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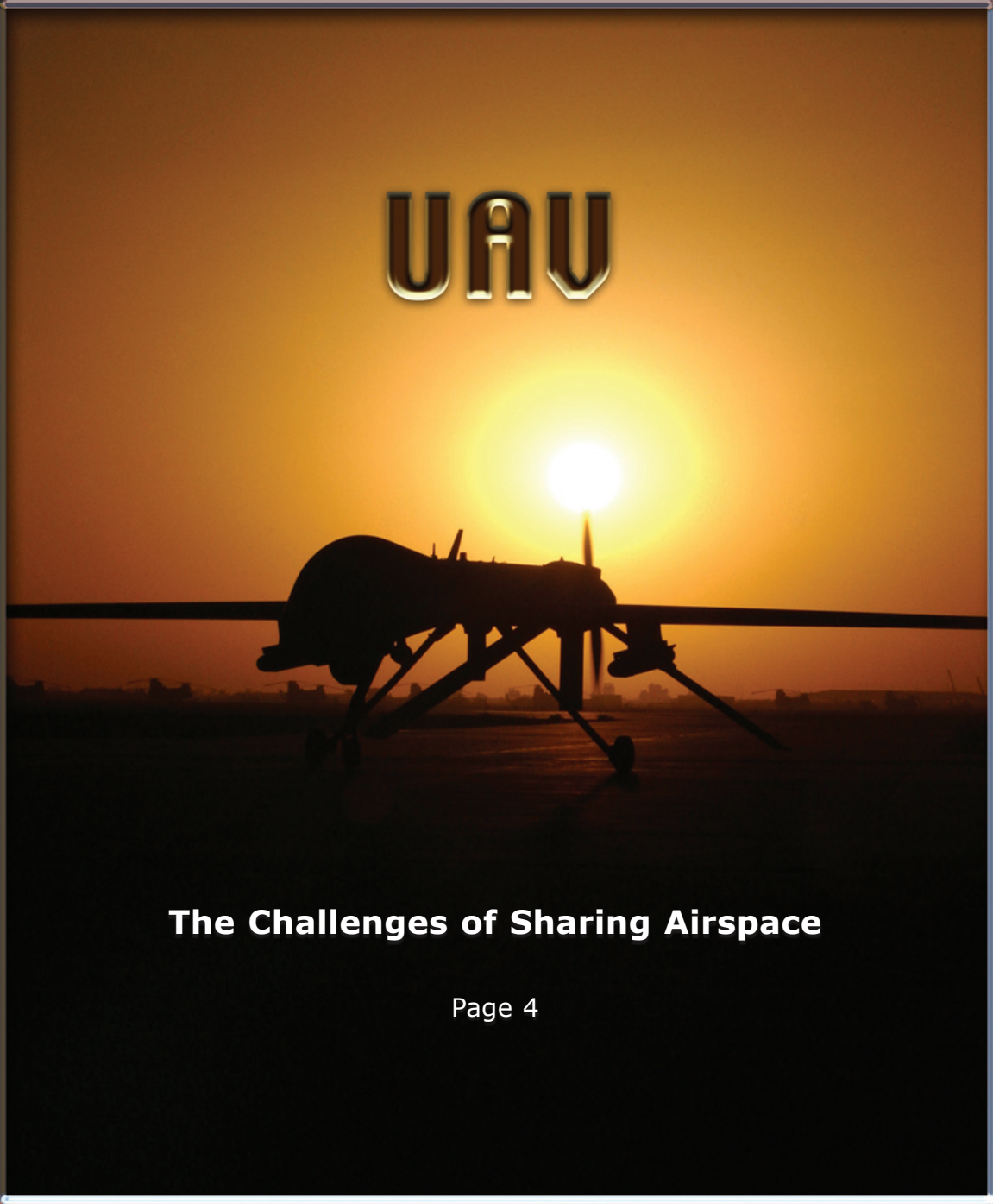
# UAV



## The Challenges of Sharing Airspace

Page 4

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# contents

4 **RQ-4 Global Hawk NAV-BARO Issue**
*UAV Ops: A cause for concern in the NAS*

6 **Using Good CRM — Teamwork**
*Teamwork is sine qua non for good CRM*

8 **The Helpless Feeling of "Settling with Power"**
*Rotor droop?*

11 **Just Another Approach? Maybe Not**
*How did I forget to lower the landing gear?*

14 **Air Force Chief of Safety Visits PACAF**
*Safety is everyone's priority*

15 **The Ejection Decision**
*Minimum ejection altitudes – Not a suggestion*

16 **Poster**
*UAVs*

18 **Too High, Too Fast for Safe Approach: A Scary Lesson to Learn**
*What if the SCNS fails?*

20 **Full-Throttle or Go Home**
*KC-10 crew chooses the latter*

22 **Deceptive Communications**
*When in doubt, verify*

24 **Near Midair in the Middle of Nowhere**
*Fatigue and complacency on long missions*

26 **The Unexpected**
*Should we expect it?*

28 **Student/IP Communication**
*Keep the brief sacred*

30 **Aviation Well Done Award**
*Major James Howell, 357th Fighter Squadron*

31 **Class A Flight Mishap Summary**

Cover:
U. S. Air Force Photo by Technical Sgt. Rob Jensen
Rear Cover:
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U.S. AIR FORCE

SAFETY SAGE

## What You Should Know When Sharing Airspace With UAVs

Predator, Reapers, Global Hawks … the list is growing rapidly. Unmanned aerial vehicles are here to stay, are actively flying in the same airspace as civilian and military aircraft, and have safety challenges unique to their platforms that all flyers need to be aware of. Compared to most of the manned aircraft, UAVs are less mature in development and their sense-and-avoid capabilities are extremely limited. Numerous flight agencies, civilian and military, are continually working to improve the procedures for safe operations in shared airspace.

As a flyer, here's one thing you should be concerned with when operating in the same region of airspace, generally in the AOR, as a UAV: they have an extremely limited field of view. If they do see you, the delay on the signal through the satellite link to the operator in CONUS may make a collision unavoidable. To possibly prevent a before-your-time event of UAV origin, you must educate yourselves. Check the NOTAMs for TFRs generated by UAV ops. In the AOR, check the ACOs and ATOs, and know what airspace is blocked for UAV usage. Listen to the advisories given by controlling aircraft and other agencies on their presence in a given area of ops. Take the time to plot out where they are in relation to your aircraft. And lastly, learn a little about their capabilities.

In this issue you'll find an informative story on UAV safety as we provide you with useful information on UAVs from the viewpoint of systems operators. Take a moment to read it and learn a little about their world. These aircraft are the wave of the future, and all in the flying community need to ensure our Airmen are educated on the operating procedures and limitations of UAVs to prevent having their wind screen filled with an aircraft that isn't going to be turning any time soon.

Fly Safe!

