

# TAC ATTACK

AUGUST 1975

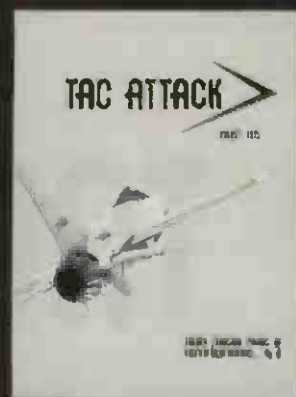


TWENTY THOUSAND POUNDS OF  
FIGHTER PERFORMANCE... Pg 4

Timkowski

# TAC ATTACK

FOR EFFICIENT TACTICAL AIR POWER



## FEATURES

TWENTY THOUSAND POUNDS OF FIGHTER PERFORMANCE	4
PITCH FEEL TRIM SYSTEM	12
AWARDS	16
BIRDS, PLANES VIE FOR THE SKY	20

## DEPARTMENTS

Angle of Attack	3
Aircrewmen of Distinction	9
TAC Tips	10
Safety Awards	15
Flaggram	18
Chock Talk	22
Phyz Biz	24
Weapons Words	26
Emergency Situation Training (F-100)	28
Down to Earth	29
TAC Tally	31

TACTICAL AIR COMMAND

GENERAL ROBERT J. DIXON  
COMMANDER

LTC GENERAL ROBERT E. HAILS  
VICE COMMANDER



COL J. D. MOORE  
CHIEF OF SAFETY

MAJ JOE TILLMAN  
EDITOR

CAPT MARTY STEERE  
ASST EDITOR

STAN HARDISON  
ART EDITOR

MARY KONOPNICKI  
EDITORIAL ASSISTANT

TSGT JOHN TOMKOWSKI  
LAYOUT PRODUCTION

TACRP 127-1

Articles, accident briefs, and associated material in this magazine are non-directive in nature. All suggestions and recommendations are intended to remain within the scope of existing directives. Information used to brief accidents and incidents does not identify the persons, places, or units involved and may not be construed as incriminating under Article 93 of the Uniform Code of Military Justice. Names, dates, and places used in conjunction with accident stories are fictitious. Air Force units are encouraged to republish the material contained herein; however, contents are not for public release. Written permission must be obtained from HQ TAC before material may be republished by other than Department of Defense organizations.

Contributions of articles, photos, and items of interest from personnel in the field are encouraged, as are comments and criticism. We reserve the right to edit all manuscripts for clarity and readability. Direct communication is authorized with: The Editor, TAC ATTACK, HQ TAC/SEPP, Langley AFB, Va. 23065. Autovan 432-2937

Distribution F% Controlled by SEPA

# Angle of ATTACK



there  
is no  
mystique....

COL J.D. MOORE  
Chief of Safety

Supervisor scheduled two pilots for low-level navigation training mission. Neither pilot was flight lead qualified. One pilot had a physical condition that should have grounded him. Briefing was inadequate. Weather was below minimum required for low levels. Flight routing was changed, but flight service was not advised. After completing low level, pilots climbed and performed unbriefed, unauthorized trail maneuvers through several airways. The last maneuver exceeded the wingman's

capability. He stalled the bird, did not recognize the stall and failed to initiate proper recovery. He almost did not eject in time. He still is not sure whether he even swung once in the chute.

Aircraft had hydraulic leak after starting. Maintenance people tightened a fitting. A pair of pliers was left in the airframe and lodged in a way that restricted aircraft control. Tool and FOD control program did not work effectively. Quality control was ineffective also. Aircraft crashed and the crew was killed.

Considering the factors involved in the brief reviews of these accidents, one might be tempted to conclude that the pilot in the first one was lucky and the crew in the second accident was unlucky. That is too simple, though.

In the first accident, all the "operators" including the pilot tried to do him in. Not actually with malice aforethought, of course, but it might as well have been planned. The only thing that was right was the pilot's decision to eject—and that was a hair from being too late.

The second accident followed suit, except, in this case, maintenance set it up. Could not have been neater. Everyone cooperated by falling down on the job.

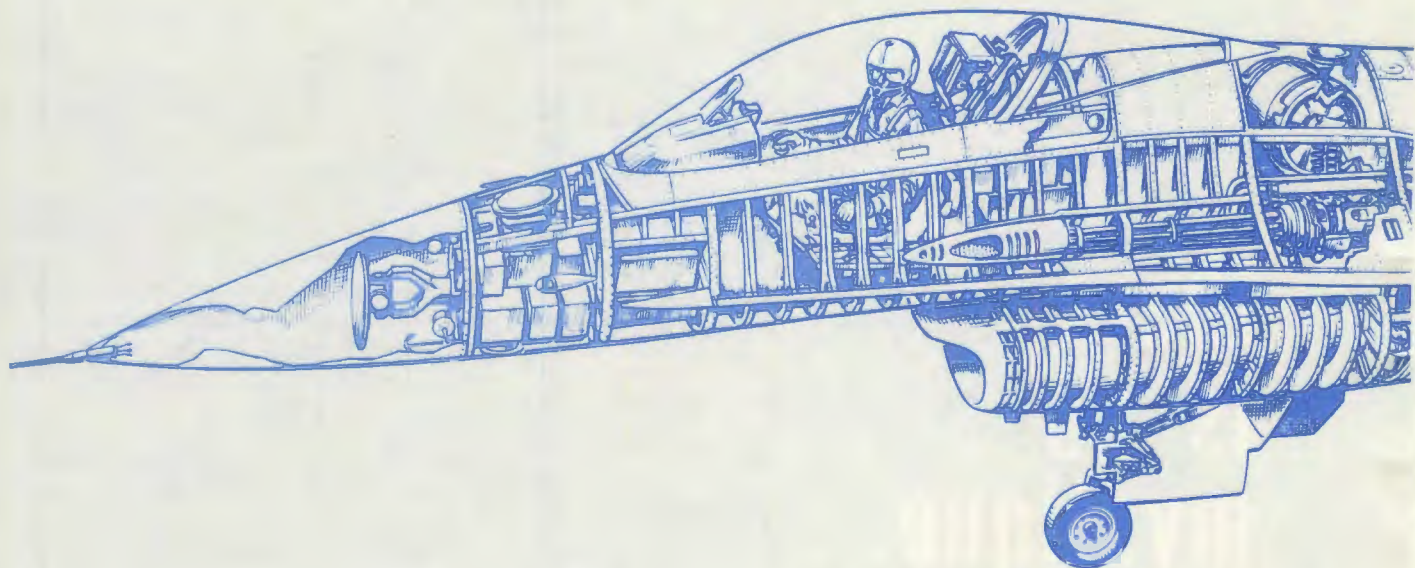
It is consistently impossible to qualify the luck factor in the chain of events that causes an accident and loss of an airplane and crew. In the final analysis, the cut of the cards does not have anything to do with it. Accident after accident shows that we make our own luck. Since people always have control over events at one stage or another, luck can be discounted. All we need to prove it is dedicated, conscientious performance.

As one of my previous bosses said:

**"THERE IS NO MYSTIQUE TO SAFETY—IT IS  
SIMPLY DOING THE JOB RIGHT."**

That is something to think about—all the time. Have a good one!

# TWENTY THOUSAND POUNDS OF FIGHTER PERFORMANCE



**W**ould you believe that an aircraft could accelerate in level flight from 0.9 to 1.6 Mach number in less than 60 seconds, complete a 360° turn in less than 20 seconds while maintaining airspeed, perform a 10,000 foot MSL level flight acceleration to above 800 knots, pull in excess of 8.5 "Gs" without overstressing the aircraft and complete a triple Immelmann all on the same flight! Well, that's the kind of performance that was demonstrated in the YF-16 during a recent test flight.

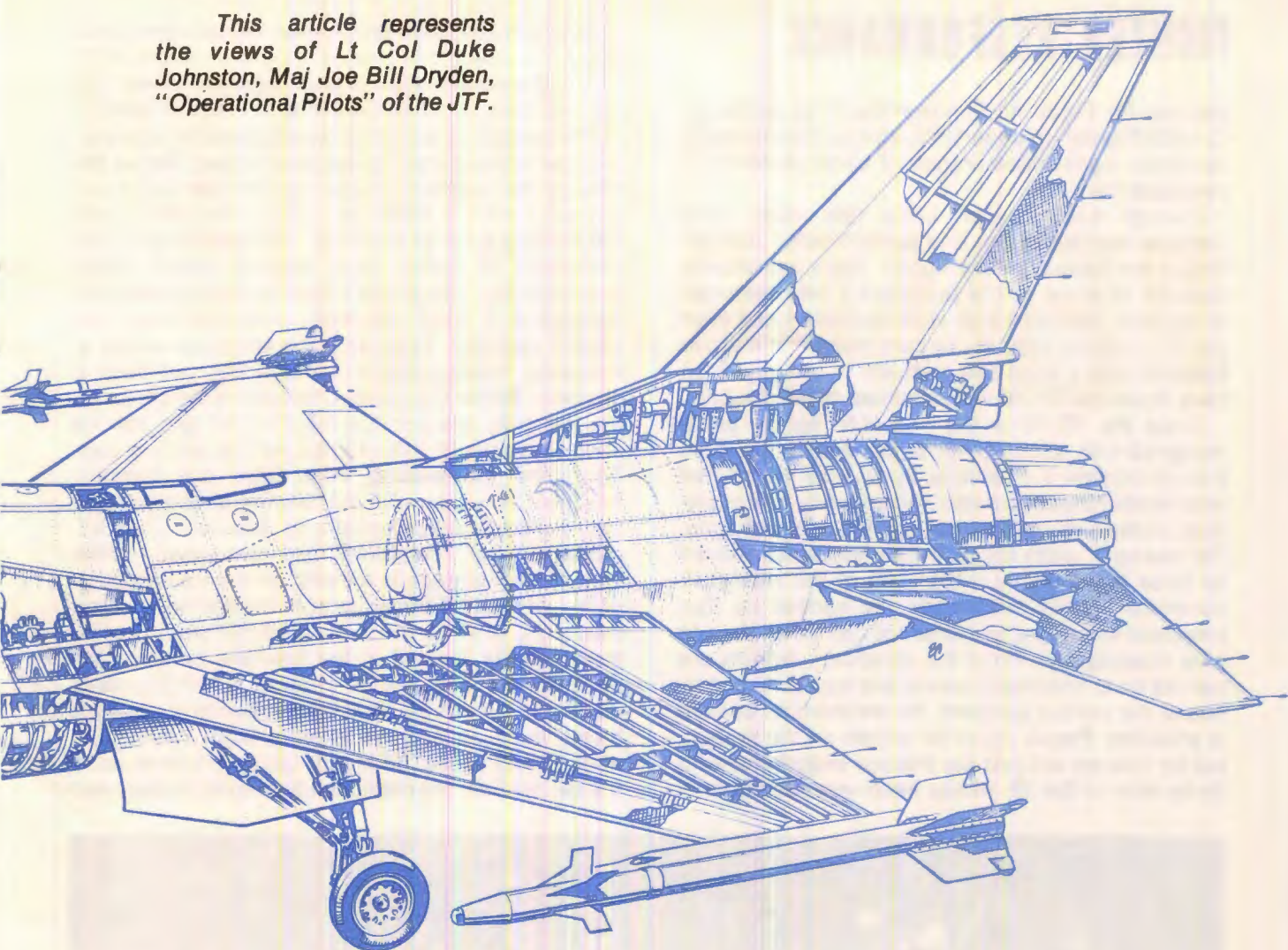
Before describing the YF-16 that was flown in the Lightweight Fighter (LWF) program, a recap of the test program is in order. In January 1974, the six Air Force pilot members assigned to the LWF Joint Test Force (JTF) were on station at Edwards AFB. The group included three test pilots and three operational pilots. Two contractors had been selected to build two each prototypes, incorporating advanced technology features, to be flown in a feasibility demonstration of a lightweight fighter.

