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SAFETY SAGE

Maintenance ~ Educating the Troops

Aircraft maintainers are the backbone of the greatest Air Force in the world. Every day thousands of sorties are flown safely, generated by blood, sweat, and tears of our mechanics from all AFSCs. We have been under pressure to perform under extreme conditions at home and abroad, compounding the difficulty in aircraft generation. In this issue, you have the privilege to read about our maintainers in action, working with our operators, supporting the war on terror and defending the finest nation in the world. Learning never stops in aviation. My goal is that when you put this magazine down, you will have added another tool to your box.

The Safety Sage

DEPARTMENT OF THE AIR FORCE — THE CHIEF OF SAFETY, USAF

PURPOSE — ***Flying Safety*** is published monthly to promote aircraft mishap prevention. Facts, testimony, and conclusions of aircraft mishaps printed herein may not be construed as incriminating under Article 31 of the Uniform Code of Military Justice. The contents of this magazine are not directive and should not be construed as instructions, technical orders, or directives unless so stated. SUBSCRIPTIONS — For sale by the Superintendent of Documents, PO Box 371954, Pittsburgh PA 15250-7954. REPRINTS — Air Force organizations may reprint articles from *Flying Safety* without further authorization. Non-Air Force organizations must advise the Managing Editor of the intended use of the material prior to reprinting. Such action will ensure complete accuracy of material amended in light of most recent developments.

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There I Was ...

... he was attempting to remove the landing gear pin by hitting the bottom of it with the hammer.

Photo Courtesy of Author

CMSGT SANDY STACY
AFSC/SEF
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As was my norm, I was on the flight line watching the aircraft being prepped and launched. During a normal launch, there would be about 12 aircraft in various stages of launch procedures. I would go out at crew show and stay until the last aircraft had taxied to EOR.

Prior to crew show, I habitually walked the entire ramp looking at the jets and stopping to chat with my Airmen while they worked. I would often pick a row of jets to watch by seeing either who was working or which pilot was flying. This way I managed to watch almost my entire squadron at least once a week.

On this day, I had been casually leaning on one of the poles that held up our newly installed sunshades. This way I was able to watch an entire row of aircraft without experiencing a personal meltdown. I was usually on the flight line for about an hour during these launches, and since I always left my BDU blouse on, any excuse to get in the shade was good for me.

Normally while enjoying the launch, I would look around the entire line every 5 minutes or so to see if we were experiencing any type of maintenance issues. If we were, I would then walk over to see what was going on. On this particular day, the whole launch had gone smoothly, and I hadn't left the comfort of my shaded spot.

As the flight line got quiet, I turned to head towards the office, when I spotted one of the jets still sitting in the chocks. As I approached, I looked to see if I could identify why it was the only jet still sitting on the ramp with the engines running. There wasn't an expediter near it, and there were no visible specialists talking to the pilot on the headset; only a fire guard leaning on the fire bottle. As I got closer, I could see the crew chief inside the left wheel well. I walked around the landing gear door and stuck my nose into the wheel well to see what was going on, fully expecting to see either a popped delta-p or a hydraulic leak.

What I saw shocked the heck out of me. The 3-level crew chief had a hammer in his hand, and he was attempting to remove the landing gear pin by hitting the bottom of it with the hammer.

I stopped him. I motioned for him to come out of the wheel well and tell me what was going on. He shouted the pin was stuck, and he couldn't get it out. Normally these pins are extremely loose and the only pressure required to remove it is the pressure applied to the locking pin on top.

I went back inside the wheel well and tried to remove the pin. It was indeed stuck and wouldn't even rotate inside the hole. I went back outside and instructed the crew chief to shut the aircraft down and move the pilot to a spare aircraft.

If the young crew chief had been successful in his attempt to remove the gear pin, it is highly likely he would have been crushed inside the wheel well.

USAF Photo by SrA Lakisha Croley

I watched the landing gear as the aircraft shut down, hydraulic pressure decrease, and saw the gear "unlock" as pressure went to zero. After the aircraft was completely shut down, I went into the wheel well and successfully removed the gear pin.

I could see no obvious reason for this to have happened, so I asked the expediter to get a 7-level crew chief out to inspect the gear. One arrived in a few minutes and within just a few seconds, came back out and said he knew what happened.

It seems at some point the hydraulic lines that control the drag brace had been switched, so that whenever hydraulic pressure was applied (as in during engine runs), the drag brace was trying to retract the landing gear.

To see what would have happened if the pin had been successfully removed, we jacked the aircraft, pulled the landing gear pins, and applied hydraulic pressure. As the system went past 1500 psi, the left gear started to retract and as it reached 3000 psi, the left gear completely retracted. If the young crew chief had been successful in his attempt to remove the gear pin, it is highly likely he would have been crushed inside the wheel well.

Upon investigation, we found that the night before, a 5-level crew chief had found the hydraulic lines leaking, cut the safety wire, tightened the lines, and applied hydraulic pressure to check for leaks.

He did not re-safety wire the lines or perform a "jack and retract" operational check. Furthermore, even though he documented removing the lines, he didn't annotate the correct job guide, which would have led him to the correct follow-on maintenance actions.

Compounding the error was the 7-level crew chief that cleared the "Red X" in the aircraft forms. He was working another aircraft inside a hangar and never looked at the aircraft before signing his name. If he had looked at the aircraft, he would have seen the lines installed incorrectly and noticed the safety wire missing.

Finally, when the 5-level crew chief had asked his expediter what the follow-on maintenance was for the lines, he was told to apply hydraulics, put the landing gear handle in the "up" position, and look for leaks.

We're lucky no one got hurt or the aircraft damaged during this incident. Many things should have happened that didn't. The 5-level crew chief should have gotten the correct tech data to remove/install the lines. The expediter should have ensured the crew chief had the proper tech data and made sure he was using it. The 7-level crew chief should have left the hangar and inspected the aircraft. The 3-level crew chief should have known better than to try to apply unusual force to remove a safety pin.

Moral of the story? If something looks strange on the flight line, always stop and see what's going on … you might save someone's life.

Do You Know How To Tow?

ANONYMOUS

Photo Courtesy of Author

Here's the scenario–30 minutes until shift change and the pro super decides he wants to tow the aircraft to fuel cell in order for the next shift to get a jump on the 12-hour repair. The tow team is assembled, briefed, and the tow is underway. The aircraft is slowly proceeding into the hangar as your attention is diverted to the tow vehicle driver wanting to know where (on the center line) you want the aircraft stopped. Meanwhile, your wing walker notices that the maintenance stand, originally thought to be clear of the wing tip, is in the way, and he's trying to get your attention to stop the aircraft. However, you are still distracted by the vehicle tow driver, so you don't hear or see the wing walker yelling and giving you the emergency stop signal. Your wing walker is now trying to move the stand out of the way–but it's too late! The aircraft surges as it strikes the stand and you yell for the "uke-driver" to stop. Staring at the "now-stopped" aircraft, you see the right wing tip severely damaged and realize that going home a few minutes late has now turned into a few hours … or even longer.

Think this could never happen to you? I hope you're right, but you need to know that we continue to have mishaps with aircraft striking objects while under tow. Most of the mishaps occur while towing the aircraft into or out of a hangar; however, wing tips striking powered and non-powered AGE equipment are up there too. So, how do we reduce these types of mishaps? We get back to the basics and take time to refresh our memories on a few "aircraft towing items" from AFOSHSTD 91-100, *Aircraft Flight Line-Ground Operations and Activities*. For example, consider the following:

• When differences exist in towing procedures prescribed in AFOSHSTD 91-100 and applicable technical data for the specific aircraft, the technical data takes precedence.

• Aircraft ground handling personnel will be thoroughly familiar with all published towing procedures pertaining to the type of aircraft being towed.

• Written proficiency tests on local procedures and operating standards will be conducted at least annually.

• Newly assigned aircraft maintenance specialists must pass a proficiency test on the types of aircraft towed after completing supervised on-the-job training. Wing and tail walkers may not be required to be familiar with all published towing procedures or receive annual proficiency training if their duties are restricted to these positions during tow operations.

• Supervisors of towing teams will clearly define duties and responsibilities at the time of the pre-tow briefing.

• The supervisor of the towing team will be in complete command and take a position that ensures surveillance of the towing procedures and performance of other team members.

• The supervisor will use a checklist covering all items pertaining to the safe movement of the type aircraft being handled. Applicable steps of this checklist will be completed, and towing personnel will be briefed before the aircraft is moved.

• The supervisor will be the only team member authorized to give the "all clear to move" order and will ensure all team members are qualified.

• When towing aircraft, team personnel will be stationed to conform to applicable aircraft technical order procedures for the type aircraft being towed.

• A brake rider (a qualified person authorized by the supervisor) will be in the pilot's seat to operate the aircraft's brakes and to observe and follow the supervisor's signals. If the person in the pilot's seat is unable to maintain hydraulic pressure, another qualified person will be stationed to watch and maintain the pressure. The supervisor will be notified if the pressure drops below safe operating limits, and if so, the towing operation will be terminated.

• The towing vehicle driver will be responsible for operating the vehicle in a safe manner and will follow the instructions issued by the team supervisor.

• The vehicle operator will also obey emergency stop instructions given by any team member.

• The vehicle operator will stop the vehicle upon losing sight of or communications with the tow supervisor.

• Wing walkers will be responsible for properly signaling the supervisor, as soon as it appears the aircraft is in danger of colliding with an obstruction ... and in such cases, towing will be stopped until clearance is personally checked by the supervisor.

