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TCAS Near Miss or Near Hit?

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Photo Illustration by Dan Harman

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GENERAL JOHN P. JUMPER
Chief of Staff, USAF

MAJ GEN KENNETH W. HESS
Chief of Safety, USAF

COL KIRBY HUNOLT
Chief, Safety Education and Media Division
Editor-in-Chief
DSN 246-2968

JERRY ROOD
Managing Editor
DSN 246-0950

CMSGT JEFF MOENING
Maintenance/Technical Editor
DSN 246-0972

PATRICIA RIDEOUT
Editorial Assistant
DSN 246-1983

DAN HARMAN
Electronic Design Director
DSN 246-0932

TSGT MICHAEL FEATHERSTON
Photo Editor
DSN 246-0986

Commercial Prefix (505) 846-XXXX

E-Mail — jerry.rood@kirtland.af.mil
Address Changes —
patricia.rideout@kirtland.af.mil

24-hour fax: DSN 246-0931

Air Force Safety Center web page:
http://afsafety.af.mil/
Flying Safety Magazine on line:
http://safety.kirtland.af.mil/magazine/htdocs/fsmfirst.htm

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THE CHIEF OF SAFETY, USAF

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SAFETY sage

Twelve Standard Aviation Questions that Shout "Watch out!"

1. Is this flight necessary?
2. Who is in charge?
3. Are all hazards identified and have you made them known?
4. Should you stop operations or flight due to:

—Communications?

—Weather?

—Confusion?

—Turbulence?

—Personnel?

—Conflicting Priorities?

5. Is there a better way to do it?
6. Are you driven by an overwhelming sense of urgency?
7. Can you justify your actions?
8. Are there other aircraft in the area?
9. Do you have an escape route?
10. Are any rules being broken?
11. Are your communications getting tense?
12. Are you deviating from the assigned operations or flight?

WHEN IN DOUBT————DON'T!

Reprinted from the National Forest Service Aviation Safety Summary, August 2003. Prepared by the National Aviation Safety Center.

TCAS
What Every Pilot Should Know

USAF Photos by SSgt D. Myles Cullen and SSgt Jeremy T. Lock
Photo Illustration by Dan Harman

MAJOR ERIC CAIN
Chief, Cockpit Displays Programs
AFFSA/XOPF

If pilots aren't properly trained on how to use the system, they may create an unsafe situation.

Following a 1997 mid-air collision between a USAF C-141 and a German Air Force Tu154 off the coast of Africa that killed 33 people, the USAF increased efforts to equip all its passenger-carrying aircraft with a Traffic alert and Collision Avoidance System (TCAS). With every new cockpit upgrade or new aircraft acquisition, more of the Air Force's pilots are flying with a TCAS on board. While TCAS is very well designed and easy to use, if pilots aren't properly trained on how to use the system, not only could many of the intended benefits be lost, they may create an unsafe situation.

TCAS provides protection from other transponder-equipped aircraft and is designed to work independently from air traffic control. TCAS interrogates other aircraft transponders and determines the range and closure rate of those aircraft. This range and rate information is used to track aircraft and, if needed, provide traffic advisories (TA) and resolution advisories (RA). A TA is an indication given to the pilot that a certain aircraft is a potential threat. An RA is an indication given to the flight crew recommending a maneuver to avoid a collision. There are three basic versions of TCAS: TCAS I, TCAS II version 6.04 and TCAS II version 7 TCAS I is a very basic system that aids in the visual acquisition of other aircraft and will provide TAs, but will not provide RAs. TCAS I is installed primarily in rotorcraft and other types of "less maneuverable" aircraft. TCAS II V 6.04 is very capable, but has been found to issue unnecessary RAs and is not compatible with the decreased aircraft spacing that is part of Reduced Vertical Separation Minimum (RVSM) airspace. TCAS II V 7 is an upgrade to version 6.04 with numerous improvements including increased surveillance capability and RVSM compatibility. Additionally, version 7 allows TCAS-equipped aircraft to coordinate RAs and even reverse direction, if necessary. RA coordination means that when two TCAS II V 7 equipped aircraft approach each other, they will data link the direction they intend to maneuver, allowing for a less disruptive solution to the conflict. This coordination process is only possible if both aircraft are equipped with a Mode-S transponder. TCAS II V 7 is the only TCAS system that meets the International Civil Aviation Organization (ICAO) standards for worldwide implementation. Because most USAF TCAS units are TCAS II V 7, it is the focus of this article.

TCAS monitors traffic and categorizes it into one of four groups: Other, Proximate, TA (Intruding) and RA (Threat). Other traffic is any aircraft beyond six NM and 1,200 feet of your aircraft (displayed as an open diamond). Proximate traffic is an aircraft that is within both six NM and 1,200 feet of your aircraft (displayed as a filled diamond). A TA is most commonly displayed as a yellow circle and indicates that an aircraft is a potential threat and an RA may be necessary within, approximately, the next 25 seconds. An RA is displayed as a red square and is accompanied by a recommended vertical maneuver.

RTCA DO-185A—Minimum Operational Standards for Traffic Alert and Collision Avoidance System II (TCAS II) Airborne Equipment.)

Despite all of the new TCAS features, a pilot's actions can make or break the overall safety of the system. A solid understanding of what the pilot is expected to do will ensure that the system will provide its intended level of safety. A pilot's responsibilities change depending on the type of target detected by TCAS. Other and proximate targets are displayed for situational awareness purposes only. No action or maneuver by the pilot is expected or desired.

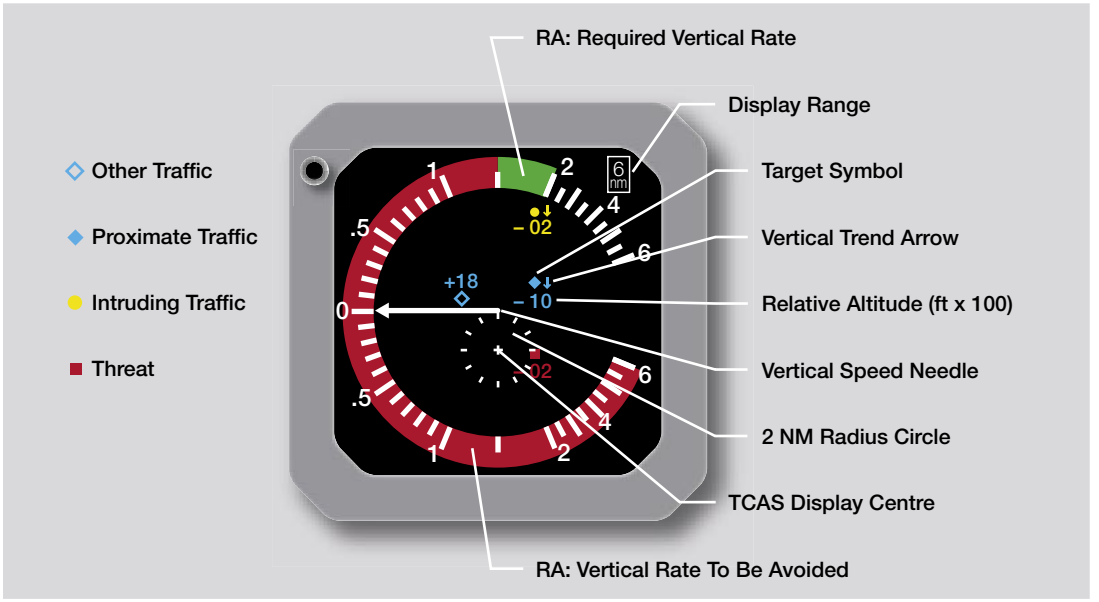


Figure 1—Typical TCAS Display

A pilot's actions can make or break the overall safety of the system.

The purpose of an RA is to either increase or maintain the existing vertical separation from an intruder. One thing to keep in mind is that TCAS almost always calculates maneuvers based on time, not distance. TCAS logic uses time to closest point of approach (CPA) by analyzing closure rate information. The only exception is during encounters where the closure is very slow. During these slow-closure encounters, it is possible for aircraft to get dangerously close without satisfying the time to CPA criteria necessary to issue a TA/RA. To protect aircraft in these situations, TCAS makes use of a distance modification (DMOD) feature. DMOD is a distance at which, regardless of closure rate, a TA or RA will be issued. *(For more information on TCAS logic and functionality reference*

When a TA is issued, the pilot should use the displayed information to aid in the visual acquisition of the intruder and to prepare for an RA, which may follow within the next 25 seconds. An RA is a vertical maneuver designed to maintain or provide safe separation from another aircraft.

RA displays come in three basic designs: instantaneous vertical speed indicator (IVSI), vertical speed tape or as a pitch cue. Unlike the IVSI, which is usually a stand-alone display, vertical speed tapes and pitch cues are integrated into the primary flight display (PFD). If an aircraft doesn't use an IVSI (similar to figure 1), then another display should be available to function as the traffic display. A traffic display graphically presents aircraft within a specific volume of airspace around your aircraft. A stand-alone traffic display will only

show traffic, it will not provide the guidance for an RA. When presented with an RA, the pilot should follow the recommended guidance offered by the TCAS display(s). An IVSI and the vertical speed tape both make use of color to show vertical speeds to be avoided (red) and desired vertical speeds (green). A pitch cue, on a head-down or head-up display, uses distinctive symbology to display a specific pitch to be flown or avoided to resolve an encounter. When an other or proximate target is displayed, the pilot should bring the traffic display into the normal instrument crosscheck and allow the information to enhance visual lookout and overall situational awareness. If a TA is issued, the pilot should use the information to aid in the visual acquisition of the intruder and prepare for the possible occurrence of an RA. When an RA occurs, the pilot has **five seconds** to assess the situation and maneuver the aircraft to the green or recommended area on the display. If the TCAS displays an increase rate or reversal RA, the pilot should comply within **2.5 seconds** utilizing 1/3 g acceleration. Pilots should note, during RAs the required altitude excursion will rarely exceed 300-500 feet.

Knowing and understanding the basics of TCAS is essential.