General Dynamics Corporation designed and built the YF-16 while Northrop Corporation designed and built the YF-17. The YF-16 was first flown in February 1974 and the YF-17 was first flown in June 1974. By January 1975, 330 flights/419.7 hours had been flown on the two YF-16s and 282 flights/338.7 hours had been flown on the two YF-17s.

The concept of testing these prototypes was unique in that three disciplines (contractor, Air Force Flight Test Center, and the operational team—composed of TAC and AFTEC) participated in planning, flying and reporting. Each contractor was responsible for aircraft development. The Flight Test Center aided the contractor and was dedicated to evaluating the aircrafts' performance. A new member to the JTF concept was the Air Force Test and Evaluation Center (AFTEC) team, composed of potential using command (TAC) personnel. Their responsibility was the evaluation of the operational potential of the aircraft. The program was extremely

by Maj Dean Stickell

*This article represents the views of Lt Col Duke Johnston, Maj Joe Bill Dryden, "Operational Pilots" of the JTF.*



operational oriented as evidenced by formation being flown of both aircrafts' first flight, operational pilots flying one-third of the sorties, and flying an air combat configuration on more than 90% of the flights. Although some sorties were totally dedicated to operational elements, the majority of flights included combinations of testing required by each of the three disciplines. Great effort was exerted to fly nearly identical flight profiles in both the YF-16 and YF-17.

Emphasis during the early stages of the program was primarily on envelope expansion. However, formation, tracking and simulated instrument approaches with the chase aircraft were practically routine on even the early flights. Testing rapidly progressed to AIM-9 firings, airborne gun firings, dart firings, air-to-ground (utilizing MK-84s) and strafing. The culmination of the operational testing was a fairly extensive Air Combat Maneuver (ACM) phase flown against slatted F-4Es from the USAF

Tactical Fighter Weapons Center.

During the summer of 1974, the decision was made that a derivative of one of the LWFs would fill the role of the Air Force's Air Combat Fighter (ACF). This changed the complexion of the program from a one-year feasibility study to a competition resulting in a full-scale development program. Four Multinational Consortium countries (Belgium, Denmark, the Netherlands and Norway) entered the picture by indicating that they needed a replacement for their F-104s and they might have an interest in the aircraft selected by the USAF. During the latter part of 1974, a source selection board met to evaluate all aspects of the competing aircraft. Their findings, which were based on the results of the prototype program, contractor proposals for full-scale development airplanes, cost studies, etc., were then presented to the Secretary of the Air Force and Secretary of Defense. In January 1975, Secretary of the Air Force McLucas announced

## FIGHTER PERFORMANCE

that the Air Force had chosen the F-16 as its Air Combat Fighter. In June 1975, all four multinational countries signed Memoranda of Understanding to purchase the LWF.

Enough background. Let's talk about this machine that looks like it is going Mach 1 just sitting in the hangar. Many fighter pilots are initially dubious of some of the prototype's new features: fly-by-wire, the force side stick controller and even the 30° inclined seat. We're convinced that a trip to Edwards and a short talk with any of the guys who have flown the YF-16 will eliminate these doubts.

Since the YF-16 is the first U.S. fighter to be designed with full fly-by-wire, the system deserves a quick comment. Basically, fly-by-wire means that pilot control inputs are transmitted by electrical signals instead of mechanical cables and linkages. For example, pitch and roll commands are sensed by force transducers in the base of the side stick controller. These commands are carried by four electrical wires to a four-channel computer (four to give redundancy). From the computer, signals are carried on to command servos and hydraulic actuators at the control surfaces. No mechanical backup is provided. Pages could be written on the system, but for now we will just say that our experience with fly-by-wire in the YF-16 has been very favorable.

Aesthetically, gear up or down, the airplane looks good. It's small with a span of 30 feet, length of 47 feet and a weight of around 22,000 pounds with full internal fuel, two AIM-9s and a full load of 20mm.

The canopy is a bubble type polycarbonate with the bow located behind the pilot's head. Below the canopy the forebody strake can be observed curving out from the fuselage and blending back into the leading edge of the wing. This feature provides increased lift during high angle-of-attack (AOA) maneuvering. The single intake mounted on the underside is a fixed geometry inlet (for cost and weight savings). Even with the long taxi routes at Edwards, foreign object damage has not been a problem. Below the canopy, but above the strake on the left side, the port for the M-61A1 gun can be seen (capacity is 515 rounds). In the landing configuration, the leading edge flaps are normally drooped; however, with the landing gear retracted, they schedule automatically to give increased lift, increased "G" capability and decreased buffet. One control surface is located on the trailing edge of the wing and it serves as both the flap and aileron (flaperon). Much of the aircraft's 6,500 pounds of internal fuel is located in the fuselage between the flaperon and slab. A total of about 1,100 pounds is carried in the wings. That 6,500 pounds is good for three hours on a cross country flight cruising at altitude and above .86 Mach. Looking further aft to the tail section, the clamshell type speedbrakes can





be seen at the end of the fuselage just inboard of the horizontal stabilizer. The burner eyelids of the single Pratt & Whitney F-100-PW-100, 25,000 pound thrust class engine extends slightly beyond the trailing edge of the slab. A keen observer will ask, "Can the tail be scraped on landing?" The answer is "yes." If touchdown occurs much above 15° AOA, the burner eyelids can be touched.

The next step in our introduction is to see how the cockpit fits. We have shown the aircraft to many pilots. As they climb in and lower the canopy, their facial expressions normally leave little doubt as to the comfort of the 30° seat. Since your legs don't have the feeling that you are sitting on a park bench, your faith is restored in the designers. They really did include some pilot wishes in this bird. Obviously, the 360° visibility is a big hit! The side stick has a rather natural feel, and we all believe adaptation to it is very rapid. The fact that it is on the side and doesn't move is not a big deal. One-half inch of rudder pedal travel gives full rudder translation. Thus, instead of adjusting the pedals to insure that maximum throw can be obtained, they can be adjusted for maximum comfort. In keeping with the philosophy of a "clean and simple design," a traditional flap handle is not included. The flaperons raise and lower automatically when the gear is retracted and extended (maximum gear speed is 300 knots). The prototype includes a Heads Up Display (HUD) and a version of this HUD is planned for production aircraft. An 18-inch rail paralleling the canopy rail on each side is installed as a hand grip to aid in body movements during ACM. After sitting in the seat for awhile, its comfort becomes even more apparent. Another benefit of the seat is that the headrest is lowered by the 30° tilt. This allows good vision over, as well as around, it. We don't want to imply that the cockpit is perfect; since the aircraft is small, the forward console and panel space is at a premium. We are doing our best to locate all essential equipment on the left hand side, since use of the right console is inconvenient under certain flight conditions. It should be noted, though, that the 16 can be flown with the left hand.

Now that we've gotten our cockpit time, we're ready to see if the airplane feels as good in the air as it does on the ground. If there is still a twinge of anxiety about that side stick, fear not, for we operational guys only had a couple of T-bird (the one with the side stick) rides prior to transition to the 16. We believe the transition is no sweat. The hardest thing to get accustomed to is being able to see so much!

Anyway, starting is routine with external power being required on the prototype. A jet fuel starter is planned for the production birds. Steering response during taxi resembles that of the T-38, and is more sensitive than the F-4. No runup is required after taking the runway, and most takeoffs are accomplished in military power. Even with two MK-84s on board, a mil power takeoff is routine with the ground roll being between 4,000-5,000 feet. Clean configuration, full internal fuel afterburner ground rolls run around 1,200-1,500 feet. If dazzling the spectators or an intercept type profile is desired, then a burner takeoff is in order. After an immediate A/B takeoff, rotation to 60° of pitch will give a 200-knot climb at that attitude. That type climb is impressive, but not very effective. More suitable for an intercept is to accelerate to .75, and then start a nice smooth pull, continue past vertical to about 45° inverted, then roll out so as to maintain .9 Mach. Once you catch up with the aircraft, you will realize you are passing 30,000 feet.

During a normal mil power takeoff, rotation is started around 110 knots with liftoff occurring around 125 knots. The Environmental Control System (ECS) is unusually quiet and the first airborne observation is "Wow, the visibility!" With the gear retracted, the customary trimming to compensate for airspeed changes is not required, since the computer handles that function. This doesn't mean



# FIGHTER PERFORMANCE



that trimming is eliminated, just reduced significantly. The aircraft's roll rate compares to that of the F-4, but the roll onset or the rate at which the roll can be stopped is surprisingly high. In fact, you will probably encounter some ratcheting (over-controlled wing movement) during your first rolls, but after several attempts, this disappears. To bring your proficiency level to its peak in close formation, a short practice period may be required. The prototype is responsive. We routinely flew formation takeoffs and landings during our ACM phase. At present, air-to-air refueling is easier in the 16 than the F-4. The receptacle is located behind the cockpit. Several flight control iterations have been flown on the tanker. The latest includes reducing the flight control gains (making the aircraft less responsive) when the air refueling door is opened. This type of flight control gain change is easily handled by the fly-by-wire system. We've refueled at various conditions from 210 to 310 knots indicated, 18,000 to 31,000 feet MSL and with both the KC-97 and 135 tankers.

You are certain to find the maneuverability, acceleration, and endurance of the airplane very impressive. We'll give several examples when we cover the ACM phase. Once the gear is lowered during the recovery, trimming is required to compensate for airspeed changes. Turning final in the traffic pattern, the trim can be run full nose up, producing the desired 13° AOA for landing. AOA is primarily used during the approach, and as the aircraft enters ground effect, the rate of descent is reduced with no inputs from the pilot. A normal weight touchdown is around 125 knots indicated. The gear is stiff, but smooth touchdowns can be achieved. Basically, it's a comfortable airplane in the pattern and easy to land. Due to the thrust-to-weight ratio (at idle), moderate braking is required to continue deceleration once the nose is lowered (around 90 knots).