• Wing walkers do not require annual proficiency testing and need not be fully qualified in all towing procedures (Thorough pre-tow briefings by a qualified towing supervisor will satisfy the training requirement).

• A tail walker will be used during towing operations when the aircraft is to be turned sharply or backed into position.

• When towing at night, two luminous wands will be issued to towing team members who require wands. The use of wands by the towing team supervisor will be required even when aircraft interphone contact is established with the towing team supervisor, the towing tractor operator, and the brake person in the cockpit. Wands or wing tip lights will be used by other tow team members, as required, to warn any aircraft traffic that may approach.

• In order to prevent serious mishaps, aircraft brake systems will be charged before each towing operation, and towing will be stopped immediately if brake pressure drops below safe operating limits. Aircraft with faulty brakes will not be towed, except to repair facilities, and then only with personnel standing by, ready with chocks for emergency use.

• Before moving any aircraft, the towing vehicle, tow bars and connections, and other associated equipment will be inspected by the tow team supervisor for defects (only authorized equipment in good condition will be used in towing operations).

• The supervisor will ensure all equipment, workstands, loose aircraft parts, and other materials are removed from the vicinity of an aircraft and are properly stored. Secure any equipment or materials left outside to prevent accidental movement by winds or jet and propeller blasts.

Although this is not an all inclusive list, I hope it has helped to get you rethinking about towing. Now let me ask you two questions: When was the last time you reviewed Command and Base supplements dealing with tow qualifications and procedures and reviewed AFIs 11-218, *Aircraft Operations and Movement on the Ground* and 21-101, *Aircraft and Equipment Maintenance Management* on towing procedures and qualification? If it has been awhile, maybe it's time you get back to basics and help us protect our resources through mishap prevention!

Until The Job Is Done

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To the average person, the idea of air-to-air refueling (AAR) seems absurd. Two (or more) aircraft purposely running into each other at roughly 300 miles per hour makes little sense. However, to the average Air Force aviator, aerial refueling is necessary to carry out the mission, and with time, becomes second nature. Even as a young wingman, after a couple weeks in theater, I had become comfortable with taking gas airborne on a regular basis. Perhaps I had become too comfortable in my approach to refueling and had not been focusing enough attention on the task.

In early spring of 2007, after being deployed for over 2 months, I had an unforgettable combat sortie. All of my Air Force training had built up to a day like this, and it was remarkable for too many reasons. Our two-ship of F-15Es had been called to support a troops-in-contact (TIC) situation. We pushed up the power and arrived overhead to support coalition forces that were surrounded on the ground. For

USAF Photos / Photo Illustration by Dan Harman

the next 4 hours, our flight found, identified, and targeted enemy fighters as they fired rockets and small arms at the friendly compound. So that we could maintain continuous overhead coverage, our flight had gone to the tanker one at a time, since the shooting had broken out on the ground.

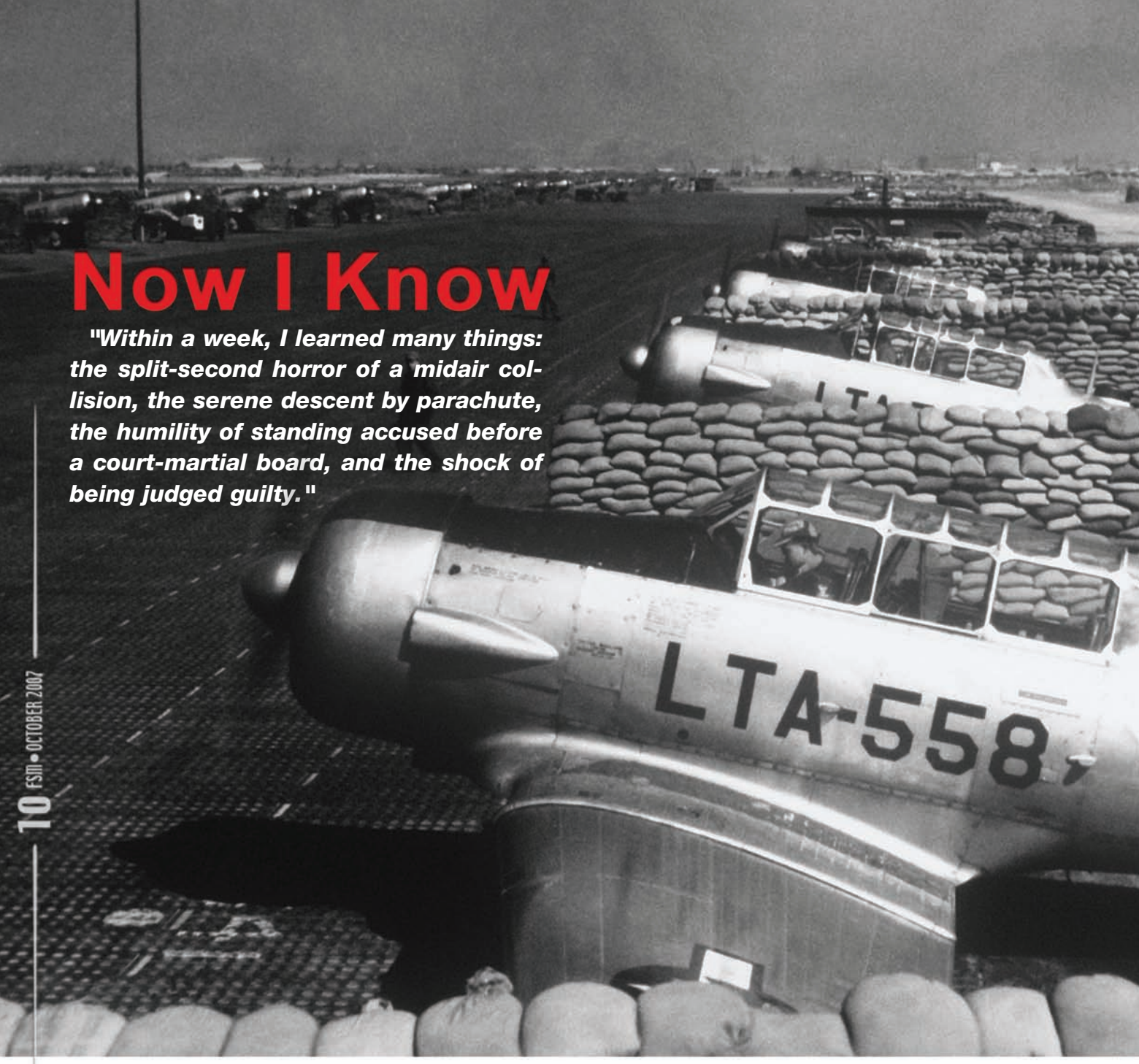
We executed yo-yo ops like this for four AARs without incident. As the day wore on and the situation on the ground had finally begun to turn, our flight was told to extend until the TIC was closed or we were out of weapons. The CAOC supplied our flight with another tanker to allow us to stay on station for the extra time. My flight lead had received extra gas already, so it was my turn to go to the tanker. In all of the coordination, there had been a misunderstanding as to where we were working, and as a result, the tanker was nearly 70 miles farther than I was expecting. I pushed up my power to expedite the rendezvous, so I could get back to the TIC as quickly as possible. After initiating radio contact with the KC-10, I was cleared to rejoin. For my fifth time that day, I quickly arrived at the boom and took gas without incident. While on the boom, I found out that the tanker had been extended to pass his remaining fuel to me and would be going home as soon as the AAR was finished. As I took the last of the tanker's available fuel, I coordinated to clear off 2,000 feet high, direct to my working area, just as I had four times previously on that sortie.

I disconnected from the boom and drifted aft of the tanker to create separation. I started a climb 2,000 feet above the tanker's altitude and turned roughly 30 degrees left, direct to the TIC. After climbing above the tanker, I transitioned my attention back to the TIC, and regaining situational awareness of the situation on the ground became my highest priority. For nearly 2 minutes, I attempted to contact the controlling agency to verify my altitude and clearance, but received no response. I also heard the tanker make multiple attempts to contact the controlling agency, as they were ready to RTB and needed to start a climb. There was a broken transmission at about the same time that I saw a KC-10 pass behind me from right to left within a half mile. Was that the same tanker that I just left 2 minutes ago? After some quick radio confirmation that I was cleared to my working area and the tanker was cleared to RTB, we continued our missions and each made it back to our respective bases. But one burning question remained. How had our two aircraft, which were supposed to be clear of each other, come to within 3,000 feet of each other?

It had been a long and eventful sortie and during our flight debrief, we worked to recreate the close call that I had with the tanker. Initially I figured that it had to be a different KC-10 that had passed so close to us, but a quick call confirmed that there was only one KC-10 flying near our location that day. The more I thought about what had happened, I came up with three factors that contributed to the situation. First, the controlling agency had a radio outage at an inopportune time, and the KC-10 and I proceeded on our own, without coordination with ATC. I found out later that before the radio outage, the tanker was told that once our refueling was complete, they were cleared to climb and RTB. Before I disconnected, I had confirmed with the tanker that I would climb 2,000 feet above them, but ATC had not heard our plan. Second, the tanker had finished the AAR and pushed up power to climb, anxious to RTB. The lightweight tanker was able to accelerate quickly and close distance between us, as I was now full of gas and climbed more slowly than the tanker, unable to accelerate much by the time we passed. These two factors made the encounter physically possible, but the situation was most definitely preventable.

