron inputs result in adverse yaw -- the more aileron deflection -- the worse the adverse yaw. Some instructors stress using only rudder above 15 units AOA -- that means after liftoff on takeoff, during portions of advanced handling, BFM, ACM, ACT, and in the base turn and landing for no-flap patterns. Covers a lot doesn't it?

Now permit me to analyze a bit more ... above 15 units, we roll using rudder alone, but that also results in an increase in AOA, which results in an increasing roll rate, which results in increasing AOA, which results in ... you broke the code! The procedure sounds good on paper, but there's also a good deal of technique involved. That's what would happen if you continued to push on the rudder; but you are obviously going to coordinate your inputs and keep better control. How much you coordinate depends on your method of flying the beast. If your feet and hands can't work together, big ugly'll bite ya!

Max performance lies in the 19-20 unit regime. Here you'll find your tightest/best turn rate. Above 450 knots or so, don't try to reach 19-20 units 'cause you'll bend the airplane 'fore you get there -- and that's a clear airplane. If you're loaded down with tanks, guns, and missiles, you'll have to back off some more knots to keep things shipshape. Don't forget that max performance is not a sustainable flight regime. You are going to be losing altitude, airspeed, or both; so don't try to keep it up forever. Besides the buffet and aural tone, the hardwing will tell you when it's reached max performance by the sound of the airstream. You have to have a few hours in the bird to pick that up, and it's much more apparent from the back seat. In almost every other flight regime, it's a completely honest airplane, so I'm not going to go into each one. Besides, the purpose of this article isn't to rehash RTU academics.

The real thing we're concerned with is what to do when you've ceased to be master of your machine for whatever reason. Once more, refer to Sections III and VI for out-of-control recovery procedures and characteristics. Again, I'll hit the high points.

In straight ahead, 1-G level stalls, the airplane does everything but put up a big sign that says, "STALL," before it goes. I won't list the warnings except to stress the one caution that these warnings are "not entirely predictable or repeatable." And if you ever get to a real accelerated stall, "rapid application of aft stick will result in immediate heavy buffet as the airplane stalls." Note the "as" the airplane stalls, not "before." If you want to snatch the stick, you're betting on an over-G or departure ... take your pick.

To recover from a stall/departure/spin, the Dash One recovery procedure is the only way to go. Another tongue-in-cheek method suggested by Mr. Don Stuck, who was mentioned in the first article, implies who is the real cause of all the problems.

1. Put feet on floor and spread knees wide apart.
2. Look at manual cabin temperature control switch and place right hand on same.
3. Look at the drag chute handle and place left hand on same.
4. Look outside -- if aircraft is flying, go immediately to step 5. If aircraft is still in incipient gyration, pull drag chute handle.
5. When aircraft recovers, return right hand to stick.

Remember, this tongue-in-cheek method was used in selecting the present Dash One recovery procedure. The procedures contained in the Dash One have proven to be the most positive and responsive.

• • •

I've really only scratched the surface on hardwing flying characteristics. The only real method is to see for yourself how the aircraft handles in various flight regimes. I'm not advocating that you go out and depart the aircraft just to get the hang of it! Far from it. You should, however, know your limits and the limits of your aircraft. Fly within both, and you'll dwell in fat city forever. ➤

chock talk

*...incidents and incidentals
with a maintenance slant.*

STATIC ELECTRICITY

We've all experienced the phenomenon of static electricity. We've heard the "zap" and seen the blue spark when shuffling our feet across a rug or scooting across the seat of a car and touching the door handle.

Static electricity is generated by contact and separation or by friction between materials. It is more noticeable on a cold, dry day; but it occurs under all climatic conditions. A few examples of activities that produce static electricity are: a moving rubber-tired vehicle, liquid dropping through a hose, or an individual removing a coat or flight jacket, and just about any operation that involves movement. Surprisingly, an individual can generate a stored charge in his body as high as 10,000 volts. Refueling trucks, while in motion, have been known to develop static charges of 25,000 volts.

Static electricity is a very real hazard where flammable vapors are in the air. In the past, several major fires occurred with static electricity as a source of ignition. These can result in loss of aircraft and refueling trucks.

We cannot stop the generation of static electricity, but we can reduce the hazard by proper bonding and grounding of equipment during fueling operations. Also, persons working around fuels, munitions, and other explosive devices must ground themselves frequently. This requires skin to metal contact and must be done prior to performing an operation that may release fuel vapors.

BOOOM!

An airman in another command was servicing helicopter tires with a low pressure air compressor. When he was servicing the last tire (which had been newly installed on the aircraft), the tire exploded. Luckily, the airman escaped injury and only minor damage was done to the aircraft.

The tire shop had mistakenly delivered the wrong tire to the aircraft. Instead of a 10-ply rated tire, the tire was a 6-ply tire rated at 50 psi. At units where a number of similar types of tires are utilized, the possibility for a repeat of this kind of incident is high -- unless effective QC procedures are in effect. How's your tire shop?



Loose Fuel Cap=Lost Tanks

A T-33 was returning from a pilot ferry mission to home station with an enroute refueling stop. During the refueling operation, the pilot watched the refueler replace the tip tank caps. The pilot then checked the caps for security and preflighted the aircraft.

Enroute to home station, the pilot noted a heavy left wing. Suspecting trapped fuel in the tip tank he initiated checklist procedures. The procedures failed to correct the problem, and as the airplane approached destination it became apparent that the aircraft could not be controlled in its present configuration. Manual jettison of the left tank failed and the pilot was forced to jettison both tanks electrically.

While the investigation of the damaged tank was not conclusive, it appeared that the fuel tank O-ring seal was missing which would allow the cap to be installed at a slight angle. This would not create a positive seal so the tank would not feed. The missing O-ring was worth \$5,000: A pretty expensive seal...

LOOK OUT BELOW...

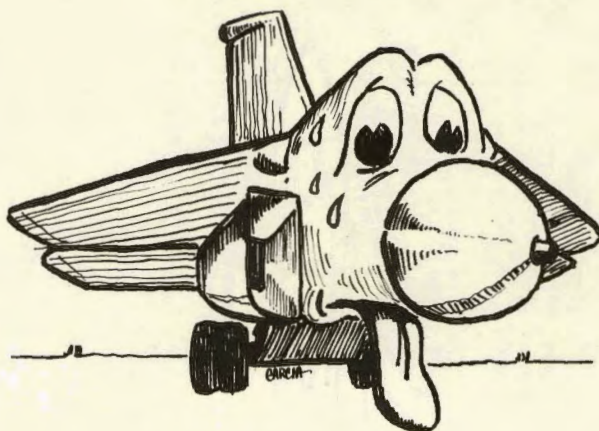
A weapons load crew was dispatched to an F-4 to dearm the centerline and wing stations in preparation for maintenance. The same load crew downloaded a SUU-23 from the aircraft several days later. After all maintenance was complete, another load crew was dispatched to upload a TER, SUU-21, and SUU-23. During aircraft preparation, the number two man verified the Aero-27/A panel had an AF255 seal indicating the ejector carts were removed (local procedure). He opened the panel, but his crew was called to another aircraft before he could finish disconnecting the breech caps.