The small size, relatively smoke-free engine, excellent visibility, outstanding performance and maneuverability of the prototype make it a super air-to-air machine. Since radar was not installed during the ACM phase, only the visual environment was evaluated. A radar competition is ongoing and the aircraft should have a credible lookdown radar. The fire control system in the production bird will provide both tracer line and lead computing sight presentations. Armament remains oriented toward the 20mm gun and AIM series missiles. Although it

is unfair to compare the prototype with the 15-year-old F-4, most TAC folks are familiar with the Phantom and comparisons are meaningful. As we would expect, the prototype's superior acceleration and turning performance allow it to dominate the F-4. Subsonically, when idle and speedbrakes are selected simultaneously in both aircraft, the 16 slows noticeably more rapidly. Once engaged, the F-4 cannot successfully disengage or separate. As the altitude increases, the prototype's dominance also increases. We demonstrated on one flight that a single YF-16 was able to control an engagement of two F-4s above 30,000 feet. In addition, an F-4 could be engaged until reaching his bingo fuel state, then another engaged until reaching his bingo fuel state. After the two had been engaged individually and departed due a low fuel state, the prototype still retained above a bingo fuel.

We tend to resent the cluttering of the bird with external tanks, bombs, ECM pods, etc. However, a limited but very significant air-to-ground potential was demonstrated during the LWF program. Actual deliveries of MK-84s and 20mm were accomplished. We have also dropped MK-82s. The airplane was refueled and landed with an asymmetric load of one MK-84. Gun noise levels in the cockpit are higher than the F-4, and are more like the F-100 or F-104. All types of patterns and simulated deliveries were flown. The aircraft proved to be a very stable and effective weapons platform. Production aircraft will have ground attack delivery capabilities similar to those available in the A-7.

During the next year and a half, we will continue testing the prototypes until the first full-scale development airplane arrives at Edwards (around December 1976). Delivery date of the first F-16 to TAC is tentatively scheduled for January 1979. Some of the differences between the YF-16 and the F-16A are: an increase in wing area of 20 square feet (YF: - 280 square feet, F: - 300 square feet); a one-foot increase in length (YF: - 47 feet, F: - 48.06 feet); an increase in internal fuel from 6,500 pounds to around 6,900 pounds and a maximum gross weight increase from 26,000 pounds on the YF to 33,000 pounds on the F. Takeoff weight with full internal fuel in the clean configuration is advertised to remain approximately the same: 22,000 for the YF and 22,500 for the F. Flight test instrumentation accounted for about 1,000 pounds of weight in the prototypes. Production birds will include a tailhook, but like the prototypes there are no plans for a dragchute. Also, around 15% of the aircraft built for the USAF will be two seaters, F-16Bs.

As the operational pilots of the JTF, we have attempted to cover as much material in as accurate and informative a manner as possible. Obviously, the airplane is exciting, but our goal is to remain totally objective and fully aware of our (TAC's) needs. It is our belief that the F-16 will be an excellent addition to the USAF fighter inventory. ➤



## TACTICAL AIR COMMAND

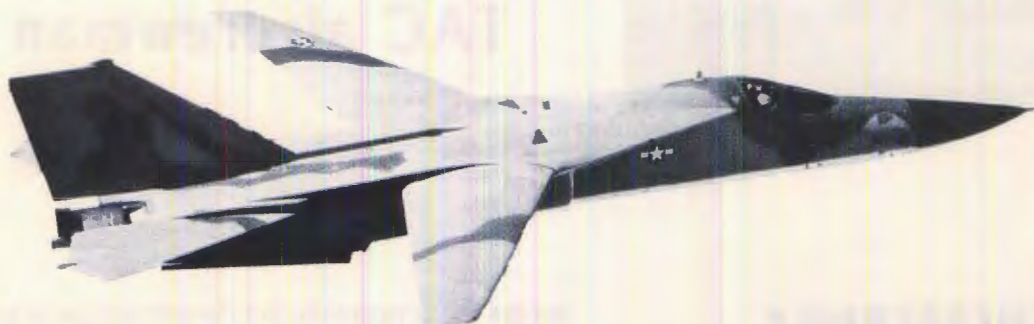
# AIRCREW MEN OF DISTINCTION



**Captain James D. Thompson**  
390th Tactical Fighter Squadron  
366th Tactical Fighter Wing  
Mountain Home AFB, Idaho



**1st Lieutenant Vic A. Sorlie**  
390th Tactical Fighter Squadron  
366th Tactical Fighter Wing  
Mountain Home AFB, Idaho



Captain James D. Thompson, Instructor Pilot, and First Lieutenant Vic A. Sorlie, Pilot Systems Operator, were flying a single-ship F-111 training mission at 480 knots and 1000 feet AGL in mountainous terrain. While flying the low altitude, high speed navigation profile utilizing Terrain Following Radar (TFR), the crew experienced what, at first, appeared to be a serious explosion in the forward nose section. Pieces of radome slammed back into the windscreen completely shattering the right-hand section. The glass panel was pulled loose from the frame for approximately 14 inches causing airblast in the cockpit. Captain Thompson disengaged the auto TFR, swept the wings forward and climbed to the prebriefed minimum en route altitude. Voice communication was difficult between the aircrew due to cockpit noise from airblast. Both primary and alternate airspeed indications read zero, angle of attack indications were fluctuating from -10 to +25 degrees, and the stall warning horn and pedal shaker were activated. Using ground speed indications from the Inertial System, Captain Thompson reduced airspeed to prevent the shattered windscreen from imploding. However, when he began to lower the slats, the aircraft abruptly yawed 30 degrees. Slats were immediately retracted in order to regain control. Because of adverse weather conditions, Captain Thompson elected to remain in an orbit at his present location. He effected a rendezvous with another F-111F

using inertial navigation positioning and ground speed readouts.

Inspection of the damaged aircraft by chase confirmed that the radome was completely shattered and had folded back onto the nose of the aircraft. Aircrew had now confirmed that damage was caused by a strike from a large bird. The windscreen had been struck by both the flailing radome and the bird. Remains of the bird had penetrated the windscreen, but the windscreen remained partially attached to its mountings.

While returning to base, Captain Thompson and Lt Sorlie rebriefed actions necessary in event of windscreen implosion. A HOTEL conference call was established between the 366th TFW/DO/CC and experts at General Dynamics to discuss possible courses of action. Decision was made to make a no-flap, no-slat approach to prevent altered airflow from possibly failing the windscreen. Upon assuming the wing position and lowering the landing gear, Captain Thompson discovered that bank angles in excess of 15 degrees resulted in extreme yaw. Despite limited visibility and by not using more than 10 degrees of bank, Captain Thompson accomplished a successful landing.

Close crew coordination, professional judgment and careful analysis of an emergency situation enabled Captain Thompson and Lieutenant Sorlie to recover a valuable tactical fighter aircraft. They have been selected for this month's Tactical Air Command Aircrewmembers of Distinction Award. ➤

# TAC TIPS

BETTER BEANS AND BACON IN PEACE  
THAN CAKES AND ALE IN FEAR.

AESOP

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

## GROUND EMERGENCIES...

After completion of the gunnery mission, the Phantom's right engine was shut down in the dearm area. The pilot was part way through a right turn into the taxi space between two rows of aircraft when the aircraft stopped responding to nose gear steering commands. Brakes were applied with no results and the aircraft headed toward a parked Phantom.

The pilot centered the rudder pedals, reengaged nose gear steering, and reapplied rudder with no response. Seeing that collision was imminent, the pilot lowered the tail hook to alert ground personnel to his problem. The WSO, who had been looking to the rear to see if a maintenance vehicle was following, turned forward and saw the parked aircraft ahead. He also depressed the brakes and found them inoperative.

The F-4 struck a fire extinguisher, a maintenance stand, and then the parked Phantom, causing extensive damage to the parked aircraft.

Cause of the problem was a massive utility hydraulic leak from a ruptured utility hydraulic brake fuse (due to metal fatigue).

A few other facts also surfaced. The pilot had his mask off, was "cold mic" and could not alert the WSO of his problem. As a result of this accident, TACM 55-4 has been changed to require both crewmembers to maintain hot mic communications while taxiing in a congested area.

Another problem was that the pilot didn't recognize

the utility hydraulic failure until just prior to impact. Because of this, he did not actuate the emergency brake system. This could be a training problem. In the simulator, how many times have you practiced utility failure on the ground? When was the last time you sat in the aircraft and thought about what you would do if you lost utility hydraulics or had a hard-over nose gear steering malfunction when taxiing? TAC has the best jocks in the world, but most of us are geared to inflight, takeoff or landing emergencies. Don't get caught short—practice ground emergencies too.

The Phantom doesn't give you any warning if you lose hydraulics when one engine is shut down. Once an engine is shut down, the "Check Hydraulic Gauges" and "Master Caution" lights illuminate when the PC system corresponding to the shut-down engine drops to about 1,500 psi (plus or minus 100 psi) and the utility pressure stops. Subsequent failures don't illuminate any other warning lights. Besides, who taxis with their eye-balls caged on the hydraulic gauges? So if you notice the nose gear steering isn't working, quickly check your utility pressure and brakes. If you have a problem, get the emergency brakes going. Remember—use a smooth steady application, as you don't want to pump all that nice emergency hydraulic fluid overboard.

All emergencies don't happen in the air. Take some time to practice those that can get your adrenaline going on the ground. Learn those seemingly innocent *non-boldface* procedures... you may not have time to look up the answer to a big problem.



## HAMMER OF THOR

Recently, TAC had two aircraft incidents caused by phenomena associated with thunderstorms. One involved a four-ship formation of Phantoms, the other involved a lone Aardvark.

While flying in cirrus conditions and descending through 12,000 feet, the F-4 aircrews observed a bright flash, but no indications of a lightning strike were evident. After landing, all four aircraft were found to have lightning damage. Lightning first struck lead and exited via the trailing edge wing tips. It then proceeded to go through all aircraft in the flight—chain reaction style. This time old Thor got four aircraft with one bolt.

At the time of the lightning strike, the nearest thunderstorm was 20 miles west of the route of flight. What happened? No one knows for sure, but it is relatively common that aircraft can trigger lightning. The electrical charge an aircraft can build up is caused by impact of particles, ranging from haze and tiny ice crystals to large rain drops. The larger the aircraft and the faster it flies, the more particles it will impact, thereby generating a higher charge. If the cloud is electrically active, even though not producing natural lightning, aircraft passing through may trigger a strike. This is what may have happened here. Fortunately, damage to all F-4s was limited.

The other unusual incident involved the F-111. It suffered hail damage. Nearest thunderstorm? Ten miles—and the aircraft was flying in the clear. Damage was minor, but could have been much worse. Hail damage is known to occur as far as 25 miles from a thunderstorm if conditions are right. This is infrequent—but it can happen.

Thunderstorms have a variety of weather phenomena associated with them—all bad as far as pilots are concerned. Give Thor a wide berth at all times—don't let him hammer you.

# PITCH FEEL TRIM SYSTEM AND ASSOCIATED MYSTERIES

by Pete Garrison, Chief Experimental Test Pilot  
McDonnell Aircraft Company  
Reprinted from "Product Support Digest."

*An RF-4C recently experienced a major over-G due to leakage in the bellows system which caused a low pressure in the bellows. This condition is very insidious since some of the "No Bellows Pressure" cues mentioned in the Dash 1 are not available and the consequences may be nearly as bad.*

*Back in 1971, McDonnell Aircraft Company published the following article about the F-4's pitch feel trim system in their "Product Support Digest." It's an excellent discussion of bellows malfunctions and what the aircraft will do as a result of this malady. The folks at McDonnell gave us their permission to reprint it, so here it is. Hope you enjoy it as much as we did and learn a little more about the Phantom's control system.*

A recent flurry of paper (including a report of an unplanned 9 'g' maneuver), plus a prod from the boss, has once again prompted me to impose my prose on you unsuspecting captives of the "Fly Safe Required Reading File."