Knowing and understanding the basics of TCAS is essential, but it isn't enough. Pilots need to be exposed to and practice complying with different TCAS encounters, so they can learn what TCAS does and why. There are many different ways TCAS training can be accomplished. The ideal way would be classroom instruction followed by a realistic simulator profile. If you use TCAS, your training program should be very similar to the sample program shown below. If you use TCAS and your program doesn't include the items listed below (or if you are saying "what TCAS training program?"), this would be a good time to restructure (or build) a comprehensive training program. Realize that this complete sample program is only possible if the specific aircraft platform has the necessary equipment capable of simulating TCAS encounters. If this type of equipment is not available, substitute computer-based training or comparable tabletop instruction for the simulator. There is no set amount of time that should be dedicated to each of the following topics, but each area should be covered in enough detail to adequately prepare pilots to understand and comply with TCAS recommended maneuvers. The training program, at a minimum, should contain the following:

1. Academic Classroom Instruction
   a. Theory of Operation
   b. Operating Procedures
   c. Display Interpretation
   d. Crew Coordination
   e. Reporting Procedures
2. Simulator (Initial)
   a. Response to TA/RA
   b. Should sample all possible aural/visual presentations
3. Simulator (Refresher)
   a. Response to TA/RA
   b. Introduce realistic scenarios to include a reversal

NOTE: The following publications will help provide the information necessary to expand on each of the topics listed in the sample-training program above.

- *Introduction to TCAS II V 7 (available at www.arinc.com/tcas/)*
- *AFI 11-202 V 3 para. 5.29*
- *AC 120-55B: Air Carrier Operational Approval and Use of TCAS II*

The documents listed in the note above will help with all the listed training programs except for reporting procedures. It is important that TCAS incidents are reported, so the situation in which the incident occurred can be studied and understood. This knowledge is used to evaluate the correctness of the TCAS logic, airspace design, ATC procedures, maintenance procedures and pilot training. An RA may indicate a problem in one or more of the above areas. As the pilot in command, if you feel that an RA incident was a result of deficiencies within one of these areas, contact your safety office and explain the situation. With or without an RA, if you believe the TCAS displayed incorrect information, gave an incorrect advisory or omitted pertinent information, make a write-up in the aircraft forms and, if the situation warrants, notify your safety office and see if they have any recommendations. Lastly, let the AF Flight Standards Agency (AFFSA) know via the AFFSA problem reporting site at: https://wwwmil.andrews.af.mil/pages/AFFSA/xo/xop/xop_dir.htm. AFFSA will work with the TCAS experts to try and solve your problem.

In addition to formal training, TCAS functions and procedures are excellent topics for squadron training days and as part of the instrument refresher course. Additionally, during flight briefings, it's a good idea to discuss the responsibilities of the pilot and pilot not flying (PNF). The briefing should include expected pilot actions during TCAS maneuvers, and the PNF's duties to include assisting in visual acquisition of the intruder and required radio calls to ATC.

Many people are familiar with the midair collision between a Tu154 and a Boeing 757 over Europe in the summer of 2002. In that midair collision, both crew members on the DHL 757 and the 57 passengers and 12 crew members on the Tu154 were killed. While there were many different factors that led to the mishap, a major contributing factor was that the crew of one aircraft disregarded the TCAS RA in order to comply with ATC instructions. The TCAS issued a climb maneuver, yet the pilot descended per the controller's directions. The main lesson learned is pilots *shall* respond to all RAs *as directed* by the TCAS system, unless doing so would jeopardize the safe operation of the aircraft (e.g., descent into obstacles). I know several pilots who read the accident report and thought, "there is no way that would happen to me…obviously, I would follow the RA." When seated at your zero airspeed and 1 g desk, it is easy to say what you would or wouldn't do in a given situation. The truth is there are several situations where pilots may feel uneasy about complying with an RA that seems to be contrary to rules or common practices. For example, let's say you are VFR below the lateral limits of Class B airspace or VFR at 17,500 ft, and you get a climb RA. Complying with the RA will cause you to enter airspace without a proper clearance, what would you do? The answer is–comply with the RA. Not only is it the safest thing to do, you are procedurally protected by AFI 11-202, volume 3, para. 1.4.1 which states, *"A PIC may deviate from any flight rule only when: (1.4.1.2.) Deviation is required to protect lives or (1.4.1.3.) When safety of flight dictates."* You may cause a little disruption and have to answer a few frantic radio calls, but it's better than hitting another airplane. Also, remember that you have responsibilities after the deviation has occurred. According to AFI 11-202, volume 3, para. 35.29.1.4., *"Pilots who deviate from an ATC clearance in response to an RA shall notify ATC of the deviation as soon as practical and promptly return to the current ATC clearance when the traffic conflict is resolved or obtain a new clearance."* Now, let's say you get a TCAS RA, but you have visual acquisition of the intruder and believe it is no factor, what would you do? Comply with the RA! You have no way of knowing if the traffic you visually acquired is the traffic causing the RA. An "unnamed" Air Force crew almost learned this lesson the hard way. The crew was conducting multiple IFR approaches to a civilian airport. During a turn to downwind, they received a climb RA. The PNF stated he had the intruder in sight and it was no factor. The aircraft stayed level and had a small single-engine aircraft pass less than 100 ft below them. The entire time, the PNF had visual contact with a different aircraft in the downwind pattern at an adjacent airport. There are many other scenarios to consider. What if an RA directs you into weather? What if you have an RA during an emergency (loss of thrust)? What if you are at your aircraft's service ceiling and get a climb RA? It is better to think about these situations while you're on the ground where you have all the time you need, which isn't always the case in the air.

TCAS functions and procedures are excellent topics for squadron training

TCAS is a very simple system to use, but pilots must understand how the system works. Proper knowledge and realistic training will help all pilots safely comply with TCAS maneuvers. This article represents a brief overview of TCAS and its associated rules and procedures. It was not intended to teach you everything there is to know about TCAS. If you would like more information about TCAS and TCAS-related procedures try these web sites.

http://www.arinc.com/tcas/
http://www.eurocontrol.fr/ba_saf/acas/Index.htm
http://www.eurocontrol.int/acas/welcome.html

If you have questions or need additional information, please contact Major Eric Cain, HQ AFFSA/XOP, at DSN 857-5226 or email at eric.cain@ andrews.af.mil. ☐

Wow, I'm Really @#^&!@ Up!

A Story Of

HQ AFSC Photo by TSgt Michael Featherston
Photo Illustration by Dan Harman

LT PETE "EWOK" KASARSKIS
524 FS
Cannon AFB NM

I was very leery of my actual instrument experience.

I grabbed my grade book with anticipation to see what impressions my IP had on my last ride. Much to my surprise, the IP had written a rather benign statement, "Big learning curve with poor weather—much experience gained." On what I considered my scariest flying incident yet. This is the story of how I unknowingly put an F-16 into 90 degrees of bank and couldn't recover the aircraft by myself.

I graduated UPT the previous September with the opportunity to fly the single-seat F-16. Immediately, the realization I would become a single-seat pilot caused me to question where my weaknesses were. I began my training at a UPT base that rarely flew during weather, so I had little opportunity to experience severe spatial disorientation (Spatial D). By graduation, I could count the number of instrument approaches I had flown in actual weather on one hand. Because of this, I was very leery of my actual instrument experience. Fortunately, I thought, I'm going to Luke AFB in the desert and won't have to worry about Spatial D for awhile. I mistakenly thought that with more experience (albeit day VFR) and better avionics, Spatial D might never be a problem.

When my F-16 B-course began at Luke, we learned we would be the first F-16 class to train there with NVGs as part of the basic course syllabus. The squadron leadership was excited and nervous about this new training. Apparently, some doubted the Air Force could safely send student pilots with only 50 hours of Viper time into the night with NVGs. However, because the Air Force operates at night, NVG experience is a critical skill for new wingmen. Using good ORM principles, the squadron leadership trained additional NVG instructors and modified the F-16D models to allow the students to have backseat IPs as safety observers on all flights.

The mission was my second in the NVG training phase and was flown as a two-ship with one student and one instructor in each jet. We planned to hit a tanker and then practice basic two-ship tactical maneuvering followed by 1v1 intercepts on each other. Unfortunately, we were flying in the middle of the Arizona monsoon season, and the weather forecast called for scattered layers of clouds with thunderstorms in the airspace. It was a low illumination night over the Arizona desert, with no moon or significant cultural lighting, just the kind that severely degrades NVG capabilities. Despite the environmentals and our collective inexperience, I don't recall spending any extra time briefing Spatial D, other than the standard "get onto the round dials and recover the aircraft."

The ground ops, takeoff, and departure were uneventful. I goggled and was cleared to a one-mile line-abreast formation as we climbed into the tanker track. As promised, we ran into several unseen (with NVGs) cloud layers en route to the tanker. In fact, I went lost wingman "*three*" times with the IP taking the jet to get us rejoined the final time. We finally rejoined on the turning KC-135, degoggled, and stabilized in the observation position. The lengthy tanking (my second night tanking ever) took us through several turns in the AR track while flying in and out of the weather. After the extensive time flying formation in turns without a horizon, I didn't feel quite 100% as I finished refueling and rejoined onto my flight lead's wing.

I regoggled, and we departed the tanker VMC in route formation with a climbing right-hand turn to fly to our airspace. Soon after, it became rapidly apparent we would reenter the weather, so lead cleared me to a mile radar trail. I began to weave and slow the aircraft to get spacing while simultaneously selecting the dogfight mode to get an ACM boresight lock on lead. Unfortunately, we entered the weather when I selected the ACM radar mode, which takes the artificial horizon line out of the HUD. I had just lost two sources of attitude data, horizon and the HUD.

While fumbling in the cockpit for an OPS check, I noticed the main ADI telling me I was in about 45 degrees of right bank, significantly different than what I felt. (I probably put this attitude in during the weaving spacing maneuver.) I immediately concentrated on the round dials and placed the HUD back into the normal position. Before I could fight my senses and recover, lead came on the radio announcing he was in a right-hand turn. Despite suspecting that I was Spatial D'd, I instinctually rolled the aircraft further to the right and placed the aircraft into 90 degrees of right bank. Instead of immediately recognizing/confirming/recovering, I added back stick pressure to maintain my altitude, thus beginning a graveyard spiral which could have ended in collision with the ground 30 seconds later. Luckily, knowing the increase in Gs was not right for instrument flight, I finally let go of the controls saying, "I'm really @#^&!@ up right now." The whole chain of events took no longer than 10 seconds.

My IP immediately recovered the jet, informed lead we were Spatial D'd, and we let the autopilot fly for a good five minutes while we recaged our gyros. Once we got to the airspace, we quickly decided to terminate and come home because the weather wouldn't allow tactical maneuvering. This was probably a good call because it wasn't until after the recovery, ILS, and even touchdown that I felt "normal" again.