The crew returned with another team chief later. (The new team chief was not certified for the task.) Functional check on the TER was completed, and the crew started the check on the SUU-23. When the man in the cockpit activated the centerline jettison, the SUU-23 was jettisoned to the ramp.

Apparently, the first crew failed to complete the dearm job, and the second crew failed to insure the aircraft was dearmed. Add the poor

supervision and a lack of tech order compliance, and the result was a bashed SUU-23.

Luckily, no one was injured. Next time we might not be so fortunate.



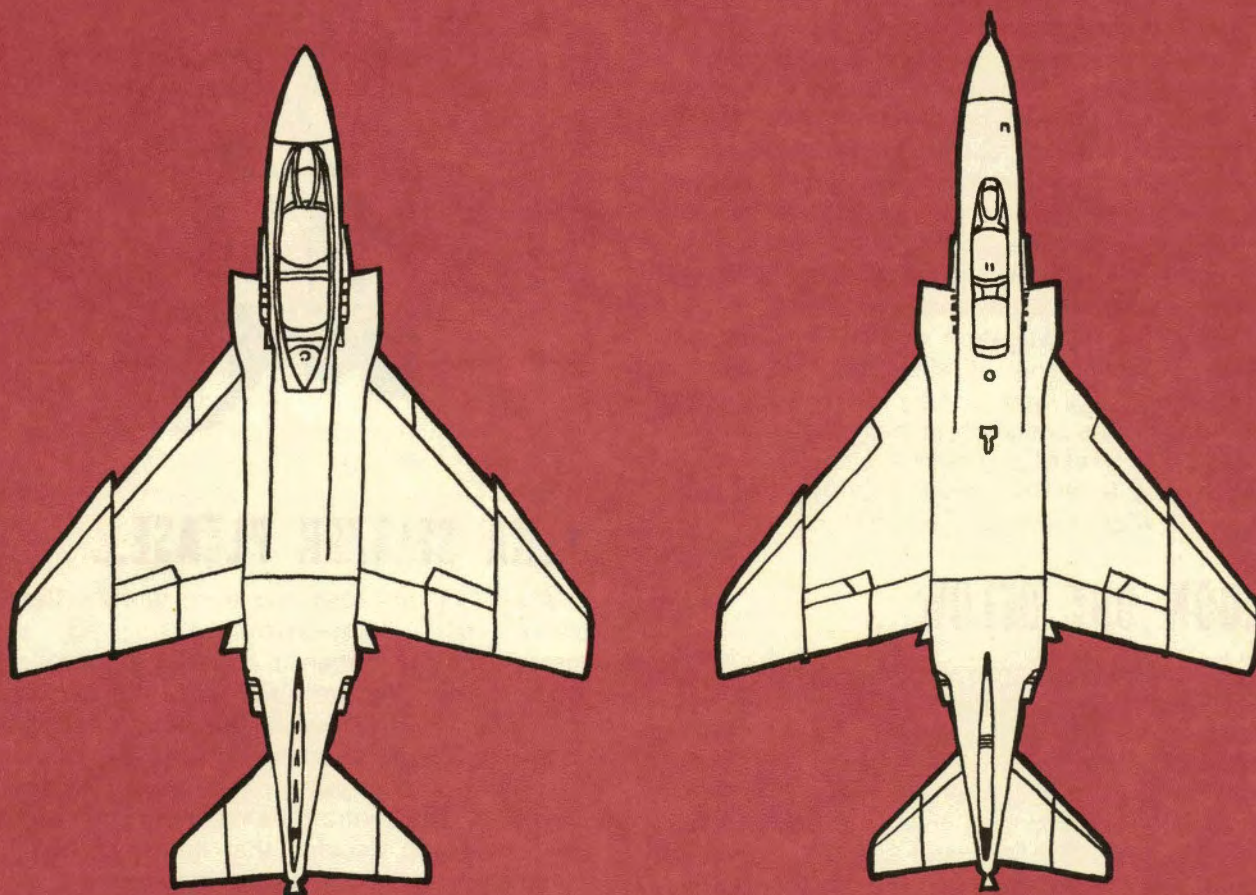
ALKA SELTZER PLEASE...

An F-111 on cross country recently suffered a case of indigestion (coupled with groundabortitis) when it ingested a checklist on engine start. The crew arrived at the airplane to continue their flight when they found that refueling was still in progress. During the refueling, the fuel truck ran out of JP-4 before the aircraft was full. The aircraft commander checked the fuel level and decided that he could make his destination without any additional fuel.

After preflighting the bird, the pilot climbed in while the crew chief and the refueler finished their jobs. Engine start for the right engine was normal, but when the number 1 engine was started, sounds of immediate indigestion and other internal disorders were heard. The aircraft was quickly shut down.

At some time, the transient alert crew chief put his servicing checklist in the left intake. Unfortunately, the mistake wasn't discovered until it was too late --- about 45,000 dollars too late. There are many other places on an aircraft to leave a checklist, wrench, etc. Although the intake is probably one of the handiest spots, it's also the worst if tools are forgotten...

Flying the F-4 LEADING EDGE SLAT



By Capt Frank J. Romaglia
35 TFW
George AFB, CA

(Condensed from Mar 77 TAC ATTACK)

All you F-4 hardwingers out there getting ready to step up to the softwing .. prepare yourself for a pleasant surprise. Also, prepare yourself for an aircraft that looks basically the same but has significantly different and improved handling characteristics. That being the topic of our discussion, we'll dispense with the questions that can be answered by the Dash One and "LES" Transition Manual and stick to what to expect when the servo between the stick and throttle yanks and banks.

HANDLING CHARACTERISTICS

Let's examine handling characteristics as we progress through the various aspects of a normal mission (the phrase "normal mission" is often used in conjunction with "the Real Air Force").

TAKEOFF

With a slotted stabilizer, the aircraft will be a good bit more responsive in the longitudinal axis at slower speeds; you can start the nose up by 100 knots. The LES aircraft is more susceptible to jet wash and wind gusts, so watch your T/O attitude: Do not yank it off into a gusty crosswind (by the way, max crosswind component is 25 knots) with both your nose and AOA high -- you'll have your hands more full of machine than you want that close to the ground! Gear and flap retraction is normal, and the slats will retract as AOA decreases below 10.5 units



TAC ATTACK

RIG/STAB AUG/SLAT CHECK

Now we add that slat check. Here are some points to ponder: If you pull up too gradually in attaining 11.5 units AOA, your airspeed will bleed off to 300 KCAS or even less. Also, it takes crew coordination to watch slat operation, slat indication, and the AOA gauge all at the same time. This check is accomplished prior to high AOA maneuvering, so pay attention to what it's telling you. Just because all of our 25-ton tricycles look alike doesn't mean they all fly alike -- rigging can vary from aircraft to aircraft.