Since the day the slip stick boys admitted they couldn't control supersonic kiddie cars with piano wire and pulleys, they have confused, confounded, and antagonized us lesser beings with a bewildering array of suspicious devices intended to

convince the unsuspecting pilot that a 50,000-pound bullet is as docile as the family flivver. This is fine as long as things work as advertised; however, when they don't, well, that's the point of today's lecture.

First, a brief history lesson on the subject of aircraft control systems! When Orville and Wilbur took to the air, they discovered that lo and behold, the faster they flew, the more difficult it became to move the pole, and they so recorded this fact in Mil Spec 000.00. Many years and many aircraft later, when the F-4 was conceived, the use of a "speed/force sensor" in the form of an air bellows had been used in several fighter aircraft. By feeding this "sensor" information into the F-4 feel system, Mil Spec 000.00 seemed satisfied until it was discovered that too much force was being produced. In order to reduce some of the force, a very perceptive decision was made: punch a hole in the bellows to let some of the pressure out! Well, that helped some, but if the hole was made large enough to make supersonic stick forces reasonable, the low speed stick forces were too light - so - a venturi (convergent-divergent nozzle) was plugged into the pressure pickup line. This gadget has the characteristic of "choking" at high speeds so that no more pressure can be generated downstream even though speed is increased above "choke" speed. The overall fix had the additional advan-

tage of being a "flowing" system (air constantly moving through it) so that it would promptly ice up if exposed to the proper flight conditions. (You're right! A heater around the inlet and the venturi!)

So much for the history lesson. Now let's take a look at the system as it is today, and what you can expect from it. In fact, I want to take a look at it from the standpoint of what *you* do when it doesn't do quite what it should.

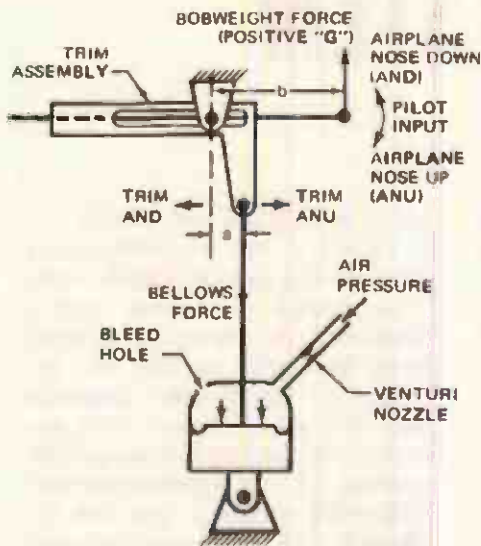
The schematics of Figures 1 through 3 illustrate what I'll call the "Garrison version" of how the system is tied together. Although it may not be geometrically perfect, it does enable me to picture what goes on in the back end of this beast. With reference to the illustrations, I'd like to make the following observations which can help analyze the problems I'll discuss a bit later —

- The bobweight force is always pulling the stick forward at positive 'g' (greater than 0) and pulling the stick back at negative 'g'.

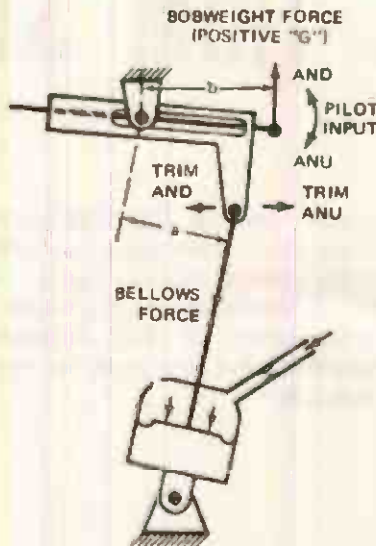
- In trimmed flight, the bobweight force is balanced by the bellows force. The pilot trims the trim assembly back and forth as airspeed changes the bellows force (i.e., changes dimension (a) with a corresponding change in cockpit indication).

- The bellows is always pulling back on the stick in trimmed flight. **However, it is important to note that as the stick is deflected from trim, the bellows**

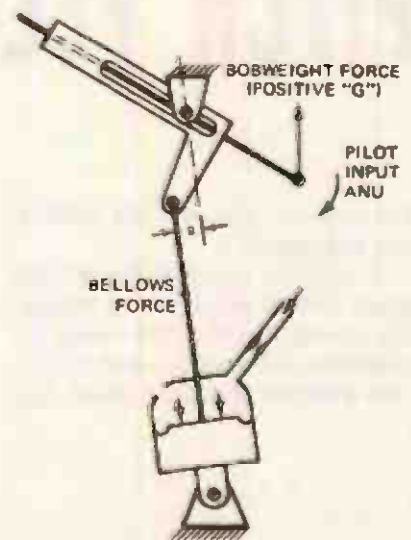
**FIGURE 1 TRIMMED CONDITION AT HIGH SPEED**



**FIGURE 2 TRIMMED CONDITION AT LOW SPEED**



**FIGURE 3 AIRCRAFT NOSE-UP STICK DISPLACEMENT FROM TRIM**



(Figures 1 and 2)

1. Dimension (a) changes with trim.
2. Dimension (b) does not change with trim.
3. Cockpit trim indicator shows position of trim assembly.
4. Bellows force is balancing bobweight force.

(Figure 3)

1. Dimension (a) changes as control stick is deflected from trim.
2. Bobweight force increases as "g" increases.
3. Both bellows force and bobweight force are opposing stick motion.

is very quickly opposing the stick motion, regardless of the direction the stick is moved.

- The maneuvering stick force the pilot feels is the result of both the bobweight and bellows forces.

I'm going to confine the remainder of this dissertation to the bellows system since it seems to be the most maligned. The chart on page 14 pretty well details my personal observations about the system and once again, a quick look at the illustrations will help tie down questions.

So what if you find yourself with any of the symptoms outlined? What next? Your handy dandy checklist is the "bible," but let me try to shed some light on the "why" in each situation.

#### OVERPRESSURIZED BELLOWS

The character of the problem here depends on when the bleed hole decides to plug up. If it's plugged prior to takeoff, no particular problem exists, except

the excessive nose-down trim requirement and the slightly higher stick forces. However, if the bleed hole should suddenly unplug in flight, a nosedown transient will result. Conversely, if the bellows were normal at takeoff, but suddenly plugged in flight, a noseup input would occur. (The resulting stick forces can always be trimmed out.) The magnitude of these unwelcome pitch motions would, of course, be determined by the flight conditions when they occur.

Generally, the higher the indicated airspeed and the lower the altitude, the more severe the "bump." The "bump" alone won't be enough to cause anything except a mild heart attack unless you get to jabbing the stick around in response to the motion. This is one place where the guy with the slower reactions will probably come out ahead.

#### NO BELLOWS PRESSURE

This one can cause a couple of problems. First, the longitudinal

control is going to be more sensitive. It's flyable, but apt to really bug you, particularly if the CG is a bit aft and/or wing stores are loaded; just stay with it. The second is more insidious and a real potential hazard. If the bellows should suddenly repressurize while you're flying merrily along with full nose-up trim, particularly at high indicated airspeed, you're going to have one of those "moments of stark terror" when the old pole slams back in your lap (nose-up)! Now the "bible" says: with bellows failure, trim to neutral. This will approximate most high speed trim positions so that in the event the bellows force does come back, it won't pull the stick nearly as hard.

Remember, since the bellows is dead, trimming from full nose-up to neutral shouldn't significantly change the pull force you have to hold since the bobweights can't be trimmed out. (In reality, it will get slightly heavier as you trim toward neutral since

# PITCH FEEL TRIM SYSTEM

full nose-up will trim out a bit of the bobweight.)

A bellows rupture should not be as critical since you're probably going to be pretty close to trim when it happens; and as you can analyze, the only force you

should feel is the bobweight force nose-down (approximately three pounds in 1 'g' flight). I'm sure it would be a bit of a shock if it happened at high indicated airspeed, but it should be controllable.

## LOW BELLOWS PRESSURE

Here's a real bummer since some of the cues available in the "no pressure" case aren't available, but the consequences may be nearly as bad. To explain: A low bellows pressure will still allow normal trim, except it will be more nose-up than normal. If the lighter-than-normal stick forces or the trim indicator don't alert you, you will go merrily on your way with the trim mismatched; and if the bellows should suddenly repressurize, it's "wa-hoo" as explained in the "no pressure" paragraphs. If it simply continues to leak, the maneuvering stick forces will be lighter than normal and could cause a bit of over-control.

In closing, I'd like to give a quick opinion on autopilot operation with a bellows problem, particularly with no bellows pressure. As long as the bellows stays unpressurized, you can probably get normal autopilot operation except that the auto trim will keep running full nose-up. The autopilot will hold this force okay, but once again, if that bellows should suddenly repressurize - baby, I don't want to be along. I strongly suspect that the autopilot would be instantly overpowered with subsequent rather violent pitch oscillations. That's just an opinion, verified by talking to a couple of the "smart guys", and if someone out there can prove me wrong, I'll gladly take my lumps. In the meantime, I'll leave the autopilot alone if I'm faced with a bellows problem.

MALFUNCTION	PROBABLE CAUSE	SYMPTOMS TO PILOT
OVERPRESSURIZED BELLOWS	(1) BLEED HOLE PLUGGED UP.	(1) LONGITUDINAL STICK FORCES SLIGHTLY HIGHER THAN NORMAL. (2) TRIM POSITIONS SLIGHTLY MORE NOSE DOWN THAN NORMAL AT ANY GIVEN FLIGHT CONDITION.
NO BELLOWS PRESSURE	(1) PLUGGED AIR INLET LINE, I.E. ICE, BUGS, INLET PROBE COVER, ETC. (2) RUPTURED BELLOWS SKIRT.	(1) LIGHT LONGITUDINAL STICK FORCES (SENSITIVE AIRPLANE). (2) 1 'g' TRIM POSITION IS FULL "AIRPLANE NOSE UP" WITH STICK STILL TRYING TO MOVE SLIGHTLY FORWARD. THE BOBWEIGHT FORCE CANNOT BE COMPLETELY TRIMMED OUT, HENCE THE PILOT WILL PROBABLY USE FULL NOSE UP TRIM ATTEMPTING 1 'g' TRIM!
LOW BELLOWS PRESSURE	(1) RESTRICTION IN AIR INLET LINE. (2) LEAK IN BELLOWS SKIRT.	(1) LIGHTER THAN NORMAL STICK FORCES. (2) TRIM POSITION MORE NOSE UP THAN NORMAL AT ANY GIVEN FLIGHT CONDITION.



# TAC

## SAFETY AWARDS

### Maintenance Safety Award

Sergeant Edward E. Kittrell, Jr., 23d Field Maintenance Squadron, 23d Tactical Fighter Wing, England Air Force Base, Louisiana, has been selected to receive the Tactical Air Command Maintenance Man Safety Award for this month. Sergeant Kittrell will receive a certificate and letter of appreciation from the Vice Commander, Tactical Air Command.