Safety Sage

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# RQ-4 Global Hawk NAV-BARO Issue

***UAV Ops: A cause for concern in the NAS***

**CAPT. DERECK M. O'BRIEN**
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The RQ-4 Global Hawk was Teledyne-Ryan's winning entry to The Defense Advanced Research Projects Agency's High Altitude, Long Endurance Unmanned Aerial Vehicle Tier II+ program. Later acquired by the Northrop-Grumman Corporation, Global Hawk has gained respect as it gradually comes of age and its operators gather experience in operational theaters.

Global Hawk is truly a marvelous system — it flies higher than commercial aircraft and by far exceeds other aircraft (manned or unmanned) in endurance; typical operational sortie duration can be 20-plus hours (test sorties conducted to much longer durations).

Guidance for the aircraft is provided through the GPS system; the aircraft flies a preprogrammed return route through touchdown and rollout. It can even taxi back to parking.

Already considered an essential intelligence, surveillance and reconnaissance asset by combatant commanders, the RQ-4 can image large areas using multi-spectral sensors. With innovative advancements on the horizon, demands to rapidly provide information that ensures battlefield dominance is bound to increase.

Originally conceived as a fully autonomous unmanned aerial vehicle, the Global Hawk has actually proven the necessity to have humans involved in all aspects of aircraft operations. Some of that requirement stems from an understandable safety concern and a nervousness regarding UAVs. Also, Global Hawk is years ahead of its time, or to put it another way, the times are far behind Global Hawk.

Having the ability to function autonomously in a mostly manual environment is risky business, and the lack of understanding regarding the RQ-4's abilities, as well as its limitations, is an impediment to broader integration into the National Airspace System. One example of its shortcomings can be highlighted by recalling the following event. And while it should be noted that all aircraft have growing pains, the RQ-4 has surprisingly few to speak of.

U. S. Air Force Photo by Bobbi Zapka

Several months ago, an RQ-4 was returning to base from a local sortie. Global Hawk is preprogrammed with several routes, some of which are autonomously driven but are accessible to the pilot through the human interface or HCI. By selecting the desired routing, the pilot can fly a specific route to or from the desired point. An override mode also allows the pilot to maneuver the vehicle with a fair degree of precision.

Since the RQ-4 is a UAV, the standard from NORCAL approach/departure has been to issue a temporary flight restriction for the airspace around the base. On this particular day, a civil aircraft busted the TFR while the UAV was on its primary return routing. ATC NORCAL requested the RQ-4 pilot deviate from the assigned UAV approach. As ATC was unable to vector the aircraft violating the TFR away from Global Hawk, ATC directed the RQ-4 pilot to deviate and fly off his return routing. The pilot selected the override function and proceeded to command the required altitude hold and heading commands. Unfortunately, the override attempt occurred inside the programmed initial approach fix, and though the pilot complied with the controller's instructions, the UAV didn't respond and remained at its initial programmed altitude.

The pilot recognized he was off his desired altitude and that repeated commands to the vehicle to climb were unsuccessful. NORCAL filed a report. Eventually, the pilot was exonerated, but the damage was done. Global Hawk was considered unsafe by ATC and an unwelcome visitor in the NAS.

What really happened? Did the pilot do everything right? Why wouldn't the vehicle climb as it was commanded to do? The answer lies buried in the UAV's "Logic"… its programming. When the vehicle looks ahead to its next waypoint, and that waypoint is the initial approach fix, and it's within 5nm of that waypoint, it changes the way in which it receives its altitude information. In other words, the source of its altitude information changes.

Ordinarily, the aircraft operates on barometric altitude, but that information is considered too inaccurate for the vehicle's brain to effect a proper landing. When the next point is the IAF and the aircraft is within 5nm of that point, it switches over to a navigational altitude provided by GPS.

GPS altitude is worldwide; it's built on a standard reference datum plane, much the same as the barometric plane is built by pilots setting 29.92 in their Kollsman window. Unfortunately, the GPS altitude and the barometric altitude can differ by quite a bit — sometimes as much as 2,000 feet.

When the vehicle passed through its programmed IAF, it switched from barometric altitude to navigational altitude. When ATC vectored it off its approach path, the pilot went to override mode but the vehicle's logic was still set to look at the next point, which was still a point inside the IAF … meaning that the aircraft remained on GPS altitude. On that day, the GPS and BARO altitude difference was about 500 feet, hence ATC's compunction for violation.

What's the right answer? What could the pilot have done to preclude this? The pilot could have deviated as ATC asked, but in order for him to reprogram the vehicle's logic to switch to BARO in addition to complying with ATC's desires, would have required 18 individual commands and around two minutes of execution time, provided all the links sending telemetry to the vehicle provided minimal latency. Obviously not as simple a process as you might initially expect.

As Global Hawk continues to mature and other UAV systems become more prevalent, ATC and others involved in air transport will need to become more aware of the inherent limitations and subtleties of operating an unmanned aircraft in proximity to manned aircraft. While more work remains to be done, UAVs are here to stay, and their safe integration into the NAS remains a high priority.

# Using Good CRM — Teamwork

**Anonymous**

For some of us, it seems that every time we get comfortable with our aircraft and the mission, something jumps up and takes us by surprise. It could be something as simple as a maintenance problem we've never seen nor trained for, or as major as finding yourself in unforecasted bad weather. This story starts out with an experienced mobility airlift crew who has done similar missions repeatedly for several years in support of Operation Iraqi Freedom.

It was a typical launch out of Spain after sitting in Bravo alert. The day was considerably long. The mission called for one stop into Iraq and then back to Spain. There was no tanker on the front end or the back. Since the weather was forecasted to be decent at their destination, the crew decided to put on just enough gas as planned to conserve gas supplies downrange. The crew selected an appropriate distant alternate in Spain since it wasn't in the weather system their destination was in.

They safely exited the combat zone on the return flight, and everything was going as planned. They updated their weather with Naval Air Station Sigonella metro, only to discover the new weather report was worse than they were told originally in their IFM package, but was still good enough to shoot an approach. They looked at fuel requirements again and continued toward Spain as planned.

With no major problems, it seemed like it would be a routine arrival back in Spain. The crew updated the weather once again before descending. Weather was reported lower than previously expected, but still above visibility and ceiling requirements for a Cat I ILS, although the controller said that fog was quickly moving in and an adjacent airfield near the destination was already closed due to fog. The crew determined they had enough fuel to shoot the approach, even as a visibility-only approach, but it would be close if they had to go to the alternate, where the weather was still forecasted to be VFR.

The crew completed all checklists and briefings during the descent, intercepted the localizer, and ATC cleared them for the approach.

When the crew switched to tower frequency, they were told the fog had moved in and visibility was dropping rapidly. Since the crew was already established on the approach, they decided to continue. Flaps and gear were set for final configuration, but when they hit the missed approach point, there was no runway in sight, so they executed a go-around, bringing the gear up and the flaps to one-half.