AEROBATICS

The softwing will be stable and responsive throughout its envelope, most noticeably at low airspeeds. You can be out of airspeed and flying with all the aerodynamic properties of a rock, and you'll still be able to point the nose wherever you want. Aircraft acceleration is a little slower than you're accustomed to, due to slat drag; but once you're up to high calibrated airspeed, it'll feel solid to at least 6-1/2 Gs. Holding 4-5 Gs will produce no perceptible buffet down to about 350-377 KCAS. A good technique for achieving 200 KCAS over-the-top is to begin easing back to 15 units AOA after you get into light buffet.

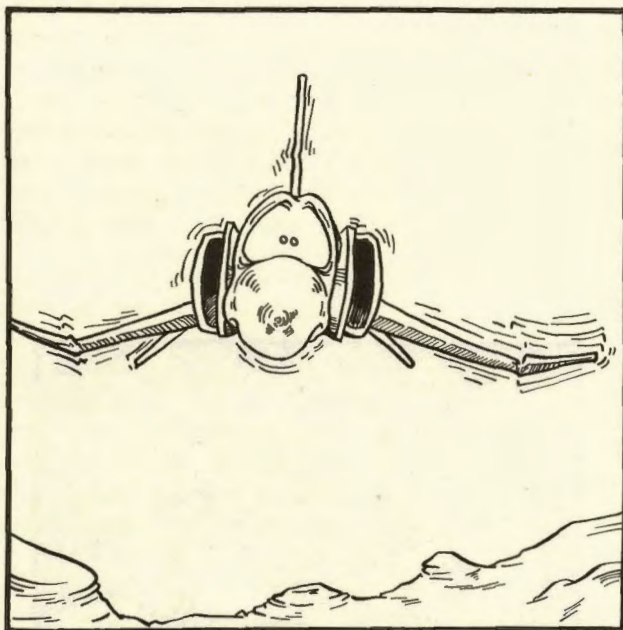


flying the F-4 leading edge slat

STALLS

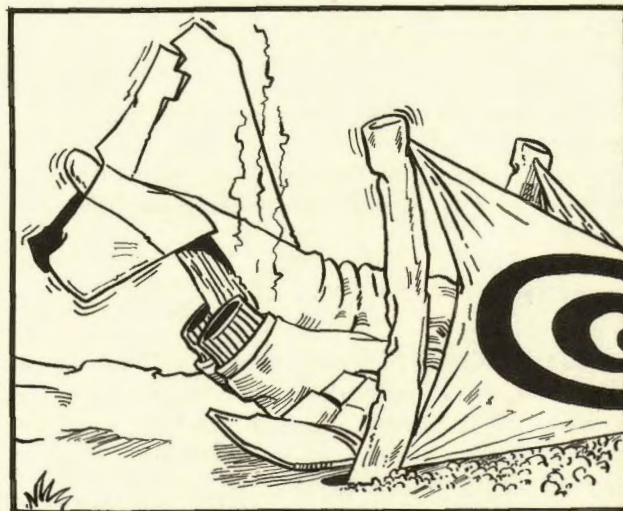
Generally, buffet will be mild to moderate -- if at all. Wing rock will occur above 26-28 units AOA -- if at all. Here's a warning note from the Dash One's excellent discussion of characteristics: "Aircrews should not depend on wing rock buffet, directional instability (nose slice), or any classic characteristics for a stall warning. In any configuration or loading, and especially with moderately high pitch change rates, it is possible to increase AOA above 30 units without wing rock or loss of directional stability *at which time loss of control may result.*" (Italics mine.)

Slats will only smooth out and delay an out-of-control condition -- they won't prevent it. 'Nuff said!



AIR-TO-GROUND GUNNERY

Be aware you'll be able to make tighter turns, so you might want to change your roll-in technique to prevent undershooting. Also beware of slat tuck or dig-in; you'll get an increase in G without any stick inputs as the slats extend. Its most probable point of occurrence is a stick snatch trying to prevent a low pullout after a press (... Let he who is without sin cast the first stone ...).

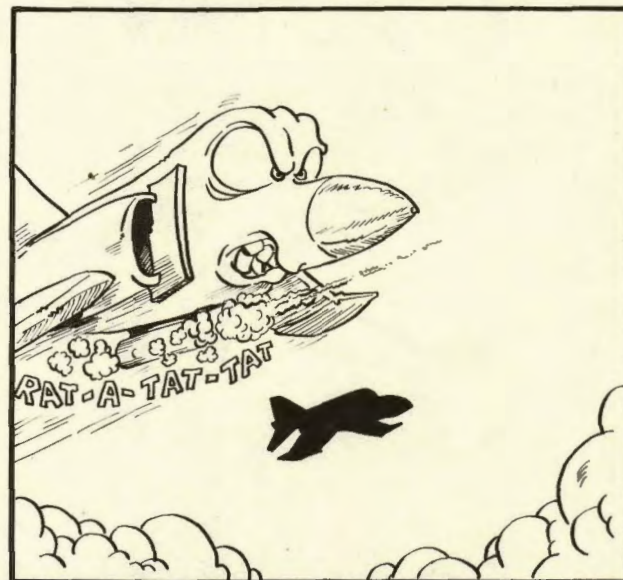


AIR-TO-AIR COMBAT

Here's where the softwing excels. Considering a training arena of 10-15,000 ft AGL and a 6-1/2 G limit, the corner velocity is about 40-50 knots less than a hardwing.

The increase in specific excess power (P_S) becomes readily apparent as you match turns with a hardwing, but you're at a reduced power setting. To fully appreciate this P_S advantage, have your wingman override his slats for an engagement and see how fast he becomes the attackee. Enough about F-4 hardwings; the known bad guys aren't flying them yet.

You'll notice an increase in comfort throughout the high AOA envelope due to increased stability and reduced buffet. Adverse yaw is negligible (not nonexistent) and coor-



minated rudder and aileron are fine, though it's still advisable to maneuver at high AOA with the pole pretty much in the middle. Reason? If you turn with ailerons at high AOA (above 20 units), you'll have to definitely move the stick forward to maintain the same AOA; you might also experience roll hesitations. Wing fences keep the wingtips from stalling as quickly as before and also improve lateral stability -- the aircraft is supposedly slightly more sluggish in the roll.

Another nit-noi: Going from a high AOA situation -- especially when combined with a nose-high condition -- to an extension or acceleration maneuver, you'll have the drag of extended slats until the gauge gets below 10.5 units.