Being a Human Factors major, this incident piqued my curiosity. To find answers, I looked no further than AFMAN 11-217, Chapter 22. Its opening paragraph states: "The potential for spatial disorientation increased dramatically with the introduction of high performance, single-seat fighters in the Air Force inventory." A quick check with the HQ Air Force Safety Center (AFSC) revealed that 30% of the 190 Class A F-16 mishaps (1975-1993) had spatial disorientation and channelized attention listed as primary causal factors. Clearly this is a common F-16 occurrence.

According to 11-217, as a new pilot, I was set up for Spatial D. My general flying inexperience with the F-16 cockpit (50 hours) had not allowed me to become comfortable in the new aircraft. Additionally, since this was my third night ride, my NVG crosscheck was not yet routine, causing me to frequently go heads-down in the cockpit. Not surprisingly, pilots with less instrument time are also more susceptible to Spatial D. Therefore, my lack of real instrument

Not surprisingly, pilots with less instrument time are also more susceptible to Spatial D.

time in pilot training aided the onset of Spatial D. Similarly, 11-217 says Spatial D usually occurs with pilots with limited night proficiency in the past 30 days. This factor is independent of experience, as Spatial D "generally involves a pilot who has had limited flying experience in the past 30 days." Again, this was only my third night ride in 45 days; I was clearly not proficient.

In addition to the inexperience issues, the formation phase of flight increases the likelihood of Spatial D. It is difficult to suppress the vestibular sensations when in formation, because the focal vision is not concentrating on a primary attitude reference. Instead, it's focusing on a moving aircraft that may or may not provide reliable information with respect to the aircraft's attitude in relation to the horizon. Because the eyes do not receive reliable attitude information, there is no way to counter the vestibular sensations the body feels. Hence, 20 minutes of formation flying with the KC-135 in and out of the weather probably degraded my sense of a horizon, making me more susceptible to Spatial D.

The dangers of Spatial D cannot be overemphasized.

A final contribution to Spatial D is cockpit workload. During night or instrument flying, the body cannot rely on the subconscious sensory information, because the peripheral visual information is not present. Instead, a person relies on their focal vision on attitude instruments to maintain visual dominance. NVGs do not add any peripheral vision and still require an active crosscheck to maintain visual dominance. The tasks of finishing post refueling checks, frequency changes, maneuvering to a new formation, and working the radar at the same time channelized my attention and disrupted my crosscheck, causing me to lose the horizon. Unfortunately, with weather and lack of horizon in the HUD, I lost two instruments that provide focal vision to counter my incorrect perception that I was in straight and level flight. The excessive head movement while searching for switches probably exacerbated these sensory misperceptions. If I had stayed on instruments during the weave/spacing maneuver, visual dominance would have been maintained. Instead, a case of the leans gradually developed to the point where I felt straight and level despite being in 45 degrees of right bank.

As fighter pilots, we continually prepare for emergencies with EPs of the day and monthly SEPTs. Accident reports show that the physiological aspects of flying can kill you just as easily and should be reviewed frequently as well. According to the AFSC, there have been 31 F-16 engine failures from 1998 to Mar 2003, with no fatalities. During the same period, six F-16 pilots have died after becoming spatially disoriented. Clearly, the daily review of emergencies has paid great dividends to safety. Equally, pilots should not become complacent and ignore the dangers of spatial D, as this kills more often than engine emergencies.

Unusual attitude recoveries train pilots to do the mechanical recognize, confirm, and recover steps with relative ease without fighting Spatial D. New AF pilots are subjected to the Barany Chair to experience strong vestibular sensations, but they don't have to fly an aircraft at the same time. Ideally, the AF could develop a training device that combines these two, making a realistic training aid which allows for recovery from an unusual attitude while experiencing strong Spatial D. While this seems rather unpleasant, it could pay great safety dividends.

In the interim, refresher academic training should be more than a simple, "yes, Spatial D is going to happen, just simply recognize, confirm, recover" briefing. Rather, specific task saturating aspects of flight should be identified and briefed to prevent channelized attention and breakdowns in crosschecks. Experience and proficiency levels for both flight leads and wingmen need to be evaluated on every flight to prevent two susceptible pilots from flying with each other. A knock-it-off and "fly the jet first" mentality should be stressed at the first hint of Spatial D. Finally, the immediate actions of recovering the aircraft should be chair-flown to maintain familiarity with procedures.

As the Air Force continues to fly more at night and less experienced people are introduced to NVGs, the dangers of Spatial D cannot be overemphasized. In my case, I was fortunate I recognized the Spatial D, and had 25,000 feet and help from a guy in the backseat to figure it out.

USAF Photos, Photo Illustration by Dan Harman

MAJOR FRANK "SPONGIE" STEPONGZI
917th Wing Flying Safety Officer
Barksdale AFB LA

The past few years have been extremely busy for the Air Force, to say the least. We've fought in Afghanistan and Iraq, and have a continued presence in these theaters of operation. Deployment rates are still high, but are starting to cut back towards the normal pre-war levels. Something that has not gone down along with the Ops Temp is our Class A flight mishap rate, as it is up from the past few years. As a recently deployed crewmember of a combat squadron and a member of a Class A safety investigation board, I want to share with you some of my observations.

During combat missions, we flew our aircraft with full weapons loads, at maximum gross weights and in all-weather conditions. For strike aircraft, we flew in high-threat environments and at times employed weapons in close proximity to friendly troops and sometimes close to non-combatants. For transport and tanker aircraft crewmembers, many operated (and still do) out of unfamiliar airfields that do not meet US military standards. In short, we accepted more risks on these operational missions than on our training flights back home. After two years of operating this way, combat operations may have become routine to many aviators.

As we wind down from combat operations and return to flying training missions, we need to dust off the training instructions and review our Rules of Engagement (ROE). As much as we don't like to admit to it, there are differences between how we fight and how we train (I'm sure a few "patch-wearers" are starting to cringe). Even though we comply with directives for combat operations, many times our instructions allowed us to operate at higher levels of risks to accomplish our missions. For example, crew duty day limits for many weapon systems were extended, and the safety zones were reduced for ground forward air controllers during close air support operations.

Now that many of us are back home or conducting training flights from forward operating locations, we need to "change gears" and get back to basics with our training programs and mindsets. Unlike many combat missions, training sorties give us the luxury of aborting a bomb run or canceling the mission due to minor aircraft malfunctions. There are no high priority targets during training. That piece of dirt in the middle of the desert can wait another day to be bombed.

Commanders play a vital role in the safe operation of a unit. Oversight is a must and it doesn't take a lot of time to ensure day-to-day operations are running smoothly and safely. Asking your staff questions such as: "What is our process?" or "Have we accomplished a risk assessment?" for upcoming events will hit the mark every time.

Whether you are flying home station training missions or from a forward operating location, take the time to review your unit's processes, ROEs and command guidance to ensure flight safety. It is much easier to explain why you canceled a sortie than to explain why you lost an aircraft or injured someone. FLY SAFE!

Who's The Enemy?

HQ AFSC Photo by TSgt Michael Featherston

MAJOR GREGORY R. "CHAIRMAN" NEWMAN
HQ AFSC/SEFF

These mishaps resulted in the untimely deaths of three fellow fighter

After a troubled start to the year, the fighter community seems to be in reach of finishing strong. As of March 03, the fighter community suffered four midairs and one CFIT mishap. These five Class As alone accounted for six destroyed and three damaged aircraft. More sobering though, these mishaps resulted in the untimely deaths of three fellow fighter brethren. And no one has been exempt… these mishaps have involved the F-15, A-10 and F-16 communities. To recap:

25 Oct 02—Midair, two destroyed aircraft and one fatality. The aircraft were part of a 4v4 Instructor Pilot Upgrade (IPUG) sortie for mishap pilot 1 (MP1). On the mishap engagement MP1 directed the wingmen to target their respective groups. After mishap pilot 2 (MP2) took a simulated missile shot, without looking to see where his wingman was, MP1 initiated a non-clearing turn into MP2. MP2 was not in the proper formation position and much closer to MP1 than briefed. As a result, the two aircraft collided, rendering both unflyable. MP1 ejected safely. MP2 was extracted from his crippled aircraft and fatally injured. The AIB report attributed the mishap to a failure by both mishap pilots to properly deconflict their flight paths. Other contributing factors included loss of Situational Awareness, misinterpretation of closure and visual cues, task misprioritization, channelization and expectancy.

13 Nov 02—CFIT, one destroyed aircraft and one fatality. The MP, a highly experienced IP, was part of a four-ship opposed SAT training mission. On the day of the mishap, the white salt flat covering the range was covered by two to three inches of clear, calm water, which created a mirror between the ground and sky. This mirror effect diffused the horizon, giving the illusion to

the MP that there was unlimited maneuvering space, when in fact the mishap aircraft was operating perilously close to the ground. The aircraft impacted the ground in an 80-degree left bank and nine-degree nose down pitch, killing the MP instantly. The cause was determined to be the MP's loss of SA, resulting from channelized attention and a visual illusion caused by the unusual environmental conditions.

4 Dec 02—Midair, two destroyed aircraft and one fatality. While performing the tactical portion of an Air Interdiction mission, two A-10s collided. During a formation rejoin, MP2 lost sight of his flight lead and mistakenly rejoined behind MP4. Believing MP2 to be rejoining, MP1 initiated the follow-on attack without further assessing MP2's position. Misleading radio calls and acknowledgements, mistakenly reforming behind the wrong "lead," and a loss of situational awareness (SA) throughout the flight contributed to MP1 and MP2's eventual collision. After the collision, MP1 initiated a successful ejection and was recovered. MP2 initiated ejection but was fatally injured.

18 Dec 02—Midair, two damaged aircraft. The MA were numbers three and four of a four-ship NVG upgrade sortie. During separate, element RTBs, MP2 was directed by MP1 to take spacing for a radar trail recovery. Focusing on an inoperative VVI, MP2 ceased to engage in the proper crosscheck procedure both inside and outside his cockpit. MP2 obtained an undetected 110-knot closure on MP1 and collided with his lead. The AIB cited MP2's failure to prioritize his responsibilities while performing a routine night recovery as the cause. Additional factors were MP2's channelized attention and failure to maintain his formation position. Both aircraft safely recovered at home base.