The major factor in this scenario was my lack of prioritization after disconnecting from the tanker. I was so focused on getting back to the fight quickly, since I was farther away than was planned, that I neglected to finish the task at hand. A refueling is not complete until both aircraft are sufficiently deconflicted, under positive control, and able to continue their assigned missions. I had taken my fuel and was ready to get back to my mission, but I had only started to deconflict flight paths with the tanker. The combined confusion about our follow-on clearance and the radio outage with ATC should have forced me to focus solely on my separation from the tanker. Instead, my attention was focused on getting a situation update from my flight lead and trying to contact ATC in the other radio on the way back to the fight. A bad situation was narrowly avoided, because the tanker was visual with me and we weren't going to actually cross paths, but we definitely passed closer than is comfortable for two aircraft that supposedly separated from each other already.

My biggest lesson learned is to look more closely at my refueling priorities. I now view AAR as a three-step process. The first is to find the tanker and rejoin. The second is to take gas. The third step is to affect a positive separation and maintain that separation until I am well clear of the tanker and can transition to my follow-on mission. This last step was one that didn't seem all that important to me, until I had an uncomfortably close call with the tanker that had just refueled me. Combat operations often cause us to focus entirely on the tactical portions of our sorties, but getting refueled in flight is a large part of our ability to carry out the mission, and should therefore be given as much attention as all other portions of our sortie. I am now vigilant when refueling to maintain my focus until the ENTIRE refueling process is complete, so that everyone makes it home safely.



Now I Know

"Within a week, I learned many things: the split-second horror of a midair collision, the serene descent by parachute, the humility of standing accused before a court-martial board, and the shock of being judged guilty."

CAPT ADAM "SHAG" NEIL
16 ACCS
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To prevent future accidents, we should look at the mistakes of the past. The following is an excerpt from an article written in the *Flying Safety Journal* circa 1946. The article was written by a young adventurous WWII pilot, whom I'm proud to call Grandpa, about a mishap that happened early in his Air Force career.

"… Can't recall a sorrier day of my young life than that day when I should have graduated from the cadets. Instead, I was sweating, and, brother, I mean sweating … for an act done without thought.

"We reached the end of our training, all our time was logged, but the instructor decided to send us up for practice on the last flying day before the Great Day. I remember him saying, as he assigned us ships, "It won't hurt to get this extra time. Do some *solo* acrobatics, but don't do anything foolish.

"Believe me, foolish stunts were furthest from my mind as I took off in the AT-6. However, I was the third of three ships that took off in quick succession which wound up in formation as we circled the field for altitude. That formation was the freezer that chilled two hot fliers.

"Had the guy in the lead plane been content to fly straight and level, I might have received commendation that day rather than condemnation.


USAF Photo

But he started in with the fancy stuff and sheep that we were, we followed. After all, we were about to be winged.

"And winged we were. Executing a squirrel-cage, the leader's plane came from my left and slightly above me. I shoved rudder and stick full right. It wasn't enough. My props chopped through his tail with a jar that rattled my teeth. I had 4,000 feet, but lost some of it trying to get the plane to respond to the controls. There was no response, so over the side I went. The other cadet had also jumped, a fact I learned several hours later. Both of us still shudder at the thought of the consequences had either of us gone down with his ship. We were lucky, make no mistake about it."

Then he was told to go and fly and do some solo acrobatics, yet here he was, aircraft destroyed, career in jeopardy, and simply lucky to be alive. Unfortunately, he's not the only one in the last 65 years that had to learn a lesson the hard way. This is a simple case where following simple orders/rules could have prevented an accident, yet a few pilots felt they knew better, and disaster followed.

The other portion of his story details the importance of his training and equipment and how you never know when you will need both.

"I learned other things besides the necessity of obeying orders that day. Important things about the parachute; I respect that sack of silk and handle it with special care. No more do I throw the chute in and out of the plane, nor do I expose it to anything that might damage it, like oil, grease and water. My chute is repacked every 60 days, with at least five inspections between repacks.

"And I was taught plenty about jumping. I went out head first, and I remember I had to use quite a bit of push to get out of the cockpit. While free falling, I was watching the clearance from the plane when I made the pass at the rip-cord. I missed it.

"I absorbed that bit of education before the next second was clocked off. Not only did I look at the ring before reaching the second time, but I also made sure I had a firm grip on it before yanking. When I saw that white sail fat with air above me, it was the most wonderful sight my eyes have ever seen.

"Within a week, I learned many things: the split-second horror of a midair collision, the serene descent by parachute, the humility of standing accused before a court-martial board, and the shock of being judged guilty. And I was taught the feel of defeat when I was denied my wings at the time my classmates received theirs.

"In the long days of waiting and waiting for the restriction period to end, I vowed to do everything according to the rules, so that if anything did happen, I'd be in the clear. You know, they can take the wings from you, just as they can strip you of your commission."

Pass on "hard-earned" knowledge by dropping by your safety office and informing your flight safety officer, so he/she can properly document the incident. Or, volunteer to brief your fellow flyers at the next safety meeting and start a dialog with your fellow pilots. You may prevent a similar accident or highlight, or discover that there may be a local issue that has potential to cause harm to fellow flyers.

Now fortunately my grandfather went on with these lessons learned and enjoyed a distinguished flying career both through WWII and Korea. But these lessons learned should be learned through stories like this, instead of creating similar "there I was" stories. Mistakes are always better learned through others; however, if you do make a mistake, pass on that knowledge to prevent future mishaps.

Preventing Midair Collisions In The Air-To-Air Arena

Very few air-to-air midair collisions occur between opposing forces.

USAF Photo by Tom Reynolds

MAJ MIKE "OVER" BENHAM
325 FW
Tyndall AFB, FL

Fighter pilots have been running their aircraft together for as long as air-to-air training has been conducted. Surprisingly, over 80% of these midair collisions are blue on blue, meaning that the fighter pilots who briefed together and are operating together against the simulated enemy are the ones running into each other. Very few air-to-air midair collisions occur between opposing forces. Fighter pilots are taught that midair collision avoidance (MACA) is their top priority from the very beginning of training, and it is ingrained in every flight briefing. Yet, we still have a significant number of midair collisions resulting in the loss of important combat assets and sometimes the irreplaceable pilots who fly them. If training emphasizes MACA, and these collisions still occur, what else can be done to minimize the risk?

Why do highly trained, experienced fighter pilots have midair collisions? Air-to-air may very well be the most complex type of combat, and *information overload* is a significant issue that fighter pilots must deal with. The best fighter pilots are able to process

large amounts of information by first prioritizing, then picking the appropriate bits of information from a myriad of displays and communications in priority order. Pilots can make very quick tactical decisions based on the prioritized information they have gathered; it is very difficult to do well, even under the best of conditions. Prioritization is the key to being able to operate effectively in these complex and very quick air-to-air engagements, and it is taught to young fighter pilots early in their training. In fact, prioritization training begins in undergraduate pilot training. All Air Force pilots know the flying priorities of aviate, navigate, and communicate. In the fighter business, those priorities become formation, radar, and communications. Formation is the top priority, and it doesn't simply mean staying in the proper formation position. It means that the number one job for both the flight lead and the wingman is to not hit each other. More responsibility is placed on the wingman to accomplish this, but the flight lead must ensure the wingman is complying. This sounds simple enough, but when information overload becomes an issue, and either the flight lead or wingman fails to properly prioritize formation first, the potential for a midair collision increases. It can be very easy for a fighter pilot to fixate on one or some of the many bits of information available to him and fail to crosscheck the position of his element mate, possibly resulting in a midair collision. Oftentimes the big sky theory holds true and no midair collision occurs, but the big sky theory has let many fighter pilots down over the years. Training has obviously emphasized MACA through the years, and it doesn't seem to help reduce the rate at which we run jets together, so what else can be done to reduce this risk?

Engineering solutions are the most effective means to reduce the risk of human error or at least minimize the impact of those errors. However, you won't find any engineering solutions for avoiding midair collisions currently designed into any of the systems in our fighter aircraft. Why not? The heavy world has TCAS systems to help them avoid midair collisions. Is there potentially a similar type system to help fighters avoid midair collisions as well? Is anyone doing research along these lines? There are three systems currently in use in fighters that may have the potential to be modified to provide an in-cockpit midair collision warning system to the pilot.

The first system is LINK-16. LINK-16 is a data link system that includes a fighter-to-fighter network transmitting the precise positions of each fighter in the link. This system may possibly be used to provide warnings of impending collisions between aircraft participating in the link. This system would have the advantage of being usable in both training and combat, and it likely would not require any hardware changes to existing aircraft. The current system would probably only require addition of software code to implement a collision avoidance system, which would help keep cost down. Disadvantages of this system would be that not all USAF fighters are equipped with LINK-16 systems yet, or the LINK-16 terminal in a particular jet could be inoperative. In either case, that aircraft could not contribute to the midair collision avoidance system. Still, any system would be an advantage over what fighter pilots currently have.

Another possible engineering solution to pursue would be the integration of a MACA into existing Air Combat Maneuvering Instrumentation (ACMI) systems. The latest generation of ACMI systems has the ability to data link between pods mounted on participating aircraft for the purpose of real-time kill removal, even when ground-based ACMI systems are not available (Kadena Interim Training System is an example of such a system). It may be possible to design a MACA system into this type of ACMI system in a similar manner proposed for the LINK-16 system. Advantages would be similar to the LINK-16 system except that ACMI pods are not carried into combat, so it would be a peace-time only system. Other disadvantages would include the expense involved with upgrading all ACMI systems to accommodate the latest generation pods (which may be underway anyway), and the requirement to fly with an ACMI pod for the system to work. Currently, the Air Force does not have enough ACMI pods to put one on each jet and purchasing that many would be an expensive venture.