SGT KITTRELL

### Crew Chief Safety Award

Staff Sergeant Richard I. DeShong, 4th Organizational Maintenance Squadron, 4th Tactical Fighter Wing, Seymour Johnson Air Force Base, North Carolina, has been selected to receive the Tactical Air Command Crew Chief Award for this month. Staff Sergeant DeShong will receive a certificate and letter of appreciation from the Vice Commander, Tactical Air Command.



SSGT DeSHONG

# Awards



**Major General Benjamin D. Foulois**  
9 December 1879—25 April 1967

Major General Foulois, a military aviation pioneer, enlisted in the Army in 1898. He served in Puerto Rico, Cuba, and saw action in the Philippines. General Foulois was the first commander of a tactical air unit during the Mexican Punitive Expedition where he became the first man to use an aircraft in combat.

General Foulois, who never held the rank of Colonel and was twice promoted to the rank of Brigadier General, devised tricycle landing gear for aircraft, invented the seat belt, and designed the first receiving set ever used in the United States in an aircraft. A man whose life spanned aviation history from the Wright Brothers to the astronauts, General Foulois greatly contributed to the advancement of American military aviation.



TAC earned the Daedalian's Major General Benjamin D. Foulois Award for having the most effective accident prevention program in 1974. In this case TAC stands for the collective efforts of you, the people maintaining and flying the birds. People like you make up the TAC team that prevents accidents. This is your award and you can be justifiably proud of the honor it accords.

TAC won this award only once before, in 1958. A comparison of accident statistics in TAC for 1958 and 1974 sheds some light on how far we have come in the business of aircraft accident prevention. Last year TAC flew about 600,000 hours with an accident rate of 3.2. In 1958 TAC flew about 125,000 hours more than in 1974 and ended up with an accident rate of 16.9. Last year TAC had 19 major aircraft accidents. In 1958 we experienced 123. In 1958, our high-time fighter, the F-100, flew 236,554 hours and was involved in 88 major accidents producing an aircraft accident rate of 37.2. Last year our high-time fighter, the F-4, flew 186,705 hours with 7 accidents. This gives the aircraft a rate of 3.7—one-tenth of the 1958 figure for the F-100. If these statistics seem misleading, take a look at the Air National Guard F-100 record last year—86,808 hours, 9 accidents and a rate of 10.4. Even though the aircraft were 16 years older than in 1958, these figures show a rate reduction of about 70 percent.

Why? We could cite many reasons—improved aircrew training, aircraft technology, and quality control to name just three, but the big factor is people like you—the guy behind the gun. Paperwork never prevented a single accident—people prevent them.

All of us at TAC Headquarters salute you for your outstanding accomplishments in 1974.



## KOREN KOLLIGIAN, JR. TROPHY

Captain Nicholas H. Hobbie, Jr., deceased, 64th Fighter Weapons Squadron, Nellis AFB, Nevada, has been named the winner of the Koren Kolligian, Jr. Trophy for 1974. The Trophy was established in 1958 by the Kolligian family in memory of the late Lt Koren Kolligian, Jr., who was declared missing on a T-33 flight off the California coast on 14 September 1955. The trophy, symbolic of an Air Force jet pilot, is presented annually to the aircrew member who responded most successfully to an inflight emergency.



Captain Nicholas H. Hobbie, Jr.

## Citation to Accompany the Award

Captain Nicholas H. Hobbie, Jr., is awarded the Koren Kolligian, Jr. Trophy (posthumous) for his extraordinary feat of airmanship while flying as an Instructor Pilot on 6 December 1974.

On that date, during an air combat maneuver, the ejection seat of the front seat pilot malfunctioned, thrusting and immobilizing the pilot and seat survival kit against the control stick, causing the aircraft to enter a rapid dive. Using both hands to pull on the control stick, Captain Hobbie brought the aircraft under control and realizing the inability of the front seat pilot to safely eject, elected to land the aircraft. Without engine or flight instruments due to cockpit modification, using ground reference only, Captain Hobbie successfully returned to the home base and executed a flawless approach and landing.

Through his superb airmanship and humanitarian regard for his fellow aircrewman, in the dedication of his service to his country, Captain Hobbie reflected great credit upon himself and the United States Air Force.



General David C. Jones, Chief of Staff,  
USAF and Mrs. Nicholas H. Hobbie, Jr.



# FLEAGLEGRAM

## RESPONSES FROM THE FRONT

Dear "FLEAGLE",

In the April 1975 issue of *TAC ATTACK* magazine, page 14 is a short article entitled "Throw a Quarter on the Grass" which caught my eye. The survival kit appears to be the same RSSK-8 Rigid Seat Pan which is installed in our A-7E Corsairs. Much to my surprise, the advice given by the "Good Guys" at the 354 TFW Life Support Branch on deployment of the kit overland is in direct conflict with the Navy A-7C, A-7E NATOPS Manual, NAVAIR 01-45AAE-1, page 5-13. Our manual states: "If landing on land is assured, do not release the survival kit since it can provide protection for the lower backside." There was a case at our home station, NAS Lemoore, California, which vividly illustrates the advantages of following the Navy procedure. The pilot landed in a vineyard following ejection and, but for the protection of the seat pan, would have had a lower torso orifice penetrated by a grape stake! The stake penetrated about half way through the seat pan.

It would seem that those of us in the Navy and Air Force flying the same aircraft (A-7, F-4) should be using the same procedures in cases of identical equipment. I would also presume that some study has been conducted to arrive at a given procedure thereby lending a measure of credibility to the procedure. Are such procedures discussed between the Air Force and Navy? If not, I submit that they should be!

Best regards and keep producing the first class magazine that is *TAC ATTACK*.

LONDON G. COX, JR.  
LCDR, USN  
Safety Officer  
Attack Squadron NINETY-FOUR  
Fleet Post Office  
San Francisco, CA 96601

Dear Swabby,

*There are several differences between the RSSK-8 kit used in Navy A-7Es and the Koch 140000-135 kit used in USAF A-7Ds. The RSSK-8 (NAVAIR 13-1-6.3) is strictly a manually-deployed kit, while the 140000-135 (T.O. 1A-7D-2-2) has an automatic deployment feature. With "auto" selected on the kit mode selector switch, the kit will be deployed by a sensing cable 4.0 seconds ( $\pm$  1.0 seconds) after parachute opening. With "manual" selected, the kit must be deployed manually during parachute descent. There are additional design differences between the kits, but this is one of the main ones that concerns the pilot. This info is also basically true for kits used in Navy F-4s versus those used in Air Force F-4s. Ours are automatic, yours aren't.*

*The Air Force has found that the automatic deployment feature is a good thing to have in a survival kit. Statistics show that about 20 percent of the aircrews who land on undeployed kits receive serious to fatal injuries; the most common being fracture of one or both femurs due to the "leverage" effect of the front edge of the kit. For this reason the Air Force personnel parachute manual (T.O.*

14D1-2-1), emphasizes getting the kit deployed before parachute landing fall. With the "auto" feature, the kit will open even if the pilot is incapacitated during ejection.

It should also be noted that Air Force procedures for tree landings call for deploying the kit and jettisoning it prior to going into the trees, as the risk associated with landing on an undeployed kit is considered greater than the risk of injury due to tree entanglement. For overwater ejections, the kit is also deployed. It's better to have an inflated raft waiting for you than to trash about in the water trying to open the kit. An incapacitated pilot would be likely to sink rather quickly with an undeployed kit attached to his harness. T.O. 14D1-2-1 was recently rewritten, with inputs from the Air Force Safety and Inspection Center, Major Air Command Life Support Branches, experienced pilots and some highly

proficient parachutists. A bunch of actual experience was also considered when survival kit procedures were formulated. Ejection data has proven the procedures effective.

The uncontested sensitivity of lower torso orifices to grape stakes is one of those things according to our penetrating analysis) that simply must be endured, although the end result for the "stake-ee" can be sharply disconcerting. We have it on good authority that exposure to MIGs, SAMs and ground fire can, in some cases, markedly increase lower torso orifice rigidity. Perhaps a training program is the answer.

Although USAF hasn't had any recorded instances of pilots landing in grape arbors, one ejectee did parachute into a zucchini patch. He was squashed.

Fleag

Dear Fleagle

Our T-39 was cleared onto Rwy 25 at Home Plate. While holding in place on the runway, I noticed what looked like paper on the runway approximately 1,000-1,200 feet ahead. Watching the "paper" I noticed it was moving in several directions (wind was calm). We finally determined the "paper" was, in fact, birds. Although we had been cleared for takeoff, we elected to hold. After repeated calls to Tower and Base Ops, the Ops vehicle was launched. Minutes later the birds were gone, the Ops vehicle was gone and we were airborne. Trip was uneventful. Had we not noticed the

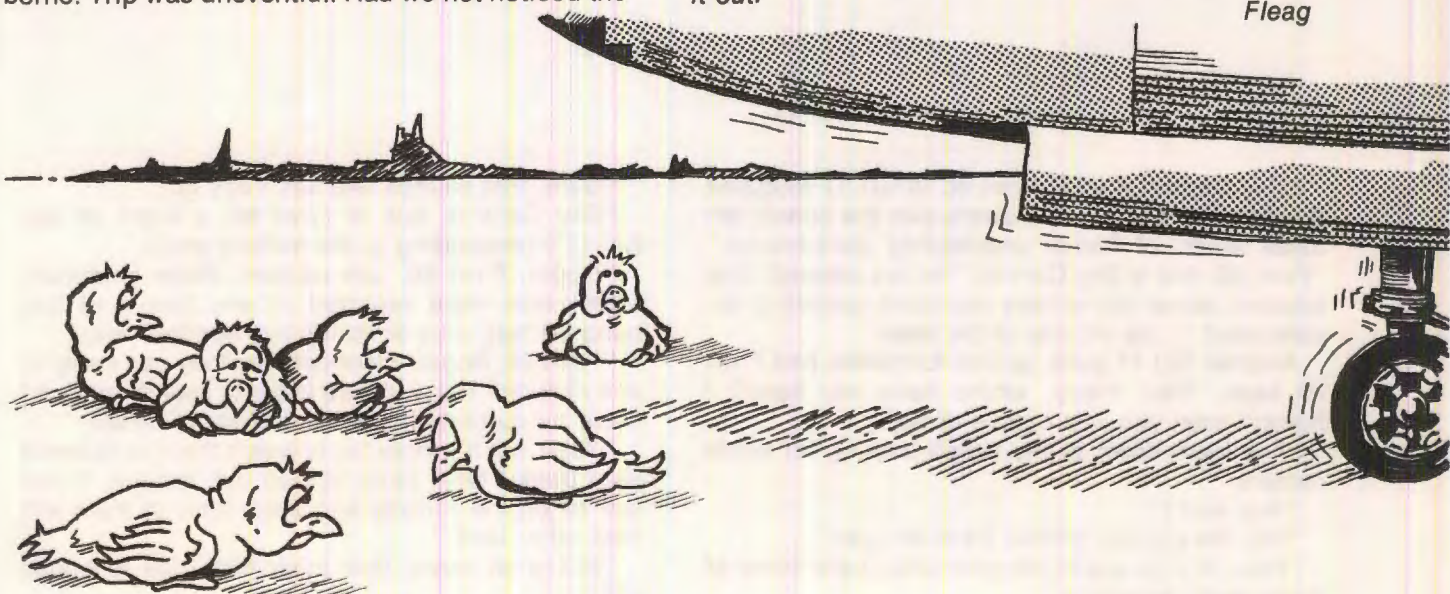
"paper" and questioned its presence, we could have "swallowed some of our feathered friends" and had an exciting day.