17 Mar 03—Midair, one destroyed and one damaged aircraft. The mishap flight was flown as an Air Combat Maneuvering (ACM) training mission. MP1 and MP2, both blue air, were maneuvering against a single bandit. After the visual bracket, MP2 took a shot of opportunity against the "hostile" aircraft, but misjudged his lead's aspect and failed to deconflict. Thinking his lead was not a factor, MP2 pressed the fight and shortly thereafter, collided with MP1. The aircraft went into an uncontrollable spin and MP2 initiated a successful ejection. MP1 safely recovered his aircraft at home base. The AIB cited the failure of MP2 to properly clear and deconflict his flight path with that of his lead prior to entering lead's fighting airspace as the cause.

Some key points to consider from all of these mishaps.

- Human factors, in some form or another, were involved.
- Assumptions and contracts are good, but you cannot assume each flight member is doing exactly as briefed every time.
- A good motto to follow is: "Trust, but verify." I'm not saying to "baby" your wingmen or be overly conservative to the detriment of sound tactics, but as a flight lead, check the position of your flight members throughout the sortie and correct anything that's not "right."
- As a wingman, fly what was briefed.
- Remember the basics of "VFR"… stay VISUAL, be in FORMATION, and then use the RADAR (if your MDS has one).
- If you can't do those basic tasks, inform the flight lead and/or call a terminate or knock-it-off (KIO).
- Each flight member has the KIO hammer and the obligation to use it when and where it's needed.

Some other food for thought. Our greatest enemy does not exist in the AOR. The biggest threat is not North Korea, Iraq, China or even the former Soviet Union. Our biggest threat is ourselves! (Some examples are channelized attention, misprioritization, visual illusions, formation responsibilities.) Think about it. Over the last six years, how many aircraft have we lost to hostile actions versus "our own" actions/mistakes? Combat knowledge and tactics are necessary and vital, but not if that knowledge comes at the expense of "forgetting" the basics.

Things to consider before every sortie: Are we putting too much on our plates on any one mission? Is the "tactic" we're training for really the way we will fight? From the operations desk to the cockpit, we need to practice sound leadership throughout the squadron. Everyone needs to be held accountable for their own and their flight's actions. The fighter pilot's "Culture of Assumptions" needs to become "Trust, but verify."

Fly safe. Fly smart. Check 6! ☐

Our greatest enemy does not exist in the AOR. Our biggest threat is

Photos by SSgt Ricky A. Bloom, USAF
and PH1 Ted Banks , USN
Photo Illustration by Dan Harman

MSGT TRACY A. GRAVES
Chief, Airfield Management
Dyess AFB TX

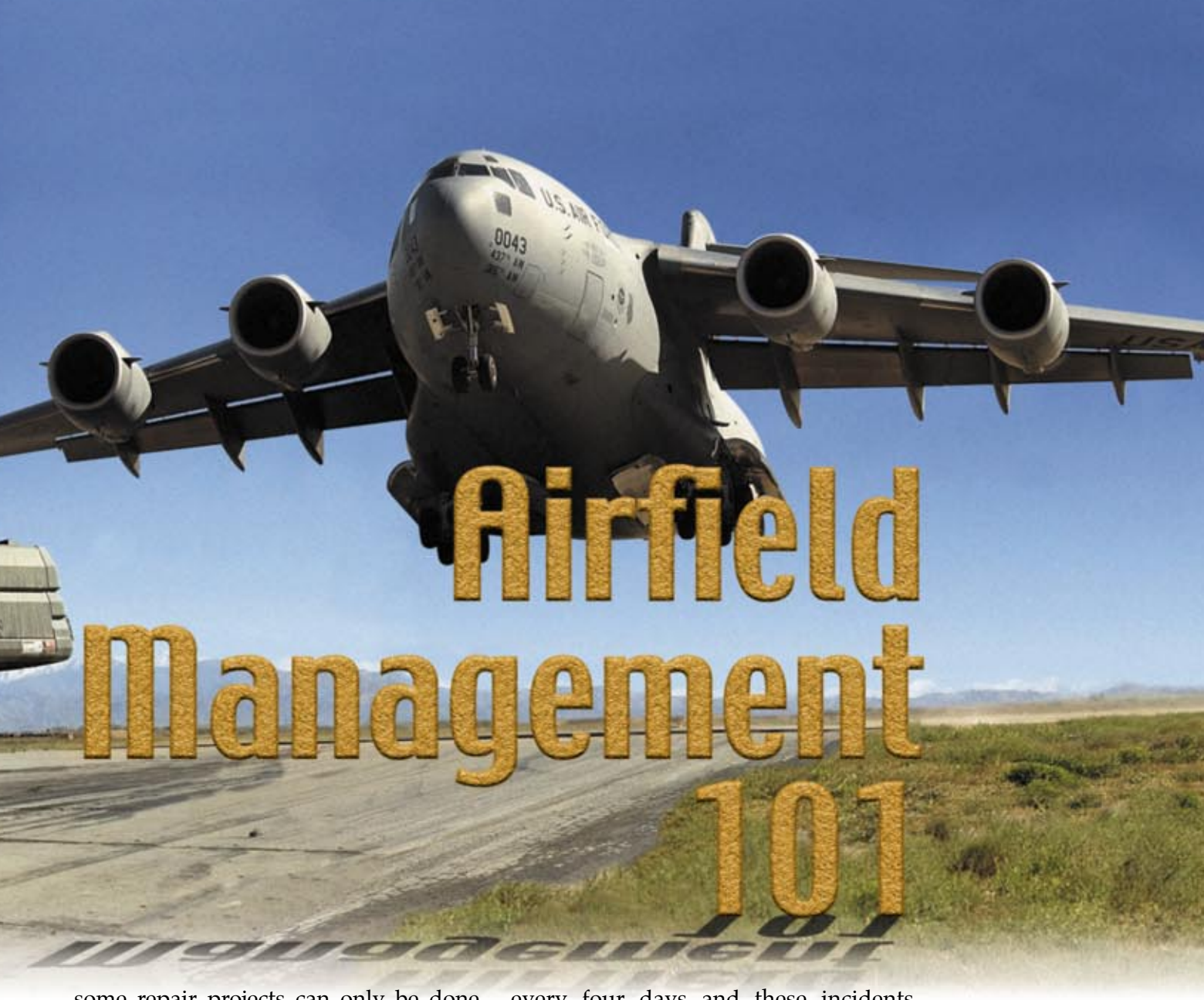
At what point do mission requirements conflict with safety

The importance of military aircraft safely arriving and departing a base to accomplish their mission goes without saying, as does doing so with the least amount of complications. But at what point do mission requirements conflict with safety and which one takes priority?

As an airfield manager I am tasked to correct airfield deficiencies, provide for safe operations, and do so with minimal impact to airfield operations. Although this sounds impossible, what it requires is creative planning by airfield managers and civil engineers, all with the cooperation of the base flying community.

Pavements continue to crumble from operations despite the efforts of civil engineering, airfield management, safety personnel, contractors and the wing foreign object debris (FOD) manager. With the current operations tempo, conducting construction on the airfield directly impacts flying operations and is a logistical nightmare. Construction must be completed quickly and sometimes the result is short-term patches instead of permanent repairs. Thus, an endless cycle of re-accomplishing repair projects every few months.

When planning an airfield construction project many factors are considered, but the basis for every decision is the impact to airfield operations. Most contractors work a standard workweek, and anything outside of this can drive the project cost substantially upward. Even if the contractor is willing to work outside the hours of flying operations,



some repair projects can only be done during daylight hours, and many projects are completed over the weekend to reduce the impact to flying operations. But with the military's mission being what it is, there will be times when the two requirements conflict.

This is where airfield managers need the flying community's cooperation. Flying cannot continue at an airfield that will crumble beneath the aircraft. We assume additional risk by allowing flight operations at an airfield with inadequate facilities. Is this risk worth the possibility of loss of life and/or aircraft? Complacency derived from no FOD incidents or no past major pavement failures, makes stressing the importance of pavement repairs versus flight operations a difficult one.

The Air Force has a FOD incident every four days and these incidents average $220,000 in repair cost per incident. From FY93 to FY02, the Air Force spent $201 million to repair FOD incidents; many were due to improper care of airfields. This is why airfield managers strive to repair airfield facilities before they become a problem, not after a mishap. By taking care of our airfield properly the first time, we reduce the risk to flight operations while reducing construction costs.

It takes a team effort to ensure airfield facilities are maintained in the safest possible condition. The airfield manager has made safety the top priority when construction is taking place at your airfield, and has considered the impact to flying operations. Bottom line, paying the bill up front is the cheapest and safest way to meet the Air Force mission!

Flying cannot continue at an airfield that will crumble beneath the aircraft.

CFIT

The Ultimate Oh S#@t!

HQ AFSC Photos by TSgt Michael Featherston
Photo Illustration by Dan Harman

There I Was:

Aviate, Navigate, Communicate

CAPT GREG TOLMOFF
357 FS/SE
Davis-Monthan AFB AZ

So, There I Was…

I was on top of the world at my A-10 Flying Training Unit (FTU). I got checked out at the local airport, and re-hacked my currency flying single-engine-propeller planes. On this day, the sun was shining and the weather was perfect, even by Southern Arizona standards.

In my rented Cessna 150, I flew from Tucson to Phoenix, completed some licensing paperwork with the FAA, and was on my way home. I was about four months into my six-month A-10 FTU, so I thought I knew it all! I decided to pull the throttle of the Cessna, descend down from 3000 feet AGL to 500 feet AGL and do a little low-level flying over the Arizona desert.

When I pulled the throttle, the engine quit. "You're S%$@ing me!" What happened next surprised the hell out of me.

- I maintained aircraft control.
- I analyzed the situation and took appropriate action.
- I landed as soon as conditions permitted.

First, I established my glide, then I picked a field for my landing area and aimed straight for it. Next, I tried to figure out what had just happened. I ran through the appropriate engine failure/restart checklist—Fuel, Mixture, Throttle, Carb Heat, Master, Primer, Key. None of it worked. However, I remembered my civilian instructor years earlier saying, "If it doesn't work the first time, try it again—what do you have to lose?"

So, I tried the sequence again, and the engine fired up! I leveled off, and found an old, abandoned airstrip about two miles off my nose. I was in a perfect base position, just a little bit low! The engine kept up for about 10 seconds, just enough time for me to guarantee making my intended landing point. Then the engine died again, and I glided the aircraft to a picture-perfect landing on a less-than-perfect runway.