The increased turn capability results in a smaller combat arena -- you can start a hi yo-yo 1,000-1,500 ft closer. This increased turn capability, especially at slower airspeeds, also allows you to back yourself into a corner. Pay close attention now: Sustaining maximum performance will result in an airspeed bleedoff so rapid that the needle will be a blur. You might get a kill, but your 300-knot tail won't be much competition for the next MIG at your six. This airspeed bleedoff can go unnoticed due to increased stability and pitch responsiveness, lack of buffet or wing rock, and the fact that your fangs are lodged in your faceform. The machine gives you fewer clues, so use the aural tone. Once the nose gunner padlocks a bogey, GIBs should pay increased attention to parameters.

TRAFFIC PATTERN

All that we gained in combat capability doesn't come for nothing -- handling qualities in the pattern are slightly degraded.

There are two problems in the pitchout phase: The first is losing 200 ft in the pitch while looking for staff cars at mobile. It's a personal problem ... but a little top rudder might help. The second is that at 300 KCAS, the machine turns beautifully; so well, that if you honk it in, you'll practically be going down initial in the opposite direction. But getting ready to come off the perch at 180 KCAS, you'll find the aircraft doesn't turn quite the same -- watch tight pitchouts!

The softwing approaches about 6-10 knots faster than the hardwing Phantom. The airspeeds for various slat/flap combinations are in



your checklist, so there's no need to dwell on them here. You'll notice that the single-engine approach AOA is still 17 units; for all other approaches when the slats are out, use 19.2 units; when the slats are in, use 17 units. Reread this paragraph and you'll have it wired. When the slats are extended, it's fairly smooth; with the slats retracted, it's definitely not smooth.

Some people say it's tougher to fly a constant AOA; I don't find that a problem. What is noticeable is the increased stabilator effectiveness ... you can definitely flare the aircraft; by the same token, you can drag the stab tips -- especially in a no-flap. Don't forget its susceptibility to jet wash and wind gusts plus reduced lateral control due to wing fences. The Dash One recommends a 17-unit approach in these conditions. Use both aileron and rudder to bring up a dropped wing and be spring-loaded to the go-around position.

No BLC means very little instant lift by just pushing the throttles forward. To get increased airflow over the wings, you have to increase airspeed -- that might mean unloading; and that might mean being unable to salvage an overshoot. Conversely, just by pulling off power doesn't mean you lose lots of lift -- your airspeed must bleed off first. This causes two things: A tendency to be hot, and a tendency to float -- you'll see what I mean at least once. Happy landings, and remember you're not out of a high threat area until you see mobile's grade slips.

P-38 Lightning





AIRCRAFT STABILITY AND CG

By Capt Pete Abler
Editor

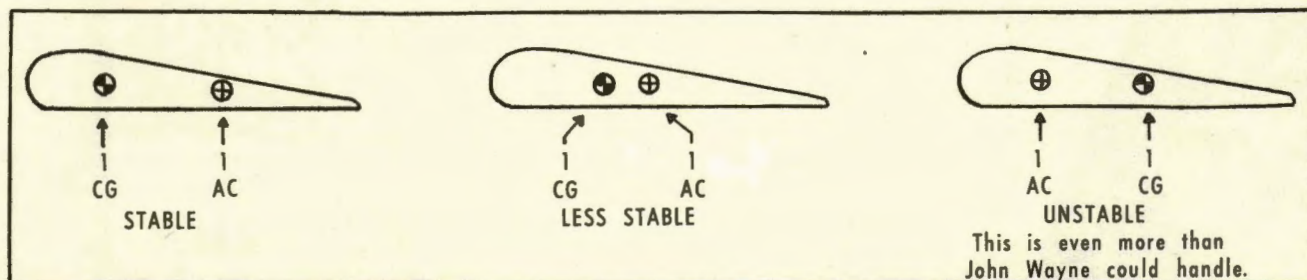


One of those subjects guaranteed to warm the cockles of your heart and make everyone sit up and pay untiring attention, isn't it? Actually, you and I both know whenever someone starts talking about center of gravity (CG) that the end result is the same as studying the Dash One -- guaranteed Zs within 5 minutes. Knowing that, I'll try to keep this short but interesting.

First, I won't bore you with definitions of static and dynamic stability. It's the engineer's job to make sure that all that stuff is taken care of; and for the most part, it has been. But when an airplane is designed to carry 2,736 different weapons, dispensers, suspension racks, fuel tanks, and the ultimate in engineering -- the dart tow rig -- changes in CG are bound to occur. And those changes in CG affect the way your aircraft handles -- and ultimately, your ability to control the aircraft.

The real measure of stability is static margin -- the distance between the center of gravity and the center of pressure (lift), also called aerodynamic center (AC). The figure below should explain any questions you may have about the relationship of the two.

My 3-year old daughter just looked at these illustrations and stated, "Gee Daddy, if you move the CG forward, the airplane must be more

