

TAC ATTACK

JANUARY 1985





ANGLE OF ATTACK

individuals involved were not new or poor performers. They were generally well qualified and experienced "old heads." In some cases they chose to disregard their own limits and/or those of the aircraft, and in others they ignored prescribed procedures and proven techniques. While the circumstances behind each mishap vary, there is one overriding theme -- a compromise professionalism. We must reverse this trend. A loss of life or aircraft is undesirable, but that loss is particularly tragic when it could have been prevented by TAC people.

Welcome to 1985

The new year is always a period for reflection and introspection -- a time to look back at where we have been and ahead to where we are going. We can all be very proud of what has been accomplished in Tactical Air Command. Our people are better trained and equipped and more combat-ready than ever before, and in most areas, safer than ever before. However, one very critical area where we need to improve in 1985 is the command-controlled accident rate.

TAC has come a long way in reducing the overall number of aircraft accidents. Back in 1964, we lost 77 aircraft. In 1984, we are down to about one quarter of that number -- and I am convinced that we can do even better considering that over half of our losses in '84 could have been prevented by TAC people exercising good common sense and adhering to established rules and procedures.

One particularly discouraging aspect of these accidents is that in the majority of cases the

I place my trust in each of you to accomplish your job professionally during every day of 1985. Demand excellence of yourself and others. Know your capabilities and your aircraft's capabilities -- and don't exceed them. Never sacrifice yourself or your aircraft in favor of achieving that one risky, short-term success. It isn't smart, and it isn't worth the price.

You are the finest aviators and maintenance professionals in the world. I know it. You know it. Let's not do anything to tarnish that fact in 1985.

Jerome F. O'Malley

JEROME F. O'MALLEY
General, USAF
Commander



TAC ATTACK

JANUARY 1985

ON THE COVER:
Authoritative vigilance—
E-3A AWACS and F-15 EAGLE

JANUARY 1985

DEPARTMENT OF THE AIR FORCE

HON VERNE ORR
SECRETARY OF THE
AIR FORCE

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By Capt Lance Beam
74 TFS, 23 TFW
England AFB, Louisiana

The number of incidents of bomb fragment damage in recent years has brought high visibility to the concept of safe escape. Part of the problem, no doubt, lies in the transition from the Vietnam era (of primarily reduced threat weapons delivery) to today's emphasis on minimizing exposure time while delivering free-fall ord-

nance in a high-threat situation. As a result of increased emphasis on tactics, we have discovered a great deal about the safe escape problem. The purpose of this article is to bring the tactical community up to date on what has been learned and relearned.

Why Safe Escape?

When a bomb detonates, the bomb casing breaks into fragments. The size, shape, weight, and velocity of these fragments is determined by a wide variety of factors ranging from the type and amount of explosive and the shape of the casing, to the

impact angle and location of the fuse. As shown in Figure 1, the majority of target killing fragments are projected toward the 3 and 9 o'clock positions from bomb impact—commonly referred to as the sidespray. However, fragments also travel perpendicular to the bomb's axis in radical directions about the axis. Many simply impact the dirt under the bomb while others hurl upward, endangering the delivery aircraft.

Safe Escape Model

To collect data for safe escape, a variety of weapons were exploded in a static test arena. The average number of tests per weapon was three (actual numbers ranged from 1 to 8). Two to three percent of the

How safe is safe escape?

fragments were captured and used to develop a computer model of the expected fragmentation envelope as it expanded over time. The computer model was then revised to account for weapon impact velocity and impact angle.

It is important for aircrews to realize that in developing the computer model some assumptions were made, and certain anomalies were *not* taken into account. Aircrews need to know what the assumptions are and to understand that they are as realistic as possible without undue conservatism. (If

model contained every conceivable anomaly, we would be faced with delivery parameters that are unacceptable in a tactical environment.)

Unlike the real world, in the computer model, the fragments are averaged and assigned generic drag coefficients and flight characteristics. The model also assumes the "average" bomb—disregarding the effects of mass production such as variations in casing thickness and in the amount and quality of explosive.

One anomaly of an exploding munition that is not considered in safe escape data is the lug or hardback area of the bomb. The hardback will typically break up into three large fragments which have been documented to travel miles from the explosion.

One reason that hardback fragments are discounted is because free-fall weapons are

spin-stabilized and the chance of the lugs being pointed at the aircraft at detonation are considered remote.

A second anomaly not considered again results from mass production. After the bomb casing is filled with explosive, void areas may result from settling of the explosive mixture. These "hot spots" can act as miniature shaped charges and expel fragments at greater than normal velocities.

Escape Maneuver

Since we now have a computer model of fragment travel per unit time, the next step is to compare the fragment travel to the aircraft flight path and determine the probability of the two occupying the same piece of sky at the same time; i.e., probability of hit (P_H). The current safe escape criteria requires a risk of less than or equal to one in a thousand (P_H is less than or equal to 0.001) chances of fragmentation damage. In order to predict the correct aircraft position at particular times, the delivery aircraft *must* fly a *specific* escape maneuver after weapons release. *Therein lies the root of many problems* in this area. The Dash 34s vary greatly in the maneuvers allowed and in the extent to which the maneuvers are described. As a result, many pilots are under the mistaken impression that the maneuver flown after weapons release is not important. *Any*

deviation from the chosen escape maneuver invalidates the safe escape numbers and may substantially increase your probability of taking fragments.

Any deviation from the chosen escape maneuver invalidates the safe escape numbers and may substantially increase your probability of taking fragments.

The Dash 34s for several aircraft have been formally identified as lacking in safe escape information to varying degrees. Revisions to eliminate these deficiencies and to standardize the safe escape information in all Dash 34s are being considered.

Because of their importance to the safe escape problem, I will give an example of maneuvers approved for the F-4, A-10, and F-16. Consult your Dash 34 for more complete and current information on safe escape maneuvers. For an F-4 dive delivery, the Dash 34 simply calls for a 4-G in 2 seconds

How safe is safe escape?

recovery that does not result in a descending turn. A recent change to the A-10 Dash 34 makes one recovery essentially the same as the F-16 maneuver: the 4- to 5-G recovery in 2 seconds is held until the nose reaches the horizon, when full power is selected. The G is maintained until 20 degrees nose-high and then relaxed until a constant 30-degree climb-out angle is achieved.

The escape maneuvers just described for delivering freefall ordnance obviously are not tactically optimized for a high-threat environment. Considering all the attention we spend on pop-ups and high-threat tactics (which are designed to minimize exposure time), until recently, very little has been done to provide escape maneuvers that also minimize exposure. One organization, 57 FWW/DT at Nellis, is currently

working on a project to provide the TAF with just such high-threat escape maneuvers. Scheduled for completion in the spring of 1985, the project will test maneuvers intended to reduce exposure time. The test includes, for example, a 5-G, 75- to 90-degree bank descending turn to rollout at egress altitude for the F-4 and F-16, and a bunt over to 200 feet following a level pass for the F-111. In conjunction with examining the maneuvers themselves, these tests will also consider releases with a P_H of greater than 0.001 for combat use.

Preflight Planning

Armed with a working knowledge of safe escape data and escape maneuvers, we are now ready to pick a delivery mode, fuse setting, and release mode to optimize weapon em-

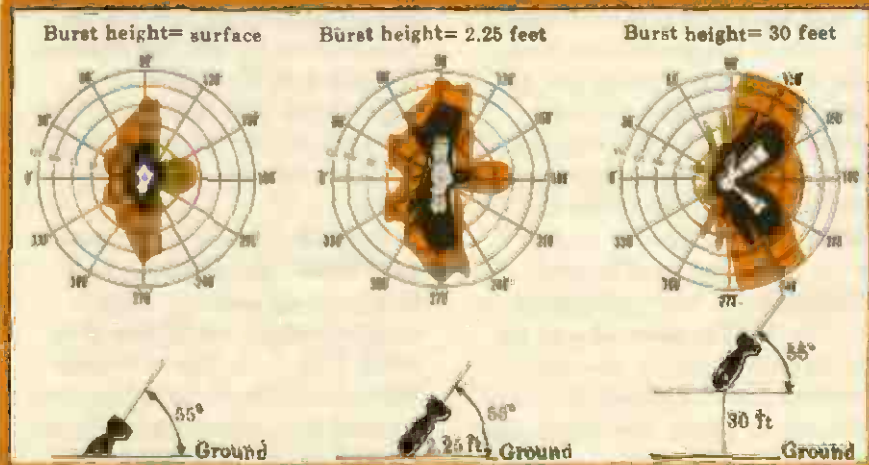
ployment. Depending on your aircraft and delivery mode, you must consider several factors in conjunction with the altitude obtained from your safe escape charts. Among these are —

- altitude lost during pullout
- required ground clearance
- minimum release altitude for fuse arming
- altimeter lag and correction.

Assuming safe escape is the limiting factor, we now come to the part of the problem which requires some pilot judgment. The altitudes listed in the safe escape charts are hard and fast numbers. They are the absolute minimum altitudes at which, with the exact dive angle and airspeed selected, you can employ your ordnance and execute the prescribed escape maneuver with a probability of less than or equal to one in a thousand of

Any deviation from selected parameters which takes you lower than planned, leads to an exponential rise in the probability of hit (P_H).

Figure 1



Normal fragment ground pattern shape versus burst height for a MK 82.

taking a bomb fragment. Any deviation from selected parameters which takes you lower than planned, leads to an exponential rise in the probability of hit. For example, a single MK-82 low drag delivered from a 30-degree dive at 400 knots true airspeed and a planned 4-G in two seconds recovery has an acceptable PH of 0.0005 when released at 1,770 feet. At 1,750 feet, the PH equals 0.0122, and at 1,730 feet, pressing only 40 feet below the planned altitude, the PH equals 0.0432, 43 times the allowed amount. Similar results occur with increased dive angle and/or airspeed.

Obviously we must build some sort of pad into our delivery problem to account for pilot error. The minimum release altitude for frag clearance (again, assuming this is the limiting factor) corrected for altimeter lag and altimeter installation error, should be your abort altitude above ground level (AGL). Pressing below the abort altitude is absolutely unacceptable. The judgment part of the problem comes in determining the amount of pad you decide to add to your abort altitude to get the AGL pickle altitude. This buffer permits us to distinguish between releasing slightly below planned pickle altitude to correct for parameter errors—an allowable method to get bombs on target—and “pressing” below the abort altitude which results in unacceptable fragmentation damage risk.

Tactical Considerations

Now that we have an approved solution on paper, let us look at some tactical situations

that might also cause problems:

First, the density altitude of the target area affects bomb fragment travel. Second, for those of us without a radar altimeter, a serious problem could occur from an incorrect barometric altimeter setting or the normal ground check altimeter error. It will obviously be difficult to obtain an accurate altimeter setting in a combat situation. This, combined with an allowable altimeter error of plus or minus 75 feet, can place us in a situation of pickling below abort altitude when the altimeter says we are above it. Third, obtaining an accurate target elevation may be relatively easy on a preplanned

interdiction mission, but consider the close air support alert sortie where target elevation is received in the forward air controller's briefing or from a quick plot using a map with 40-foot contour lines while in the low altitude arena.

Looking Out for Number Two

A final area we must consider is fragment deconfliction between other members of the flight. There are three ways for succeeding members of the flight to avoid the frag of lead's bombs. The first is absolute altitude separation—in no part of the delivery descend below the maximum fragment height. The second is by avoiding the

Figure 2

MAXIMUM BOMB FRAGMENT TRAVEL

MUNITIONS	Altitude (feet)		Horizontal range (feet)		Time of flight (seconds)	
	sea level	5,000 feet	sea level	5,000 feet	sea level	5,000 feet
MK 82 Snakeye*	2,050	2,325	2,310	2,625	24	25.5
MK 84 Low drag	2,750	3,100	3,100	3,350	30	30
CBU-52/B CBU-58A/B CBU-71A/B* MK 20*	1,380	1,575	1,645	1,850	19.4	20.6
BLU-61A/B**	665	755	775	880	14.2	15

* The data for intact clusters assumes the dispenser did not open in flight and a high order detonation of the entire munition on impact.