(It turned out there was a large piece of debris in the fuel filter, and at certain angles of attack, it would close off the fuel flow to the engine, causing it to stall. When I pulled the throttle and started the descent, I hit the "critical" angle of attack.)

It was then that I realized the enormity of what had happened. My legs started shaking and I felt nauseous. But I had done everything correctly, and I saved my own life. There was nobody else in the cockpit with me who could have helped me with my problem. I aviated, I navigated, and I communicated. I actually didn't communicate because time and conditions did not permit.

I had done everything correctly, and I saved my own life.

I have often reflected on that day. I then understood why all of the early morning stand-ups stressed the basics— Aviate, Navigate, Communicate. Maintain aircraft control, analyze the situation, and land as soon as conditions permit. The Air Force was trying to help me develop habit patterns that I could fall back on when routine flights went south. And on that day, even though I was not in an Air Force aircraft on an Air Force mission, those habit patterns saved my life. Now I teach the young Hawg Drivers, and I continually emphasize the basics and the development of good habit patterns. You never know when your day is going to go south, and take it from me, you want solid habit patterns on your side.

USAF Photo by TSgt Michael R. Nixon

Timeless Topics

The Ops And Maintenance Team

"Fixing" is just as important to the mission as "Flying and Fighting."

CAPT DUANE W. DEAL
HQ USAF/LEY
Washington, DC
Revised from *Flying Safety*, August 1983

"How about an additional duty as a maintenance officer?"

"You gotta be kidding. With Stan-Eval on my back, the mission planning and alert, I barely have enough time for my Ops duties."

"Me? I'm a fighter pilot! I just want to fly and fight!"

"How would you like to help yourself accomplish your Ops duties while making it easier to 'fly and fight'?"

"Sounds good to me."

"Roger."

Back to the original question. The way to accomplish this feat is for each aircrew to become a more active part of the Ops side of the maintenance program. Further, perhaps one of the most important things aircrews can do to ensure their own success, and that of their unit, is to serve daily as "ex officio" members of the maintenance Quality Assurance (QA) office.

In a parallel to the Stan-Eval office, maintenance has its QA office. As a direct representative of the MXG, it has the dual charter to conduct evaluations of personnel and inspections of equipment to determine the health of the maintenance complex. Another important aspect of the office is its responsibility to serve as watchdog to assure sound safety practices exist throughout maintenance. QA has an interface with every area of maintenance, performing

Aircrews must become a more active part of the Ops side of the maintenance program.

The aircrew is a partner in providing a healthy product to meet the unit and Air Force mission.

USAF Photo

evaluations, soliciting feedback and ensuring adequate training is provided. Finally, QA offices are tasked with the essential duties of monitoring the functional check flight, the aircraft weight and balance, and the tech order and material improvement programs. Plus, serve as the focal point for all tech orders in the unit (from your aircraft Dash One, to checklists on everything done in maintenance). But how does the aircrew fit into the QA picture?

As with the new recruit or technician, part of an aircrew's in-processing to a new unit should ideally be an introduction to the maintenance complex. This overview, led by the Ops training office with Maintenance Group guidance, should inform the aircrews not only about the location of various work centers, but also about the functions of those areas. Just visiting the working areas of specialists during a unit tour provides a new dimension for many aircrews, as they witness the behind-the-scenes activity which provides them with mission-capable aircraft. Also, an appreciation might be gained for why specialists' support takes longer than desired due to workload, priorities, and/or sheer distance. Most importantly, the aircrews should become aware of their much-needed contributions in providing a sound maintenance product. These contributions/responsibilities include:

Complete 781 Discrepancy Write-Ups.

An effective description will provide enough detail to speed up troubleshooting and subsequent repair. Although the following actual write-ups may have seemed sufficient at the time, each created extra work on the part of maintenance due to its inexact nature: "cabin pressure shaky," "IFF INOP," "afterburner slow" and "radio operation intermittent." Discrepancy narratives must include such information as instrument readings, time into the flight, aircraft configuration, altitude, attitude, and weather conditions (as appropriate for the discrepancy). Other clues not readily available to maintenance should also be included, such as the aircrew resetting the circuit breakers or applying "Gs" to remedy a problem. Finally, aircrews aren't doctors, and maintenance troops aren't pharmacists, so take the time to write and sign legibly.

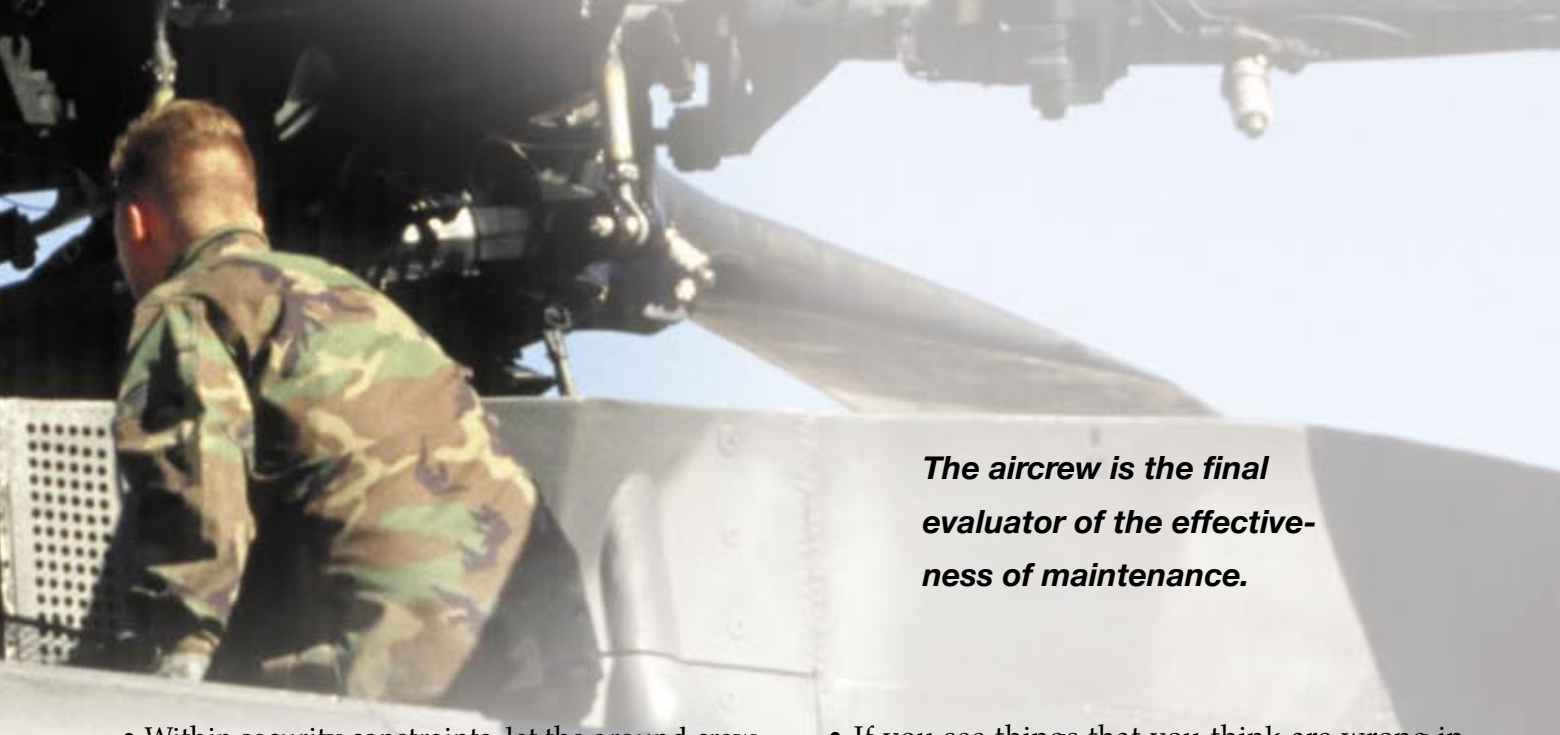
Proper Application of Dash One Procedures.

To prevent problems induced by lack of knowledge, you should work to maintain a complete understanding of your equipment usage procedures, beyond what is available in the in-flight checklists. Such knowledge obviously promotes everyday individual effectiveness and success, particularly during tests and checks by the Stan-Eval section. Just as important, however, this knowledge serves to avoid preventable malfunctions, and thus frees up maintenance for other repair priorities.

Along the same lines, an up-to-date knowledge of current modifications on your system will go far to prevent "embarrassment" on your part and wasted work on maintenance's part. If you've missed the Ops training shop or QA's discussion of aircraft changes, make certain you know the Dash One supplement guidelines which accompanied the modification. Also, with newer systems having different blocks of aircraft, don't be shy to ask technicians about malfunctions before writing them up.

A Healthy Interchange With Maintenance.

The aircrew is looked upon in many ways. They may serve as an example to younger troops who might possibly prefer the perceived "glory aloft" to the tough work of maintaining the aircraft below. Hopefully, the aircrew is at least seen as a partner in providing a healthy product to meet the unit and Air Force mission. Regardless of how it's perceived, it is this aspect of the partnership which is the aircrew's most important role. To enhance their side of the team aircrews should:



The aircrew is the final evaluator of the effectiveness of maintenance.

• Within security constraints, let the ground crew know what is planned for the mission; likewise after the flight, let them know the mission's success. (Unless you bring home a boom, or otherwise have a doggy flight!) You might be surprised to know the pride and rivalries that develop between the technicians over the success of their birds. Also, if time and mission allows, let maintenance troops into the Ops mission briefings. It will increase their understanding both of the unit's mission and what "stresses" their airframes are programmed for.

• Maintenance knows you have to debrief the mission, call the controller, fill out reports, and plan for future missions. But, by all means, please, take the time to answer the questions maintenance debriefers may have over your discrepancy entries. You should prepare yourself for these questions while in-flight by noting as much information as you can, such things as altitude, gauge readings, etc. The specialist and debriefer may be trying to isolate the cause so the aircraft may be turned for another flight, for alert, or another purpose. They also may not be able to read your writing or may not understand the write-up at all. Once you leave the maintenance debriefing area for the Ops sanctuary, you're pretty hard to find.

• The technicians have a tough job. They sometimes feel unsure of their contribution to the overall unit mission, they work long hours, may feel they have little voice, work with old equipment, are given additional base details aircrews would probably refuse, and finally, in a sense, they put their career on the line every time you walk out to their aircraft. Yet, it's the individual technician who has the greatest impact on the quality of the product the unit produces, which includes your success in the air. To protect that valuable resource, you must treat them as the team members they are. Although you may get the "quarterback's recognition," you need those "linemen" out in front of you!