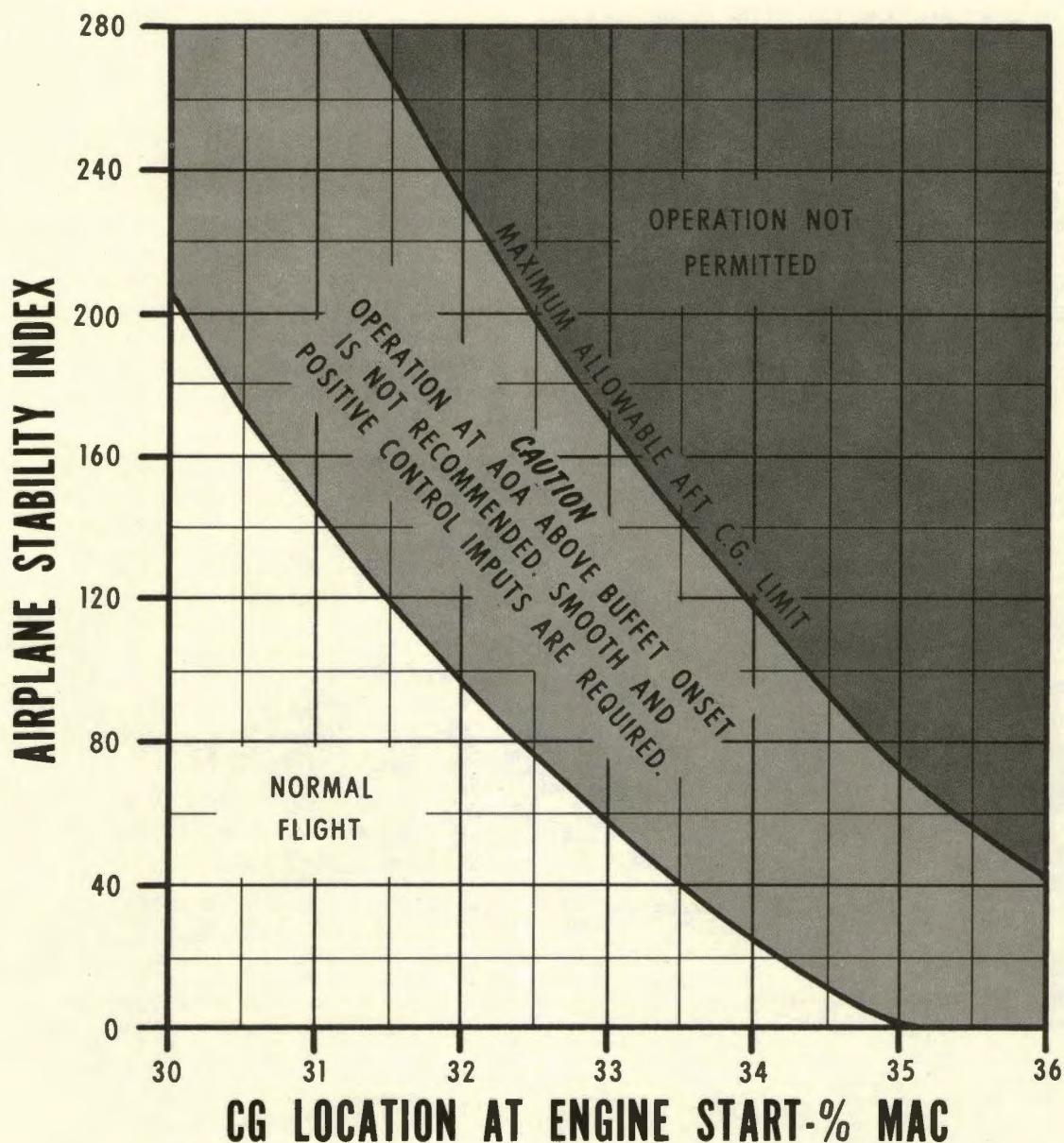


stable; and if they move closer together, things could get really squirrely!" Einstein, move over. That, in a nutshell, is the key to the whole problem. So now all you need to know is how various stores, fuel configurations, etc., affect your CG.

Guess what guys ... it's easier than you think. There's some folks over in maintenance who figure out the CG for the various configurations which your unit might use. For takeoff, all you have to do is plug the info from the DD Form

365F into the charts and you've got your takeoff data. From here on in, all you have to worry about is fuel management, right? You're pretty close. One more step is required. You must consult the stability index for the external stores on your aircraft and compare that figure with the CG in the chart in Section V of the F-4 Dash One. If the two lines intersect in the green, you're golden; yellow means you can fly, but you're at minimum acceptable longitudinal stability; and red means you don't fly.

AFT CG LIMITS



AIRCRAFT STABILITY AND C G

Don't fall into thinking that those division lines on the chart are absolute limits. Since the situation is dynamic, you're constantly moving about in the static margin. The green area also does not imply that you can ham-fist your bird and get away with it! Neither does the yellow area imply instant tragedy if the airplane is flown properly. The next change to the Dash 1 should have a more realistic discussion of this subject, including a new chart.

Now let's talk about moving gas around. The most common F-4 training configuration is 370 gal wing tanks plus stores. From start to takeoff, you're burning fuselage fuel -- for each 1,000 lbs you burn, the CG moves forward about 1%

which means a higher nose wheel liftoff -- if you've been waiting 25 minutes in the arming area, expect to find the nose a bit more reluctant to come up.

Once you're airborne, you're transferring the external tanks (assuming you turned the switch on). As the wing tanks deplete, the CG moves aft (Aha, CG aft -- squirrely aircraft). That's why the bird is so pitch sensitive at level-off and especially when the tanks go dry. What can you do about it? Not much, if your mission requires a lot of maneuvering. You need to get the tanks dry ASAP because of G limits. If maneuvering is not a consideration, using the tank 5/6 lockout allows external fuel into fuselage cells 3 and 4 only. Your CG will remain in a much more favorable position, but your ability to maneuver is degraded. Looks like you're stuck with a somewhat sensitive airplane once the tanks are dry. So what. If you'll just fly smoothly and be aware of where the CG is, the only time you'll have to use your chute is on landing.

Well, that's the quick and dirty about CG. If you're concerned about movement of the AC, read "Square Corners and Other Pitfalls to Avoid" on page 26. That subject will be covered along with some cautions on various phases of flight. May an aft CG never bite you in the ➤



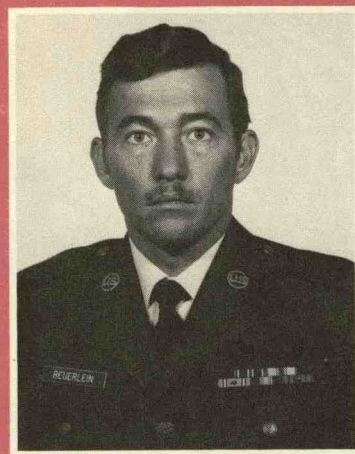


TAC

SAFETY AWARDS

INDIVIDUAL SAFETY AWARD

Staff Sergeant Carl E. Beuerlein, 354th Equipment Maintenance Squadron, 354th Tactical Fighter Wing, Myrtle Beach Air Force Base, South Carolina, has been selected to receive the Tactical Air Command Individual Safety Award for November 1978. Sergeant Beuerlein will receive an engraved desk set and a letter of appreciation from the Vice Commander, Tactical Air Command.



SSgt Carl E. Beuerlein
354 EMS/354 TFW
Myrtle Beach AFB, SC

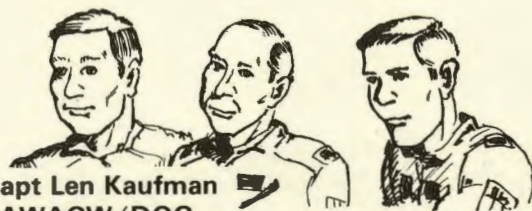
CREW CHIEF SAFETY AWARD

Airman First Class Janice K. Moore, 33d Aircraft Generation Squadron, 33d Tactical Fighter Wing, Eglin Air Force Base, Florida, has been selected to receive the Tactical Air Command Crew Chief Safety Award for November 1978. Airman Moore will receive an engraved desk set and a letter of appreciation from the Vice Commander, Tactical Air Command.



A1C Janice K. Moore
33 AGS/33 TFW
Eglin AFB, FL

No Utopias Here



By Capt Len Kaufman
552 AWACW/DOC
Tinker AFB, OK

If Sir Thomas More was working as a squadron ground training officer he would quickly realize that there are no easy Utopian solutions to the problems encountered in structuring an effective training program. Let's discuss a few of those problems, and I'll relate how one organization dealt with them. Keep in mind that these problems may not be encountered in every unit, nor will the solutions work each time or even more than once. It is up to the ground training officer to keep the program effective and dynamic.