A final type of system to consider would be transponder-based, similar to the TCAS systems on heavy aircraft. This type of system has proven its effectiveness in a world of air traffic routes and relatively predictable aircraft flight paths, and could potentially be feasible in the air-to-air fighter environment if the update rates of a transponder-based system are fast enough for the dynamic air-to-air arena. It is certainly worth researching. However, it would likely require hardware changes to some older fighters with analog transponder systems like the F-15C and would not be usable in combat unless they used an encoded transponder. Even then, stealth aircraft like the F-22 may not use the system depending on mission requirements.

Midair collisions have been a problem in air-to-air training for as long as we have been doing it. We have learned that training alone cannot completely stop this problem. Air Force leadership may want to consider researching the possibility of incorporating an air-to-air MACA system to help overloaded fighter pilots avoid hitting each other. There will likely be significant costs in implementing such a system, but a cost-benefit analysis would almost certainly prove that over time, a MACA system would pay for itself by preserving scarce combat aircraft and the lives of their pilots.

Reduce Human Error Mishaps With MRM

LT COL ED "HERTZ" VAUGHAN
HQ NGB/SE
ANGRC, Andrews AFB, MD

USAF Photo by SSgt James R. Ferguson

July in Tucson is normally hot. A certain July day in 2005 was exceptionally hot, even by Arizona standards. The second degree flash burns on the crew chief's neck clearly hurt worse in the "dry heat" than they might otherwise. As the emergency medical technicians carried the burn victim away on a stretcher, the Chief of Safety watched him solemnly. A 25-pound BDU-33 practice bomb had inexplicably fallen off an F-16 fighter jet and partially detonated on the back of the crew chief's neck, burning and bruising the man. At that moment, the Chief of Safety, Lieutenant Colonel Doug "Odie" Slocum of the 162d Fighter Wing, resolved to do everything he could to prevent any reoccurrence of such mishaps.

As a new Wing Chief of Safety, Colonel Slocum agonized over why his base, and much of the Air Force, suffered such a disturbing string of maintenance-related mishaps. With a background in program management, formal aviation training, and curriculum development, he looked to other experts for help. He consulted his fellow safety professionals and quickly realized that he wasn't alone in his distress. Following a timely data pull by Mr. Jay Johnson and the staff of the Air Force Safety Center Analysis and Integration Branch, Colonel Slocum discovered that approximately 18% of all USAF aviation and related mishaps could be attributed to preventable maintenance human error. Further, Federal Aviation Administration research revealed that a similar statistic exists in civilian aviation as well. That statistic didn't even include industrial and ground mishaps or efficiency losses due to human error. These were aviation-related mishaps caused by non-aviator human error.

What constituted "human error" in this context? Colonel Slocum discovered a wide range of discrepancies, such as failure to follow technical orders, use of improper tools or parts, and failure to review or check work when completed. There were myriad mishaps, including fatalities, caused by locally-developed "work-arounds" and shortcuts. He also found that virtually every one of the mishaps was easily preventable had the person with the right information simply spoken up or otherwise communicated that a hazardous situation was developing. In the world of aviation, that equated to calling a "knock-it-off" or "time out." He concluded that these factors revealed the same

root causes addressed by aviators through Crew/Cockpit Resource Management (CRM) training.

In most cases, the root cause of the maintenance error, which is what Colonel Slocum really sought, wasn't recorded in the safety report. He needed to answer the question "why." Why would a trained and qualified Airman fail to follow published guidance or use a short-cut that clearly presented an unacceptable risk? Why would that Airman's supervisor let that Airman make that mistake? Finally, why would the organization tolerate a culture where one person's mistake led to a catastrophic result, and how could the Air Force fix it?

The answer … train maintainers in the same teamwork, mutual support, communication, and decision-making concepts as we train aviators. In fact, the same concepts apply to any career field. As simple as it sounded, this was a revolutionary concept requiring a well-designed and well-executed training plan. In crafting his plan, Colonel Slocum drew upon his prior experience designing a CRM lesson plan for F-16 pilot error reduction training. He reckoned that if he could teach CRM concepts to the multi-language international F-16 pilot community that his base trained, he could teach these concepts to anyone else in the Air Force. He met with maintainers around the country and sought their feedback. He briefed his plan to whoever would listen and incorporated real-world examples and case studies provided by the men and women he briefed. He aptly called the resulting program Maintenance Resource Management (MRM).

MRM is neither a new title nor a new concept. The term has been used internationally and domestically to describe any type of training addressing teamwork concepts. However, prior to Colonel Slocum's program, none were cost effective. MRM's parent program, CRM, has been used by aircrews since the late 1970s, first in the airline industry and later by the military. CRM has proven successful in capturing and mitigating many of the causes of pilot and aircrew human error. MRM is beginning to show the same effectiveness in aircraft maintenance. A June 2006 letter signed by the 27th Fighter Wing Vice Commander, Cannon AFB, NM, states that "… Airmen of the 27th Maintenance Group demonstrated exceptional attention to detail and trumped the proverbial mishap chain of events by utilizing the MRM Knock-it-off." In that case, a $35 million F-16 was saved when maintainers detected and intervened in an impending failure of a No. 4 engine bearing. Since Colonel Slocum began teaching MRM around the Air Force two years ago, there have been more examples like that one.

Since mid-2005, Colonel Slocum has taught MRM at 36 active duty, Air National Guard, and Air Force Reserve bases with attendance exceeding 10,000 Airmen. Many more were briefed by MRM coaches that Colonel Slocum trained at those visits, including the MRM representative at Cannon AFB. MRM resonated with front-line maintainers who felt newly empowered by the training. Throughout 2005 and 2006, there was a ground swell of support for MRM. Finally, after an initial investment by the National Guard Bureau Flight Safety Office, the Department of Defense elected to fund MRM in late Fiscal Year 2006.

The Defense Safety Oversight Council (DSOC), formed in response to the Secretary of Defense's 2004 call for a 50%, then 75% reduction in military mishaps, provided direct funding for MRM. The DSOC stipulated that MRM would first be demonstrated in the Air Force, using Colonel Slocum's Air National Guard training model, and then offered to the rest of DoD services later. In May of this year, Mr. Mark Johnson of the Air Staff, AF/A4M, asked Colonel Slocum to assist the MRM Integrated Process Team (IPT) at Davis-Monthan AFB, AZ with development of an Air Force-wide program. Consistent with DSOC, the Air Staff designated Colonel Slocum's version of Air National Guard MRM as the Air Force-wide benchmark.

Facilitated by Lieutenant Colonel Pete Markle, AF/A4MM, the MRM IPT included representatives from the MAJCOMs, including Air Force Safety Center's Chief Master Sergeant Sandra Stacy. At the end of the week-long meeting, the IPT proposed changes to AFI 21-101, *Aircraft and Equipment Maintenance Management*. Essentially, these changes require every maintenance Airman to receive initial training in MRM fundamentals for the purpose of preserving life and preventing mishaps. Any detailed or subsequent recurrent training will be left to the MAJCOMs and wings to determine. The basic Air Force MRM syllabus and courseware can be found on the Air Force Portal, or by searching communities under "Logistics" and clicking the Community of Practice (CoP) named Maintenance Resource Management.

As the MAJCOMs wrestle with how to implement this tool and get the most mishap prevention out of it, it remains incumbent upon each Airman to use sound risk management in daily ops. As Colonel Slocum learned in a discussion following one of his many seminars, nothing better captures the spirit of MRM than the Air Force's long held wingman concept. General Moseley said it best in his June 2007.

CSAF Vector: "One of my top three priorities is developing our Airmen and taking care of them and their families. It's a notion that's deeply rooted in our Air Force culture and heritage. "Taking care of Airmen" means more than just providing them with the training, equipment, and quality of life they deserve. It also calls for providing leadership they can trust unconditionally. The wingman concept–the bond we all share as Airmen–is at the core of this conviction. It reflects the ultimate confidence in our fellow Airmen: we trust each other, quite literally, with our lives."

"The beginning of knowledge is the discovery of something we do not understand."

Frank Herbert

Safety is Paramount

USAF Photo

ANONYMOUS

Safety is paramount ... safety is the backbone of our mission. We've heard it all at one point or another. The truth of the matter is that the mission is the heart of what we do in the Air Force. Service before self! In the Heavy community, safety has often been in direct conflict with the successful completion of the mission. Day after day, airlift crews are pushed to the physical and mental extreme. At the end of the day, many of us question the day's events and often wonder if we've pushed the limits just a little too far. On one recent mission, complacency and miscommunication got our crew into an awkward situation. In a split second, CRM crumbled, and the crew was left wondering what had just happened.

The mission departed Ramstein AB on a rainy spring afternoon. Onboard we had three crew chiefs accompanying the aircrew. The mission was planned for 22-hours. We would route to the south, catch a tanker, and head to southwest Asia. After dropping our goods off there, we were heading on to our final destination. The weather along route was looking sketchy at best. We were expecting thunderstorms along the air refueling (AR) route and possible low ceilings at our first destination. The crew was very preoccupied with the events ahead.