• If you see things that you think are wrong in maintenance, use the formal chain of command or several informal channels to voice your concerns. If the problem is safety related, immediately call attention to it through whatever supervisors are present. If, in your judgment, the problem should remain somewhat low key, approach a flightline supervisor, QA or go through your training officer to utilize the informal lines of communication. At any rate, don't let any perceived problem go unspoken!

• You probably get pretty good service overall from your maintenance troops. However, when that certain individual comes along and gives that extra ten percent, please make sure he or she is recognized (preferably in writing). If no type of ground crew evaluation form exists, suggest the debrief section get one. Until then, letting the supervisor *and* the individual know about a good job will ensure the same treatment is provided again.

This article has presented a brief prescription for us Ops folks to follow toward fulfilling our end of the Ops-Maintenance partnership. In an informal but major way, every aircrew is a member of the QA team; through the use of the equipment provided by maintenance and the subsequent AFTO Form 781 entries, the aircrew is the final evaluator of the effectiveness of maintenance. Thus, one of the most important things aircrews can do to ensure their own success is to be an active part of this essential team.

Editor's Note: The aircrew-maintainer relationship is key to any unit's success. How well do you talk to each other? Since the reorganization that moved maintenance to the MXG, do you still work together to meet the unit's needs? If not, then you need to get together and work out the differences.

BREAKER, BREAKER
(GOOD BUDDY)

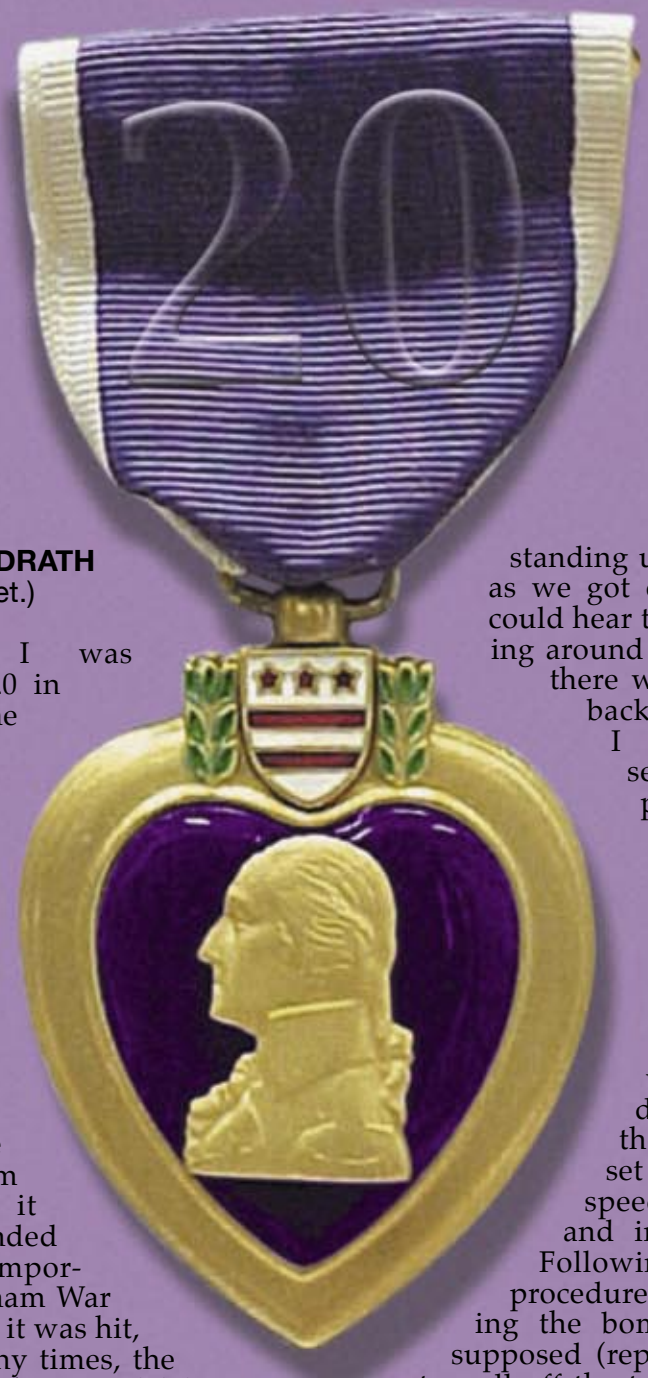


Photo Illustration by Dan Harman

DONALD C. WINDRATH
Colonel, USAF (Ret.)

The hair started standing up on my neck as we got closer.

Well, there I was again—number 20 in a strike force—the position called "Purple Heart 20." Meaning that I would be the last guy to drop the bombs on the Ty Nuyen steel mill and have the most exposure to the gunners on the ground. Though the mill was some distance from "downtown," it was heavily defended because of its importance to the Vietnam War effort. Every time it was hit, and that was many times, the Vietnamese added more AAA. Today was no exception. The gunners on the ground started firing away when the first flight was two-three miles from the target. The hair started standing up on my neck as we got closer and we could hear the 85s exploding around us. Of course, there was no turning back, although I would have settled to just pull up and take a vote to determine if we really wanted to do this. By the time I could even think about it, we were in the delivery with the airspeed set at 550 KIAS, speed brakes out and in full burner. Following standard procedures after releasing the bombs, we were supposed (repeat supposed) to pull off the target, clean up the aircraft, come out of burner and head for the tanker. I was somewhat concerned when this didn't happen immediately. Very concerned.

Instead, lead stayed in burner and started climbing. I couldn't imagine what he was thinking or doing. I called him on the radio. No answer. I tried to signal him that we were still in burner and we were using a lot of fuel. No acknowledgment. He just kept looking straight ahead like a robot. He had a hole through the left wing which didn't appear to cause any flight control problems, and no fire because the F-105 "Thud" had a dry wing. So, he appeared in good shape except that he stayed in burner and kept climbing. Still no radio contact and no HEFOE hand signals (e.g., hydraulic, electrical, fuel problems, etc.). Soon we were up at 26,000 and lead started to descend. I saw fumes coming from his tail pipe. Then without further adieu, he gave an unfamiliar hand signal and EJECTED! I was startled, to say the least! In fact, I was so flabbergasted that I called Crown (rescue) and gave them my call sign rather than lead's. I quickly corrected the error.

I watched lead slowly enter the undercast and homed in on his beeper. Not too long after, he was swallowed up in the jungle well inside Charlie's territory. Rescue arrived on scene, but couldn't locate the pilot, although I had given them the radial and distance from a TACAN located in Laos. Crown asked me to stay and circle the area where the pilot had penetrated the jungle. I had 1800 pounds of fuel left when lead ejected. Now, I had 1100 pounds left and not enough to go anywhere but down if I didn't get to the tanker. I told Crown I had to leave and headed south hoping to find the tanker. Crown asked me to come back after I got some gas. By now the pucker factor began to build.

Little did I know that the tanker was listening to the rescue and headed north way beyond the parameters of his refueling track. Not wishing to chase the tanker south to hook up, I asked Invert (controlling radar site) if they knew how to do a 90-degree beam (old ADC tactic). When they said yes, I nearly messed by G-suit with joy. Within a couple of minutes, I spotted the tanker and got on the boom. At that point, my Thud only had 500 pounds left and was on the brink of flaming out. I had blown the external tanks way back while coming off the target and could only take on internal fuel. Not much, but enough to loiter for five to ten minutes at the rescue scene before I would have to take on more fuel and go home. I went back and noted that lead had been recovered. I really felt good that we kept him out of Charlie's hands.

I headed down to the tanker again to take on some more fuel, but alas, the crew declared bingo fuel and went home. Now, I was in a bind again. I had barely enough fuel to get to Udorn. I arrived over the runway with 400 pounds at 12,500 feet. I declared an emergency to tower, set up a flame-out pattern and landed uneventfully with 300 pounds left. Another typical successful mission concluded. YGBSM!

Well, readers, you must be wondering what is the safety aspect to this story. It lies in three parts. When the F-105 was modified to eliminate the nuclear mission, the contractor filled in the space of the removed parts that held the "nuke" up in the bomb bay with an 1800-pound internal fuel tank. A cockpit circuit breaker controlling power to the tank was placed nearly out of sight on the left side panel above the fuel valves. There was no warning light to indicate to the pilot when power had been interrupted. Certainly, this was a design deficiency. Second, I never heard the circuit breaker mentioned during F-105 upgrade or read reference to it in the Dash-1. Third, new arrivals at Korat usually met with "old heads" to learn the necessary tactics to keep from getting shot down, but the "mystery circuit breaker" was never discussed. I nearly became a statistic myself, when I thought I had trapped fuel over Laos. Fortunately, my lead saved my butt by telling me what the problem was. Therein lay the safety aspects: design modification and training deficiencies.

With every hairy story, there always seems to be a humorous side. After nearly running out of fuel and coming close to ejecting twice, I arrived at the Korat bar only to find a big celebration going on. In the middle of all this was my lead. The (deleted expletive) had beaten me home. I didn't know that was possible, yet he was standing there with a celebration drink in his hand and smiling from ear to ear. He must have had a friend in higher places to expedite his return. I know I did that day. He gave me a big kiss (on the cheek) when he saw me and continues to do so when we meet at reunions. Amen. ♥

By now the pucker factor began to build.

Main Igniter Installation

MR. GILAAD BERKO
Pratt & Whitney Customer Support
Reprinted from PSQ Vol. 24, No. 1, 2003

Recent events leading to in-flight emergencies were attributed to improperly installed main engine igniters. Misinstalled igniters can result in engine/airframe damage. As a result, engine operation and mission capability are compromised.

The most common cause involves crossthreading the igniter. This can occur if the maintenance technician does not loosen the three nuts (Item 1 in Fig. 1 and 2) on the igniter boss retainer plate (Item 4 in Figures 1 and 2) and attempts to thread the igniter (Item 3 in Fig 1 and 2).

A certain degree of freedom-of-movement of the boss is needed to properly engage the igniter threads in the diffuser case boss. By not loosening the nuts, it becomes more difficult to properly align the igniter. This can result in cross-threading the plug in the boss. If this occurs, normal engine vibrations and heat expansion can cause the plug to loosen and fall into the engine bay. If this happens, it may result in damage to the igniter, combustor, diffuser, fan duct, and surrounding region.