** Assumes the munition functioned as planned. Also used for time-delayed submunitions.

How safe is safe escape?

area until all fragments have fallen back to the ground (time), and the third is by distance—attacking a target outside the horizontal frag envelope. Care must be taken in this last case to deconflict ingress, escape maneuver, and egress routes, particularly if the targets are relatively close. Figure 2, taken from the new A-10 Dash 34, gives maximum altitudes, times of flight, and horizontal distances for common weapons.

Conclusion

There are several important concepts that we pilots in the TAF need to keep in mind

when working with safe escape data:

- First of all, we all need a general knowledge of how the data is modeled to understand the information being used. Along the same lines, we must know what data is excluded, and why it is not a part of the computer model.

- Second, we need to realize that currently there are very few specific escape maneuvers for each aircraft. These are the only maneuvers that have been run against the computer fragment model to provide a PH less than or equal to 0.001. Testing is being done to provide more tactically sound escape maneuvers. Also

being considered in the escape maneuver tests are PH values greater than 0.001 (these parameters would only be used in combat and will provide the means to maximize total aircraft survivability by balancing the danger posed by our own weapons against the PK of the enemy threat). But for now, we need to stick with what we have.

- A third area we must comprehend is preflight planning—particularly the fact there is no buffer added to the numbers. We pilots have to provide our own pad.

- Finally, we must anticipate tactical problems and plan for wingman deconfliction when refining and evaluating delivery tactics.

The bottom line: safe escape data are based on probabilities. The entire delivery problem can be planned and executed as perfectly as is humanly possible, and the aircraft may still be damaged by fragments. For example, not long ago an F-4 received frag damage which was caused by the bomb lug—an anomaly not included in our safe escape model.

By understanding the entire safe escape problem, we can place steel on target while reducing the chance of self-frag. Having a shallow knowledge of safe escape (or disregarding it) can result in the dubious distinction of accomplishing the enemy's job for him.



Captain Beane is a weapons and tactics officer in the 74th Tactical Fighter Squadron at England AFB, Louisiana. The 1979 Air Force Academy graduate completed Fighter Weapons School in May 1984 and has flown 1,250 hours in the A-10.

AIRCREW OF DISTINCTION



On 19 September 1984, shortly after dark, Major James F. Barnette took off from Greater Pittsburgh International Airport on a night air-to-ground mission. He was flying as number two in a two-ship flight of single-seat, single-engine A-7Ds.

Ten minutes after takeoff as the flight climbed through 20,000 feet en route to the range, Major Barnette heard a loud noise and felt his aircraft experience a sudden loss of thrust. He retarded the throttle, but the engine did not respond. Looking down, he noticed the Engine Hot light was illuminated and the turbine outlet temperature was very high. He told the flight lead that he had a serious engine problem.

Unable to maintain altitude, he turned back toward Pittsburgh, the nearest suitable landing site. Then, following flight manual procedures, he selected manual fuel and extended the ram air turbine. The engine continued to vibrate and to produce loud noise instead of thrust. Major Barnette began dumping fuel and jettisoned the external fuel tanks.

The flight lead, flying a chase position, reported that the engine was coming apart, that a sustained fire was burning, and that the aircraft was now trailing a long plume of flame. The A-7 had suffered a catastrophic engine failure.

The aircraft was over the densely populated Steubenville, Ohio/Weirton, West Virginia, area. Realizing that saving the aircraft would be impossible, Major Barnette turned his attention to avoiding civilian casualties. He decided to stay with the burning aircraft long enough to clear Steubenville. As the aircraft cleared the city's edge, Major Barnette successfully ejected at approximately 2,000 feet above the ground.

The nighttime ejection was just as Major Bar-



Maj James F. Barnette
112 TFG (ANG)
Pittsburgh, Pennsylvania

nette expected. Training paid off. After landing, he quickly established contact with the flight lead who remained overhead to coordinate rescue efforts. Using flares Major Barnette marked his position. Later, he used his survival radio to talk with a USAFR C-130 crew who relayed vectors to a civilian helicopter for pickup.

Because of his efforts to guide the aircraft away from the city, no damage or injuries resulted from the crash even though the aircraft impacted within several hundred yards of a house. After the ejection, Major Barnette and his flight lead worked as a team to effect a textbook rescue.

The calm professionalism exhibited by Major Barnette enabled him to avoid a potential disaster. He has earned the Tactical Air Command Aircrew of Distinction Award. ➤

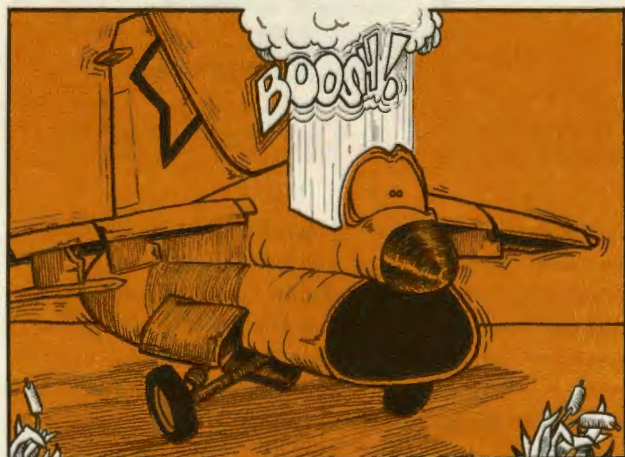
TAG

tips

INTEREST ITEMS,

I don't do windows

When an A-7 pilot came out to his aircraft for the first flight of the day, he found ice and frost all over the canopy and windscreen. After engine start, he opened the vent door about 1/2-inch and lowered the lid so the cockpit heat would clear away the frost. His plan was beginning to work. But then the checklist sequence dictated an AOA check; that required the pilot to open the canopy so the crew chief could see hand signals. Boosh! Suddenly it was cold again. When



the pilot unlocked the canopy, it sprung open with such force that it sheared the attaching bolts. Then it fell backwards on top of the fuselage, slid down the right wing, and fell to the ramp where the plexiglas broke and the metal frame bent.

What happened? It had rained the previous day and night; then the temperature plummeted below freezing. Moisture had apparently collected on other surfaces too, like inside the static ports

on the left side of the fuselage. Ice was blocking the holes. With the static ports iced over, the vent door nearly closed, and the canopy closed, the cockpit overpressurized.

We all know of stories about iced-over static ports. They can be bad news for most aircraft. Looks like we may have discovered a new consequence. Both the pilot and crew chief's exterior inspections call for checking the static ports clear. And at first glance that's probably how they looked. But a little closer look inside would have revealed the ice. Now that we all know what can happen, let's look a little closer.

What's worse than wrinkled clothes?

“And don't forget to pack your shoes and a belt.” Remember those words from UPT when you were getting ready for your first overnight cross-country mission? Showing up at destination with wrinkled clothes was bad enough; having to wear flight boots with your civies was ridiculous. But those days are over. Now we go cross-country with travel pods, and you can just about bring the whole closet. But it's still possible to show up missing a few articles.

One pilot asked the transient alert crew chief to fasten the door on his aircraft's travel pod while he did his preflight walk-around inspection of the rest of the aircraft. After the crew chief closed the door, she was called away to help move and connect the power unit to the aircraft. In a classic case of habit pattern interruption, both

MISHAPS WITH MORALS, FOR THE TAC AIRCREWMAN

the pilot and the crew chief forgot to return to the travel pod and secure the door.

The aircraft took off normally, and no one noticed anything was wrong for about 15 minutes. Then the wingman noticed the travel pod door was open and a red streamer was flapping in the breeze. After a turn back to the base they had just departed, the streamer was no longer around. Neither was the downlock for the main landing gear that the streamer was attached to. Fortunately, they were over an unpopulated area.

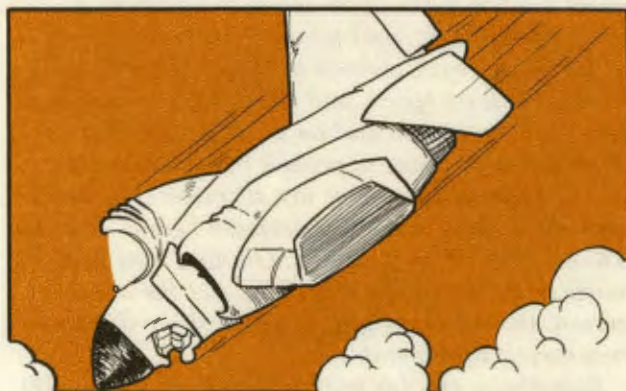
Since we also carry the aircraft's 780 gear (which includes several heavy metal objects) in the travel pod, it's more than a matter of wrinkled or missing clothes.

Don't forget your shoes or your belt. And don't forget to check the travel pod door.

Wingman nearly lost during lost wingman

A flight of F-4s had been in and out of the weather during the radar trail departure. Once on top at FL 200, they began joining up. As the wingman closed to within a quarter mile of the leader, he lost sight as lead suddenly once again disappeared into the soup. The wingman immediately turned away and transitioned to the gauges.

The pilot and WSO already had serious cases of spatial disorientation when they initiated the lost wingman procedure. The pilot felt the aircraft was entering a nose low attitude, but his attitude director indicator (ADI) showed a level left turn and no Off flags were in view. Looking around further, the pilot noticed his airspeed increasing and



altitude decreasing. And the WSO confirmed a thirty-degree dive on his attitude indicator.

The pilot switched his ADI reference to Standby and began a high-speed dive recovery. The WSO assisted by giving a running commentary of the picture on his attitude indicator. They were both really disoriented now. The aircraft bottomed out of the dive around 11,000 feet MSL and then entered an extreme nose high attitude. Soon they were back up to 23,000 feet with zero airspeed. At this point, the pilot was able to spatially reorient himself by using the emergency standby (peanut) attitude indicator. He unloaded the aircraft and recovered the aircraft to level flight and then flew back to home base.

The incident aircraft was in IMC from the time the pilot initiated lost wingman until on final approach.

How do we prepare for the unusual? How do we get ready for an airborne challenge of this magnitude? By emphasizing spatial disorientation in briefings when night/weather is likely to be a factor, by practicing unusual attitude recoveries using the emergency attitude indicator/partial panel instruments in the simulator, and by strong crew coordination.

Night and easy

RAPCON (radar approach control) was pretty busy working several local F-16s when we slipped into their radar pattern. I didn't want to shoot a lot of night approaches; it had been a long, tiring flight, and we were all ready to call it a day. Everything seemed to be going pretty well: I was flying on speed, and the controller was saying I was on course and on glide path. Cake. Then he said, "Over approach light, cleared to land." I glanced down at my altimeter and saw I was still a long way from decision height. Hmmm. Then I glanced at the DME. Oh no. I was five miles from the runway. Looking out the windscreen, the runway lights confirmed the distance measuring equipment.

Something similar to this happened to a C-130 crew some time ago. It serves to remind all of us that despite quantum advances in technology, human mistakes on both ends of the radio can still cause anguish . . . or disaster. This crew was fortunate; the terrain beneath the approaches at some bases would not forgive a similar premature descent five miles from the runway.

How did it happen? The coordination between controllers broke down at the handoff. The final controller thought he was giving approach guidance to a radar return that actually represented an F-16 making an ILS approach five miles in front of the Hercules.

The other key factor in this incident was the pilot's failure to crosscheck all available navigation aids to confirm his position. Had he compared the controller's range calls to the DME readout, the disparity would have been readily apparent much sooner.

Human error. This might be the twentieth century, and we may have tremendous computer-assisted C³I capabilities, but we, the people, are still prone to make mistakes. Night/instrument approaches demand a *complete* crosscheck to save us from our own mistakes . . . and to help us catch those that others make.