Da're

Hello Da're,


My feathered friends salute your wise decision to avoid involvement with a "paper bird." Most jocks are aware of the hazards of birdstrikes during flight, but forget about the dangers of bird/air-machine collision on takeoff. My TAC ATTACK buddies tell me they are going to give all of us a "bird's-eye view" of the birdstrike problem in this issue—check it out!

Fleag



# BIRDS, PLANES VIE FOR THE SKY

by Capt Marty Dunn  
Myrtle Beach AFB SC



"Sky Control, this is Fowl 46 (a GU-11 modified B-1rd), a flight of 26 GU-elevens over the beach, ten miles south of Myrtle proceeding northbound."  
"Fowl 46, this is Sky Control. You are cleared. Use caution: numerous military monsters operating uncontrolled in the vicinity of the base."

Another GU-11 pulls up into formation and Fowl 46 says, "Hey, Harry, where have you been? I haven't seen you in a couple of days."

"I've been down to the beach looking for some oysters."

"Any luck?"

"No, the tourists picked them all over."

"Hey, let's fly out to the base and chase some of those metal monsters."

"Sure, that sounds like fun. Let's go."

"Sky Control, this is Fowl 46, a flight of two GU-11's proceeding to the military maze."

"Roger, Fowl 46. Use caution: those aluminum albatrosses were reported at one thousand five hundred feet, plus or minus two hundred feet."

"Fowl 46, Roger. I wonder why they can't stay at one altitude? Harry, it sure is fun to soar through all these air currents those iron odysseys create."

"Yeah, but it's more fun to watch them try to avoid us. I think I have them figured out, though. If you just sit on the runway and wait, none of them will take off or land."

"But what about that truck that tries to chase us?"



"You mean that truck with the phony noisemaker? You don't think those humans really believe that awful noise sounds like a distressed gull, do you?"

"I don't know, sometimes those humans are really dumb."

"No sweat with that truck. If you take off just before it gets to you and land right behind it, they never get us off *our* property, and it *really* gets them mad."

"Did you hear that they have a new one of those monstrosities they call the Eagle? They say it can accelerate straight up!"

"Yeah, but it sure can't dive or maneuver like Jonathan Livingston."

"Fowl 46, this is Sky Control. You have an Alpha Seven at your beak position and another at your left tail feather, closing."

"Roger, Tally-ho. See him, Harry? Remember now, fly straight at it until you see the whites of the pilot's eyes, then fold your wings and dive. Watch him try to avoid us!"

"I think some of those iron uglies can fold their wings, also."

"Yeah, but I dare any of them to try it in the air."

"You'd better be careful. You know last year ol' Joe got splattered all over the runway by one of those brown bombers."

"That's because he tried to outrun one of them."

"Here they come! Dive, DIVE! Look at them try to

climb and turn!"

"Sky Control, this is Fowl 46. We just made those iron irritants turn to avoid us."

"Fowl 46 on final for a concrete 35 landing."

"Rog, Fowl 46. Cleared to land, report feet down. Let us know how many of those little ugly fellows have to go around."

"Fowl 46, feet down, knees locked."

"Hey, Harry, let's just sit here on this concrete and wait for that stupid truck. You know, you'd think those humans would stop flying those loose formations of nuts and bolts they call aeroplanes and leave the flying to those of us God gave wings to."

"Yeah, it was bad enough when we allowed them to drive those metal monsters they call automobiles on those rubber rollers down macadam routes, but these flying machines are getting downright dangerous."

*In all seriousness, birdstrikes present a hazard to everyone involved in flying. 465 birdstrikes, accounting for one fatality, three major aircraft accidents and four million dollars of damage occurred in the Air Force in 1974. (TAC aircraft hit 47 of our feathered friends.) They occur roughly at the rate of 30 per month, and one out of 120 results in an accident. Gulls are responsible for a large portion of the birdstrikes—20 percent from 1967 to 1971. Even if you don't fly around in an area that has gulls, all birds pose a problem. The energy dissipated during the instant of a birdstrike is tremendous—a two-pound bird hitting an aircraft at 400 knots produces an impact force of about 32,000 pounds! The following tips could prevent Harry or one of his friends from entering your cockpit as an unmanifested passenger:*

- Don't fly at low altitudes/high speeds unless the mission dictates. Cruise above 10,000 feet AGL when possible.
- Report all birdstrikes and sightings of large bird concentrations. A quick radio call can keep your buddy from flying into the flock.
- Keep your visor(s) down.
- Many birds, especially migrating waterfowl, dive when they see aircraft. A quick climb is usually your best bet.

# CHOCK TALK

chock talk

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

## PRUSSIAN BLUE — AND YOU

Another command noticed that many egress sections were not correctly complying with the requirement to possess Prussian blue marking dye, which is used in the initial installation of some ejection seat cartridges. This deficiency can lead to very serious consequences due to the inability of egress personnel to verify that newly installed cartridges are correctly seated.

To briefly explain the purpose of how Prussian dye is used, let's take a look at TO 1F-4F-2-5, para 4-123: Catapult Gun Firing Mechanism and Primary Cartridge (New Installation)

1. Carefully remove cartridge and inner barrel retainer from cartridge container.
2. Place new water seal on cartridge.
3. Carefully install cartridge in breech.
4. Apply a thin coat of Prussian blue to bottom of firing mechanism body.
5. Install firing mechanism and inner barrel retainer in breech by hand at least three revolutions to prevent cross threading. Torque firing mechanism to 275-inch pounds with socket.
6. Place a pencil mark on the large hex nut of firing mechanism body and a corresponding mark on inner barrel retainer.
7. Remove firing mechanism from breech, counting number of revolutions required to remove mechanism.
8. Record number of revolutions.
9. Check top of cartridge for Prussian blue transfer from firing mechanism. Prussian blue marks, the size of the firing mechanism, should have transferred to top of cartridge.
10. If transfer does not occur, firing mechanism has not bottomed on cartridge. Check for obstructions or replace cartridge and/or firing mechanism.
11. Clean all Prussian blue stains from top of cartridge and bottom of firing mechanism with acetone.
12. Carefully install cartridge in breech.
13. Install firing mechanism and inner barrel re-

tainer in breech by hand at least three revolutions to prevent cross threading. Continue counting revolutions and torque firing mechanism to 275-inch pounds. (Quality Assurance).

14. Check alignment of pencil marks on firing mechanism. The pencil marks must be approximately in alignment and number of revolutions required must be the same as recorded in step 8.

As can be seen from the above summarized steps taken from the TO, this check insures that the firing mechanism body and cartridge are in correct contact. Some egress sections have considered that the pencil marks alone are adequate. This is *not* so. The pencil marks indicate where the firing mechanism stops its movement, which could be caused by a crossed thread. Only the Prussian blue proves that the mechanism abuts the cartridge. Without a good contact, a space could be left between the assemblies, which would prevent the firing pin from contacting the cartridge upon firing. Therefore, where the TO dictates that Prussian blue will be used, these requirements must be strictly adhered to.

Check your shop and make sure you have (and use) Prussian blue marking dye.

## BATTERY FIRE

After making a low approach, the Phantom crew noticed fumes in the cockpit. They selected 100 percent oxygen and cabin pressure was dumped. On final for a full-stop landing, the rear cockpit filled with smoke.

Cause of the incident was the battery. It caught fire internally and spilled acid overboard into the battery compartment. The connector strap on the third cell connection point had a missing screw head which allowed the strap to work loose. It is suspected that this loose connector allowed the battery to arc internally and cause the fire.

It's pretty easy to get complacent about something as common and reliable as a battery, but this little item has all the properties of a time bomb if it doesn't receive proper servicing and preventive maintenance. Sometimes it's the little things that do you in.

**OOPS!**

SORRY GANG, BUT WE GOOFED IN THE JULY ISSUE. ON PAGE 9, WE MENTIONED THE "NATIONAL DATA COLLECTION" SYSTEM. THIS SHOULD HAVE READ "MAINTENANCE DATA COLLECTION (MDC)" SYSTEM. ED

## COMMUNICATIONS GAP

The Phantom's engine start and flap check proceeded normally. Pilot requested and received clearance from the crew chief via the intercom to cycle the flight controls. When yaw aug was engaged during the ARI portion of the flight control check, the rudder failed to move the required 5 degrees further to the left. The same malfunction occurred when rudder was moved to the right.

The pilot centered the controls and paused for approximately 15 seconds while he pondered the discrepancy. He then announced that he would try the control check again, and he moved the stick to the right. Unknown to the pilot, the crew chief had gone under the left aileron after the pilot had previously centered the controls. The left aileron caught the crew chief's headset between the aileron and the aft portion of the outboard tank. The crew chief pulled backwards and freed himself—but did not notify the aircrew of the incident or that the left aileron was damaged. It was not until the aircraft was ground aborted for other maintenance difficulties that the crew chief told the pilot what had happened.

Luckily, the crew chief was not injured, but it was a close one. The necessity for accurate communications is in the news often these days. Nowhere is it more important than between aircrew members, or aircrews and crew chiefs—where a life may depend on it.

## YOU CAN LEAD A HORSE TO WATER, BUT—

The egress specialists were dispatched to remove the aft bucket seat assembly from the Phantom. When the number two specialist entered the cockpit to remove the bucket seat assembly, he failed to notice that the safety pins were not installed in the seat. Upon removing the survival kit firing lanyard from the guillotine firing mechanism, he lifted up the emergency harness release handle and fired the guillotine cartridge.

This incident happened in another command, but TAC personnel are not immune to this type of inci-

dent. Human error accounts for a large percentage of our accidents and incidents each year. Failure to use tech data, rushing the job, interrupted checklists—you've seen them all.

The technician involved in this incident was lucky. His failure to use tech data could have caused him to have an unexpected ride on an ejection seat and cost him his life. Don't take the chance—do a job by the book—do it safely, and do it right.

## AARDVARK GETS HEARTBURN

After the F-111 had been marshalled into its parking spot, the ground crewmember entered the wheel well to install the speed brake actuator safety collar. As the pin was removed from the collar, streamer and pin were sucked into the blow-in door and ingested by the number one engine which was operating at idle RPM.