This was the point when their routine day changed for the worse. The pilot flying realized that the plane wasn't performing as expected. He verbalized his concerns to the pilot not flying. The PNF quickly realized the flaps were still in landing configuration, even though the flap handle was at one-half. The crew realized that they were in a place that no crew ever wants to be in. The aircraft commander had to make a monumental decision with a plane low on fuel, in bad weather, and stuck in a configuration that

U. S. Air Force Photo by Airman 1st Class Andrew Oquendo

rapidly depleted fuel. Meanwhile, the young jump-seater (additional pilot on the flight deck), who typically doesn't grasp the situation, called out that he saw the runway lighting during the go-around.

Fuel planning in airlifters calls for enough fuel to shoot an approach, go missed, climb out to 10 thousand feet to an alternate within 250 nautical miles and still have enough fuel to hold for 45 minutes. The problem with this situation was that the planned cruise was for a clean configuration during the climb and cruise to the designated alternate. With the flaps stuck in landing configuration, an enormous amount of drag was created, which severely reduced the fuel efficiency of an already gas-guzzling plane.

The aircraft commander needed to make a quick decision since his options were quickly going out the window due to the amount of fuel being consumed. Would he choose to try and make it to the alternate and hope there was enough gas, or take the plane out over the ocean and prepare to ditch? The last option was to try and shoot a Cat II approach beyond minimums and hope the plane landed on the centerline.

Making it to the alternate looked like a good bet, since the plane was empty and performed better at these weights. Trying to squeeze every last drop out of the plane may not have been enough, since the plane may not have been able to make it over the mountains that stood between them and the alternate. The other problem was that once committed to this option, there would be no turning back, since there weren't any more suitable airports. Crash landing somewhere in the middle just didn't seem like a good idea.

Ditching into the ocean is never a choice for an aircraft commander, unless there are no other options available. The outcome will always be a lost plane. In this case, the advantages were no cargo or passengers, but the chances of crashing into an unpopulated area were good. Too bad the crew didn't have ejection seats or even parachutes available to help give another option.

The last of the logical options was to shoot a precision approach all the way to touchdown and hope it stayed in the runway environment. The advantage of this option was the possibility of moving the mission and saving the plane and crew. The disadvantage was that if the instrumentation was off by just a little, the possibilities of running off the runway and damaging the plane would be as big as destroying the plane and hitting a populated area or parked planes on the apron.

Smartly, the crew decided to try and shoot several approaches down to minimums, hoping to break out or at least burn some of the fog. If this didn't work, the option to ditch was still available. The crew requested to fly an approach to the opposite runway in hopes for better visibility. That decision was also aided by the jump-seat's comment of seeing the runway. Unfortunately, the only approach available was a non-precision approach that ended in a missed approach.

After declaring an emergency, the crew set the plane on a coupled approach. After descending through the Cat II minimums and still not breaking out, the crew continued on since the ILS and glide slope were centered. The crew finally saw the runway centerlines at around 15 feet on the radar altimeter. Then the crew noticed that the plane was drifting and took over manually to finish the landing. They stopped the plane on the runway with only the runway centerline lighting in sight, and waited 30 minutes for the follow-me truck to find them on the runway.

Luckily, the incident turned out well. The plane and crew survived, and a stage crew continued to move the mission once the weather improved. As a side note, running the same scenario in the simulator showed that the crew would have run out of gas halfway to the alternate.

Although a crew can plan and do everything right, there's always the chance of something that pops up and puts a crew in a dangerous situation. During an emergency, it's always crucial for an aircraft commander to make tough decisions, sometimes with incomplete information. Working together as a team and using good CRM are always key to a successful outcome.

# The Helpless Feeling of

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It was an uneventful August afternoon. I was sitting at the flight operations desk performing post-flight duties. The squadron that I was assigned to flies the UH-1N Huey helicopter, an old helicopter from the Vietnam era that makes the famous "Whoop, Whoop" sound. Though it may not be the fanciest aircraft in the Air Force's inventory or have the latest avionics technology, it's a dependable helicopter that reliably brings crews home safely. Having been on station for 10 months as a co-pilot, I hadn't yet flown on any search-and-rescue missions.

The telephone rang; it was the Air Force Rescue Coordination Center calling to request our unit's support on a SAR. The scenario: one injured male hiker with a broken ankle who had been in a wilderness for two days. Along with GPS coordinates, the AFRCC provided a frequency to establish communication with the rescue ground party. The tasking was to extract the injured hiker and fly to the nearest hospital for medical assistance. Due to the broken trails and high rugged terrain, ground crew members were having difficulty extracting the injured hiker on pack mules.

As available crew members began mission planning, the weather shop forecasted rain showers en route to the extraction area. Due to limited manning, the commander decided which crew was going, and I was going to be co-pilot on the flight. Our crew experience level: 1,100-hour AC, 600-hour co-pilot, 1700-hour FE, and a 50-hour flight surgeon.

Mission planning was transferred to us and the AC immediately started delegating duties. Time was critical. The crew didn't want to increase the risk of the mission by running out of daylight. Crew members began performing their tasks, and it was clearly evident that because of the high elevation near the extraction area, this wasn't going to be like an everyday training sortie. The injured hiker was located in an area not far from the highest mountain peak in the state (12,800 feet MSL).

Like an airplane's wing, a helicopter's rotor blade is the surface that provides lift. The surface area of a rotor blade is significantly smaller than that of an airplane's wing. The decrease in surface area, along with a tail rotor, which consumes some engine torque used for yaw control, combine to make tail rotor-driven helicopters difficult to operate in high density altitude environments. Through operational risk management principles, the crew analyzed the mission and pinpointed the most probable area of

# "Settling with Power"

U.S. Air Force Photo by Master Sgt. Lance Cheung

high risk exposure. The extraction would be the riskiest portion of the sortie. In order to control the risk while maximizing capabilities and performance, the crew had to ensure enough engine power would be available, along with an adequate gross weight to land and depart from the landing zone.

Takeoff and landing data indicated we'd have a narrow power margin while operating in the remote landing area. One hundred percent power from our Pratt & Whitney engines wasn't going to be available on this sortie near the landing zone. Also, our flight plan indicated that only 15 minutes of loiter time would be available to find the survivor, land, and then depart before reaching BINGO fuel for the last leg to the hospital. Timing and fuel were our main concerns. After completing the predeparture briefing, flight gear was checked out and the flight surgeon arrived. It was now time to go.

Upon departure, we were one hour from the LZ. The crew focused mainly on avoiding the rain shafts spread throughout the mountain ranges and navigating with limited visibility — less than two miles in some areas, due to seasonal forest fires. The FE and flight surgeon checked and rechecked their hoist equipment while the AC and I reviewed maps for possible landing areas. We felt we had a great game plan; it was now just a matter of execution.

Five minutes out and the helicopter was flying along mountain peaks over the wilderness area. The jagged terrain, along with gusty winds, created orographic turbulence that violently threw the aircraft around. It was like a roller-coaster ride.