Two hours into the flight, we arrived at the AR initial point. The tanker met us on time, and we proceeded down track. Just as we moved in to the contact position, the tanker's wings began to flex more than normal. Recognizing the abnormal situ-

ation, I slowed the plane down and fell back to the pre-contact position. At this time, it became apparent that the formation was heading for some nasty weather. The tanker confirmed this over the radio. We were told that a storm front appeared to extend halfway down the track. We continued to fall back to 100 feet and decided to stick with the formation, keeping our fingers crossed for better weather. So far so good, right?

At this point, Murphy started working against us. Little by little the tanker's silhouette became fainter as the storm thickened. The tanker informed us that they were going to try and climb out of the weather to a higher altitude. We agreed with the altitude change, and the formation began a shallow climb. Then, without any warning, the tanker's climb rate increased from 300 feet per minute to 1200 feet per minute. In an instant, they were gone! The initial reaction involved some less than professional verbiage, followed quickly by slowing the jet, falling back, and descending to the bottom of the block. A flurry of procedures and precautions flew through my head. The co-pilot chimed in with a comment about one-mile separation, but did so almost reluctantly.

At this point, we were a little stunned. The nice on-time rejoin had turned into a less than ideal lost tanker situation. Our regulations direct us to fall back to a mile and descend to the bottom of the block. Initially I hesitated. How will we rejoin if they keep climbing and we descend to the original bottom of the AR altitude block? A lot of goofy thoughts crept into my head as we leveled off. I asked the crew for their inputs. The crew agreed we needed spacing, and I continued to fall back into a one-mile position. We hung on, tracking the tanker on the air-to-air TACAN, and following the AR track routing. Finally, just before the halfway point, the skies began to clear, and the tanker became visual again. After some discussion with the crew and the tanker, I pushed the power up and returned to a pre-contact position. With only half the track remaining, we were able to get ¾ of the gas we needed. We weren't too concerned, as we knew we could get fuel at the first destination. With the end of the track approaching and the tanker crew eager to return to their home station, they asked if we were good to press on. We gave them the thumbs up, and we began our separation. Murphy had tried her best to foil our plans for the day, but it seemed that we'd proven the victor.

As we descended down to the bottom of the block, the master caution light illuminated. This just wasn't our day. The co-pilot scanned the panel and determined that we had an engine fault. Our electronic engine control had failed on the number two engine. I directed the extra pilot to dig into the checklist. As he began to read through the procedure for correcting the problem, our three crew chiefs entered the cabin. They quickly began analyzing the condition and discussing a technique they'd used in this situation before. It sounded a bit sketchy, and involved pulling circuit breakers and quickly shutting the fuel shut-off valves off, then back on. This was some sort of reset procedure. As I flew the jet and discussed the options with the co-pilot, one of the crew chiefs began running through the fault codes on one of our primary data displays. As he was doing this, he relayed info to the other two crew chiefs who were studying the engine readings. Then all of a sudden, without discussion, the crew chiefs began testing their procedure. The crew chiefs ended up testing several of the engines, and the fault codes indicated problems with more than the number two engine.

At this point, the co-pilot and I began to catch up with what they were doing, and we didn't like it. None of the reset attempts worked. We asked the crew chiefs to fall back with the extra pilot and help him with the checklist procedure. The checklist drove us to shut down the engine and restart it. We did. After 15 minutes of what felt like complete buffoonery, we had our number two engine back online, and we were able to press on with the mission. The crew chiefs returned to the cargo compartment. With the plane in autopilot cruise, the co-pilot, aux pilot, and I had a cockpit huddle. What the heck just happened? How had the situation fallen out of our hands, and why did the crew chiefs feel that it was okay to take action on a "technique," while we evaluated a potential emergency at 25K feet?

In an instant, CRM fell apart in the cockpit. Fortunately for us, the crew chiefs' "tried-and-tested" technique caused no harm. The engine restarted and the mission pressed on. This incident led to the crew discussing CRM with the crew chiefs. We stressed the importance of clearing an action with the AC and the crew before moving forward. The crew chiefs' defense was that we didn't say no. For that, I, the AC, take a ding. As the AC, it's my job to act as the conductor of the CRM process. As soon as I saw that CRM was falling apart, it was my job to put a stop to it. Through the stresses of the AR, the bad weather, and the long day, I had let the CRM process break down. I had let my guard down. As airlift crews, we appoint a CRM monitor each time before we fly. However, we often forget to ask the monitor for his/her inputs following the mission. In the Heavy community, it can often be uncomfortable to discuss issues while enroute. Unfortunately it's also easy to avoid discussing concerns after a mission, especially when the focus is directed to which club to go to and what to have for dinner. No one wants to beat up the mission details at that point. Nevertheless, it's imperative that we address CRM issues while the situations are still fresh in our mind. In this case, the best plan would have been to discuss the issue once we were back on course, when the "cockpit fire" had settled down a bit.

What's That On The Plane?

MAJ KENNETH PEDERSEN
4 SOS
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A part of flying military aircraft is adapting to new modifications being implemented on aircraft. These modifications are intended to enhance mission performance, but many times they arrive on the aircraft with little or no technical guidance on their employment. As aircrew, we have a responsibility to seek out the questions to answers on new equipment or changes to operating procedures.

An example of an aircraft constantly undergoing heavy modifications is the AC-130U Spooky gunship. Some changes are minor, only changing the way the aircrews interface with the fire control system; others are entirely new technologies. For example, in only a matter of months, the AC-130U has tested two new weapons systems: the Single Barrel 30mm Cannon and Stand-Off Precision Guided Munition (SOPGM). Both will enhance mission capability but pose a host of different concerns for their safe employment.

The first concern should be configuration: does this new system change any existing parameters or procedures? Does the new system block any currently installed mission equipment on the aircraft from performing its function? On the new 30mm system for the AC-130U, the 30mm barrels extend much farther from the aircraft than the 25mm Gatling gun barrels it's due to replace. Functionally, the same result is achieved with either gun in the forward station off the left side of the aircraft.

Also located on the left side are onboard sensors. These include an Infrared Detection Set and an All Light Level Television (ALLTV). Both sensor balls are mounted externally to the left side of the AC-130U, one in front of the main crew entrance door and one just aft of the crew entrance door. The ALLTV is able to fire both a laser target designator/laser range finder (LTD/RF) and a laser illuminator assembly (LIA). All of these systems have cautions associated with them, since they are high power lasers, and reflective or direct energy can damage the human eye. Crews discovered during mission planning and testing of the 30mm, that if the ALLTV is firing the LTD/RF or LIA, the energy beam in some cases can strike the long single barrel of the 30mm and can potentially reflect energy back against the left side of the aircraft. This was never a factor with the shorter 5-barrel system on the 25mm. Both the pilot and flight engineer look out the left window of the flight deck during AC-130 employment and had these issues not been discussed or caught, the potential for an unsafe laser event could have occurred.

The other weapon system tested for possible fielding was the SOPGM. This is derivative of

USAF Photo by SSgt Greg L. Davis

the brilliant attack munitions, also called Viper Strike, which consists of a small bomb that glides to target and picks up a laser target designator to find its mark. The employment of this weapon is non-standard from traditional AC-130 weapons employment. Crews had to ensure thorough mission planning was accomplished, so they could understand the flight dynamics and requirements for the weapon. Also, checklists had to be modified for ground operations. For normal ammunition upload, the No. 3 and No. 4 engines are shut down for upload through the parachute door. With the SOPGM units being mounted on the left wings hard point, this required the pins to be pulled in hot cargo with the No. 1 and No. 2 engines shut down. Both pilots and the flight engineer had to be aware of what aircraft systems they would lose with the engines shut down, in an order they were not used to.

For the fire control officer, navigator, electronic warfare officer, and sensor operators, crew coordination was vital for a successful launch and weapons acquisition of the target. Situational awareness and understanding of the weapons systems flight profile were also required for the safety of range personnel. A detailed mission planning brief walks the crew through the stages of the weapons flight profile, where the gunship needs to be, and what the gunship needs to be doing for a successful impact. The testing of the SOPGM also required another station be set up in the AC-130U's battle management center, so there would be another man in the loop to challenge the crew coordination.

The flight tests cards developed by the engineers were thorough for knowledge required to conduct a launch. The flight profiles developed were not well suited for the known limits on systems onboard AC-130U. This is where the crew had to be vigilant and really press the test engineers to modify the test profiles, since the profiles designed didn't meet the performance characteristics on some AC-130U systems. In this particular case, the engineers profile had the AC-130U too far from the target to get a stable enough laser spot on the test target. By utilizing ORM, the aircrew was able to have the profiles modified to meet the requirements of the test and still have a stable laser spot on the target.

Where are we going to shoot today? Limited number of bases from years past, along with urban encroachment, threaten many military ranges. Some aircraft travel across states just to reach a suitable range for air-to-air or air-to-ground operations. Crews need to be sure that the range regulations for the range they are about to use are compliant with the types of munitions to be expended and that they meet MDS-specific AFIs.

The AC-130s have been looking for joint-use ranges to help alleviate the already crowded Eglin ranges. One joint-use air-to-ground range is run by the Army in Mississippi. After review of the AC-130 operations, the Army signed off on the gunships shooting on their range both in VMC and IMC conditions. AC-130 employment requirements were met by the Army, but they did not meet the requirements in AFI 11-2AC-130 or local Hurlburt Field series instructions for IMC shooting. In this case, the squadron's range operations personnel were unable to see and clear the impact area for the gunship prior to shooting, when the AC-130 couldn't see the ground due to clouds. The Army's requirement of the range being cleared by their personnel didn't meet the intent of the AC-130 instructions for safety. This range is uncontrolled, meaning there are no gates or fences to keep the public out, so a careful clearing must be done just prior to the AC-130s shooting, not several hours prior the day of by Army personnel as their requirement dictates.