Positive ID

In the September issue, we ran an article in Down to Earth about safe hunting. One paragraph encouraged hunters not to shoot until they were absolutely sure of their target. That advice goes for fighter pilots, who are, in a very real sense, hunters.

During a recent realistic training exercise, one such hunter didn't follow that advice; he released a MK-106 practice bomb before positively IDing the target. On his first weapons delivery sortie of the deployment, he misidentified smoke from a manned Smokey SAM (missile launch simulator) site as the spotting charge from lead's practice bomb. His bomb impacted about 600 feet wide of the site which was located a full three miles from the real target.

How did it happen? He was number two in a flight of three, about eight miles in trail behind the flight lead, racing toward the target using auto terrain following equipment for a level 400-foot delivery. Reacting a lot like an excited hunter who sees his first deer of the new season, when he saw the smoke, he disregarded all the clues trying to tell him he wasn't in the right territory.

In the hunter's defense, we should mention the visibility wasn't pure and the run-in heading was westbound into the setting sun. But the onboard navigation gear wasn't affected by these limitations. The basic problem was abandoning that navigation information *too early* in the bomb run in favor of visual procedures for final alignment.

We aren't sure if the mix-up resulted in the Smokey SAM shutting down for the rest of the afternoon, or if the crew ran out of quarters for an unscorable bomb. But we do know that the potential is high for someone getting hurt during realistic training by the hunter who shoots before he's absolutely sure of the target. The more we work with the Army, and the more we drag threat simulators and other manned equipment onto our ranges, the greater the potential.

Be a good hunter.

TAC Special Achievement in Safety Award

Technical Sergeant Victor Pattarozzi, Staff Sergeant David Boyd, Airman First Class Randy McClaskey, and Senior Airman Michael Messer were testing a TF30 engine that required a complete functional test of engine systems and afterburner operation. After 20 minutes of normal operation, Sergeant Boyd advanced the engine, which is the F-111 aircraft's power plant, to maximum power; fuel started to drip from one of the manifold fittings. Power was reduced, but fuel started gushing out of the inspection port on the 2,500-gallon main fuel tank; the emergency fuel shutoff valve had also vibrated closed. The team responded immediately.

Sergeant Boyd performed an emergency shutdown of the engine, notified the fire department and weapons storage area, evacuated the control cab, and manned a fire extinguisher. Sergeant Pattarozzi opened the emergency shutoff valve and closed the inspection port allowing fuel to flow back into the 5,000-gallon auxiliary tank. Airman Messer shut down the electrical power cart and towed it away from the spilled fuel. He then monitored the engine for possible internal failure as the rpm wound down and manned a second fire extinguisher.

Airman McClaskey hosed fuel off the sound suppressor, control cab, and surrounding concrete pad to prevent a spread of fire in case the fuel ignited within the fuel dike. He then manned a

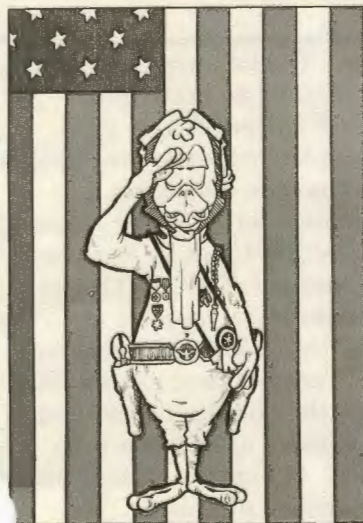


TSgt Victor Pattarozzi
SSgt David Boyd
A1C Randy McClaskey
SrA Michael Messer
366 CRS, 366 TEW
Mountain Home AFB, Idaho

fire extinguisher. The fire department arrived and foamed down both fuel tanks and approximately 200 gallons of JP-4 fuel inside the dike.

By their timely actions, superior teamwork, and excellent system knowledge, the test cell crew prevented a possible fire/explosion of nearly 7,000 gallons of JP-4 fuel.

FLEAGLE SALUTES



Senior Airman John M. Parker, 355th Equipment Maintenance Squadron, 355th Tactical Training Wing, Davis-Monthan AFB, Arizona. Airman Parker was washing an engine in front of a hangar when a ground support tow tractor drove by. He saw that it was on fire and that the driver was not aware of the problem. Airman Parker then stopped the tractor and extinguished the fire while another member of his crew called the fire department.

Airman First Class Michael W. Gore, 4th Supply Branch, 4th Tactical Fighter Wing, Seymour Johnson AFB, North Carolina. Airman Gore was refueling an aircraft on the main parking ramp when the tanker's engine suddenly shut down; smoke was coming from the engine compartment. After notifying the fuel control center that his vehicle was on fire, Airman Gore located a nearby fire extinguisher and, with the aid of other people, successfully extinguished the fire before the fire department arrived.

EVOLUTION NOT REVOLUTION



By Capt Dave Jeter
186 TRG (ANG)

Ed note: *TAC Attack's* editorial policy generally prohibits recognizing an individual unit in the magazine *unless* they have made a significant safety-related contribution that might be applicable to other units in

TAC. The following article was written by an active duty USAF Project Season pilot about the very positive changes he has seen during his assignment with the Air National Guard RF-4 unit in Meridian, Mississippi. The 186 TRG is recognized by many of us in the TAC recce community as tactical employment experts. However, the plan that they used is applicable to any unit that seeks to improve its abilities, regardless of mission.



Expanding Tactical Capabilities

CHEVY, BREAK LEFT!
Bogey 6 o'clock, 6,000 feet, closing."

Relaying call sign, directive commentary, and position of the threat is one of the very basic skills needed to survive in a high threat environment. It requires good mutual support, timely visual acquisition, and judgment as to the appropriate reaction. Can the flyers in your unit consistently relay that simple yet critical message when it counts? It's not as easy as it seems, and it's only a beginning when talking about

surviving in combat.

Three years ago, the leadership in the 186th Tactical Reconnaissance Group, Meridian, Mississippi, decided the unit's aircrews needed to improve their tactical skills if they were going to accomplish their mission and survive in their Checkered Flag area of operations. They set a very clear goal for the unit: to become the most tactically sound squadron in the TAF. In the course of three years, the unit has made great strides towards accomplishing the goal. An excellent ORI (operational readiness inspection), selection as a USCENTCOM resource, and favorable comments and recognition from participants in major flying exercises all confirm that the goal is being realized.

An important aspect of this achievement is that it has been done safely—not a single mishap in over two years of inten-

sive training. The key to this safe expansion of tactical capability was and continues to be the maintenance of *proper supervision* during all phases of the transition and the conduct of training in a *realistic* and *professional* manner.

The terms proper supervision and professional training are often overused, somewhat ambiguous, and hard to translate into clear objectives. Many units embark on improvement projects with these in mind but fail to adequately define *how* they are to be accomplished. Meridian's success is attributable to an evolutionary process involving three very specific and manageable steps:

- 1) long range planning;
- 2) a building block approach; and
- 3) the total integration and involvement of all squadron functions.

Long Range Planning

Long range planning begins with goal setting. The 186th had an ideal goal to use in guiding their pursuit: the next ORI was two years away. The unit was determined to demonstrate superior capability to



Evolution not revolution

perform the tactical recon mission and survive. The ORI was used as the focal point for planning and implementing the expansion. It provided the incentive for upgrading as well as giving a realistic time frame in which to accomplish the objective. The driving force behind all the planning became "Get ready for the ORI!"

In conjunction with the long range objective, more specific planning occurred on a weekly basis. Key personnel met each week to evaluate progress and to identify necessary adjustments to the plan. These meetings were critical, because they allowed supervisory inputs to weekly activities and provided timely feedback on how well the training objectives were being met.

Building Block Approach

It was obvious that this program to expand the unit's tactical capabilities could not start at the graduate level for all aircrews. However, impeding the progress of those ready for advancement was also counter-productive. The answer was to create a building block approach, to lay out a string of specific benchmarks or milestones, one after the other. Only after achieving proficiency in a lower block would an aircrew be challenged with the next step. Each benchmark was based on developing or improving specific tactical events required in the operating envi-

ronment of real world threats. This meant checking our people out at the lowest possible altitudes as well as teaching them appropriate reactions against as many air and ground threats as feasible.

Recognizing the necessity for mutual support, formation flight became the rule rather than the exception. Accordingly, flight leads and wingmen were challenged with increased tasking. Standard squadron formation procedures were developed so everyone was singing from the same sheet of music. Wingmen were given certain contracts and responsibilities which were extensively briefed. Every crew member had to be an asset to the formation.

Initially, a standard low level route was developed which included a full array of threats and predetermined reactions. This allowed aircrews to test their coordination and understanding of the threats in a controlled environment before developing their own scenarios. Physical reactions to threats on low level missions soon became standard operations.

An extensive defensive maneuvering (DM) program was implemented to make everyone comfortable with the full capabilities of the RF-4C. After demonstrating proficiency in max performance aircraft handling, aircrews were challenged with regular dissimilar air combat training against several



evolution not revolution

units from around the country. Aircrews were not pressured into progressing to the next stages. Rather, they were presented with the opportunity to develop at one level; so they were more than ready to take on the new challenge.

Once an aircrew had demonstrated proficiency in low level tactical maneuvering, formation, and DM, they were allowed to test their capabilities in a hostile environment. A low level profile was scheduled each week with F-15s attacking RF-4 two-ship formations as they operated in the local MOA. These locally generated scenarios filled the vacuum that previously existed between flying local missions and the intensity of a RED FLAG exercise. Before graduating to flying in a RED FLAG-type exercise, aircrews first had to demonstrate proper situation awareness in a less hostile environment. The building block approach insured effective control of attempts to expand tactical capabilities.



Total Integration

The most important aspect of this process was the integration of all squadron functions and the cooperative support towards accomplishing the goal. Everyone had the same clear goal and worked together to help expand the unit's effectiveness. Intell worked hard to educate everyone on the threat and the operating environment. Tactics translated this general information into specific reactions to be applied against the anticipated threats in the area. These reactions were then incorporated into the squadron's daily flying operations. Since everything centered on real threats, everyone was motivated to press for the appropriate response.

Most importantly, stan/eval became intimately involved in the process by challenging aircrews to fly checkrides with the same aggressiveness they were displaying on daily training missions. By doing this, true tactical abilities were being

evaluated on checkrides. Suddenly, acquiring at least two of three targets on film became only one of the priorities on a checkride. Stan/eval also expected aircrews to demonstrate the ability to survive in a hostile environment during the mission. This meant several changes in stan/eval practices: fragg targets had to be realistic as well as challenging. Targets like the single-lane bridge hidden in the woods weren't thrown out of the target bank; they just weren't assigned in high threat areas where maneuvering off track for threats was likely. That didn't make the checkride easier, because real air threats (F-15s or local Barons) and simulated ground threats were incorporated into the profile. They challenged the checkride examinees' ability to identify/defeat the threats and then return to course and acquire targets. By conducting checkrides that evaluated day-to-day skills, stan/eval was able to closely monitor each aircrew's

progress as the complexity of the unit's flying increased. This close supervision and guidance was the critical element in the evolutionary process, and it insured supervisors knew what was going on at all levels of operation.

Conclusion

"The key to success is constancy to purpose."

Disraeli

The 186th had a clear goal and a well defined plan to accomplish the goal. This plan was an evolutionary process involving three very specific and manageable steps, each of which continues to be an integral part of everyday operations. The result is a squadron that continues to improve its tactical capabilities while maintaining the proper supervision and professional training required to insure safe mission accomplishment. ➔

Ed note: How about your unit? Are you perfecting the basics then moving on to improving tactics? This technique is equally applicable to personal progression from MQT to MR to flight lead to instructor to SEFE. Our semiannual training requirements aren't just squares to be filled again and again without challenge. Use them to improve your combat capability.