We initiated a power check and found the No. 2 engine was the limiting factor, allowing only 91 percent for dual-engine torque. That meant if we used more than 91 percent dual-engine torque, the main rotor would droop, resulting in a loss of lift.

We arrived at the GPS coordinates given to us by AFRCC, but didn't find any sign of the survivor. Feeling the "pinch," we initiated a search. The terrain, coupled with dense vegetation, made it difficult to sight any members of the ground rescue party. The AC was finally able to establish communication with the ground members. After searching through several valleys, the FE spotted a bright red coat from one of the ground crew. We immediately prepared for extraction with only 10 minutes to bingo.

Initially, the ground party requested the survivor be extracted via the hoist, but it wasn't an option, due to our limited power and fuel status. We asked

them to move the survivor several hundred yards down the mountain to a small marshy area that provided a good approach and departure path for the helicopter. The AC briefed the remote landing to confirm any major obstacles within the LZ; none were noted.

We were now on final into an LZ at 9,000 feet MSL. The FE and I made mandatory parameter calls while clearing the aircraft into the LZ: "200 feet above landing site, airspeed 30 knots, sink 400 feet per minute, torque 45 percent, clear down right, left." The AC nailed all the approach parameters, and the Huey was skids down with seven minutes until BINGO fuel.

To help the rescue ground party move the survivor, the FE recommended repositioning the aircraft another 100 feet forward in the front one-third area of the LZ. As the AC hovered the helicopter 15 feet above the ground, the crew collectively agreed to avoid small bushes that were spread throughout the marshy area. The helicopter was repositioned in a corner with 50-foot trees off the nose and right side of the aircraft. After a deep breath and sigh of relief, my initial thought was, "This is a piece of cake." Now the only thing to worry about was BINGO fuel and getting to the hospital.

The FE and flight surgeon returned with survivor in the stokes basket, and we prepared for departure. The AC added torque, and the helicopter lifted off the ground. After adding the survivor onboard, an additional 220 lbs, the AC wanted to reconfirm if current gross weight would allow the helicopter to clear the trees on the departure path. With a light headwind off the nose and only 85 percent torque applied, the helicopter unexpectedly sprang up to 30 feet above the ground. The performance was so good, it actually caused confusion. The FE recommended taking off from present position, but the AC conservatively wanted to back-taxi in order to get a run at the takeoff, ensuring obstacle clearance. The AC cleared for the aircraft to make a 180-degree turn and began back-taxiing, when the helicopter suddenly buffeted and started moving uncontrollably. Sinking uncontrollably to the ground, the AC instinctively started adding power to arrest the descent. To ensure the pilot flying doesn't overtorque the engines, crews train for the pilot not flying to guard the collective any time such a situation is imminent. With my left hand over the collective, I called out, "Torque 88, torque 90, torque 91, stop pull, stop pull!"

Having never been in this situation before and seeing the ground begin to rush up, I was at a loss for words. I had the desire, but not the ability to make any more significant inputs to the crew to help maintain situational awareness. It grew uncomfortably quiet over the intercom as we were descending towards uneven ground — 20 feet, 15 feet, 10 feet, and then the FE blurted out, "Fly it to the ground, fly it to the ground." The helicopter touched left skid first, which caused it to rock to the right and wobble for a moment or two, but it was still hovering! As we gathered our wits and shifted around in our pants, we said, "Let's try this again and get out of here." The AC pulled power, and off we went, clearing obstacles, but encountering turbulence just above the treetops, causing another moment of worry. Soon, however, we were gaining airspeed and altitude and were well on our way.

Flying direct to the hospital, we were below BINGO fuel, and a tailwind that turned crosswind didn't help matters. The flight surgeon treated the dehydrated survivor, while the FE closely monitored a combining gearbox oil temperature that was at its maximum operational limit. The hospital drop-off would not be an option due to our fuel status, so the closest FBO was Plan B.

Other than reported wind shear at the airport with winds gusting to 40 mph, the remainder of the flight went as planned. Tower controllers coordinated for medical assistance, and EMTs were waiting for us on the tarmac. The flight was finally complete, and the crew had successfully completed the assigned mission.

My first SAR as a co-pilot was a tremendous learning experience. The uncontrolled descent that occurred in the LZ was due to a rotary wing phenomenon known as "settling with power." The AC's initial hover pickup with the survivor onboard was accomplished with a light headwind. After initiating the back-taxi, the helicopter was repositioned to have a direct tailwind. The tailwind simply made the rotor disk produce less lift. The rate of descent, coupled with the high DA, put the helicopter in a position where maximum power from our engines couldn't arrest the sink towards the ground. As a crew, we allowed ourselves to get into that situation by growing complacent. Until that event, every facet of the mission had gone according to plan. Most importantly, I saw firsthand how aircrews must use CRM to successfully complete a mission when exposed to high risk. As the co-pilot, I was able to make inputs to the crew to help prevent overtorquing the engines. After that, I was simply along for the ride. The experienced FE quickly realized the dire circumstances, and was able to pick up the co-pilot calls and continue to provide meaningful inputs for the crew. The AC obviously showed tremendous airmanship and a willingness to not quit by flying the helicopter throughout the impact with the uneven terrain. In the end, teamwork got the crew through the "settling-with-power" situation and onto the FBO — a great display of effective communication and group effort, resulting in success.

# Just Another Approach? Maybe Not

**ANONYMOUS**

U.S. Air Force Photo by Technical Sgt. Keith Brown

"There I was" a couple years ago deployed overseas flying as an instructor pilot in the C-17 on a typical night airlift mission to a downrange airfield. The only other pilot onboard was in upgrade training to become an aircraft commander. We also had two loadmasters onboard. Things were going well and the weather was clear VMC. The visual approach was briefed, and we got our clearance into the airfield. The AC in training flew a standard tactical approach, nothing crazy or overly aggressive. It was just another approach, or so I thought.

When we were handed off to tower, after several attempts, the Army controller told us that helicopter traffic was approaching the airfield along the extended centerline of our landing runway. That got my attention because I've heard stories of aircraft getting too close to each other in the AOR. We were approaching a high-steep downwind at this point, visual with the airfield, but searching for the traffic. There was talk of our aircraft lighting as well, and we ensured it was set correctly. Finally, we visually identified the traffic, and the tower cleared us to land as number one. We kept it tight on the base turn, not wanting to hold up the helicopters.

At about 900 feet AGL, we got our first Terrain Awareness and Warning System alert, "TERRAIN, AHEAD," which annunciated twice. This got my attention, but I wasn't alarmed since both of us had the runway in sight. We called visual and continued. At about 700 feet AGL, we received a TAWS warning, "TERRAIN, TERRAIN." This time it kept repeating "TERRAIN, TERRAIN," so in order to "shut her up," I automatically turned off the TAWS warnings/alerts on my mission computer display. The warnings stopped, we again reiterated we were visual and continued the approach. Both of us commented how strange it was to have these TAWS alerts.