Based on field reports, crossthreading of the left-side igniter seems to be more prevalent than with the right-side igniter. It should be noted that when dealing with the PW-100/-200/-220/-220E engines, a properly installed left-side igniter is positioned deeper (radially inboard) than the right-side igniter. That means the measured distance between the fan duct sleeve and the wrenching flat is approximately 0.500" greater when comparing the right-side igniter to the left side. This assumes the igniter Immersion Check was performed per the applicable Technical Order (T.O.). The Immersion Check assures proper ignition penetration based on the possibility of combustion chamber warpage.

An improperly installed left-side igniter, (see Photo A), which protrudes radially outward, may appear like a properly installed right-side igniter (see Photo C). Thus, giving the impression of a proper installation. An improperly installed right-hand igniter is more easily detected because the O-ring (Item 2 in Fig. 1 and 2) is not engaged in the fan duct sleeve. Photo B shows a properly installed left igniter.

Damage to the igniter, diffuser, combustor, fan duct or engine bay is likely if the plug is disengaged. This is due to the escape of hot gas from the combustor and/or igniter spark arcing against adjacent surfaces. Considerable repair or replacement of parts is certain and an engine bay overheat/fire warning is quite probable.

The most important element is the negative impact on airstart capability due to the deficiency in ignition. Special care should be given to following the applicable T.O. procedures when installing main igniters. This will ensure ignition integrity is maintained. Finally, always refer to the applicable T.O. for procedures regarding grounding of the igniters and exciters during maintenance to ensure maintainer safety.

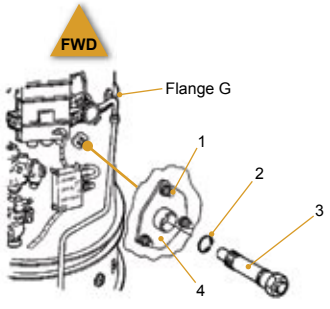


Figure 1. Engine Left Side

A
Improperly Installed Igniter–Left Side

B Properly Installed Igniter–Left Side

Properly Installed Igniter–Right Side C

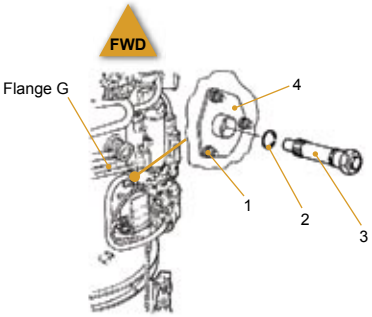


Figure 2. Engine Right Side

The Aviation Well Done Award is presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

Capt Jason Towns and Capt Jimmy Mott
16 SOS
Hurlburt Field FL

On 13 June 2001, the crew of WHIM 69 helped save the life of a civilian pilot who had become lost and flew into conditions he was not trained for.

WHIM 69 was flying a support mission in a 16th Special Operation Wing C-130E. Passing over the Rocky Mountains, the crew heard Air Traffic Control talking with a civilian single-engine aircraft. The private pilot had inadvertently flown into instrument meteorological conditions and was requesting vectors to keep him clear of terrain. It became evident, from his tone of voice and slow response time, that he was very nervous and preoccupied with the surrounding terrain. Ice was accumulating on the wings, and he was having trouble maintaining altitude. The aircraft, a Piper, did not have de-icing capability.

Capt Jimmy Mott, the C-130E navigator, determined the Piper was located in a mountain range with peaks up to 13,300 feet. The icing eventually forced the Piper from 14,500 feet down to 11,000 feet, where communications and radar contact with Denver Center were lost. As the non-instrument-rated civilian pilot was beginning to panic, Capt Jason Towns, the C-130E aircraft commander, initiated communications and attempted to calm him down to enable him to fly and navigate.

When the Denver Center controller realized WHIM 69 was in radio contact with the Piper, he asked them to be a relay platform. While the copilot maintained a properly positioned orbit, Capt Towns passed along navigational information to the Piper. When the pilot of the Piper reported to the C-130E crew he was on the Taos 150 radial, Capt Towns and Capt Mott determined he was mistaken. Capt Towns talked the pilot, who was not instrument rated, through the proper reading of his instruments and discovered he was actually on the 330 radial. Capt Towns directed him to fly a 140 heading and to look for the airport 14 miles past the navaid. WHIM 69 stayed with the Piper until the pilot reported visual conditions and airport in sight.

The exceptional airmanship and flawless teamwork of the crew of WHIM 69 in a critical, life-threatening situation saved the life of a civilian pilot.

Editor's Note: The following accounts are from actual mishaps. They have been screened to prevent the release of privileged information.

Eyes Open—I seem to be repeating this topic, but unfortunately, you all are giving me way too much material to write about. So, here are some more examples where eyes open and see-and-avoid allowed us to write a HATR instead of a Class A report.

KC-135 Deviation

A KC-135 was transitioning through a base, when they received a traffic advisory call for VFR traffic at 12 o'clock and six miles. The crew searched for the traffic and sighted a Cessna at or near co-altitude. They initiated a climb and passed approximately 100 feet over the Cessna. The Cessna took no evasive action.

Now, the Cessna was operating legally in Class D airspace, so they weren't required to talk to the tower. The tower radar does sometimes miss traffic, and the investigation concluded the Cessna the KC-135 evaded was a different aircraft than the one they issued the advisory for. The tower did not see the Cessna until after the KC-135 took evasive action.

This seems to be a problem at this location and they are trying to get the airspace reclassified as Class C instead of Class D, so the VFR traffic is required to talk to the tower. Lesson learned: Don't always rely on traffic calls from ATC. See-and-avoid!

TCAS To The Rescue

Another KC-135 almost joined with a King Air, but TCAS saved the day. The aircraft was cleared by the local airport to enter right downwind for a right-base visual approach. As the crew descended, an advisory resolution was activated by TCAS. The boom operator picked up the aircraft at the same time and both TCAS and the boom directed an immediate climb to avoid the aircraft. The King Air took no evasive action. When queried, the tower had no indication of the other aircraft on radar.

Several things complicated this event. First, the regular radar for the airfield was down, so they were using a feed from another location. The aircraft appeared on TCAS, so it was squawking, but must have been too low for the alternate radar to pick it up. TCAS showed 200 feet vertical separation. The two aircraft were in Class D airspace, so the King Air wasn't required to be in contact with the tower.

Lesson learned from this event? Keep your eyes open. For the KC-135 world and the three-person cockpit, it highlights the importance of the boom operator helping the pilots see-and-avoid! TCAS is great, but a third set of eyes is always nice to have.

I Think We'll Wait

A KC-135 was cleared to taxi to the hold line and wait for clearance. Being professional Air Force crewmembers, they did as instructed and called tower when in place. Almost immediately, they received clearance to cross the active and proceed to the runway. The crew, being eyes open and aware, noticed a commercial aircraft on one-mile short final. They told the tower that they would wait until the aircraft on final landed. Once the commercial aircraft landed, they received their clearance and proceeded without further incident.

The crew strongly believed they didn't have time to cross the runway with the aircraft on final and **chose** not to taxi as instructed. Is this good risk management, or what? They saw, they analyzed, and they acted. Good on the crew for making the right decision. The tower investigation revealed that the ground controller cleared the aircraft to cross the runway without talking to the tower controller. Be aware out there and make the right choice!

Do I Descend or Not?

While returning to home base, a T-37 was given a traffic advisory from the approach controller. The traffic was 12 o'clock, four miles and 300 feet below. The aircrew elected to continue their descent to make an altitude restriction at an upcoming area and 12 seconds later acknowledged the traffic call. The T-37 visually acquired the other aircraft about five seconds later, approximately 800 feet away slightly low and **not** moving in the windscreen. The T-37 then took evasive action to avoid collision and missed the other aircraft by about 600 feet. Things do seem to happen fast in the sky.

It is unknown where the second aircraft came from, as there was no flight plan for any other aircraft to be in that area. The unit had set up a VFR corridor through the area so aircraft would be de-conflicted, and passed out charts depicting this route to all the units and local airfields. The sad part is that the second aircraft was not violating any rules, but could have prevented the HATR if they had used the established corridor.

The controller made the traffic call when the second aircraft appeared on his scope, but could have provided more information to help the T-37 identify the second aircraft sooner. The pilot, by deciding to continue his descent instead of leveling off with the traffic call, would have better served the situation if he had leveled off or a slight climb, or a slight change in course could have enhanced his chances seeing the other aircraft sooner. Bottom line. You make choices in the cockpit every day. Make sure the ones you make are the ones that *reduce* your risk of an accident.

Deployed Closeness With The Navy

While under the control of an E-3 airborne controller, a Navy aircraft tried to get too close to one of our deployed KC-135s. The E-3 radar found traffic at 15 miles to the right of the tanker formation that was on a converging course. They tried to visually find the aircraft, but were unable to do so until the Navy was about three miles away crossing right to left. The tanker asked the E-3 to clear traffic, and before anything could be done, the Navy aircraft climbed and passed about 400 feet above the tanker.

Now, this is too close if you ask me. This was the third HATR concerning our Navy brethren at this location. The CAOC and LNO worked the issue and changes have been made to deconflict the ATO to avoid these air conflicts. Ultimately, this is see-and-avoid, non-controlled airspace. That means, aircrew, you are on your own for the most part. Keep them eyes wide open in the AOR and make sure you get home safely.

C-130 Versus Glider

The C-130 was climbing out of a California base, and as they were passing through 5300 feet MSL the flight engineer called out conflicting traffic on the right side of the aircraft. The copilot identified the traffic as a glider and the crew immediately climbed, while the glider dove under the C-130. Estimates are that they missed by about 200 feet.

Although everybody was clearing, the glider wasn't seen until almost too late. Luckily, the aircrew had chosen to remove the dash-mounted SKE/radar scope that would have normally been in the center of the dashboard. If the SKE/radar scope had been there, they may not have seen the glider until just prior to impact. ATC was immediately notified, but they had no information on the glider.

Make sure you keep scanning and looking for the unknown intruder that could ruin your day and/or life.

Editor's Note: The following accounts are from actual mishaps. They have been screened to prevent the release of privileged information.

This edition is about the folks that let the daily grind get the best of them—resulting in them damaging themselves or Air Force equipment. Follow the rules and always think Safety!

My Eyes!