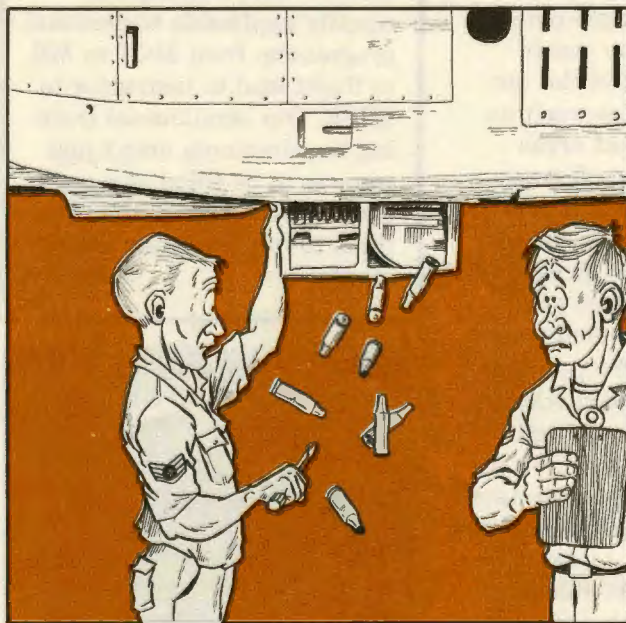
Capt Jeter is an active duty Air Force pilot stationed with the 186 TRG (ANG) in Meridian, Mississippi. He has flown around 650 hours in the RF-4 since his assignment to the unit in May 1982. As a Project Season aircrew member, he has been an assistant in many of the unit's operational functions including stan/eval, scheduling, and tactics.

WEAPONS WORDS

Brass attack

Near the end of his fifth pass with the 30-mm GAU-8 cannon, an A-10 pilot heard a rumbling sound and noticed the Gun Unsafe light. Rats! Just when he'd figured out the windage and elevation. The pilot safed all the switches, declared an emergency, and brought the Warthog directly home.

After the aircraft was parked in the unsafe gun area, some weapons folks dropped the gun access panel to clear the weapon. When the panel was opened, several empty 30-mm cases fell out and



scattered all over the ramp. The problem was obvious — the access unit's load gate was ajar because only one of the two latches was fastened.

Apparently after loading the cannon, the load crew didn't completely fasten one of the latches (the sprung latch, on the right side of the load gate, wasn't readily visible except from a vantage point directly beneath it). When the gun fired, vibrations caused the latch to disengage, and the load gate opened slightly. Then a wayward spent case wedged into the opening and jammed the gun. Minor mistake.

In peacetime, gun jams caused by minor mistakes like this one are frustrating to pilots and to specialists who have to repair the damage. They're also expensive; this little omission cost about \$18,000. But in combat, where we need every bullet to count, a minor mistake like this may cost much more. We need to be training like we're going to fight. That's not a cute little phrase for pilots — it's a mandate for all of us.

Better believe it

Some people snicker in disbelief at the suggestion that a little 25-pound BDU-33 practice bomb can be dangerous. After all, one of the reasons we use them for practice bombing is because they are so much less destructive than the real McCoy's. Compared to live bombs their spotting charge is puny. But BDU-33 practice bombs pose a serious potential danger to the men and women who handle them for a living. If you don't believe



it, talk to Peter, James and John.

Peter is a line delivery crew chief who was transferring BDU-33s from an MHU-12M trailer to a wooden rack inside an aircraft shelter. While trying to place one of the bombs on the rack that keeps them off the floor, the bomb's striker plate contacted the concrete beneath the rack. KaPow! Peter's clothes caught on fire, and he was seriously burned from the waist down.

James was one of a group of workers clearing access road at the range. Over 300 BDU-33s had accumulated on the road had to be removed before it was safe to use. When he was placing one of the practice bombs in a front-loader bucket, it discharged in his hand. The blast fractured his hand and required a bone

graft. The sad part was that James wasn't even an explosive ordnance disposal (EOD) specialist and shouldn't have been doing their work. A range supervisor incorrectly interpreted AFR 50-46 and thought it was OK to send him to clear the road.

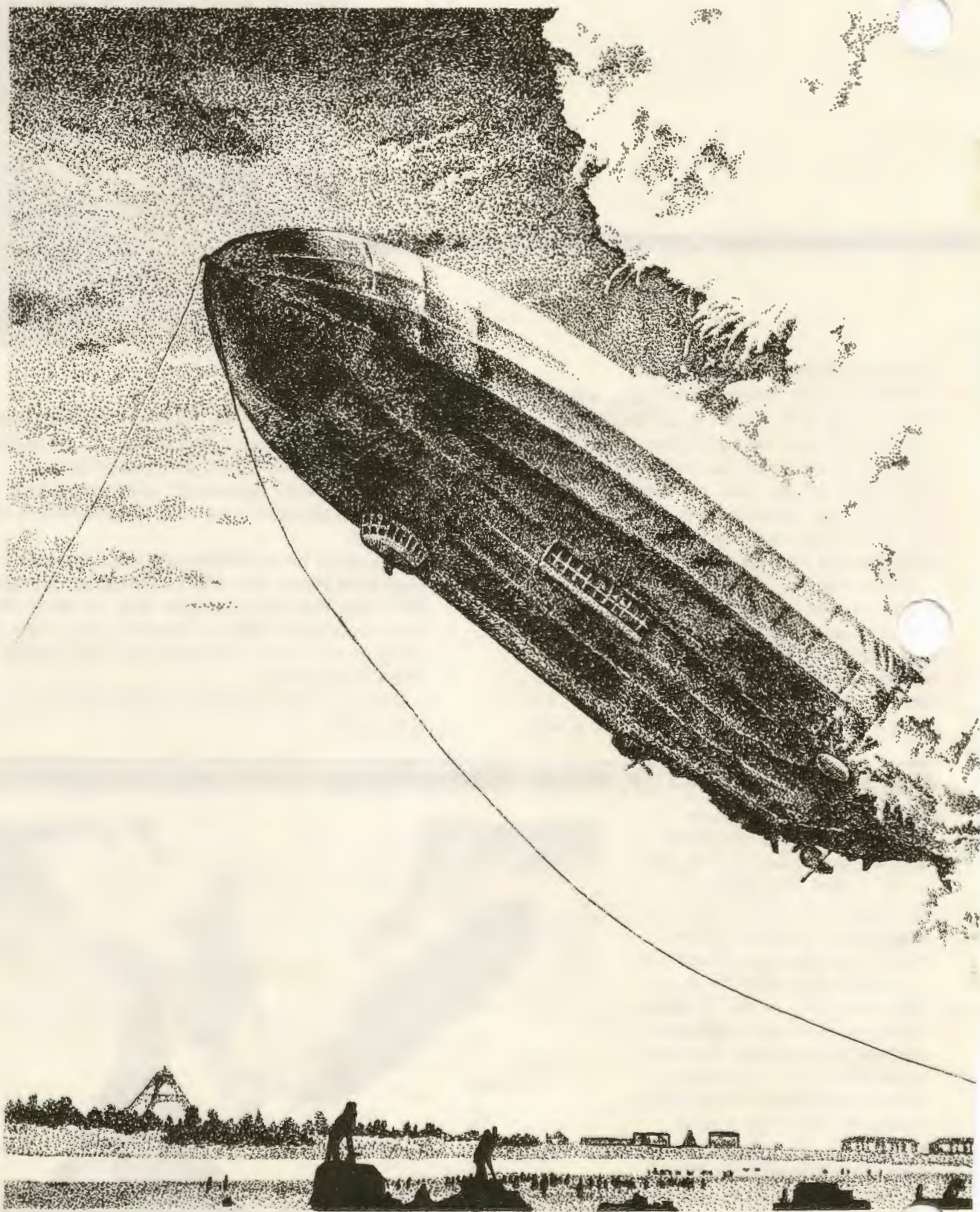
You could have talked with John, another man with recent first-hand experience handling BDU-33s. But he's no longer with us. While trying to retrieve a BDU-33 from the range (for its scrap metal value), the young man was killed when it exploded.

Believe it. And work with BDU-33s like you believe it.

IN THE CENTER

When the *Hindenburg* inaugurated scheduled transatlantic passenger flights in May 1936, the Zeppelin Company's dirigibles had logged over a million miles without a passenger fatality. A year later, just after 7 p.m. on May 6th, 1937, as the *Hindenburg* was about to complete its journey to Lakehurst, NJ, disaster struck. An explosion ignited seven million cubic feet of hydrogen. The huge airship caught fire like a Japanese lantern. The demise of the *Hindenburg* brought to an end the g line of Zeppelins.







Kelvin Taylor

An Interview with Erich Hartmann, the Ace of Aces

By Maj Rich Martindell and
Capt Bill Mims
HQ USAFE Safety

Ed note: we were extremely impressed with *AIR SCOOP'S* interview with Erich "Bubi" Hartmann (Oct 84). Col Hartmann relates many good lessons for today's fighter pilots: younger tigers, FAIPs, flight leads, instructors, and commanders.

Col Erich A. Hartmann, German Air Force (Retired), was born on April 19, 1922, in Weissach/Wuerttemberg, Germany. His early education was aimed at a career in medicine but was interrupted by the outbreak of World War II. In October 1940, he reported for flight training at Berlin Gata LKS 2, Neukuhren, East Prussia. He was commissioned a second lieutenant on March 1, 1941, and began training at Fighter School 2, Zerbst-Anhalt, Germany. He reported to Fighter Group 52 on October 10, 1942, and began flying combat missions. He scored his first kill some three weeks later. He became an ace (10 victories according to the German criterion at the time) when he scored his 10th and 11th victories on April 30, 1943. He ran his score to an amazing 352 victories by the war's end in 1945. After the war he spent 10 years in Russian prisons. After his repatriation, he re-entered the German Air Force and flew F-86s and F-104s. He retired at the rank of colonel.

AIR SCOOP: What's the most important thing to remember when you're engaged in com-



...t? I'm referring to making decisions in the cockpit, not while planning the mission.

COL HARTMANN: What we always told our pilots was that you had to control the highest altitude possible, because in no air combat situation you can find, will you win air superiority from the bottom up. You have to get it from the top down. This was true in World War I and in the Second World War. You had it in Korea and Vietnam. It will always be the same. Whoever controls the high altitude will win air superiority.

AIR SCOOP: How did you develop your tactics of *See, Decide, Attack, Reverse, or Coffee Break*?

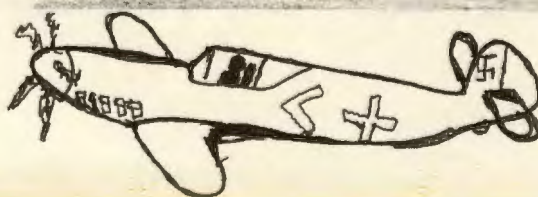
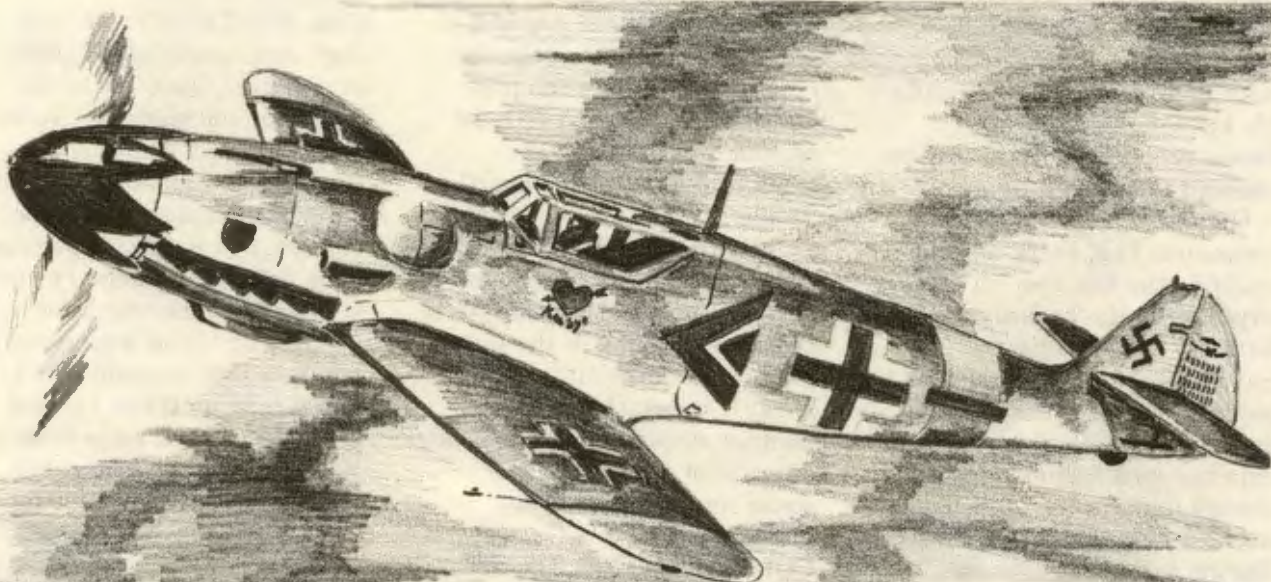
COL HARTMANN: I developed my tactics by watching my leader. My first leader, MSgt Eduard Rossman, was always cautious. He said he didn't like to pull a lot of Gs because of a bad shrapnel wound in his arm. He would look over each fight and decide if he would enter.