It wasn't more than a few seconds later that the acting AC in the left seat, who was flying the approach, looked across the cockpit and urgently called "Gear down!" I looked down at the instrument panel, and to my amazement, all the gear was still in the up position! Here we were on less than a two-mile final to land, and we still hadn't lowered the landing gear.

My heart raced as I quickly lowered the gear handle and armed the spoilers. I immediately considered calling go-around, but made a quick decision

that we still had time. I checked and double-checked that our gear was down, spoilers were armed, and we had full flaps selected. I checked that our landing lights were on, confirmed we had clearance to land and that our defensive system was set. Then I called "300 feet stable." It all happened very quickly.

As we rolled out on the runway, I was still in disbelief at what had just happened. How could I have forgotten to lower the landing gear? How could I have forgotten about the entire Before Landing Checklist?

Forgetting to lower the gear was only part of the chain of events. A few of the contributing factors were: only two pilots up front, darkness, fatigue, a distraction on downwind, a missed checklist, a complacent IP, poor systems knowledge, poor habit patterns, poor CRM and an AC in training. Luckily we broke the chain of events and prevented a mishap, but it shouldn't have gone that far. Here are some takeaways.

**Experience**

Experience can be a hindrance. Don't get me wrong; normally experience is of great benefit, but in some cases, watch out. When you reach a certain comfort level in your aircraft, you may think you've seen it all or have an attitude of "That wouldn't happen to me." That's why experienced crews can sometimes be the most dangerous. Never in my career have I forgotten to lower the gear, nor did I think I ever would. Lesson learned: it can happen to anyone.

I had flown the C-17 for a long time before we ever had TAWS installed. When it was installed, there were numerous false warnings. This was old baggage that most likely affected my decision making on this approach. It turns out the TAWS was trying to tell us something, but I was immediately convinced it was giving us false information. Lesson learned: a TAWS alert is not normal on just about any approach today! The only time TAWS will give you bad information is if you're flying to a custom-built airfield (i.e., not in your database). Had we not caught our own error, the Ground Proximity Warning System would have annunciated "TOO LOW, GEAR" at 250 feet AGL. I'm hopeful that would've broken the chain of events before a gear-up landing.

**TAWS Refresher**

TAWS provides situational awareness and gen-

U. S. Air Force Photo by Technical Sgt. Robert Jensen

erates primary flight display annunciations and central aural warning system alerts for impending controlled flights into terrain. TAWS has three operating modes: normal mode, tactical mode and runway mode. Used properly, it's a great system, especially for low-levels, when we use the tactical mode. Not understanding the system, however, can set you up for a mishap.

There are two TAWS alerts: cautions and warnings. Caution alerts can call out obstacles and terrain ahead. The terrain ahead alert means an evasive action is required within 5-30 seconds to avoid penetrating the Minimum Clearance Height. The warning alert indicates an evasive action is required immediately to avoid penetrating the MCH. The MCH is set at 700 feet AGL for the normal mode, adjustable in the tactical mode and variably predetermined in the runway mode.

The runway mode is automatically entered during the approach to an airfield in your database. TAWS cautions are inhibited when in the runway mode. TAWS warnings are always available in any mode, but the threshold to trigger them changes. In the runway mode, crews normally never get a TAWS warning.

To enter the runway mode, the aircraft must be within 15nm of the database runway, flaps ½ or more, and either Takeoff/Go Around mode engaged or gear down. Since we didn't have our gear down, we were still in the normal mode. This explains why we got two separate TAWS alerts as we approached the 700 feet AGL MCH. The TAWS worked perfectly.

We should have followed our AFI 11-2C-17V3 guidance, which is to fly an escape maneuver (essentially a go-around) any time an aural GPWS or TAWS alert is received at night or IMC. But we knew we were well above the ground and visual with the runway, so automatically we suspected a false warning. It just didn't make any sense, so we continued the approach. If we had additional eyes up front, maybe things would have been different, which leads me to my next point.

**CRM / Crew Complement**

Normally, a C-17 crew is augmented (three pilots and two LMs); however, many squadrons now employ a combat basic crew that eliminates one pilot or LM (usually the pilot). This has helped with filling more missions, but I think most pilots of crew aircraft would agree that having that third pilot onboard is usually a good thing, especially with upgrade training going on.

Whether or not you have a third pilot, use all your crew members. Get the LM up front to help back up the pilots. Brief them on what to look for and listen to, and how they can help you. It's amazing how much more an extra person sitting behind you can see. Some folks call it the "smart seat" and it's just that. That person could be the one to break a chain of events before a mishap occurs.

LMs can also back up the pilots from the cargo compartment by paying attention and speaking up. They can back up the pilots on basic things, like completing all checklists, receiving landing clearance from tower, and ensuring the gear is down before the pilots configure past half flaps. If the LM hears several TAWS warnings that are basically being ignored, the LM should speak up. A simple "Is that normal?" or "Shouldn't we go around?" could make a huge difference to the pilots' perspective up front. Call "timeout" if you need to. Pilots need to encourage this interaction, and LMs must pay attention and not be afraid to ask frank questions.

Maintain situational awareness and avoid distractions. When something doesn't sound, look or feel right, then it probably isn't. Stop what you're doing, verbalize your concern and take a look around at the big-picture things. Both pilots knew it was strange to have the TAWS alerts, and ultimately, it made one of us look around and realize what was wrong. But we should've caught it right after the first TAWS alert. We also shouldn't have let the helicopter traffic distract us. We were completely caught up in looking for the traffic, which interrupted our normal habit patterns.

**Habit Patterns**

Create good habit patterns and stick to them. For instance, when configuring with slats and half flaps, you might as well lower the gear as well and run the Before Landing Checklist. You may think you'll remember later, but humans can easily be distracted and forget. Studies show that nearly 80 percent of all aircraft accidents are due in large part to human error. Good habit patterns can prevent errors.

Guard against complacency. How many times have you thought, "Here we go, just another approach." Challenge yourself to stay clear and focused on the task at hand. Don't take anything for granted. Set milestones on each arrival. Have a specific point during your approach and arrival when things will be done, e.g. approach check completed by 10,000 feet or 30nm, before landing check done by 10nm, etc.

**Conclusion**

One thing to take from this story is that you never know when a chain of events will sneak up on you and catch you by surprise. It can happen to even the most experienced pilot. Ask anyone who has ever been involved in a mishap, and I'm sure they will probably tell you the same thing. Mishaps are not planned events; they happen unexpectedly. Bottom line: always be prepared to fly, don't think you're smarter than your systems, and follow your regulations.