A worker had just finished washing one of the unit's MC-130Ps. Instead of going home, he ended up in the hospital, with chemical burns to 80 percent of his corneas. How did this happen you might ask? The unit had changed from the old really bad cleaning solution to a new more environmentally friendly and less caustic soap. However, the MSDS does warn of acute eye irritation. The worker started the day at 0700 and used all the required PPE. At lunch, he told his supervisor that his eyes were dry and blurry, and that he had added Visine to make them feel better. The new soap does not give an immediate burning sensation, but the burning sensation occurs over time. Around 1400, he felt his eyes burning and becoming blurry, so he went to the eye wash station and flushed his eyes. He then headed home with some friends. As he was driving, not a good thing, his vision started to become very blurry. He stopped the car and one of his friends took over the driving and went straight to the hospital. This is when the doctors found the damaged eyes.

Anyone who has ever washed an aircraft knows that it takes a special skill to keep the soap, water, and sweat out of your eyes. When you are washing an aircraft the water/soap/sweat solution can run into places it was never supposed to go. Most likely, some soap ran onto his eye protection and leaked through without him knowing about it until it was too late. During aircraft washes everyone needs to be aware of this potential, and if you get soap in your eyes, rinse it out right away and notify supervision. Don't wait till your vision is blurry. Make sure your PPE fits properly, and if it leaks, "fix-it" before you continue. Supervisors, if your troops talk about their eyes hurting, take the extra step to ensure it's not caused by something worse than a lack of sleep.

Slip Roller Versus Fingers

A reservist had reported for his annual training and was assigned the task of fabricating a fuel probe wrench. He used the available power slip roller (PSR) and was feeding some rebar into the machine and had made several bends. Next thing he knew, his left glove was caught in the roller and was swiftly pulled into the machine. A fellow worker heard his plea for help and pressed the emergency shut-off. The emergency crew was called and took him to the hospital where he lost some fingers.

The PSR is a 1963 vintage machine, but still current equipment. The PSR is required by AFOSH to be retrofitted with after-market safety devices, i.e., guards, foot controls, etc. This PSR had none of the required guards installed, and the electrical switch was mounted where it cannot be reached from the point of operation. Do you think this PSR was an accident waiting to happen? Where was the last safety inspection by the shop or unit? The worker who was injured was considered to be one of the best fabricators

in the unit and very skilled, but here we have the equipment he was using getting the better of his skills. A momentary attention lapse by him, and the lack of required safety guards, cost him part of his anatomy. When was the last time you took a look at your equipment for proper safety guards? Safety guards may be a hassle, but not as bad as losing body parts.

Crowded Warehouse

A worker was using a forklift to take two pieces of classified aircraft equipment to TMO for shipping to a classified location. The equipment was in two cardboard boxes and was picked up from the classified vault and taken to TMO. Unfortunately, TMO couldn't ship it that day, so back to the vault it went. The worker proceeded 200 feet across the warehouse to the vault with the load facing forward. This means the boxes and the forklift mast blocks the forward view. As she headed for the vault, looking out the left side of the forklift, she crossed the yellow line that identifies the driving isle. Intending to cut the corner leading to the vault, she turned and impacted a building support beam about two feet above the ground. She was not hurt, but the two boxes of classified gear were totally destroyed.

This worker violated a few of rules of the road for forklifts even though she was fully qualified for the task. What rules did she break?

- AFOSH STD 91-46 states you must drive backwards when the view is blocked by a load or the mast, and you will travel with the load no more than six inches off the ground.
- AFMAN 23-210 states you must not cut corners.

Common sense rules that could/should have come into play:

- She could have stayed between the lines and followed the rules.
- She could have used a spotter.
- She, or her supervisor, could have checked with TMO for shipping availability before they moved the equipment.

A simple task by a qualified airmen cost us $420,061 and no telling how much operational capacity was lost due to the destroyed equipment. This is one of those mishaps that was **totally** preventable by the person involved. Follow the rules and life is good.

The Lone Tree!

What does Murphy say? "If it can happen, it will happen." Here is a case where there was a lone tree near a taxiway and we managed to hit it with, of all things, a C-5 wingtip. At an overseas base, the aircraft was parked on the regular cargo ramp and required maintenance for a vibration problem. The aircrew leaves and a maintenance recovery team (MRT) was sent in to take care of the aircraft. The MRT replaced the defective parts, but the aircraft can't be run on the regular parking ramp due to the high traffic flow and the power settings needed for the run. The aircraft has to be towed to the hot cargo pad. There is a nice taxiway to enter and exit, but there is a road about 100 feet from the taxiway asphalt edge with some trees that line the road. The ground rises to the road and the lone tree in question is 139 feet from the centerline of the taxiway. There are other trees in the area, but they are about 159 feet away from the centerline. If you look at the airfield pubs for this location, the rising ground would be identified, but not the tree line. The tree line does not meet obstacle clearance guidelines published in AFMAN 32-1123. Now, for a little math. The C-5 has a wingspan of 222 feet 9 inches, which gives them how much wingtip clearance from the tree?

The MRT is there. The tow supervisor and brake rider are qualified, but the tow driver is qualified on his driver's license but is not current. The only people with radio communication were the tow super and the brake rider, the minimum should have been three, the tow driver should have his own radio as well. The driver was facing the aircraft during the tow and they headed across the ramp to the hot cargo pad. As they reached the cargo pad, the transit alert folks provided the tow super with a map of the location, which showed a non-usable area in the center of the hot cargo pad. This is a recessed drainage area. There was some confusion on how the aircraft was to be parked, and the first spot they stopped the aircraft wasn't right. So, they moved the aircraft again, and the aircraft was towed 30 feet right of the centerline. Did you calculate how much room they had from wingtip to tree? As they moved the aircraft, the wingtip struck the lone tree about two feet in from the wingtip edge.

What should have happened? The tow supervisor should have ensured:

- He had the full equipment he needed
- All the people utilized were task qualified
- The crew knew where the aircraft was going, and if in doubt, stop and make sure.
- Properly identify any obstacles in the area.
- If there were obstacles at the wingtip, where were the wing walkers?

Another case where the mishap wouldn't have happened if tech data and common sense had been followed. There were many chances to stop this chain of events, and all it would have taken was someone to stand up and stop the task when things weren't going right. Can you make the right call and say stop? If not, then you need to talk to someone and get that fixed. ✈

FY03 Flight Mishaps (Oct 02-Sep 03)

31 Class A Mishaps
10 Fatalities
22 Aircraft Destroyed

FY02 Flight Mishaps (Oct 01-Sep 02)

35 Class A Mishaps
22 Fatalities
19 Aircraft Destroyed

18 Oct	✈	A TG-10D glider crashed during a student sortie.
24 Oct		An F-15 experienced an engine failure during takeoff.
25 Oct	✈✶	An RQ-1 Predator crashed during a training mission.
25 Oct	✈✈	Two F-16s collided in midair during a training mission. One pilot did not survive.
13 Nov	✈	An F-16 crashed during a training mission. The pilot did not survive.
04 Dec	✈✈	Two A-10s collided in midair during a training mission. One pilot did not survive.
18 Dec		Two F-16s collided in midair during a training mission.
20 Dec	✈	Two T-37s collided in midair during a training sortie.
02 Jan	✈✶	An RQ-1 Predator crashed during a training mission.
26 Jan	✈	A U-2 crashed during a training mission.
06 Feb		A manned QF-4E departed the runway during takeoff roll.
11 Feb	✈✶	A QF-4 drone crashed during a landing approach.
13 Feb	✈	An MH-53 crashed during a mission.
08 Mar	✈	A T-38A crashed during a training mission.
17 Mar	✈	Two F-15s collided in midair during a training mission.
19 Mar	✈	An MH-53 crashed during a brownout landing.
19 Mar	✈	A T-38 crashed during a runway abort. One pilot did not survive.
23 Mar	✈	An HH-60 crashed during a mission. All crewmembers were killed.
31 Mar		A B-1 received damage during weapons release.
03 Apr		A KC-10's number two engine was destroyed by engine-contained FOD.
16 Apr		An F-15 experienced a single-engine failure inflight.
21 Apr		A C-17 suffered heavy damage to the MLG during a landing.
02 May		A KC-135 experienced a birdstrike during landing roll.
22 May		An MH-53 suffered severe damage to the main rotor system.

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29 May	✈	An F-16 crashed during takeoff.
04 Jun	✈	An F-15E departed controlled flight and crashed.
10 Jun	✈	An F-16 crashed during a training sortie.
12 Jun	✈	An F-16 crashed during a training sortie.
13 Jun	✈	An F-16 crashed during a training sortie.
16 Aug		A T-1 departed the runway.
09 Sep	✈	An F-16 crashed during a training sortie.
14 Sep	✈	An Air Force Thunderbird crashed during an airshow.
22 Sep	✈	An F-16 crashed during a training mission.
25 Sep		An F-16B clipped power lines during an approach.

FY04 Flight Mishaps (Oct 03-Oct 03)

2 Class A Mishaps
0 Fatalities
1 Aircraft Destroyed

FY03 Flight Mishaps (Oct 02-Sep 03)

3 Class A Mishaps
1 Fatalities
3 Aircraft Destroyed

09 Oct		A KC-135E experienced a #3 engine fire.
14 Oct	✈	A T-38 crashed during takeoff.

- A Class A mishap is defined as one where there is loss of life, injury resulting in permanent total disability, destruction of an AF aircraft, and/or property damage/loss exceeding $1 million.
- These Class A mishap descriptions have been sanitized to protect privilege.
- Unless otherwise stated, all crewmembers successfully ejected/egressed from their aircraft.
- Reflects only USAF military fatalities.
- "✈" Denotes a destroyed aircraft.
- "✶" Denotes a Class A mishap that is of the "non-rate producer" variety. Per AFI 91-204 criteria, only those mishaps categorized as "Flight Mishaps" are used in determining overall Flight Mishap Rates. Non-rate producers include the Class A "Flight-Related," "Flight-Unmanned Vehicle," and "Ground" mishaps that are shown here for information purposes.
- Flight and ground safety statistics are updated frequently and may be viewed at the following web address: http://afsafety.kirtland.af.mil/AFSC/RDBMS/Flight/stats/statspage.html.
- **Current as of 28 Oct 03.**

FY03 Class A Mishaps Cost:

The Goal Is Zero!

* Final statistics may change.

HQ AFSC Photos by TSgt Michael Featherston
Photo Illustration by Dan Harman