The lesson to take away is this: review your flight profile carefully. Just because your current operations has scheduled and developed a sortie profile doesn't always mean all the gaps have been closed. The burden falls back onto the crews to adhere to the more restrictive guidance and apply the common sense check with themselves and squadron leadership before launching.

Last Link In The Chain

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There I was late in 2003, flying A-10s out of Tallil, Iraq with the 74th World Famous Flying Tigers. It was my second sortie in country and my first flight lead sortie ever. Our mission was to provide close air support (CAS) for an Army unit, during their cordon-and-search operation through a few towns in northern Iraq, located about 50 miles west of Kirkuk Air Base. It was a pretty standard mission and not too much was happening on our end, but we were there just in case. I was very familiar with this type of operation from the ground perspective, as earlier that year I spent 4 months with the 82nd Airborne in Afghanistan. While in Afghanistan, I was a certified joint terminal air controller and acted as a jump battalion air liaison officer to the Army. While there, I went on several missions with the 82nd in Afghanistan, and played my small part in many of their cordon-and-search operations. It was nice to see this type of operation from the air this time.

About 30 minutes after we made contact with the joint tactical air controller (JTAC) and showed up on station, the Army unit began searching their second small town, at which point my wingman saw about 8-10 vehicles speeding away from the town the Army had just entered. My wingman talked me onto the location of the fleeing vehicles, and I informed the JTAC of what we were seeing. It was obvious the drivers of the vehicles didn't want to interact with the Army. We were able to show the Army where the vehicles were by first talking the JTAC onto my aircraft, then flying near the vehicles while putting out flares to mark their position, after receiving permission from the combined air operations center (CAOC) to do so. The JTAC and the Army quickly located the fleeing vehicles and informed me they were sending several humvees to intercept them. The plan was for me to keep an eye on the vehicles and guide the Army onto their location. Shortly after we talked the JTAC onto the vehicles, the Army ground commander requested, through the JTAC, a warning shot with the mighty 30mm GAU-8. The ground commander's intent was to stop or slow down the vehicles.

I told the JTAC that it wouldn't be a problem, and he immediately came back with "Cleared Hot" before I was even close to rolling in for the warning shot. I began to set up for the attack and had my wingman

USAF Photo

fly cover. About this time, we noticed the convoy turn southbound into another small town. I informed the JTAC that a warning shot anywhere nears the convoy would most likely harm Iraqi civilians, and my plan was to wait until the convoy was out of the town. After a brief pause, the JTAC came back with the ground commander's initials and cleared me hot again.

When a ground commander gives the attacking aircraft his initials, that means he's serious about wanting you to shoot, and he also takes full responsibility for any collateral damage. A normal example of attacking aircraft being given ground commander's initials would be during a troop-in-contact (TIC). A TIC normally involves friendlies and enemy forces fighting in close proximity, and the probability of injuring friendly forces with CAS is increased. In this situation, the ground commander would weigh the benefits of CAS with the dire situation of his unit. After concluding that an aircraft attack was the better answer, he would then give his initials to the JTAC, who would pass it to the aircraft, thereby clearing them for attack.

In our situation, the ground commander's intent was to use a burst of 30mm rounds to slow down or stop the fleeing convoy. No one from the convoy had fired upon the friendly forces. This was not a dire situation where friendly forces were in a close proximity fight. When the JTAC gave me the ground commander's initials, I replied, "Negative," because innocent civilians would most likely be harmed, and the Army's humvees would soon intercept the convoy and stop them either way.

I told the JTAC three times that we weren't going to put down a warning shot in a town of civilians ...

After informing the JTAC of the situation a second time, there was another brief pause, and the JTAC came back once more with the ground commander's initials, along with another "Cleared Hot."

Looking back on this situation with more experience now, the answer was simply an immediate "Negative" for the same reasons. At the time, however, I was a brand new flight lead and wanted to do what any CAS aircraft is supposed to do: meet the ground commander's intent and help him win the war. The answer, even then,

was simple, but it took a moment of consideration and a bit of perspiration for this young flight lead to again tell the JTAC "Negative." The JTAC and ground commander were not pleased with my decision. I explained, yet again, why it wasn't a good idea, and why we weren't going to put 30mm rounds in a small town, just to warn a fleeing convoy to stop.

While the back and forth was going on between me and the JTAC, my wingman was doing an excellent job of keeping quiet and letting me work through the situation. We did, however, use a great deal of Cockpit Resource Management. I spoke with my wingman in between some of the radio calls to the JTAC. I kept him informed of my plan, and my wingman agreed we were making the right decision. One of the few times he spoke up on his own was to request tanker support. Good idea. During this young flight lead's stressful decision-making process, I considered fuel and recalculated our bingo gas for nearby Kirkuk, and then informed my wingman. I didn't plan to land back at Tallil, but my wingman did. My wingman's answer, a better one, was to get a tanker overhead to continuously refuel us, until the Army no longer required CAS. We went with his fuel plan. We received excellent tanker support, and there was a tanker nearby already listening to what was going on.

By this time, I told the JTAC three times that we weren't going to put down a warning shot in a town of civilians; two of those times, we had the ground commander's initials. My wingman and I continued to monitor the fleeing convoy. Shortly after requesting tanker support, the convoy began to exit the small town southbound. I informed the JTAC that we could now put down a warning shot and slow down the convoy. Remembering that the Army sent several humvees to intercept the convoy, I asked the JTAC if he knew where those friendlies were, and if they were a factor to our warning shot. The JTAC came back, "Friendlies no factor; Cleared Hot." I put my wingman in a cover roll and planned to roll in from the north and put my bullets south and east of the convoy's position, as they were still headed south and slightly east. I already had clearance and began to roll in for the attack, when I saw several humvees exiting another town located south of the convoy, heading northbound. The humvees were approaching the same location I planned on shooting, for the same reason: to stop the convoy. I aborted the pass. After aborting the pass, I informed the JTAC that friendlies were a factor, and that those friendlies had now intercepted and stopped the fleeing vehicles.

I am currently an A-10 formal training unit instructor and occasionally tell my students this story during their surface attack tactical phase of training. The last link in the chain of events leading to killing bad guys, friendly fire, or unnecessary collateral damage, is the attack pilot who pulls the trigger or presses the pickle button. The last link can also be the same pilot not pulling the trigger. CAS pilots continually train to never shoot without clearance; we drill it into our students and train to it daily.

USAF Photo by TSgt Maria J. Bare

Shooting without clearance is something a CAS pilot never wants to do. On that same note, friendlies are not normally injured when CAS pilots shoot the correct target without clearance. Normally, friendlies are injured or killed when CAS pilots have full clearance from the ground commander to shoot the wrong target. It was lucky for us that day that our situation was relatively simple and the circumstances weren't dire; however, this is not often the case. Attack and fighter pilots train harder than we fight. While it's difficult to simulate every situation we'll face in combat, we do our best to prepare for it. After landing that day, I told my director of operations what happened, and he agreed with our decisions; he trusted us to decentrally execute the mission. I didn't have to worry about what my squadron commander thought, because he could have spoken up any time during the flight.