**Back row, left to right:** Maj. Gen. Wendell L. Griffin, Staff Sgt. Christine Holbrook, Staff Sgt. Katharine Hallows. **Front row, left to right:** Technical Sgt. Eduardo Osorio, Airman 1st Class David Hibson. U.S. Air Force Photo

## Air Force Chief of Safety Visits PACAF

**MAJ. SEBASTIAN J. CARRADO**
Air Force Safety Office, Pentagon

"Safety should be everyone's priority" was the central theme of the recent visit to the Pacific Air Force theater by Major General Wendell L. Griffin, the Air Force Chief of Safety and Commander, Air Force Safety Center.

General Griffin has made it a point, since becoming the Air Force's most senior ranking safety officer in June 2007, to spend time with each MAJCOM and their respective safety offices, to not only get a first-hand look at some of the critical safety issues and concerns facing the MAJCOMs and wings, but to talk about what's on his scope in the way of safety priorities.

This past February, accompanied by Colonel John Kreger, the PACAF Chief of Safety, the general set out to visit PACAF and spread the safety message. The Air Force Chief of Safety engaged in an extensive visit to pitch his three primary points covering five Air Force installations — Hickam AFB, Yokota AB, Misawa AB, Kadena AB and Andersen AFB. Speaking to an audience of operators and maintainers at the first-ever 35th Maintenance Group Quarterly Safety Meeting at Misawa AB, Japan, Maj. Gen. Griffin ticked off the three largest items on his scope: "Leadership, Operational Risk Management/Maintenance Resource Management, and the Wingman philosophy are my three big points." These points have been at the center of an aggressive campaign by the Chief of Safety to take the safety message to the field. "It's all about leadership …" Gen. Griffin began with his first point, "… It's all about commander involvement." He stressed how critical it was for commanders to be engaged and to also put safety on their scopes. "If leadership makes it a priority and gives it attention, the force will take notice, and it will get better," he said.

He also highlighted the importance of reinvigorating ORM/MRM as part of his back-to-basics on safety approach. These programs focus their respective functional communities on assessing and minimizing risks inherent in the nature of doing their jobs. ORM/MRM should be applied where guidance is not available or doesn't cover all aspects of a particular situation — which includes a great deal of what the Air Force is doing today. Even where technical order guidance provides pretty exact instructions, human factors, the environment, and other issues must be evaluated. That's where ORM/MRM comes into play. ORM/MRM is intended to help identify and minimize unnecessary risk. In ops and mx, people get into trouble when they cut corners and don't follow procedures. If your conscience is questioning what you're doing or how you're doing it, step back and re-assess. As Maj. Gen. Griffin pointed out to the group, "… If you hear someone talk about a "work around" or "shortcut," that should make the hair on the back of your neck stand up."

The Chief of Safety then transitioned into his third point, the Wingman Culture. He applauded the Wingman concept saying, "In 32 years of service, I've seen programs come and go, and this is a great program. It's all about Airmen taking care of Airmen … everyone should be a wingman, and everyone should have a wingman. I have a wingman; you should have a wingman." He emphasized that the Air Force is building a culture that says when someone sees something wrong, they will identify it, report it and attempt to fix it 24/7.

Other areas the general touched on included Human Factors being at the heart of a lot of mishaps on and off duty. Whether it is maintenance, flying, or driving a car/motorcycle, the concepts and problems remain the same. He also focused on reaching out in the right way to ensure our high risk group (18-26 year-olds), whom he referred to as "The Indestructibles," are getting the right message in the medium they work and play in. "Saving lives and protecting resources — no matter what we do, that is the bottom line for a safety program, and it's how I will judge myself after this command," the general noted. "We need to get our eye back on the target. We need an increased focus on the safety analysis of near misses, almost accidents, almost mishaps. We need to analyze the leading indicators of where the next accident or next mishap is going to be and prevent it from happening. The key is to create a safer environment on and off duty."

Maj. Gen. Griffin also took the opportunity to observe and fly aboard an AWACS mission with the 961st AACS while visiting Kadena AB, Japan (see above photo). He saw firsthand some of the safety issues that face these dedicated Airmen every day. ★★

# The Ejection Decision

U.S. Air Force Photo

**MAJ. BRIAN "RODENT" MOLES**
Air Force Safety Center
Kirtland AFB, N.M.

You're at the floor, out of ideas, and decide to give your adversary one more pathetic problem to solve as he saddles up. You can hear the derogatory bar talk now. As you yank on the pole with your Hormel hands and kick the pedals with your big floppy clown shoes, the jet decides you're not a competent aviator and wants to relieve you of any control other than your school-girl shrieks over the radio. You've been to college and know your mighty impressive 2.2 GPA with a history degree from a Big Ten school should help you solve this little dilemma in plenty of time before the houses and trees below become actual size. You vaguely hear your wingman (through the laughter at your buffoonery) calling out altitudes. You remember something about controlled/uncontrolled altitudes. The little devil pops up on one shoulder saying, "You've got it," while the little angel on the other shoulder says, "Are you kidding me?" As you're getting lower, you notice those houses need new siding and those trees could sure be pruned. You muster up a manly "I'm getting out" call and punch out, still not sure if you were regaining control of the temperamental beast. Everything works as planned, although that fireball sure is a heck of a lot closer than you expected. After a quick helicopter ride back to the base and a couple of flight doc's fingers that make you say "Moon … River!," you make it back to the bar for a couple shots of Weed. So, Grasshopper … how'd you do overall? Still wondering how you let Nintendo-boy gun your brains out? Wondering whether they'll give you the seat to make a groovy chair for upside-down margaritas? How about that ejection decision?

While the above scenario is fictional (OK, except for the ejection part, it was about half of my BFM setups), is it really that unusual? How many times do we delay our ejection decisions while giving it the old college try? I'm guessing there are a number of cases where we did save the day that just weren't reported. You brought the jet back, isn't that a good thing? You bet. I'm all about preserving combat capability. The problem is what part of combat capability are we trying to preserve? The jet we can replace. What about you? Well, I guess we can replace you too, but replacing a high-time flight lead/SEFE with a snot-nosed Snap isn't a good one-for-one swap in my book (your squadron may disagree). Your family sure can't replace you either (your family may disagree). Thankfully, we don't have to make the ejection decision very often, but when and if you do, are you prepared to make the right call at the moment of truth?

Here's the deal. If you look at all the ejections we had in FY07, over half were initiated below their aircraft/seat prescribed altitude minimums. "So what?" you say, everybody that did is still walking around today. The seat works, doesn't it? You bet. Great seat, I have no issues with that. I'm not pointing fingers, either. I wasn't there and might have done the exact same thing. I'm also not going to argue whether those altitudes are too conservative. The smart folks that came up with those numbers didn't just pull them out of the sky; they're designed to give you a great chance for survival (altitude above you with a parachute malfunction ain't doing you much good). Do we routinely operate near/below those altitudes? Yep. Nature of the beast. The eye-popping history is that over the years, over a third of those killed during ejections had their initial emergencies at altitudes adequate for successful ejections. You may like those odds at a $5 Vegas table, but with your life? You may not know what's wrong with your jet at the moment of truth. It could be your Spam hands. It could be a no-kidding jet problem that ain't gonna get better. Or it could even be global warming. The point is, how long are you gonna stay with it trying to figure it out?