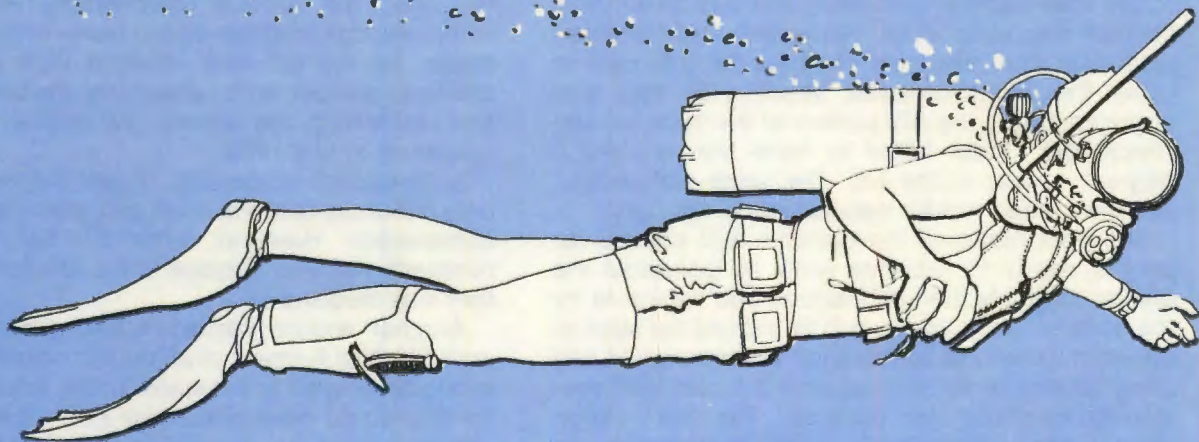
A borescope inspection of the engine revealed only minor nicks to the ninth and tenth stages of the compressor. However, after the fan case was removed, massive damage to the fan rotor and stators was discovered.

Another engine damaged because of FOD... cost \$50,000! A check of all pins to insure they were properly secured to the speed brake actuator safety collars would have prevented this. Whenever you are working around a jet, make double sure all tools, pins, etc., are secured so they will not be ingested by the engines. Let's prevent heartburn in Aardvarks—and all other aircraft.





# PHYZ-BIZ



## THE SCUBA SCENE

by Lt Col Harold Andersen  
HQ TAC Physiological Training Coordinator

In recent issues, our discussion of Decompression Sickness (DS) has been pretty much limited to ascents to altitude, either in an aircraft or an altitude chamber. We'd really be missing the boat if we did not extend our discussion to include SCUBA (Self-Contained

Underwater Breathing Apparatus) diving. On a recent TDY, I noticed that the local BX was carrying a full range of SCUBA gear—everything from tanks to depth meters. A magazine (SKIN DIVER) is available to enthusiasts. Diving clubs and associations are being

formed on military bases worldwide. There is a burgeoning interest in the sport.

Although it has been described as a "safe" sport by some participants, it has potential to cause grievous injury. Individuals most likely to have serious physiological problems



fall into two categories: (1) the "novice" diver and (2) the "experienced" diver! In the first instance, ignorance is bliss. The German poet von Goethe said, "There is nothing more frightful than ignorance in action." Cases abound where inexperienced divers go deeper than they intend (no depth gauge), stay longer than they intend (no chronometer) and run out of air (no judgment). In these cases, where the novice dives to approximately 30 feet, stays for about 40 minutes, runs out of air and is forced to make a rapid ascent, he faces a high probability of *either* drowning, severe decompression sickness, or aeroembolism (maybe *all three*). Here's a perfect example of "what you don't know **can** hurt you!" If you're planning to take up the sport, get a full course of instruction from the best instructors available. "Ignorance is a voluntary misfortune"—**don't** go off fat, dumb and happy!

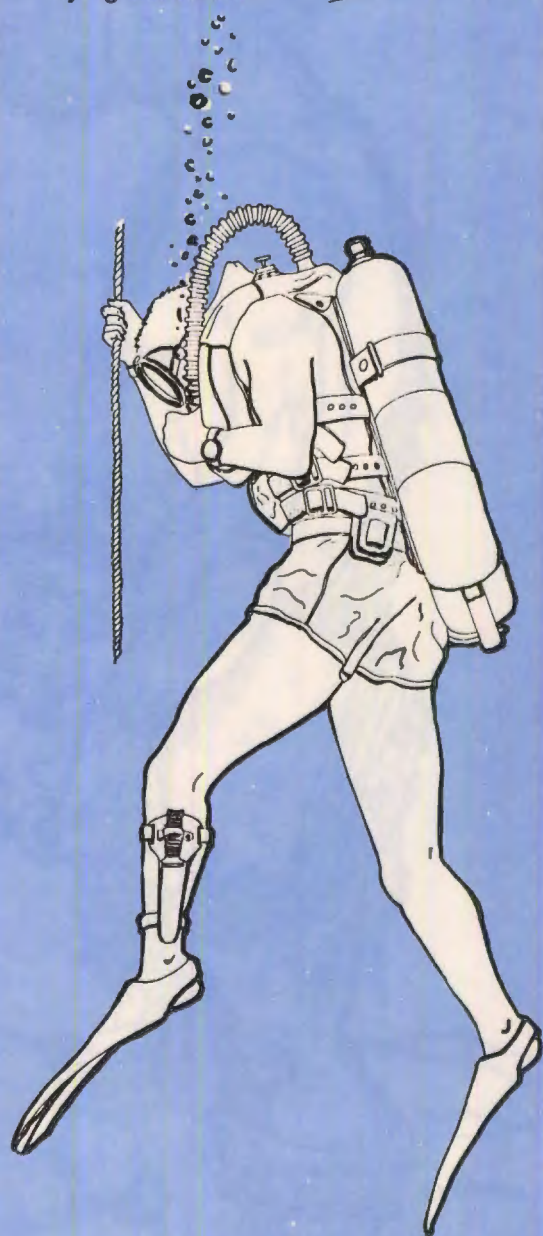
In the second instance, the "experienced" diver is at that stage where his "familiarity sometimes breeds contempt!" Another poet (this time an Englishman, John Dryden) said, "All objects lose by too familiar a view." The experienced diver who bends the rules eventually ends up getting "bent" himself. He may miss his decompression time because he didn't take the trouble to plan his dive, chart his exposure to depth and calculate his safe decompression time. He has enough experience (he thinks), so he doesn't need to do this. Or he may change the normal order of things to suit a whim. For example, one experienced diver descended to 120 to 140 feet for 31 minutes. At this depth, he recovered an amphora (a two-handled Grecian jug) from an old wreck and decided his find was important enough to go

directly to the surface with it, and *then go back down* for his stage decompression stops. But it did not work out that way—he was incapacitated by pain in both thighs and paralyzed from the waist down when he reached the surface! So, the two most fundamental factors in most SCUBA accidents are *ignorance* and *attitude*.

For Air Force aircrews, there is yet another aspect to be considered: the combined effects of the recreational activity (SCUBA diving) on the primary job (flying). They can be incompatible. The increased pressure experienced by the diver (an additional equivalent of one atmosphere of pressure for each 33 feet of sea water) directly increases the amount of gas dissolved in the diver's blood stream and tissues. Stage decompression is designed to return him safely to his normal one-atmosphere environment by permitting these dissolved gases to be liberated slowly enough so that Decompression Sickness does not occur. There is *no guarantee* that upon completion of the required period of decompression, the amount of residual dissolved gas is precisely equal to the one-atmosphere norm. There may be (probably is) more dissolved than normal. If the diver then flies unpressurized, the reduction of atmospheric pressure magnifies this excess, and Decompression Sickness may appear at *altitudes well below* the normal threshold of 18,000 feet. As a matter of fact, exposures to cockpit altitudes of only 5,000 to 10,000 feet under these circumstances can (and have) precipitated DS symptoms. In order to preclude the possibility of such a sequence of events, Air Force regulations are explicit in prohibiting aerial flight or altitude chamber exposures

within 24 hours of compressed gas diving (including SCUBA), surface applied diving and/or compression (hyperbaric) chamber dives. All aircrews who use SCUBA should be intimately familiar with AFR 161-21 and AFR 50-27.

One more quote in closing: Confucius said, "The essence of knowledge is...to apply it..." The essence of this article is to stimulate safety awareness in recreational activities, even as we promote safety in flying activities.



# OOG'S

## ejection seat

**Capt. John N. Reisbick  
TAC/SEW**

Apologies to Martin Baker and other manufacturers of egress system components for this tongue-in-cheek discussion of egress safety. Descriptions of components and procedures are fictitious, and any similarity to current equipment is purely coincidental. No malice of forethought intended.

Today's scientifically designed egress systems are a product of years of aerospace evolution not unlike that of certain animal species. Since the days of Kitty Hawk, when the Wright Brothers did their thing in a craft of questionable capability, the airplane has advanced beyond wildest expectation. The end is not in sight.

Systems designed to separate man from machine, to protect him in the process, and to insure his survival as a free spirit in earth's gravitational field have also advanced, generally keeping in step with airframe advances. As refinements and new technology increased the capabilities and reliability of various egress systems, simplicity gave way to the current state-of-the-art complexity.

For example, take the simplified egress system described above—one which may have been seen some millions of years ago, in the days of OOG.

Without going into details of OOG's vehicle, its power plant or capabilities, consider just the driver's protection system. The needs were simple—all that was required was a method to vacate the machine when in peril of being swallowed-up by a roving Tyrannosaurus. All old OOG had to do was activate the control lever and be immediately separated from the danger zone. Of course, he did encounter a slight problem on the recovery phase as parachutes hadn't been invented yet.

As you can see, the ejection sequence and maintenance procedures were simple, straight-forward, with no chance of performing an improper procedure, right? Wrong!

Poor OOG suffered quite a few lumps by neglecting to exercise due caution when changing seats. After his third inadvertant ejection, he refined the procedures by adding the WARNING to his checklist. That way he knew he had to be cautious when working around the danger area. After the



fourth inadvertent ejection, he started *using* his checklist, including the available drawing, to *properly* perform the procedures *in sequence*.