PROBLEMS

Problems are always easier to identify than their solutions. One of the largest obstacles encountered is the resistance of the aircrews. The average line jock does not want to go to ground training sessions. Who wants to hear another briefing on aircraft recognition/tactics/RHAW/etc? The list seems to go on and on. Accompanying the lack of motivation is the varying experience level within the unit. Lesson plans

must be directed both to the fledgling wingee and the old head.

The training officer who recognizes this reluctance on the part of the aircrews may be tempted to "fill the square" and simply teach the high points so the crews can pass the MEI and ORI tests. This type of training will probably get you by almost everyone but the bad guys. What would happen if the balloon went up before the next training cycle? How many of your guys could hack it?

Simply getting all the aircrews together for the training sessions can be a monumental problem. Leave, TDY, exercises, and external tasking can leave an operational squadron in shambles. Supposing you do get all the guys together. You better have a good classroom and break area or you'll lose the audience in the first hour.

SOLUTIONS

So we've identified some of the obstacles to the training program. Remember, the list is not all-inclusive. Many were not mentioned because the list would be longer than anything you would care to read. The 388 TFW at Hill AFB, UT, set out to overhaul its approach to ground training. The first step in that overhaul was to start at the top and work our way down.

We discovered that we had a communications problem. All the actors were not talking to one another, and there were too many cooks with their spoons in the pot. Once the program got rolling, most of the parochialism vanished and the squadron and wing staff functions worked together. Our program involved tasking each squadron for four formed aircrews to act as instructors for the various subjects. We then adapted our tactical training scenario (TTS) geographic location to add a bit of realism and relevance to the subject. A script was developed which combined the areas of life support, intelligence, weapons, etc., instead of treating these subjects separately. The ultimate goal of the program was to lead the aircrews to TTS certification.

In the areas which we found inseparable or overlapping (i.e., recognition, RHAW, etc.) two experts would give their presentation simultaneously, a la Huntley and Brinkley to add more interest to the subject. Also, questions

from the aircrews were more adequately answered by two people than might have been true for only one individual.

Specific note-taking outlines were published for the subject areas. The outlines listed all the topics and subtopics with plenty of room for taking notes. The job of maintaining classified notes and working papers was made a great deal easier. Additionally, the outlines made excellent study guides for aircrew testing, ORI study, etc. Anyone desiring a copy of the outlines should contact the 388 TFW/IN, AVN 458-0092.

After the formal academic program, self-study time and materials were made available to the aircrews to prepare for their formal TTS presentation. Each flight prepared their entire solution to the problem presented by their assigned target. By the end of the third month of the program, almost three-fourths of the wing's aircrews had completed the majority of their ground training. Not bad for the beginning, and we identified other benefits too.

BENEFITS

Some of the benefits of the program were:

1. Reduction of record keeping.
2. Elimination of last minute mass training and square filling.
3. Added realism and relevance.
4. Increased cross-talk and interface between the players.
5. More efficient use of the instructor's and aircrew's time.
6. Better predictability in squadron scheduling.
7. Ease of maintaining classified notes and working papers.

Don't get the impression that all the problems were solved. This was only the first step. Instead of sitting back and complaining about the sorry state of ground training programs, it's about time some of us got up and did something about the problem. RED FLAG has brought about a more realistic approach to our combat training in the air. It's up to you and I to do the same thing for ground training. ➤

SPO CORNER



LIGHT ON THE STAR

**By Maj Gerry Felix
HQ TAC/SEF**

You're a wingy on a two-ship level. With regard to radio discipline, you've been briefed to keep the light on the star and pray for a turn. Your flight lead goes whistling by a checkpoint without turning to the required heading. What do you do? Let the turkey fly off into never-never land, or punch the mike button and straighten things out?

Examining what's required of a flight lead who preaches the "light on the star" philosophy will yield the answer to the question. He must deliver a thorough flight briefing, then fly the mission precisely as he briefed it. Should he meet with contingencies he hadn't planned for, he owes the flight an audible at the line of scrimmage. Should he deviate from the plan of action without an explanation, then you owe him a radio call.

Back to the example. The flight lead didn't call the audible upon deviating from the briefing. Are you justified in making a radio call? You bet you are. If you don't, successful mission completion is in jeopardy.

We all know that "light on the star" is a philosophy designed to guard against motor-mouthing. And motor-mouthing is a lack of flight discipline that needs to be guarded against. Just be certain, as a flight leader and wingman, that you know the limits of "light on the star." We don't want to shut off radio calls that are vital to flight integrity and discipline.

SECOND BEST AGAIN

**By Capt Garry Mueller
HQ TAC/SEF**

Here's a classic example of a guy doing virtually everything right and still coming out second best. My apologies to this unlucky guy, but there is a lesson for everyone from his unfortunate experience.

Since Day One, pilots are taught, briefed, and rebriefed a single fact about thunderstorms -- don't mess with them. After receiving a weather brief, our luckless pilot proceeded on his way in an aero club bugsmasher. He contacted approach control 50 miles out from his planned point of landing. He was told there was a thunderstorm to the north which was not expected to hit the airfield. The guy pressed on and landed. He had done everything right, including thunderstorm avoidance.

The storm that wasn't supposed to hit the field promptly did what it was not briefed to do -- it clobbered the airport with heavy rain and high winds. The high winds showed up as our hapless pilot was taxiing to the ramp. He never made it. A strong gust picked up the tail of the aircraft and flipped the pilot, passengers, and bugsmasher upside down. Fortunately, no one was injured.

This story emphasizes the unpredictable nature of thunderstorms. The June 1978 copy of the Navy safety magazine, APPROACH, has an excellent article on thunderstorms. They've reproduced a drawing that depicts such a storm and the hazards involved. I thought I'd seen and heard (twice) everything about these monsters. However, after seeing this drawing, I realized I was wrong.

It only takes 5 minutes to read the article.

THE USAF AT NAS HOLLOMAN

By Capt Garry S. Mueller

TAC/SEF

No, you're not looking at the flight deck of a Navy carrier with the barrier raised. The obvious giveaway is the weed patch, although I sometimes wonder about that. What you see is the newest creation recently installed at Holloman to stop T-38s that don't really feel like flying or stopping. For all you guys who finally eliminated "barrier" from your vocabulary, sorry 'bout that.