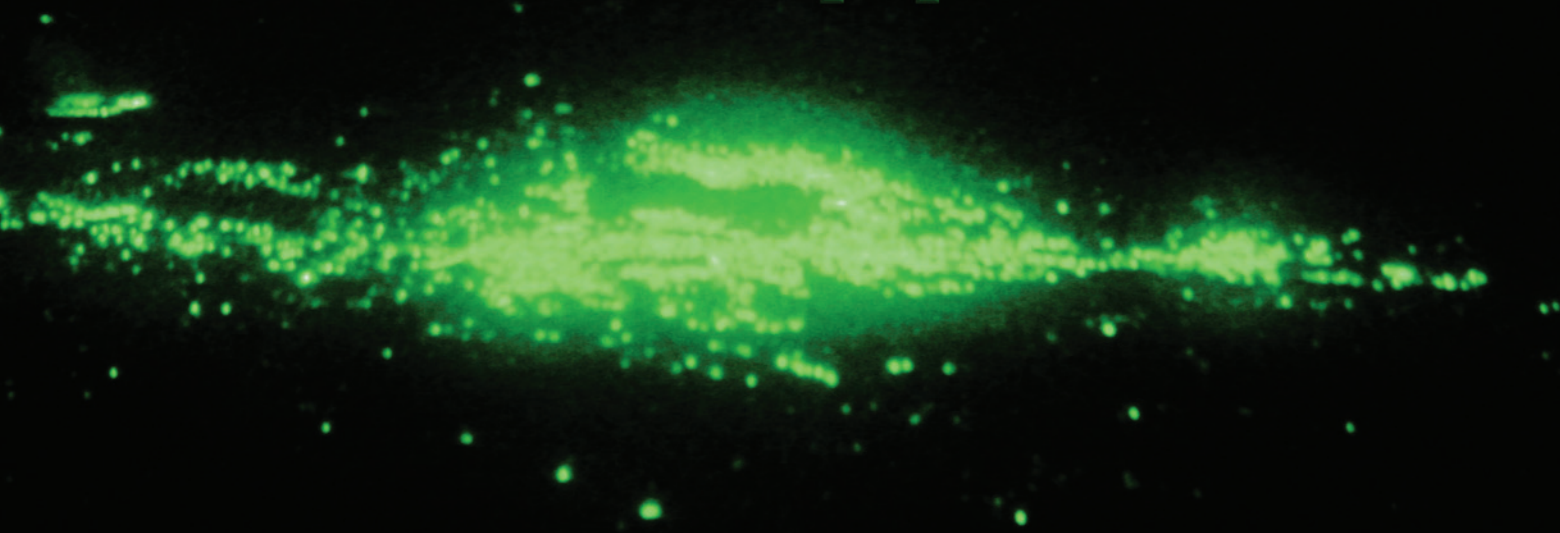
I guess the bigger question is what's really expected of you? Is it giving it the old college try or is it giving the jet back to the taxpayers? In my book, the Air Force has answered this by publishing minimum altitudes for the jet you're flying, the seat you're sitting in, and the conditions at the time. Why do we give more credence to minimums in instruments than ejection decisions? We hammer folks on check rides for missing altitudes by a 100 feet, but don't give a second thought to somebody punching out at a couple hundred feet controlled, as long as they made it out OK. What are we really learning from that? Listen, I know every situation is not so clear cut. It's easy to sit in the cheap seats and question why folks do what they do. Monday morning quarterbacks never won the ballgame. They can, however, help you game plan for the next one. I'm truly glad that ejection seats are as good as they are and that we trust them if we need them. All I'm asking is that you think about your decision ahead of time. Come up with a game plan for yourself and your crew. I would rather this article adjust your comfort level than a fatality due to a late decision from one of your bro's. Delaying your ejection decision may save the day … but then again, it may not. Are you willing to bet your life on it?

DANGER PROPELLER

# UAVs are here to stay
# Learn their capabilities
# Check NOTAMs/TFRs

U.S. Air Force Photo by Staff Sgt. Reynaldo Ramon

# Too High, Too Fast for Safe Approach:



# A Scary Lesson to Learn

**ANONYMOUS**

U. S. Air Force Photo

It started at the beginning of the war in Iraq. I moved to a different C–130 crew after my aircraft commander headed back to CONUS. Although I had a good time with my first crew, I was excited about the new one. Looking back, I feel like we gelled well, which really helped when we started our first missions into Tallil with 82nd Airborne guys in the back.

With only a few exceptions, it was going without a hitch. That changed, though, when we lost our normal navigator. It's not that the new nav was a problem, it's that we had our mojo going strong, and it was interrupted. This wasn't the best time, either, as missions into Baghdad were now starting. Another challenge was the military runway was closed and aircraft were landing on the parallel taxiway.

We've trained to do landings with NVGs with minimum lighting. No big deal, right? Well, there were some not so pleasing intelligence reports of what might be waiting for us upon our arrival. To further complicate the formula, we were going into an airfield that didn't have any usable navigation aids. Again, we've trained for this, so no problem. But we do have a new nav that we haven't flown with much.

Our preflight planning covered everything, as far as we knew. However, it's not the airplane you see that ruins your day, it's the one you don't. Our ingress and egress routes looked good. Here was the taxiway we were to land on, the dimensions and taxi plan. Weather was looking good for the night, and intel, well, the usual bright, sunny outlook they always brief. No show-stopping NOTAMs, secrets in hand and our flight plan was good. OK, we're good to go.

We departed Camp Snoopy and headed to Kuwait International for our cargo upload, then started north for the border, and our latest adventure.

"Crew, pilot, here's the plan. …" "Everybody understand?" As we cruised on, we prepared for our arrival. We turned off the feeder route and began our approach into Baghdad International. Here was where things started to go downhill. When we reached the turn point, our navigation system cycled to the right. That started distracting our attention, but luckily, the nav was still navigating and soon called out, "Pilot, runway 11 o'clock." Then another call: "Pilot, runway 10 o'clock." We're not in the clear yet. "Pilot, runway is 9 o'clock." That was indeed correct, and the aircraft dipped hard to get us around. Uh, oh … we haven't started the descent, and the field was coming up quickly. The pilot pulled the power back, "Flaps 50 percent on speed." I started tracking the flaps, waiting for our speed to decrease. Then, I noticed the power wasn't at idle. I worked the flaps and reasoned he must be trying to avoid NTS, where the prop drives the engine, versus the engine driving the prop. The situation would also prevent us from slowing down as quickly as possible. "Flaps are 50."

Things get a bit fuzzy here, but I think the idea was clear. We're getting behind quick, and options are getting thin. The pilot started descending and called for the landing gear, but we weren't slowing down as fast as I would've liked. After what seemed like an eternity, the speed was good and the handle came down. I gave the NVG airland singsong with vertical and indicated airspeed, "12 down, 10 fast."