When he did enter, it was always straight through—no turns—and he usually came home with a kill. My next leader, Sgt Hans Dammers, liked to turn and fly in the circus. The next man, 1st Lt Josef Swernemann was somewhere in between the two. He would be patient for a while, but then would get into a turning fight when he got frustrated. This is when I realized you must fight with your head, not your muscle. Your hope for each mission is to come home with one kill. That is enough. Sometimes you do better, and that is nice, but if you always get one kill, that is good. (Ed note: Col Hartmann was shot down seven times—always from ground fire, never by another aircraft.)

AIR SCOOP: Let's talk about the relationship between leadership and safety. You were a squadron commander, then the commander of the Luftwaffe's first all-jet wing, flying F-86s. How do you make the pilots in

the squadron know that if they always do the right thing, in some cases, it's not going to be what the young pilot perceives as what fighter pilots are supposed to do?

COL HARTMANN: Fighter pilots are individualists. They will decide for themselves. The commander needs to have flying experience; much more than the pilots, I think. Then the pilots listen. Up in Ahlhorn I had one case where this proved itself. After the last afternoon of the week, all the pilots came together for half an hour at the bar. Everyone got a drink. We talked about the day and what was going on. Once a pilot was telling me how he had a low-level up on the North Sea. I just listened and listened until he had told what he had done and how tough he was. Then I told him, "If everything you're telling me is true, you will be the first dead man in our squadron." Three weeks later he was dead. Then I had no problem with discipline





An interview with Erich Hartmann, the Ace of Aces

among my other pilots. They were looking at me to figure out how I knew that he would go down.

I think it would be very difficult when a squadron commander has 500 flying hours and gets a squadron full of pilots with 1,000 to 2,000 hours. He can have trouble leading this squadron because the pilots are better.

AIR SCOOP: How do you combat the macho image that depicts the fighter pilot playing hard all night and then fighting all day? How did you work with that?

COL HARTMANN: I found one of the best ways to counteract this was to ask, before the mission, who was in no shape to fly, who drank too much last night, or who didn't feel well. If someone said yes, I would stand him down for the day with no punishment or penalty. He knew he could do this. However, he would probably be induced to not do it again.

On one hand you have the awareness that every mission could be the last one—of total exposure to the hazards of battle; on the other hand you have a need to relax and compensate for the stress brought on by the situation. In my own experience, a fighter pilot is always under a tremendous amount of stress during a war. During peacetime missions, the flying is also stressful. It is a special stress for the man, and against this stress he needs an

outlet. He has a drink and does a lot of singing. And that's not necessarily bad, because every day he knows something can happen—an accident. He sees other people, for instance his wingman on a low-level, and boom! He hits a hill or something and he's dead. This stress brings a need for something to let him be free again. That's not what is dangerous for the mission.

This is my position: the day or mission is finished, and you go to the bar and have a drink for life. There is no big difference between wartime and peacetime for a fighter pilot. Business is business. On any given day you can get into an accident because you do something wrong or something happens to the aircraft.

AIR SCOOP: What you're saying is, you have to create the environment where the pilot disciplines himself. You must rely on him to be mature enough to say, "Today I can" or "Today I can't."

COL HARTMANN: Exactly.

AIR SCOOP: You mentioned a very important thing that we're sensitive to today in the fighter pilot community (in all pilots, really): stress. How do you monitor stress to know that one day a pilot can handle the stress and on another day maybe he can't handle it?

COL HARTMANN: The important thing is to know your people well. And of course, keep watching out for small

signs, such as inattention at the briefing or if a guy's attention definitely wanders. Then if you're not sure, stand him down. Don't send him on a mission. Ask him afterwards, "What's wrong?" Never ask him in front of the other guys. Every pilot will say nothing is wrong in front of others.

AIR SCOOP: How does the individual pilot establish himself as a leader, someone that other pilots who are less experienced would look to for guidance? In your early experiences in World War II, you flew on someone's wing until you gained experience, then other's flew on your wing. How do you make that transition? What experience do you go through to make the transition from wingman to leader?

COL HARTMANN: No "special" experiences at all. Just experience. You come to the squadron and you have leaders on the ground. That's your squadron commander, your wing commander, the senior officers. But in the air you can have different leaders. For instance, as in the war, a sergeant. You heard from other pilots how this sergeant was a tough man up there. He had been at the front more than a year, he had been decorated, and he already had 40 or 50 kills. Then you got him as a leader. I had no problems as a lieutenant flying as a wingman with the sergeant in the lead. I had a feeling of security be-

ause he was so experienced.

AIR SCOOP: How does an experienced pilot train a new guy?

COL HARTMANN: If you are a leader for a new wingman, then you have to take care. The first time you go out into combat, the young wingman doesn't see it. With an inexperienced pilot, you have to assume that he's going to make mistakes and that he'll blindly rely on you to do the right thing to provide an example that he can follow. If you set the proper example, the training will come by itself until a point comes where you can tell the guy, "Now don't worry about a thing. Don't worry about what to do. Just follow my example and don't lose me." That's all they have to do. When you fly two or three times, he gets the experience too.

AIR SCOOP: Let's talk about young pilots. You had many young pilots come into your squadron towards the end of the war with no experience. What was the most important thing you told the pilot?

COL HARTMANN: Watch me. If I saw he was very young and was straining with flying because he had a bad time in training (but this was only in 1945), in combat I often told him to stay high and watch me while I went for myself.

AIR SCOOP: You never lost a wingman?

COL HARTMANN: No.

AIR SCOOP: What's the hardest thing for a young pilot to learn in combat or peacetime?

COL HARTMANN: It's the same for both: to control the airplane.

AIR SCOOP: So the important thing for a pilot is to always learn his aircraft better?

COL HARTMANN: Yes. Fly, fly, fly.

AIR SCOOP: When an instructor or flight leader is flying with a new, young wingman, what must he think about, be alert to? How does he read the new pilot so he can help him?

COL HARTMANN: I found out that if you have to fly with youngsters, you should never show any kind of nervousness yourself. You should talk to him quietly, and don't expect him to be an expert. You have to, in your own mind, tell him he's not ready. As a kid, he gets nervous and he makes mistakes. And instructors must

always be very quiet.

AIR SCOOP: You don't espouse the theory of instruction by fear and sarcasm?

COL HARTMANN: Sarcasm is good only in the case if a young pilot needs cutting down to size. You can find out, especially around the bar, what people really are.

AIR SCOOP: That brings up an instructional technique we talked about: you have to know the young pilot's personality.

COL HARTMANN: You must have personal contact with every pilot. You deal with each individual pilot one-on-one.



An Interview with Erich Hartmann, the Ace of Aces

Back to the other part of an earlier question [about what an instructor can do to help the new, young wingman]: the only thing he can really offer is general advice and to always expect the youngster to do something wrong. Then, if he does, don't upset him by jumping on him. On the other hand, a lot will depend on your reputation as an instructor. If your reputation is high, then the chances that this youngster is going to become overly aggressive or do things on his own is very slim. If your reputation isn't so hot, then that would increase the guy's tendencies to go off on his own.

AIR SCOOP: Today we have pilots who are coming to fighters for the first time, but who have 1,000 or 2,000 hours flying time. They were instructors in basic training before they came to fighters. How do they get credibility and fit in?

COL HARTMANN: There is no problem. They know how to fly instruments and aerobatics. They only need to learn how to use the weapons and fly the tactics. This will come because of their previous flying experience. When I got out of the Russian prisons after 10½ years and came back into the Luftwaffe, I went to the States to check out. I first flew T-6s with a training instructor, a captain. On our first flight he said, "Do a barrel roll." I said, "What is that?" So he showed me. It was perfect. So I tried

and it was terrible. I told myself he could teach me, and he did. You must always be ready to learn.

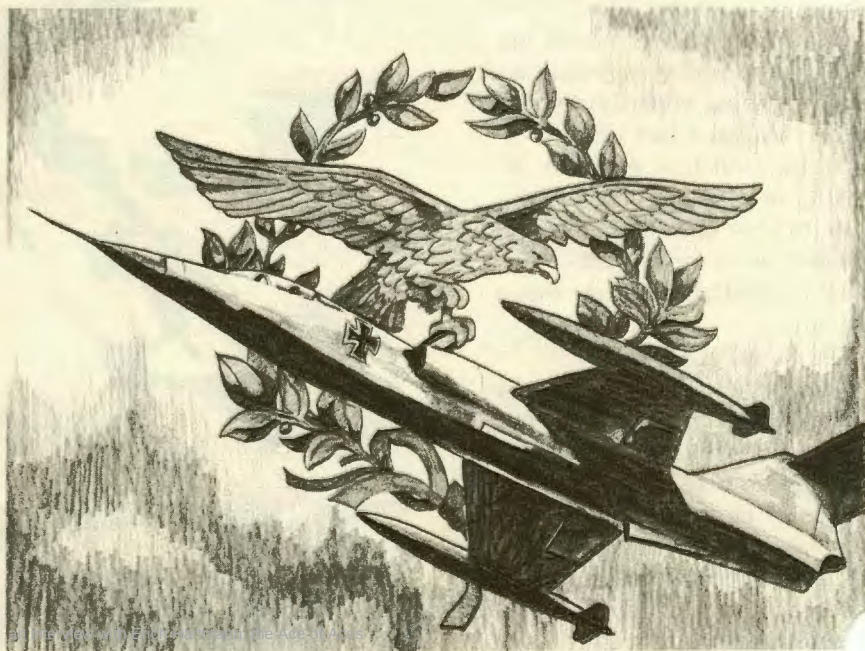
AIR SCOOP: Let's talk a little about the relationship between the pilot and the maintenance man. How do they build rapport so they are both going for the same end result—that the aircraft will always be 100 percent mission capable?

COL HARTMANN: That is simply a human problem. It's just dealing with people. Everyone must conduct himself so that he gains trust. The maintenance people must trust the pilot to the point that when he says something is wrong with the airplane, they believe him. Also, the pilot has to have faith in the maintenance people so that when they say an air-

craft is ready to fly, he is sure that it is.

AIR SCOOP: How does a pilot mentally prepare himself to go on a combat mission? What do you do to avoid undue hesitation that would prevent mission accomplishment?

COL HARTMANN: You don't need any additional preparation for that. The fighter pilot doesn't hear the shooting. With the pilot, it's the same on a combat mission as on a training mission. I never found that I had any sensation before a mission. I knew what to expect. There was no fear, as such, going into that situation. You're too busy with flying the aircraft, staying out of trouble, and killing your target. And then, after 28 kills, it becomes routine.