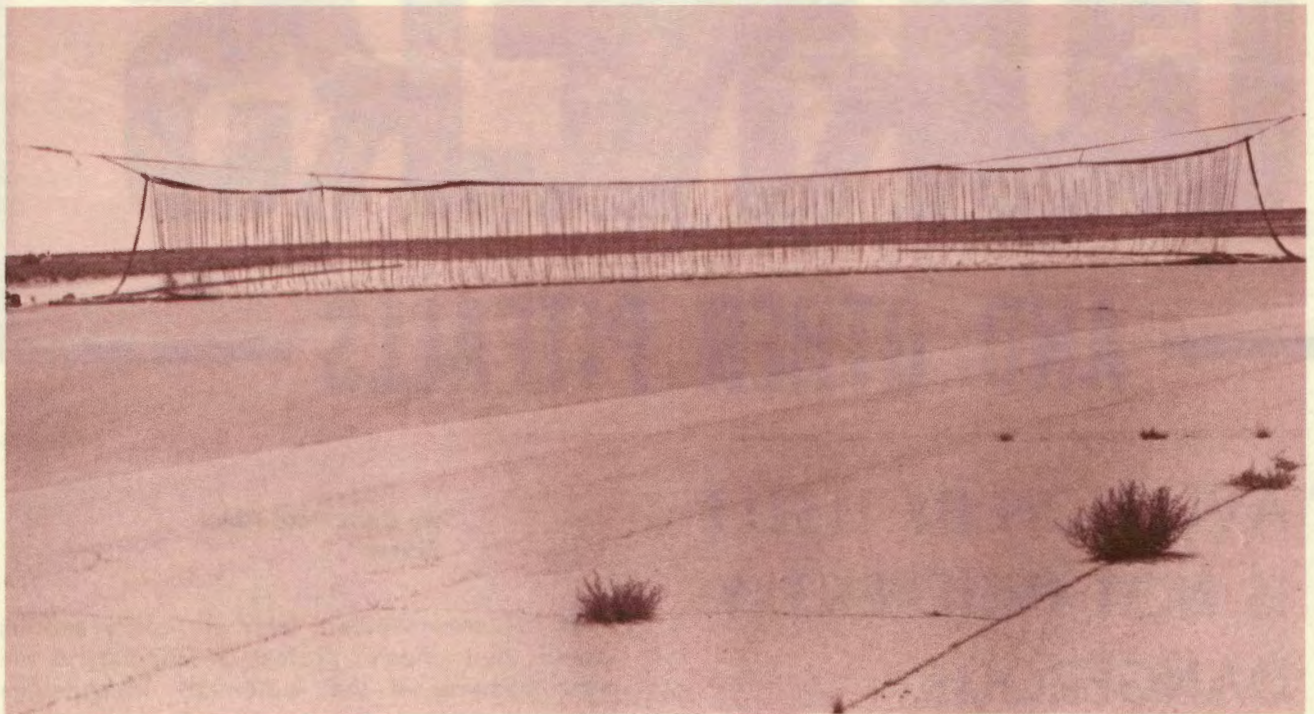
the net will be up and waiting in 3-4 seconds. There is no minimum engagement speed, and successful engagements have been made at speeds up to 165 knots.

Now, a couple of do's and don'ts with this monster. First, the do:

1. As with any barrier or arresting system, try to engage it as close to center and perpendicular to the net.

Simply stated, that's it. Now the don'ts:

1. Don't worry about all the webbing falling over the canopy and trapping you inside the cockpit. The nose of the aircraft goes through the net. The straps are designed to catch the wings of the aircraft.



The USAF now has one and is scheduled to receive a couple more.

The "rabbit catcher" is installed on runway 25 at the unbelievable distance of 13,000 ft down the runway. That should settle any arguments on whether or not this really is a carrier deck. The barrier is made of high strength nylon webbing and stands about 12 ft high at the center. However, it is normally in the down position. If some unlucky soul in a fighter or trainer type aircraft has to make a high-speed abort, all he has to do is give the tower a yell to raise the barrier. The tower guy will push a button, and

2. Don't worry about the metal wire across the top. It's designed to shear during engagement. (No, it won't come through the canopy or aircraft.)

3. Don't (obviously) hit the metal posts holding the net up. You'll counteract the purpose of the barrier.

Finally, and most importantly, it's there for your use during a high-speed abort -- don't forget about it and go whistling off through the desert in your high-speed tricycle. Remember, there still are other types of arresting gear available for hook equipped aircraft.

SQUARE CORNERS

AND OTHER PITFALLS

**"AVIATION BY ITSELF
IS NOT INHERENTLY
DANGEROUS,
BUT LIKE THE SEA
IS TERRIBLY
UNFORGIVING OF
ANY CARELESSNESS
OR NEGLECT"**

**By Capt Pete Abler
Editor**

The aircrewmembers who are really serious about their chosen profession understand the real meaning of that statement. These same aircrews make a definite effort to know where they are, what they're doing, and what their aircraft is doing at all times. A term has been used to define this area. It's called "situation awareness." Situation awareness is what makes one aircrew better than another in ACM, ACT, on the range, etc. Almost anybody can fly an airplane. The true fighter crew knows what to do, when to do it, and how much. They manage to stay away from the square corners most, if not all, of the time. I'm going to discuss a few of those corners and, hopefully, get you to increase your situation awareness in some phases of flight.

What goes up must come down

Gravity is one of those absolute forces you can't do anything about. It works against you when you want to go up but add God's G when you're trying to do a double underhanded flick noogle to hammer the other guy, and it's on your side. If you aren't careful, though, you can end up pointed toward terra firma without enuf room to reverse your direction. Consider the following:

An F-4C/D at 5,000 ft MSL, 45° nose-low, 450 kts will lose 3,800 ft before the airplane bottoms out (19 units or 6 Gs whichever occurs first). That's 1,200 ft to spare at sea level.

The same F-4 at 15,000 ft, 1.2 Mach will lose 14,800 ft if he gets the nose down 90° and tries to pull out (same limits as above).

An F-15, 45° dive, 450 kts can pull out in about 3,500 ft (6 Gs).

Figures for the F-5, A-7, and F-105 are somewhat similar to the above. All figures aren't the absolute word since the charts are designed to remain within airframe limits. You don't want to bend your bird unless it's a last ditch maneuver.

Let's put your F-4 on a low-level at 450 kts, 300 ft AGL. If you drop your nose 5°, it could cost you 100 ft+ after you realize it's time to go back up. Remember you're going 720 feet/second.

So, I'm saying if you don't watch what you're doing in BFM, ACM, on the range, or low-level, in a few seconds you can build a box that you just can't fly out of.



More on Stability

In the previous article, we spoke of how fuel and external stores affect the static margin. Unfortunately, there are other considerations which you should be aware of. Besides movement of the CG, the aerodynamic center (AC) of the aircraft moves also. First, the AC changes when external stores are added due to the aerodynamic effects of the store. That's why you compute your stability index for your configuration. The aerodynamic center also moves during certain flight maneuvers.

Stalls -- As the aircraft approaches the critical angle of attack, the AC moves forward and reduces the force required to move the stabilator (stick force lightening). Thus, just prior to the stall, it is quite easy to overcontrol the stabilator and place the aircraft further into the stall.