That's The Brakes

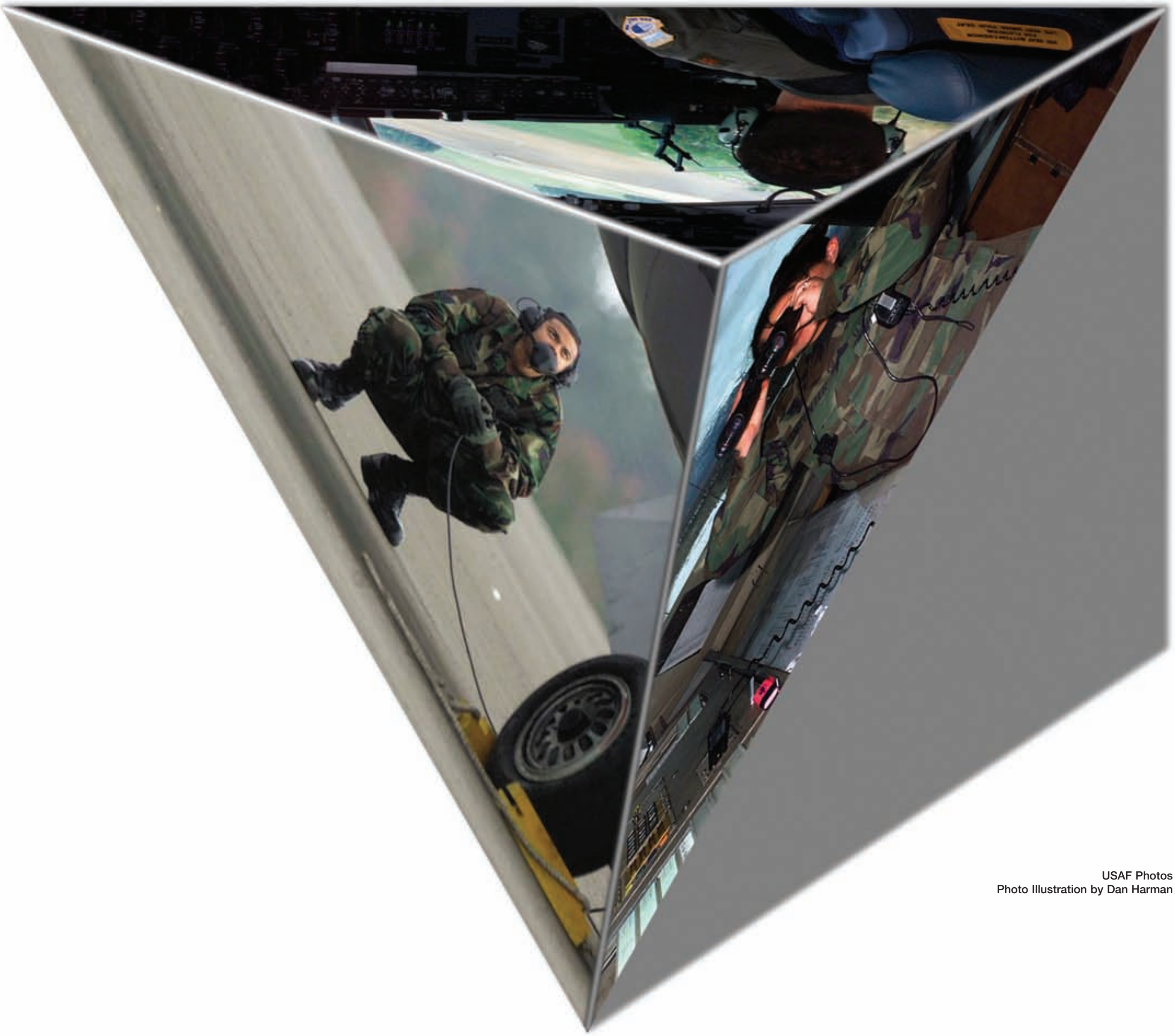
MAJ KURT LESLIE
Balad AB, Iraq

USAF Photo by SrA Lakisha Croley

On any given day or night, aircraft maintenance organizations around the Air Force are performing maintenance operations in which anything can happen, from dealing with in-flight emergencies to aggressively working hard-broke airplanes. Aircraft maintenance operations have many moving parts, but it takes talented Airmen to pull off the ballet. Maintenance leadership has to think ahead to ensure all contingencies are properly planned for and mitigate any potential pop-up issues that may affect the next mission; however, sometimes you just have to be lucky.

It was a night in which the aircraft were returning from their mission without expending any of their munitions. It was a rare peaceful night in-country. Two F-16s landed uneventfully, or so it seemed. At the same time, two more F-16s were at EOR and a C-17 was in the same area, all making their final preparations for takeoff. As the returning F-16s headed off the runway, the wingman noticed that his lead was on fire, and it was coming from the left main tire. Now let's review: Two F-16s are at EOR preparing for takeoff; a C-17 was heading for the same area preparing for takeoff; and in the middle of all this was an F-16 on fire with live munitions! This had disaster written all over it. If there is one situation that makes a maintainer nervous, it's an aircraft on fire with explosives on board. The pilot stopped the aircraft, shut it down in the middle of the taxiway, and emergency egressed the aircraft. By this time, the fire department was on scene and put the fire out; however, hydraulic fluid was still streaming from the left brake. This was a very dangerous situation, because the brake was still hot enough for the fire to flare up again. I mentioned earlier that sometimes you just have to be lucky. Our luck that night came in the form of our production superintendent; he was monitoring the situation and noticed the fire department's precarious situation. He knew that he could rectify the problem by relieving the hydraulic pressure on the aircraft, which would stop the leak. Without hesitation, he acted in a decisive manner and assisted the fire department by relieving the pressure from both the A and B system hydraulics. With the leak stopped and the brake cooled, the aircraft was chalk-walked off the taxiway, clearing the way for the other aircraft to continue their missions. As a result of the production superintendent's actions, an F-16 was spared further damage, no injuries were incurred. A C-17 taxied onto the runway and took off. Most importantly, the two F-16s that were waiting to takeoff, taxied to the runway and took off on time. What makes this a big deal, is when F-16s take off on time, the Army will always have air cover for their missions. Although the sergeant won't admit it, he saved lives and equipment in Iraq that night.

Performing combat operations in a combat zone requires that your best and brightest perform their duties at a high level from day one. We were lucky that night in Iraq, but I prefer to think we made our own luck, because we have highly motivated maintainers out there day in and day out doing their job to the best of their ability. Where's the luck in *your* organization?



USAF Photos
Photo Illustration by Dan Harman

Clarity In Communication

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Flight safety experts and investigators spend countless hours researching trends in mishaps. Communication is one of the most common factors present in aviation accidents. Pilots are taught from the beginning to aviate, navigate, and communicate; few understand that there is more to it than simply prioritization. Like any public speaker, a crew member must understand the audience to know who needs what information and in what time frame. The concept can be thought of as finding a way to speak smarter and not harder. Efficient and open communication in all realms of flight can prevent mishaps and save lives.

A chain of events along a timeline is created when studying and investigating mishaps. The concept behind developing this chain is to understand what links in that chain are crucial. Removing any link from that chain would break the chain, therefore preventing the mishap at the end of the chain. Learning how to eliminate those steps is a preven-

tative tool for the future. Communication on some level is nearly always part of this chain.

Verbal interaction is found in every aspect of flight, from the day prior to a flight during the scheduling process to the maintenance debrief after the flight. Mission briefing is the most dedicated time given to communication for the crew, whether the crew is a pair of pilots in formation, or a mix of pilots, engineers, loadmasters, etc. Interaction between the flight crew and their ground support is an overlooked chance to acquire essential information. The crew chiefs who prepare the aircraft for flight and who launch the mission can provide valuable information on the status of the aircraft. Clear communication between all crew positions and air traffic control while operating is key, whether you are a four ship of F-16s or a formation of C-130s. When back on the ground again, talking with maintenance personnel to fully debrief the status of the aircraft can prevent future problems and identify trends that might not be noticed without solid debriefs. In any day of flying, communication starts before a call sign is even established and ends well after touchdown.

How should pilots make best use of their chances to communicate? Does your crew or formation truly know the plan for the flight, and are they prepared for possible problems? How experienced is your crew chief? Has he/she been on shift for 2 or 12 hours?

Specific examples are eye-opening and cause us to stop to realize how important clear lines of communication are. In one fatal Class A mishap, the wingman in formation was working to answer a question asked by his lead pilot, when he didn't see his lead turn. Had the wingman understood the question was not urgent, proper prioritization could have saved his life. In the case of the world's most deadly aviation accident, in Tenerife, there was a collision of a taxiing aircraft and another taking off. Clear and firm communication between the two aircraft and between the pilots of the Polish airliner would have prevented the deadliest airplane crash in history. The co-pilot failed to voice his doubt of an air traffic control clearance, resulting in the pilot taking off on a runway he wasn't cleared to take off on. In another incident, an aircraft and lives were lost when a fuel imbalance developed to such severity that full flight control inputs were needed to maintain flight. The student on the controls didn't communicate the problem to the instructor pilot; the condition increased to a point that the student was unable to maintain control. The instructor took the controls to correct what he thought was the problem. Since the student had not correctly described what he was fighting on the controls, the instructor made inputs on the controls that forced the aircraft to depart controlled flight.

Personality conflicts are known to be a problem in the cockpit, but accepting these differences and overcoming the conflict by communication can make the difference between surviving a flight and crashing an airplane.

How can you prevent mishaps with your communication? Understand what you are saying and how others perceive it. When arriving at your aircraft and signing it over from your crew chief, exchange meaningful information as well as friendly interaction. Earning your maintainer's respect will yield a far better working relationship as you launch that aircraft. A simple question to inquire how things are going might tell you the reason he's yawning: because it's been a long day, or because he's just starting his day? What issues have they been working on the aircraft (other than what you might see in the forms)?

Take your thoughtful communication a step further. Be conscientious of your directions and interactions with your crew. Encourage open communication and during your mission briefing, emphasize good Crew Resource Management (CRM). CRM is all about communication and how you work with your team or crew. If you fly on a multiplace airplane, stop to think and ask who has flown with whom on that crew. Are you familiar with each other's habits in the cockpit or is this the first time working together? Be cautious of a friendly crew and know how to manage that. If there is too much chatter during mission planning, pre-flight, or flying, think about how you will squelch the friendly talk without ruining any good working relationships. Your words can make or break the atmosphere, so be gentle, but firm. When delegating tasks out to your co-workers or crew, explain the priorities of the tasks you have given them. Do they need to tackle this before their other issues at hand, or can it wait?

If you are not in charge, your communication to your pilot, loadmaster, boom operator, or engineer is just as crucial. Take survey of your situation before asking questions. Is this a good time for instruction? Perhaps writing down your question for later will actually allow for better communication on the crew. Never bite your tongue for a safety of flight issue. If any condition in the cockpit is nonstandard or uncomfortable, good CRM demands that you voice your concerns, but in doing so, apply the principles discussed here. Be open, clear, and concise. Speak smarter, not harder.

Simplicity and clarity in communications can save precious time when it is most critical. Ensuring that everyone in an operation is on the same sheet of music can prevent confusion and potential conflicts that lead to detrimental endings. Remembering to always aviate first, navigate second, but to always communicate clearly and openly will take links out of the proverbial chain of events that can lead up to a very serious mishap.

Kadena Divert

CAPT DAVID M. HENZE
60 AMW
Travis AFB, CA

"Kadena Approach, Petro 61 on the go due to weather."

"Petro 61, state your intentions."