OOG's problems, although much more simplified than those encountered by today's egress specialists, are still with us. Today's machine is certainly more sophisticated. Tech data is obviously more detailed and refined than his. Training received by today's specialists would boggle poor

OOG's brain. But, OOG's basic problem still exists. OOG's problem was:

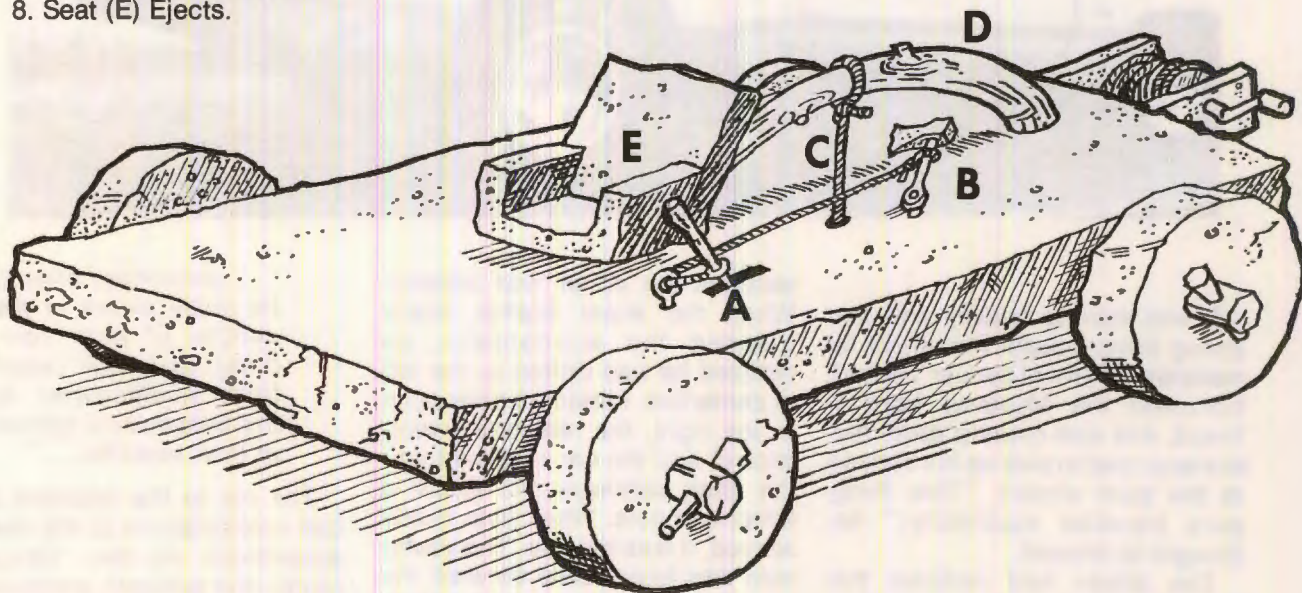
- a. Carelessness—failure to exercise caution.
- b. Inadequate tech data—unclear.
- c. Failure to follow tech data.

After he identified the cause of his problem, took corrective action, and learned from the experience, old OOG lived to a ripe old age. You too, can retire in comfort if you follow his example. ➤

### 1.1. EJECTION SEQUENCE

1. Take Deep Breath.
2. Hold On.
3. Close Eyes.
4. Pull Lever (A).
5. Cutting Blade (B) Swings.
6. Rope (C) Cut.
7. Eject. Pole (D) Released.
8. Seat (E) Ejects.

- A. Eject. Cont. Lever
- B. Cutting Blade
- C. Rope (under tension)
- D. Eject. Pole
- E. Seat



### 2.1. MAINTENANCE PROCEDURES

#### 2.1.A. SEAT INSTALLATION/COCKING

1. Bend Eject. Pole (D).
2. Tie Rope (C) to Machine (F).
3. Cock Cutting Blade (B).

#### **WARNING!**

DO NOT JAR LEVER (A) OR SEAT (E) WILL ABRUPTLY DEPART WITH OCCUPANT.

4. Place Seat (E) on Top of Fwd. End Eject. Pole (D).

#### 2.1.B SEAT REMOVAL/DEARMING

#### **WARNING!**

DO NOT JAR LEVER (A) OR SEAT (E) WILL ABRUPTLY DEPART WITH OCCUPANT

1. Remove Seat (E) From on Top of Fwd. End Eject. Pole (D).
2. Stand Aside.
3. Pull Lever (A).

# HI-JACKED



It was raining heavily and the young driver fought the wheel to maintain control of the car. He had borrowed the Mustang from a friend, and was rushing down the two-lane road to pick up his fiancée at the local airport. "This thing sure handles squirrely," he thought to himself.

The driver had noticed the large, fat, slick racing tires before he got in. Looking under the rear end, he saw the brightly painted blocked springs, extended spring shackle, relocated shocks, and right in the middle of everything was the gas tank. It seemed to him that the tank was vulnerable to rupture in the event of a rear ender.

As he approached a sweeping right curve, a vehicle approaching from the other direction hit a large puddle of water and sprayed the Mustang's windshield. For a few

seconds the driver was blinded. When the wiper blades finally cleared the windshield, he realized he had drifted to the left of centerline. Making a correction to the right, the rear end swung around and the car careened into the ditch sideways and struck a telephone pole. When help finally arrived, it was too late. The young man was found dead beneath the car. It was several hours before the wreckage was moved and the body extricated.

Let's ask the favorite accident investigation question—"What caused the accident?" Driving an unfamiliar car? Yes. The heavy rainfall? Yes. Slick racing tires? Yes. Like all accidents, no one factor was the single cause. There is another possible cause factor that is turning up more and more frequently on accident reports... usually in the form of a recommendation:

*"...personnel should be made aware of the danger of poor handling that can result from modifications to the suspension system of their vehicles..."*

The car in the accident above had modifications to the rear end suspension via the "lifting kit" route—the quickest, cheapest and probably most dangerous modification that can be made to a car. What happens to the car when the rear end is jacked up? Not much good, that's for sure. Some of the problems that can result from such a mod:

- Higher center of gravity
- Reduced cornering capability
- Reduced rear vision
- Exposed gas tank

Why do most people make this hazardous modification? A good

guess would be that the driver, in some small way, is emulating his favorite stock car driver. Unlimited stocks do, indeed, look mean with their electric color and fanny sitting way up there... but hold it... if those machines don't handle better, why do the big boys do it? The answer, of course, is that the cars do handle better — for two good reasons. First, these suspensions are modified by experts. These guys tune a suspension like the team's engine people tune the engine. Carefully... backed by knowledge and years of experience. The second reason the grand national contenders do it is because, at high speeds the front end lifts and the back end drops. Let me emphasize "high speeds." Anything remotely close to legal speeds doesn't demand the kind of mods that kill people. Don't take my word for it. Listen to some professional drivers give their viewpoints on backyard mods:



**Peter Revson:** "There is a lot of unsafe modifying being done. Many people seem to think their car goes faster if the nose points down hill, but actually that just makes for poor handling.

You still see a lot of guys on the street with racing tires on their street cars. If it rains they can become lethal."



**Jackie Stewart:** "A lot of guys make unsafe modifications to their cars. Hi-jackers are a good example; raising the rear end of a car not only makes the car's handling unpredictable, but it puts additional loads on various components. Super-wide wheels are another example. These also overload suspension components."



**Richard Petty:** "I don't modify my street cars. Many people who do really don't understand physical laws. The car was built to run at a certain height, spring-wise, steering geometry-wise, and for weight transfer in the corners. Anytime you block the car up or lower the car you are going against how the car was actually designed to maneuver. It's not a safe practice."



**David Pearson:** "A lot of guys see our cars on the track and try to make their cars similar by raising the rear end. But that's probably the worst thing to do because it ruins a car's handling. The only reason we run high rear ends is because at speeds over 160 mph it actually lowers as a result of air pressure pushing down the rear and lifting the front. In other words, the car actually runs level at these high speeds. On the highway you can't safely get around a corner if the rear end has been raised. The manufacturer delivers a car properly set up and it should be left that way."

So there you have it. Not the final word, of course... we barely scratched the surface of the perils of rear-end jacking. Some mods can be done that improve your car's handling... but if you can't afford a pro to do the job right, you're better off spending your hard earned shekels on something other than shackles. How about a nice set of radials... anti-sway bars... gasoline...

Our thanks to Captain Larry Randlett and DRIVER magazine. The drivers' quotes were taken from "Superstars on Safety" in the February 1974 issue. Look for a comprehensive article on suspension modification in a future issue of DRIVER. ➤ Ed

# EMERGENCY SITUATION TRAINING F-100

by Major Wiley E. Greene,  
Ariz ANG



**SITUATION:** You're Number 10 in a 26-ship gaggle and aren't really concerned with much more than the super wing work you did on takeoff when Number 9 (your Element Leader) nods his head, disengages his afterburner, and you detect a slight problem—your AB doesn't want to quit. You quickly yank the throttle back to idle and get a manual cutoff. As you readvance the throttle to stay with your leader, the AB cuts in again. Being of sound mind and wanting to keep your body in a similar condition, you calmly inform your Flight Leader, your Element Leader, the Airborne Spare, the Command Post, and Mobile that due to circumstances beyond your control you are departing the formation and will return for landing at a convenient time.

**OPTIONS:**

- A. Turn off your generator and battery switches.
- B. Leave it in burner and make a flameout landing.
- C. Manually cut off the AB and slowly advance the throttle to no more than 88 percent.
- D. Leave the burner cookin' and advise the formation that you are assuming lead.

**ANALYSIS:** Option "A" might work if a stuck microswitch is your malfunction, but you'll not be able to hear that good rock music on the ADF. Option "B" is dumber than dirt so we'll ignore it. Option "D" is for natural born leaders and there aren't supposed to be any. That leaves (would you

believe it?) Option "C".

Disengaging the afterburner manually is no problem. However, there are a couple of things to keep in mind. A common situation in "F" models is that the "RSO" (Rear Seat Occupant) has kicked his throttle outboard and once you have manually terminated the AB, no further difficulties should be experienced. But that's too easy so let's look further.

**GO FOR ALTITUDE!** Don't be in such a big rush to shut off the AB that you let the ground climb into your cockpit. After getting clear of the formation, safe ejection altitude should be your first consideration. Remember, under certain conditions of gross weight and density altitude, your 88 percent RPM may only give you level flight and very little zoom climb capability. Why 88 percent? Because the AB will probably cut in again at about 89 percent, plus or minus one.

**AVOID CYCLING THE AB.** It has been empirically proven that as the number of re-engagements increase, the RPM at which burner engagement takes place **DECREASES**. So if you play with it, you could still be in burner at 83 percent. That makes for a very interesting approach and landing.

P.S. Do F(?)4 drivers say, "Burner, Burner—Now, Now?"

No, No—Ed. ➤

# TAC TALLY



TOTAL ACFT. ACCIDENTS ▶
MAJOR ACFT. ACCIDENTS ▶
AIRCREW FATALITIES ▶
TOTAL EJECTIONS ▶
SUCCESSFUL EJECTIONS ▶

TAC			ANG			AFRES		
June	Thru Jun		June	Thru Jun		June	Thru Jun	
	1975	1974		1975	1974		1975	1974
2	10	13	4	10	9	0	0	4
2	8	11	4	9	9	0	0	3
0	12	6	2	6	7	0	0	1
2	6	12	3	4	4	0	0	1
2	2	11	1	2	1	0	0	1



FIGHTER/RECCE WINGS		
ACCIDENT-FREE MONTHS		
73	33 TFW	TAC
54	4 TFW	TAC
39	127 TFW	ANG
36	31 TFW	TAC
26	116 TFW	ANG

OTHER UNITS		
ACCIDENT-FREE MONTHS		
150	130 SOG	ANG
130	2 ADGP	TAC
119	136 ARW	ANG
111	143 SOG	ANG
99	DET 1, D.C.	ANG

## MAJOR ACCIDENT COMPARISON RATE 74-75

	74	75	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TAC	4.5	7.9	5.4	5.4	5.6	4.5	4.0	3.6						
	7.9	5.4	3.6	2.6	3.1	3.4								
ANG	7.2	5.3	8.6	2.8	8.2	5.3	5.7	4.7	6.0	6.3				
	5.3	8.6	2.8	5.3	3.7	4.7	7.5							
AFRES	0	0	16.4	0	8.9	0	8.8	0	6.7	5.3				
	0	16.4	0	0	8.8	0	6.7	5.3						

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

FLEAGLE