CREW CHIEF SAFETY AWARD

While launching an F-15, SSgt Bobby J. Ingle spotted a small foreign object on the ramp in front of the number one intake. The foreign object turned out to be the metal end of a mechanical pencil. He signaled the pilot to hold position and shut down the engine. Sergeant Ingle then removed the foreign object.

Sergeant Ingle's seemingly simple actions did two things that show a solid safety attitude. Despite the pressure to launch the aircraft on time, he went the extra step and removed that small foreign object, which prevented damage to the engine. His response when he saw the foreign object wasn't to walk in front of the intake; it was a conscious decision to follow safe procedures by first shutting down the engine, which precluded the possibility of ingestion.



SSgt Bobby J. Ingle
325 AGS, 325 TFW
Tyndall AFB, Florida

TAC Annual Ground Safety Professional Awards

OUTSTANDING ACHIEVEMENT IN GROUND SAFETY AWARD for one or more outstanding mishap prevention services performed for the unit, TAC, or the Air Force:



GS-11 Michael Mehalko
23 AD, Tyndall AFB,
Florida



S-11 Thomas Vaden
1 TTW, Homestead AFB,
Florida

EXCEPTIONAL PERFORMANCE IN GROUND SAFETY AWARD for continuous professionalism in providing commanders and unit personnel with safety management activities that have shown results:



GS-11 Robert Guthrie
366 TFW, Mountain Home
AFB, Idaho

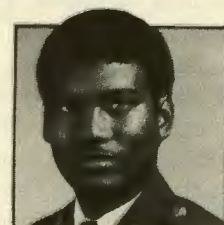


SMSgt Terrance Goodwin
HQ ADTAC, Langley AFB,
Virginia

DISTINGUISHED GROUND SAFETY NEWCOMER AWARD recognizing the young civilian or military member who through demonstrated performance has the potential for success in the safety field:



SSgt Christopher Bynum
4 TFW, Seymour Johnson AFB,
North Carolina



SSgt Earl Faulkner
31 TTW, Homestead AFB,
Florida

HOW MUCH IS ENOUGH?



By Lt Col Charlie McSwain
Chief of Safety
188 TFG (ANG)

An F-4 student aircrew on an RTU syllabus mission was having their fair share of trouble getting airborne. The mission was only the tenth F-4 flight for the student pilot, a recent UPT graduate, and the third for the WSO, a recent UNT graduate. When the crew arrived at the aircraft, the pilot noticed the left oil pressure gauge was missing; it took the

WSO four tries to finally get the INS up on the line; and after a long taxi, the end of runway (EOR) team discovered a hydraulic leak that required fixing. The crew was understandably anxious over the delays.

The two-ship flight took off a few minutes late and flew to the working area where they practiced some basic formation events. While leading a pitch-out and rejoin, the pilot noticed recurring Master Caution and Oxygen Low warning lights.

Checking their oxygen gauges, both crew members saw the indicating needle was continually rotating clockwise; as the needle swung past the one liter mark each revolution, it tripped the lights.

Now, anybody with a couple of hundred hours in the Phantom knows this is a fairly common but minor problem with the gauge. But this crew didn't know that; they thought their supply of oxygen was really low. The WSO dutifully searched the checklist as they

th selected 100 percent oxygen. The pilot reached down to select extra pressure too but inadvertently didn't push the lever up far enough into the detent (so only normal pressure was delivered). Thinking he should be receiving greater pressure, the pilot was convinced an oxygen problem existed. Both crew members began to experience a hot, flushed feeling and tightening of the stomach.

Their instructor pilot, in the backseat of the wing aircraft, didn't know anything about their problem until the crew reported they were experiencing *hypoxia symptoms*. When he heard that, the IP directed a descent and made sure they were both on 100 percent oxygen. Then he led the flight back at 8,000 feet. During RTB, the crew started feeling better. They declared an emergency, talked with the SOF, and dumped fuel. The IP led them to an uneventful landing.

The aircraft's environmental systems were thoroughly inspected. Troubleshooters found some minor discrepancies, but nothing that would account for hypoxia at the altitudes they were flying. Apparently the crew's inexperience and incomplete knowledge of the oxygen system created apprehension and caused them to hyperventilate.

The case was solved . . . or was it? In my mind, the incident raises a few questions that we would all do well to answer.

First, let's look at the human factors, not just the physiological side of this incident. The recent UPT/UNT graduates with all of 12.4/3.2 hours are hardly at home in the F-4. Anxiety. They are under pres-

sure to make good grades and perform well for the instructor who's on their wing. More anxiety. Granted, these are normal student pressures expected in the RTU situation. But when we start adding maintenance problems on the ground, how many does it take

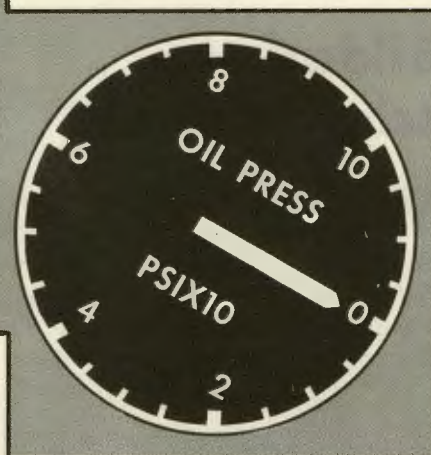


before they're wondering what's going to happen if/when they do get wheels in the well? Then they're late; color them concerned about airspace block times, turn times, etc. More anxiety. Once airborne, throw in the perception that a life-sustaining system isn't working right. How much compounded anxiety constitutes panic?

And how about pressure to produce? If the student crew (or their IP for that matter) had ground aborted, would they have lowered their self-image? Would they expect to be criticized by their peers or supervisors who are also under pressure to meet sortie goals and complete training phases on schedule?

Finally, how many times should a crew accept a maintenance guarantee that *this* time the aircraft really is fixed before they request a spare or call it a day? How many aircraft

problems in the flight are our flight leads willing to drag into the air? If your answer is something to the effect that it's your job to protect mother and country and all that, how much protection can you offer while coping with emergencies within the aircraft or flight? After all, would you really expect to get a missile off the rails or log an *effective* training mission in an



aircraft that's missing an oil pressure gauge, has an INS that needs realigning four times to get a platform and attitude information, and has a hydraulic leak that needs plugging at the end of the runway?

Hey, I'm not throwing rocks at anybody. I just think we would all do well to look at our own outfits and see what the environment's like. Are we allowing our own aircrews to get unnecessarily loaded down with many small problems that compound and complicate their mission?

Lt Col McSwain is the Chief of Safety at the 188 TFG (ANG), Ft. Smith, Arkansas, where he has also served as the unit DO and stan/eval officer. Currently an F-4C IP, he has amassed nearly 6,000 hours flying time in 17 different types of aircraft (from the F-86 to the F-4) during his career.

CHOCK TALK

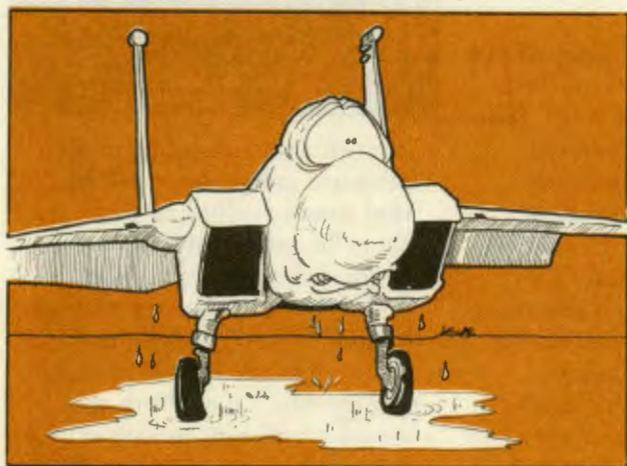
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INCIDENTS AND

Bildad the schoolemright

When an F-15 ground aborted because of a fuel leak that the end of runway team discovered, Bildad, an experienced fuel system specialist, and Schmedlock, his new trainee, met the aircraft when it returned to the chocks. They discovered a



leaking seal on the main fuel pump and began removing the pump. Schmedlock was told to disconnect a clamp on the augmentor inlet line while the more experienced repairman unhooked several other lines.

The clamp that Schmedlock was undoing consists of two similar triangular plates that bolt together over the joint at the junction of the male and female parts of the fuel line. When all three connecting bolts were removed, the clamp didn't separate into two pieces, so Schmedlock didn't notice it was a two-piece clamp.

After replacing the leaking seal, the twosome reinstalled the fuel pump and began hooking the

associated lines back up. When it was time to attack Schmedlock's clamp, which fits into a fairly cramped space, the trainee's job was to hold the clamp together and hold the nuts in place while Bildad installed the three bolts that held the clamp together. Bildad couldn't actually see the clamp as he tightened the bolts, but he assumed that since Schmedlock took it apart he would know how to properly reassemble it.

But it didn't happen that way. At some time during the pump removal, the clamp separated into its two halves. The free half slid rearward along the fuel line and wasn't seen again. During the reassembly of the clamp, Schmedlock didn't notice the rear half was missing. And the reassembly seemed normal to Bildad.

Next, three supervisors inspected the work. And it wasn't a cursory look; inspector #12 took out his flashlight and mirror and made sure the three bolts had been reinstalled. They were. Another inspector discovered a bolt that wasn't torqued correctly and a connection that was improperly safety wired.

Finally, the engine was started, and the aircraft passed a thirty-minute leak check. So it was released for flight.

On the next sortie, the seal held securely for 40 minutes. Then a wingman noticed the aircraft was streaming fuel. The pilot saw his right engine's fuel flow was considerably higher than the left one; so he shut down the engine. That stopped the fuel leak before a fire developed, and the Eagle landed uneventfully.

Hey, all you Bildads. There are a lot of clamps out there. And Schmedlock will eventually learn them all as well as you. But he'll continue to learn them by trial and error — unless you teach him otherwise . . .

INCIDENTALS WITH A MAINTENANCE SLANT

Wotchisheer stuff

A T-33 FCF pilot was up putting a T-Bird through its paces on a functional check flight that followed an engine change. The flight profile had gone along smoothly up through the clean and configured stall series. After recovering from the configured stall, the pilot raised the gear, flaps, and speed brakes. Then he noticed a light stick input to the left that caused the aircraft to roll slightly left. Hmmm.

The FCF pilot grasped the stick firmly and brought it hard right to level the wings and then turned off the hydraulic-powered aileron boost. At this point he was unsure of positive aircraft control without the aileron boost; so he turned it back on. Bad move. The stick immediately drove full left, and the aircraft followed its lead by rolling violently left. The startled pilot once again turned off the aileron boost, continued a left roll from the nose low inverted position, and recovered from the resultant steep dive around 2,500 feet above the ground. The rest of the flight was uneventful.

When he pulled back into the chocks after landing, he turned on the aileron boost once more; the stick and ailerons immediately drove full left. And this time when he turned the boost off, the stick and ailerons remained there. When the engine was shut down, the hydraulic pressure did not bleed down.

After the aircraft had warmed up in a hangar for half an hour, the ailerons relaxed to the neutral position without any maintenance action. Then one of the troubleshooters took a hydraulic fluid sample. Wotchisheer stuff? The pink color was

the first sign something wasn't right. The second was when some of the fluid solidified when it was placed in a freezer. Next, water was found in the bottom of the hydraulic reservoir. Finally a hydraulics lab confirmed water contamination of the hydraulic fluid.

The hydraulic reservoir did not leak and servicing procedures appeared to be correct. What happened? The source was never positively identified. But from the amount of water found in the system, it's a pretty safe bet that someone left off the cap to the hydraulic reservoir during servicing. Rain did the rest.