"Petro 61 requests radar vectors, PAR final."

"Petro 61, the PAR is unavailable."

Let's stop the scenario here, which is a luxury we don't have in the air. You shot the approach with the lowest compatible minimums into Kadena. You didn't break out prior to the missed approach point. You made the right decision to go around, but now what do you do? Do you enter holding to wait out the weather? Do you proceed to your alternate? How much fuel do you have? If you've waited until now to gather the facts and make the decision, you've put yourself and your crew in a precarious situation.

AFMAN 11-217, *Instrument Flight Procedures*, Volume 1, paragraph 15.1.1 states, *"A successful approach and landing in marginal weather conditions requires considerable planning, which should begin before the flight,"* and paragraph 16.1 says, *"Performing a missed approach successfully is the result of thorough planning."* At this point, you're probably wondering how we got into this situation. The chain of events that led up to this point started over 13 hours prior when we opened the crew papers from our flight manager.

A quick review of the flight plan identified a 10-hour flight with an average headwind of 42 knots and a 215,000 pound required fuel load. The NOTAMs listed runway 05L/23R as closed. The weather briefing indicated marginal conditions with gusty winds and low ceilings at Kadena, and was the first item to raise the hair on our necks. The raw TAFs showed BKN008 for our arrival time, and the TACC weather shop had somehow determined that the ceiling would actually be BKN015. The only runway at Kadena with an ILS was closed, and the weather was forecast to be anywhere from just above to well above the minimums for the TACAN 23L. Further study of the NOTAMs revealed that the PAR for the open runway was in service on weekends and holidays, but the PAA Supplement listed it as out of service during weekends and holidays. Regardless of which was correct, our landing time was scheduled outside of the listed operating hours and at night.

The links in the chain assembled so far are night arrival, marginal weather, long flight duty period (crew fatigue), a non-precision approach, and we haven't even finished mission planning yet! We discussed several options to mitigate the building risk. I called Kadena approach on the phone and confirmed that we would be able to use the PAR at our scheduled arrival time. This confirmation mitigated the risk inherent in the type of approach and many of the concerns about the weather. A review of the weather, NOTAMs, and other related information for our alternates further mitigated the risk, since we had an additional alternate on top of the required alternate; both had better forecast weather than the destination. A thorough review of the crew papers ensured we hadn't missed anything important.

USAF Photo by MSgt Brandt Smith

The 10-hour flight was uneventful, except for the average headwind being more than 30 knots worse than the flight plan winds. In this age of fuel conservation, that exception is a pretty big deal! We arrived at our begin descent point with less fuel than required to make our second alternate. We elected to descend and accomplish the approach based on our pre-flight weather and the weather update we had received from TACC 30 minutes prior to descent. The optimistic BKN015 had become the reality of FEW004 BKN008, but the weather minimums for the planned PAR approach were 200-1/2 and the back-up TACAN approach were 500-1 1/2. Either approach was suitable given the information we had. The winds were 22019G25–9 to 15 knots over our maximum landing tailwind, leaving us with no option for an opposite direction landing.

Once we were in communication with Kadena approach, we requested vectors for the PAR. Kadena approach informed us the PAR was unavailable. The safety chain had grown considerably: we were now down to one alternate, we'd been flying the last 10 hours at night and were at over 13 hours of crew duty time, the weather was worse than forecasted, and there was no precision approach into our destination.

We commenced the TACAN approach. I elected to "dive and drive" instead of making a calculated descent to reach my VDP on a theoretical glidepath, in order to give my "co-pilot" (another experienced Aircraft Commander) and myself the largest opportunity to see the runway environment. We leveled off at the published minimums and drove in to the VDP and MAP. We never saw the runway environment on the final segment and as I crossed the MAP, I called for the go around. After we leveled off and cleaned up on the missed approach procedure, we started the conversation at the beginning of the article.

As I said before, this is not the time to be figuring out what to do next. A solid plan, prepared before departure, and updated with current information is your best method of diverting an aircraft in adverse weather. Our initial plan in event of missed approach included holding until the established bingo fuel and then commencing an approach into the destination or alternate airfield, dependent upon weather conditions.

In our case, the weather was forecasted to only get worse at Kadena until well after we would have reached bingo fuel. Another looming issue was crew fatigue: the longer we held to wait out the weather, the worse we would likely perform on the approach and landing. The final information update that pushed us toward landing at our alternate (Naha Int'l) was the current condition of BKN030, even though Naha was less than a 10-minute flight down the coast.

After some coordination, we made an uneventful visual approach into Naha. Because we were prepared for the possibility of weather diverting, we reaffirmed the old adage: "A superior pilot is someone who uses his superior knowledge, so that he doesn't have to use his superior flying skills."

Thanks A Lot, Jump

ANONYMOUS

USAF Photo by SSgt Cherie A. Thurlby

Tower: "Essay 42, you were not cleared to land; contact ground when off; good day."
AC (to crew): "Ohhh, @&%*, did he just say what I thought he said?"
Co-Pilot: "Hey, is this Charlie or Delta over here?"
Jump: "Yeah, he said we weren't cleared to land."

This is a conversation no sane aircrew member ever wants to have. Here's another one:

Tower: "Qtree 11, cancel takeoff clearance; vehicles on the runway!"
AC (to crew): "We were cleared for takeoff, right?"
Co-Pilot: "Well, if he said 'Cancel takeoff clearance,' he must have given us one to begin with, right?"
Jump: "Uhhhhh …"

Here's a little background on the first situation. We were inbound to a relatively busy military field, but one with some fairly restrictive operations. About 50 miles out, the approach controller informed us that we would be cleared to land there. Everybody heard that transmission and didn't think too much of it. Subsequently, we were cleared for the visual approach … another "clearance," but obviously not a landing clearance. Here's the fun part. The co-pilot was relatively inexperienced and something of a situational awareness vacuum. He was flying and doing a fair job at it, until the actual approach. To that point, he was observing clearances, but still demanded the AC's attention. He was also a little behind with the typical cockpit duties associated with leaving cruise flight, like calling for checklists, getting ATIS, etc. When the time came, his approach was too high and fast, but he seemed pretty pleased with himself for getting the airplane configured and generally aligned with the runway. Eventually, the AC talked him into something, approximating the slot, and everyone breathed a sigh of relief. Everyone's attention focused on the landing zone and a safe touchdown, with the AC wired to take over the controls if the co-pilot approached anything unsafe. He didn't, and the landing was uneventful … almost. We overlooked one small detail; landing clearance. At this point, the aforementioned conversation ensued and the entire crew, except the blissfully unaware co-pilot, got that sinking feeling.

There was one person involved here who could have, no, should have caught the fact that we weren't cleared to land … the jump-seater (me). The fact is, I wasn't paying much attention. I was busy wondering if the co-pilot would get us on the runway prior to the 5,000 ft down marker. What I should have been doing was backing up the AC, who obviously had his hands full with the right seat actuator. Sure, I had no official duties as the jump-seater. I could have been asleep in the back of the plane, but I was in the jump seat with a headset on. I heard every radio transmission and watched the entire approach, but in the back of my head knew that the real responsibility for the success of the mission rested with somebody else. It just wasn't my problem. I was like that guy painting lines on the highway who put a nice yellow stripe over the road kill in his way. That just ain't my job.

Okay, on to situation number two. I'm in the jump seat in the lead aircraft of a two-ship UPT sortie. I was worried about all the approaches I'd have to fly when it was my turn and glad the other guy had to do the ground ops. Needless to say, I paid no attention to what was going on in the cockpit. I was engrossed in my own world and subconsciously assumed the IP and/or the student in the right seat would take care of the flying. I also assumed the crew of the other plane, with another IP and two students, would be paying attention to the radios. Had I listened to the headset covering my ears, I might have known we were not cleared for takeoff. I was in a position to use good ol' CRM and put a stop to a bad situation. I didn't, and we ended up doing a relatively high speed abort. The No. 2 aircraft also started, then stopped his takeoff roll after hearing tower's call.

In both cases, nothing tragic or catastrophic happened, but it certainly could have been worse. Most of the aviators involved were taken behind the nearest hangar and summarily executed, but I survived to tell the tale. Okay, not really. In fact, the situations were handled appropriately, and we all moved on with our lives. There's nothing like messing up twice to drive home a point.

Here's my conclusion. There is a common disease in the flying world called "Acute Jump Seat Apathy." Authorities have not yet determined how it spreads, or whether or not it's fatal, but the affliction is very real. I contend that, if not caught early, it might someday prove fatal. The prescription is readily available and extremely cheap: pay attention. Whether you're at the controls or just looking out the window, if you're part of a crew, it's your obligation to contribute to the safe accomplishment of your mission.

FY08 Aircraft Flight Mishaps
(Oct 07)

0 Class A Aircraft Flight Mishaps
0 Fatalities
0 Aircraft Destroyed

FY07 Aircraft Flight Mishaps
(Oct 06)

2 Class A Aircraft Flight Mishaps
0 Fatalities
1 Aircraft Destroyed

Nothing To Report

- A Class "A" aircraft 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 crew members successfully ejected/egressed from their aircraft.
- Reflects all fatalities associated with USAF Aviation category mishaps.
- "✈" Denotes a destroyed aircraft.
- Air Force safety statistics may be viewed at the following web address:http://afsafety.af.mil/stats/f_stats.asp
- **If a mishap is not a destroyed aircraft or fatality, it is only listed after the investigation has been finalized (as of 10 October 07).**

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