Supersonic Flight -- When an airplane transitions from subsonic to supersonic flight, the AC shifts rapidly aft. During supersonic flight, the AC is so far aft that you won't have enough stabilator authority to reach a critical angle of attack. During the transition back to subsonic flight, the rapid shift of the AC back to a forward position can cause a G overshoot if you're holding a lot of G during the transition. The F-4 slat bird isn't quite as bad as the hardwing in this respect. This shift in the AC is characteristic of all airplanes capable of supersonic flight, but is not always as dramatic as in the F-4.

SQUARE CORNERS AND OTHER PITFALLS

Asymmetric loading F-4

Most people with any amount of smarts (that must mean us) would not intentionally fly an aircraft that was loaded asymmetrically unless the difference was negligible. However, when you're dropping the big ones off your wings and only one goes, or perhaps one of your tanks didn't

First, for obvious reasons, fly a straight-in. Slow down carefully and perform a controllability check if you have any doubt about your ability to control the aircraft. Use aileron and rudder trim to aid your efforts. After touch-down, the aircraft will tend to turn away from the heavy wing during braking. Be prepared to use differential brakes, steering, and flight controls to keep the sharp end pointed down the runway.



feed; well now, you've got problems. Once you realize the problem, it's "time out." Stop what you're doing and RTB if you can. If you can't, watch the angle of attack, G-loading, etc., -- if you don't, and you stall the aircraft, your chances of spinning are close to 100%. If you must maneuver, don't hold the wing up with aileron (remember adverse yaw?). Use your rudder. Once you're firmly in control of the bird, it's time to plan the landing.

Not every square corner has been covered in this article. Nor was it my intention to cover every one. If you feel that your particular airplane has some squirrely characteristics of its own, I'd like to hear about them -- both the problems and solutions. We are constantly in search of articles on aircraft control and anything that will help aircrews take an introspective look at their operations. Remember, the only thing that can turn a square corner is a piece of chalk. ➤

...interest items,
mishaps with
morals, for the
TAC aircrewman

Abler

By Capt Garry Mueller
HQ TAC/SEF

Two guys were flying around on a transition/instrument mission when they both got headaches (1st clue). After opening the air vents, their headaches went away. (Sounds like they were in an O-2, huh?) The headaches returned when they started doing some simulated forced landings (2d clue). The crew opened the side window, closed the foot vents, and -- you got it -- no more headaches. On a short final, the pilot's headache returned; and he experienced some coordination and concentration problems (3d clue). On missed-approach, both guys reported feeling groggy, tired, and light headed (4th clue). They finally declared an emergency and landed.

The causes of all these clues were a hole in the heater air mixture box allowing engine exhaust to contaminate fresh air and a missing rear window causing the aircrew to inhale the contaminated air.

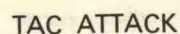
Luckily the crew was VMC and could open other windows to clear the cockpit. Had the weather been lousy, the results could have been more disastrous. The first clue was not that obvious, and maybe so with the second. The third should have done it; what they didn't need was a missed-approach to suffer through the 4th clue.

Hopefully, though painfully, another lesson learned about breathing and airplanes.

Hey Chief, take care of that one
for me, ok?

An F-4 was being readied for return to home station after a static display. The crew loaded their baggage and 780 gear into the travel pod and requested transient alert give them an end-of-runway (EOR) check and secure the travel pod. The TA folks heard the request about the EOR check but didn't remember anything about the travel pod.

Start and taxi were normal. Transient alert noted nothing unusual during the EOR check. During takeoff, the fire department personnel noted the crew's personal clothing bags falling out of the pod. The airplane landed minus the 780 gear, the spare drag chute, and the jock's socks. Have you heard this story before? I thought so. Remember your crew responsibilities. Shortcuts can bite you right in the travel pod.



TAC TIPS

Do yourself a favor...

Recently two different aircrews in two different airplanes successfully recovered their aircraft following utility hydraulic failure. They executed the inflight procedures properly and safely landed the aircraft. However, the end to each emergency wasn't quite what it should have been when both airplanes ended up in the dirt.

Why? The pilots were trying to do someone else a favor. One was taxiing clear of the runway so traffic wouldn't be delayed; the other was rolling out to the end of the runway so the recovery team would be close to the aircraft. Each man relied on his emergency brakes to stop the aircraft. Each found out too late that the emergency system wasn't working properly. In one case, the system was depleted. In the other, the brakes were improperly actuated.

When you're flying an aircraft, you "own" it until it's stopped on the ground and the engines are shut down. Don't let your desire to do someone else a favor override your other priorities. When you start handing out favors, think of yourself and the airplane first.

Stuck Throttle

A short while ago, during the descent to enter a low-level route, the phantom flyer noticed that the number one engine was stuck at 92% RPM. All attempts to regain control of the engine failed, and the crew RTBd and set up for a straight-in approach. At 7 NM from the runway, the pilot shut the engine down with the master switch and completed an uneventful single-engine landing.

Did the pilot do anything wrong? Probably not -- I guess it really depends on your point of view. When I read the incident report, the hair stood up on the back of my neck at the thought of shutting down a good engine that far away from the field -- in landing configuration.

The real point is -- very few aircraft Dash Ones give more than lip service to the problem of stuck throttles. Each one of us needs to plan for emergencies such as this one. The problem is different with one stuck at idle -- or in the A/B range. Each situation requires a different approach. Why not talk it over at your next fly-safe meeting.



TAC Flight Safety Trophy Winners

479 TTW
Holloman AFB, NM
14 Sep 1977 - 13 Sep 1978

552 AWACW
Tinker AFB, OK
2 Oct 1977 - 1 Oct 1978

184 TFTG(ANG)
McConnell AFB, KS
24 Aug 1977 - 23 Aug 1978

123 TRW(ANG)
Standiford Fld, KY
3 Sep 1977 - 2 Sep 1978

27 TFW
Cannon AFB, NM
4 Oct 1977 - 3 Oct 1978

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"F-4 Flight Control System Fault and Fixes" by Maj Jerry Gentry, Feb 70

"F-4 Out of Control" Jul 70

"Stick Force Lightening" by Pat Henry, Dec 72

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TAC ATTACK

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"Are You Out of Control?" by R. D. Hunt, 2d Qtr 69

"Stick Force Lightening" by Pat Henry, 4th Qtr 70

"An Approach To Recovery" by Jack Krings, 2d Qtr 71

"Pitch Feel Trim System" by Pete Garrison, 3d Qtr 71

REUNION



February 1979 marks the 25th anniversary of the first flight of the F-104 Starfighter. To commemorate this event, a reunion will be held in Phoenix, Arizona, on 15, 16, 17, 18 February 1979.

Anyone who has flown the F-104 or has been closely associated with its development over the years is invited to attend. For details, please write:

Starfighter 25 Ltd

PO Box PP

Litchfield Park, Arizona 85340