Have a heart for the part

Did you ever bust a knuckle installing a part in a tight spot only to find out it was the wrong part? *@!?! That's frustrating. What's even more



aggravating is supplying the wrong parts to ourselves. "How's that?," you say.

After an F-111 pulled back into the chocks following a mission, the crew chief noticed the horizontal stabilizers oscillating. The aircrew had felt minor vibrations during the flight and noticed that a six-degree stabilizer split was required to hold the wings level on final approach.

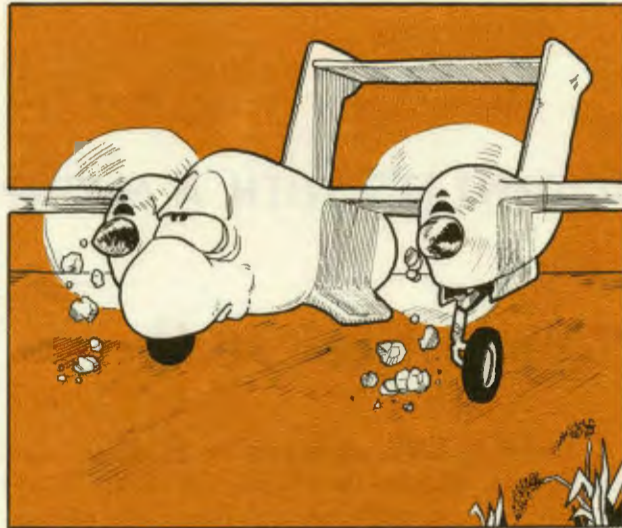
Troubleshooting finally narrowed the problem down to the right horizontal stabilizer control valve which was replaced. But the new valve didn't check out. Apparently, it was bad too. So the mechanic ordered another valve from supply and fixed the problem a second time. The new valve solved the oscillation problem, but the mechanic accidentally created another problem for someone else. Instead of submitting a materiel deficiency report (MDR) on both bad valves, the original was accidentally returned to the supply system.

Returning a bad part to the supply system unfortunately happens. But there's more involved than the inconvenience of the put-out mechanic who has to redo the work. For one, the aircraft remains unflyable for a longer time; that's unacceptable when missions have to be scrubbed, when there's no aircraft to fill the alert commitment, and during key exercises/ORIs. Also, the MDR process is deprived of some information that might be significant to all units that use the part.

We've all heard that the job's not over until the tools are put away; it's also not over until the defective parts are sent to their proper resting place. Let's not make it harder than it has to be.

School on ice

After starting the number one engine and waiting for it to warm up before unlocking the prop, an OV-10 pilot was surprised when the engine popped and flamed out. Wonder why a motor would behave like that?



Later, some troubleshooters came to find out why. When they cranked number two, several chunks of ice tumbled out of the inlet. Looking around, they saw that ice had accumulated inside both engine inlets. Apparently, the crew chief didn't notice it during his preflight inspection.

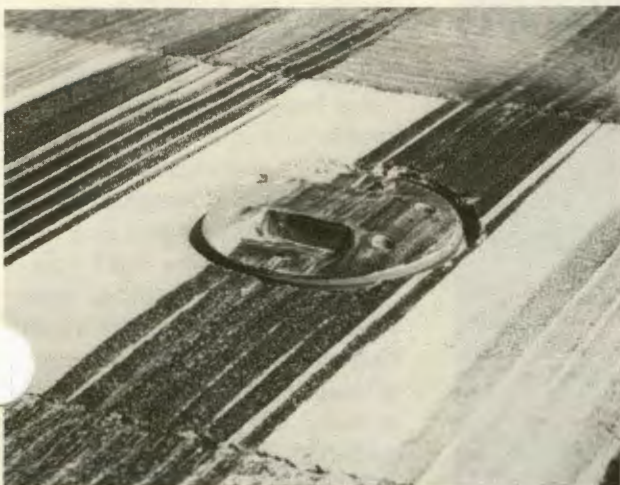
Guess where the aircraft had just come from? No, not Alaska, the wash rack. The Bronco had been washed the day before and moved into a nice, warm hangar. Then, because of a higher priority need for the limited hangar space, the still-wet aircraft was towed back outside to spend the night in the cold. Outside, where the temperature was below freezing, water that had seeped in around the inlet covers during the wash froze. No mystery here, Sherlock.

Or is there? Later during a follow-up inspection, some quality assurance workers found some interesting information that may be related — several maintenance workers in the outfit didn't know the Dash Two procedures for engine preheating. And some others said they never bothered with them, because most of the time the temperature wasn't below freezing. If the engine had been sufficiently preheated, the ice would have melted.

Now the unit conducts a review session on cold weather procedures each year just ahead of Jack Frost. If your unit doesn't, now's not too late to start.

WHAT NOW ?

An F-4 with utility hydraulic failure came in for an approach-end arrestment. Touchdown occurred at the desired airspeed about 400 feet before the BAK-12 cable. But the hook bounced when it hit the lens covers over some runway lights and sailed over the cable. When the pilot



realized he'd missed the engagement, he applied emergency brakes at high speed and then heard both main tires blow. He managed to bring the Phantom to a stop on the runway.

Another F-4 pilot wasn't so lucky. When his aircraft experienced utility failure, he too tried an approach-end arrestment. This time the cable grabbed the tailhook, but the cable snapped before decelerating the aircraft. This Phantom drifted right and departed the runway.

An A-7 pilot, distracted by an uncommanded yaw input after rolling out on final, landed about 2,500 feet down the runway with more airspeed than he really wanted. Towards the latter part of the landing rollout, when it became obvious that he wasn't going to be able to stop on the runway, he lowered the tailhook and called, "Cable, cable, cable." Tower raised the departure-end BAK-14 as soon as they could, but not in time to catch the Sluf. It took this cable a full seven seconds to reach the up-and-locked position (how long does

it take yours?). The aircraft crashed into a ditch.

Hook skip, a broken cable, and waiting too long to call for the cable—do these cable fables have anything in common? Maybe. Could it be that sometimes we place too much reliance on our arresting systems?

Unlike our navy friends, we air force pilots seem to have the mindset that once we've touched down, the aircraft *has* to stay there. Once we're on the deck, it seems that many of us feel our job is done, and now it's up to the cable. Not true. By thinking that way, we set the stage for a simple hook skip to become a mishap. What about the go-around option?

One of the preliminary steps listed in the F-4 emergency procedures checklist for an approach-end arrestment says it best: "*Plan for missed engagement.*" During a high-speed, time-compressed landing emergency, the pilot may not have time to calculate all the variables before he suddenly becomes aware that he has lost his option to stop on the remaining runway. Developing a back-up plan *before* the attempt is a must. And that seems to be where some of us are falling down.

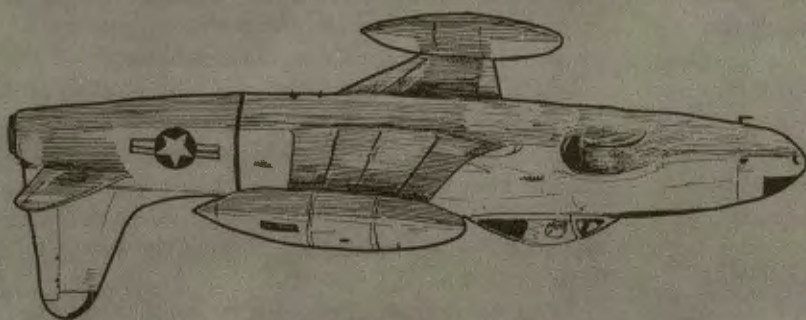
There is probably room for improvement in the way we train in the simulator (Have you ever missed an engagement in the simulator?).

Under certain conditions, the best plan might be limited to waiting for the next cable. That's entirely appropriate if the pilot has consciously chosen that course of action; what we are seeing too much of is pilots not thinking about other options until they've already missed the first wire...

True, conditions don't *always* favor taking it around. Sometimes weather, lack of fuel, or controllability preclude the go-around option. And attempting to go-around when the tailhook is firmly grasping the wire can be a deadly mistake. But there are many instances where a go-around after the aircraft is on the deck would be the appropriate response.

Like I said, for us blue suiters, it's not an automatic response; it takes a plan. ➤

I WAS THERE



By Anonymous*

It was my last flight of the day, a night sortie, and the weather was 300 and 1. Though I was a bit tired, the weather didn't bother me—I'd flown the T-33 on several approaches in 100 and 1/4 weather back when doing so was legal, and I had confidence in my instrument ability. I had 1,300 hours in the jet, was waiting to go to RTU for my first fighter assignment . . . in short, there was nothing that could happen in this jet that I couldn't handle.

Run-up was normal, takeoff was fine, and I immediately entered the weather just as I started a 45-degree right turn out of traffic. Yep, things were fine—just another sortie—until halfway through the turn my attitude indicator (the only one in the T-33) rolled in its case and died. No sweat—I immediately transitioned to turn needle, ball, and airspeed. I'd practiced these transitions many times because I'd had a flight commander earlier who swore it might save my life some day.

My real problem began as I transitioned—I looked at the ball, and it was in the *right-hand* side of the case—*not* in the center or left-hand side where it normally would be for a right hand turn. Whether the ball actually failed, or whether I was already disoriented, I can't say. I do know that I did become disoriented when I saw the right needle, right ball indication.

I remember concentrating on the stick, trying not to pull too

much backstick, and still seeing a hundred knots. I unloaded the aircraft, and I remember seeing 350 knots as I pulled 5 Gs at 2,500 feet AGL and started back up the roller coaster (all in the weather). I saw 100 knots again, started to reach for the ejection seat handles, decided to stay with the aircraft, and grimly regretted my decision as I started a 5-G pull at the bottom of the roller coaster (with the ground lights dimly visible through the top of the canopy, leading me to believe that I was at least 45 degrees nose low). This time, at the top, my head erected enough to find a semblance of level flight.

Within five minutes, I had landed safely after flying a no-
gyro, precision approach in 300 and 1 weather using a needle-and-air speed crosscheck (I still didn't trust the turn ball coordinator, though it *seemed* to

start to work after I rolled out on final).

What were my "lessons learned"? There are several. First, I owe a great debt to that flight commander who challenged me to not only know my emergency backup instrument procedures, but who challenged me to *practice* those procedures. Though no fighter in the inventory has a J-8 attitude indicator with no standby ADI (like the venerable T-33), the point is still valid—when was the last time *you* practiced a no-shootin' standby instrument approach down to minimums in a two-holer or with a chase? Trying to build the learning curve when you *are* forced to fly a standby instrument approach doesn't make much sense and has cost some guys their lives.

The second lesson involves disorientation. I'm convinced that the turn needle was par-

tially disabled. However, after landing, ground checks showed that only the attitude indicator was inop. Therefore, though I had practiced the transition from primary to standby instruments many times, when I had to do it for real, I was disoriented. In retrospect, I probably should have jumped out of the airplane both times when it reached the top of the roller coaster. I bet my life that I could stay with the jet a little longer—my disorientation could very well have cost me my life.

Finally, I learned another thing from that experience five years ago: be wary of thinking it can "never happen to me." It can. It did to me. ➤



* We often learn our best lessons from mistakes we've made. But sometimes we don't give others the benefit of our education for fear of tarnishing our reputation. That's a shame.

Do you have a "there I was" story with a moral that might help someone else? (If you've been flying tactical aircraft for any length of time, I bet you do.) Well, you can earn yourself a Fleagle T-Shirt if we print your story—even if it's anonymous.

We'll guarantee your confidentiality—but you'll have to tell us where to send the T-shirt. Send your tale/faux pas/lesson in a plain brown envelope to Editor, TAC Attack, HQ TAC/SEP, Langley AFB, Virginia 23665-5001.



DOWN TO EARTH

The ashes smolder longer

Long after the fire is out, the ashes continue to smolder. That's something people with wood-burning stoves and fireplaces should remember whenever they dispose of the ashes.

Ashes should never be carried in a cardboard box.



Some people have found out the hard way that the ashes can still be hot enough to catch the box on fire. Use a nonflammable container to carry ashes, even if you think the ashes are out.

Ashes should also never be dumped onto anything flammable. Yard fires have been started by ashes dumped onto piles of leaves or dried grass. If you dump ashes on the ground, drench them thoroughly with water to make sure they are out. Check them later to make doubly sure.

Short cut or risk?

By CMSgt Ronald Christiansen
Chief, TAC Ground Safety

Short cuts can be beneficial or risky depending on why you want to take a shorter route. Maybe you found a quicker way to get to work, avoiding traffic signals and vehicle congestion; or you use the microwave instead of a stove—beneficial short cuts. But if you decided not to enter information on maintenance forms until tomorrow (because no one would be working that night), or if you by-passed a step in the job guide (because you were in a hurry), then the short cut became a risk.

Why do we do it? People take short cuts because they are inexperienced, they don't realize what the consequences will be if they use a short cut, they don't understand the supervisor's instructions (or simply don't follow them), or they have personal problems that affect their ability to make clear judgments.

Whether you're a supervisor or a fellow worker, look at the prospects for taking short cuts. If the short cut is a better way of doing the job, change the job guide. If the short cut means taking a risk, change yourself.



Safety Kit for Kids. Would your child know what to do during an emergency if he were home alone? The American Red Cross has developed a Children's Safety Awareness Kit, designed for children under 14 and their parents. Contact your local chapter for more information.

Stress and Exercise. Emotions can add stress which could negate the benefits of exercise. That's what Steven Siconolfi, director of the Human Performance Lab at Pawtucket Memorial Hospital in Pawtucket, Rhode Island, has found. Mental stress and frustration during exercise makes the heart rate and blood pressure rise. But because the body doesn't adjust its use of oxygen accordingly, the heart is stressed. Maybe it's not a good idea to be a mad jogger.

Firewoods I Have Known:

RATINGS FOR FIREWOODS* TYPE	RELATIVE AMOUNT OF HEAT	EASY TO IGNITE?	EASY TO SPLIT?	HEAVY SMOKE?	POPS/THROWS SPARKS?	GENERAL COMMENTS
HARDWOODS Apple, ash, beech, birch, dogwood, hard maple, hickory, locust, mesquite, oaks, Pacific madrone, pecan	High	No	Medium	Little	Yes, when poked	Excellent
Alder, cherry, soft maple, walnut	Medium	Medium	Yes	Little	Little	Good
Elm, gum, sycamore	Medium	Medium	No	Medium	Little	Fair — too much water when green
Aspen, basswood, cottonwood, yellow-poplar	Low	Yes	Yes	Medium	Little	Fair but good for kindling
SOFTWOODS Douglas fir, southern yellow pine	Medium	Yes	Yes	Yes	Little	Good, but smokes
Cypress, redwood	Low	Yes	Yes	Medium	Little	Fair
Eastern and western red cedar, white cedar	Low	Yes	Yes	Medium	Yes	Fair, excellent for kindling
Eastern white pine, ponderosa pine, sugar pine, western white pine, true firs	Low	Yes	Yes	Medium	Little	Fair, good kindling
Larch, tamarack	Medium	Yes	Yes	Yes	Yes	Fair
Spruce	Low	Yes	Yes	Medium	Yes	Fair, but good kindling when dry

*USDA Forest Service

COURTESY Wood Heating Alliance

Fever Facts for Children. The American Academy of Pediatrics defines a fever as a temperature of 101 degrees F or higher and recommends starting fever-reducing medication only when the temperature reaches 101 degrees F. The Academy also says that temperatures of less than 105.8 degrees F are relatively harmless except in newborns.

Cold Facts. Forty-one percent more people died from excessive cold in the last three decades than from hurricanes, tornadoes, and floods combined. Make sure you don't become a statistic: dress warmly against winter storms, prepare a car survival kit, travel with caution, stock food supplies, listen to forecast warnings, pace strenuous physical work, keep fire hydrants clear, maintain home emergency equipment, and take care of your wood stove or fireplace.

Hot Facts. Smoke detectors are saving lives; statistics show the death rate caused by fire is going down. But there are still 6,000 deaths and 30,500 injuries each year, mostly children and senior citizens. December and January are the heaviest fire months, with most residential fires occurring at night usually from a heating source, the biggest culprit being an improperly installed wood stove.



Does Your Woodstove Back-Puff? (That's what happens when you open the door of a woodstove and a smoldering log bursts into flames.) There are two ways to avoid it. One way is to build a smaller, hotter fire using less fuel and keeping the vent open all the way. This method prevents back-puffing and chimney fires. The other way is to open the vent all the way several minutes before you open the door, and then open the door slowly so the oxygen level in the stove can increase gradually.

Road Fatigue. The South Carolina Insurance News Service estimates that after four hours of steady driving, a driver will take 20 percent longer to make steering corrections and swerve three times as far to regain control of a vehicle. Road fatigue is a killer, especially to military members who travel long distances to see relatives or friends and cram two days of driving into one in order to get back for duty on time. Road fatigue can be prevented. Here's some advice: before you hit the road, don't eat a big meal or take a cold remedy, antihistamine, or drink alcoholic beverages. Stop at least every two hours and take a break from driving. Avoid driving hypnosis by varying speeds, dimming dash lights, and looking from side to side instead of focusing on a point straight ahead. Sing, whistle, listen to the radio, but not soft, soothing music. Keep fresh air coming in, and smoke as little as possible — smoke fatigues the eyes.

Product Recalls. • Two electric heaters made by the Patton Electric Company are being recalled because of a possible fire hazard: the *Patton Heater Plus Fan Model HF-10* and *Sears Heater Plus Fan Model 201-7208*. The slide-type control switch on the top of the heater may be faulty. The heaters were sold nationwide between August 1983 and March 1984. If you own one, stop using it, unplug it, and call Patton at 1-800-528-6600, Ext 1722; Arizona residents call

1-800-352-0458, Ext 1722; and Alaska residents call 1-800-528-0470, Ext 1722. Patton will replace the defective item at no cost. • Robertshaw Controls Company has offered to pay consumers \$150 to replace old (manufactured between 1946 and 1955 and last distributed in 1960) Unitrol A-1 series LP gas water-heaters with a new one. The safety control feature can wear out leading to a potentially dangerous condition. They were produced in several styles, most featuring two dials and carrying the name *Unitrol*, *Robertshaw-Grayson*, or *RUDD*. Call Robertshaw at 1-800-421-1130 or the Consumer Product Safety Commission hotline at 1-800-638-CPSC for more information.

Vanilla Extract from Mexico could contain coumarin, an extract that has been outlawed in the U.S. as a food or food additive. The Department of Health and Human Services warns that all vanilla food products from Mexico be avoided because they may contain coumarin extract. These products are commonly sold in markets and roadside stands in Mexico and are labeled vanilla flavoring, vanilla extract, or vanillin.

Sulfites are Nearly Everywhere. They're preservatives that are widely used in restaurant foods, especially shrimp, peeled and processed potatoes, and the veggies in salad bars. They're also in beer, wine, and champagne. And some people have severe reactions to them. If you have asthma, be particularly alert to a label with *sulfur dioxide*, *potassium* or *sodium metabisulfite*, *potassium* or *sodium bisulfite*, or *sodium sulfite*.

Don't Have a Cup of Coffee to sober up. In a study at the University of Swansea in England, researchers have found that coffee may increase alcohol's more dangerous side effects. Alcohol slows your reaction to a red light by 30 percent; adding caffeine can slow you down another 24 percent. Caffeine does help your brain be more alert. But mixed together, alcohol and caffeine make you tense and tremble; incoming messages to the brain and outgoing messages to the arms and legs are slow and inaccurate. And the more caffeine, the worse it gets. What should you do? You already know: don't drink and drive.

TAC TALLY



CLASS A MISHAPS
AIRCREW FATALITIES
TOTAL EJECTIONS
SUCCESSFUL EJECTIONS

TAC		
NOV	THRU NOV	
	1984	1983
2	22	25
0	16	11
2	16	25
2	14	22

ANG		
NOV	THRU NOV	
	1984	1983
1	7	10
0	2	9
2	7	9
2	7	4

AFR		
NOV	THRU NOV	
	1984	1983
0	1	1
0	0	1
0	2	0
0	2	0

TAC'S TOP 5 thru NOV 84



TAC FTR/RECCE		
class A mishap-free months		
39	58 TTW	LUF
28	405 TTW	LUF
22	1 TFW	LFI
21	33 TFW	VPS
19	23 TFW	AEX

TAC AIR DEFENSE		
class A mishap-free months		
142	57 FIS	BIKF
95	5 FIS	MIB
92	48 FIS	LFI
51	318 FIS	TCM
42	87 FIS	SAW

TAC-GAINED FTR/RECCE	
class A mishap-free months	
151	188 TFG(ANG) FSM
143	138 TFG(ANG) TUL
142	917 TFG (AFR) BAD
120	114 TFG(ANG) FSD
109	183 TFG(ANG) SPI

TAC-GAINED AIR DEFENSE	
class A mishap-free months	
125	177 FIG(ANG) ACY
91	125 FIG(ANG) JAX
74	119 FIG(ANG) FAR
58	107 FIG(ANG) IAG
49	147 FIG(ANG) EFD

TAC/GAINED Other Units	
class A mishap-free months	
184	182 TASG(ANG) PIA
168	110 TASG(ANG) BTL
164	USAFTAWC VPS
156	84 FITS MER
98	552 AWACD TIK

CLASS A MISHAP COMPARISON RATE

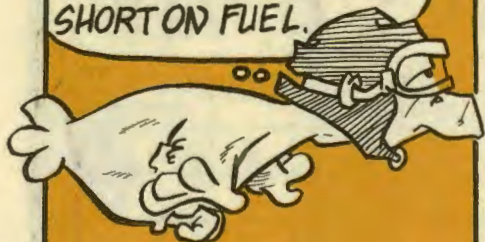
(BASED ON ACCIDENTS PER 100,000 HOURS FLYING TIME)

TAC	1984	3.4	4.3	3.3	2.5	2.9	3.8	3.3	3.2	3.1	3.3	3.3	
	1983	6.9	5.3	3.4	3.8	4.0	3.8	4.5	4.1	3.9	3.7	3.8	
ANG	1984	0.0	2.3	1.5	2.2	2.6	2.1	1.8	2.1	2.3	2.5	2.6	
	1983	9.1	7.0	4.4	4.3	3.4	4.2	4.8	4.2	4.7	4.3	3.9	
AFR	1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	2.7	2.5	2.2	
	1983	0.0	0.0	0.0	0.0	0.0	0.0	3.6	3.1	2.8	2.5	2.3	

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

FLEAGLE

LOOKS LIKE I'M A BIT SHORT ON FUEL.

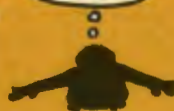


TOWER, THIS IS FLEAGLE. I'M DECLARING MINIMUM FUEL, OVER.

ROGER FLEAGLE, YOU'RE #3 BEHIND A BIG CONDOR AND A FALCON.

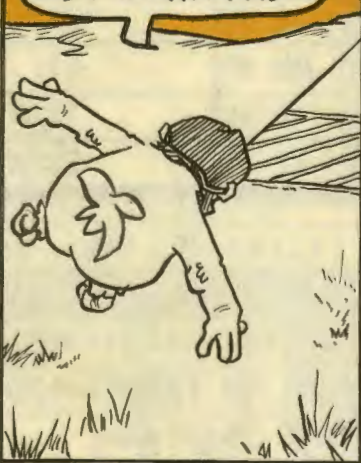


MAYBE I OUGHT TO HAVE SAID EMERGENCY FUEL.



HARRISON

I BETTER GET DOWN FAST.



OH NO!



SOMETIMES TH' DIFFERENCE 'TWEEN MINIMUM AN' EMERGENCY FUEL IS OH SO SLIGHT.