I drove the challenge and response of the checklist, and we closed it out. Back to the singsong and another check of the gear and flaps. "Flaps to 100 percent." "Tracking, on speed." Man, we were getting close! Slow down, so I can get these things going.

We then came up on short final, the flaps FINALLY at 100 percent, configuration was good, and we had clearance to land. "11 down, 12 hot." Where were the navigator's distance and glide slope calls? Here's the threshold, we're almost down, but still have a high descent rate. The last I remember, we had about 1000 feet down on the vertical speed and plus 10 knots. We were about to touch down, and someone yelled, "PULL UP!" I'm not sure how it happened, but the pilot scored a touchdown any pilot would be jealous of. Was it luck or pilot skill? I don't know, but I'm thankful for the outcome.

As we taxied clear to the download area, the only talk was the combat off-load checklist being executed. As we sat there and the loadmasters took care of the download, we remained quiet on the flight deck. What just happened? Not much time to discuss; it was time to get out of here and head home. We took off to the south as planned and returned safely back to base.

We didn't say anything about what happened until the next day. One of the loadmasters said he remembered seeing the ground come up fast, and suddenly we were on the ground. He was shaking so much he could hardly complete the download. Later, someone asked me to talk with the pilot to have a crew get-together, talk through what had happened, and find ways to prevent it from happening again. Maybe there were lessons for our buddies who are flying the same missions. At first, there was resistance, then agreement. Sadly, the aircraft commander never did sit us down to hash it out, but nobody else took it upon themselves to do it, either. Nothing like this happened again, but it has never left me.

I feel there are several points we can learn and pass on to others. First, we need to look at the root of what put us into situations like this in the first place. We can say we hadn't completely gelled with the new guy. But I think it was something much more fundamental than that: preflight planning. We thought we looked at everything and had a solid plan. Looking back, I feel there is a simple key that would've allowed us to avoid the situation. I don't remember really planning out our descent profile. Sure, we lost our self-contained navigation system, but having a good plan would have at least given us a starting point. I remember being so high when we turned final that someone even called out that we should do a 360º to lose altitude. Not optimum in a combat zone. But at that altitude, were we a bigger danger to ourselves than the enemy? What was the solution? Yes, the nav computes an airborne radar approach for NVG operations. But, what happens if the Self-Contained Navigation System fails such as on our flight?

There are three people who can calculate glide slope: the FE with 1-1 charts and the two pilots with TAB data. TAB data is readily available and very accurate with proper wind and speed corrections. This provides a backup to the SCNS, but also puts four people in on a critical phase of flight. This may also have helped us out going into Baghdad. Another basic that may have helped out was the nav could've given up trying to reprogram the SCNS for the approach and went to the radar for distance information.

Second, I feel that aircraft commanders and aircrew need to recognize their roles. Aircraft commanders must understand they have the ultimate responsibility for what happens in the aircraft. They must also understand they set the example; they get the crew to work together; they take inputs from the crew and accomplish a safe mission. Some may fail at this because they may think they're giving up authority or control, or that it may cause embarrassment. How embarrassing would it be to damage an aircraft or, worse yet, injure someone in your charge?

As aircrew members, we also have the responsibility to pass on experiences, so others may learn from our mistakes. At most, we may have passed on thinking points for others, but at least we would've cleared up what happened in our own minds.

# Full-Throttle or Go Home

**CAPT. BRUCE HOLMGREN**
32nd Air Refueling Squadron
McGuire AFB, New Jersey

We were cleared for takeoff from Al Dhafra Air Base, United Arab Emirates, on what should have been another routine day. The temperature was the same as it was every day — blistering hot. The aircraft weight was the same as it had been throughout the whole deployment — max allowable. As we finished our safety checks and set takeoff power, our KC-10 accelerated down the runway. As we gained altitude, raised the gear, switched radio frequencies, and started our first turn, the pilot flying called for climb power on the thrust rating computer, and the engines responded accordingly — or so we thought. As the auto throttles back out of takeoff power into climb power, you can normally anticipate an audible difference in the three engines as they slow ever so slightly; however, today was different. The small reduction in power became a large reduction as the thrust rating computer commanded the auto throttles to retard to the idle position. Our aircraft, full of jet fuel and at less than 2,000 feet above the ground, started to sink.

What came next was the result of excellent teamwork and hours of training. A quick scan showed that No. 1 and 3 (the wing engines) were approaching idle, while No. 2 was still producing max thrust. The pilot flying disengaged the auto throttles and returned the wing engine throttles to the approximate climb power position. With the No. 1 and 3 engines spooling up, an attempt to reduce No. 2 from takeoff to climb power identified our overall problem — it was binding. Our efforts resulted in reducing No. 2 RPM, but only enough to get it into the acceptable limits, not a percent more. There was no moving the throttle — it was full-throttle or go home with an engine shutdown. We opted for the latter.

At that point, our engine problem wasn't so bad. They were, after all, still producing thrust.

The three keys to any aircraft emergency, in order

Pilot: Capt. Bruce Holmgren
Pilot: Capt. Robert Bittner
Boom Operator: Airman 1st Class Benjamin Strader
Flight Engineer: Technical Sgt. Brian Fahey

U. S. Air Force Photos

of importance, are to aviate, navigate and communicate. Thanks to our teamwork and training, we had taken care of the first step automatically, almost without thinking about it. We now had the aircraft under control and were safely climbing away from the ground. Now it was time to figure out where we were going and talk to the Emirate air traffic controller. We proceeded to the designated fuel dump area where we "adjusted our gross weight" in order to return for a landing. Twenty minutes later, we were light enough to land and ready to initiate the checklist that would lead us to an engine shutdown in flight. Again, teamwork from all four crew members resulted in a successful fuel dump and engine shutdown. Following what seemed like endless coordination (on four different radios, simultaneously), we were ready for our final approach. We had experienced enough fun and excitement for one day, but as luck would have it, we weren't done yet.

Every pilot knows that your sortie isn't over until your engines are shut down and the chocks are in place. Today, Murphy and his silly law took yet another opportunity to drive that point home. As the pilot flying touched down, he began to lower the nose to the runway and reached for the thrust reversers — a well-engrained habit pattern in the KC-10 community. What we didn't count on was that the No. 2 engine throttle would be inconveniently in the way of the No. 1 and 3 thrust reversers. Now that we're trying to stop with a throttle still in the takeoff position, our takeoff warning horn was making us deafer by the second. This was not a routine day. Were we done? Of course not. We blew a tire.

Finally, luck was on our side. The tire that blew was from the center gear, so there was no pull to either side. In fact, we didn't even feel it blow. It was all thanks to an observation from the ground emergency services, quick coordination with the control tower, and an expediting maintenance team to secure the tire and get us off the runway. Once we got the call about the blown tire, we were a little surprised. We made a conscious effort to not make a bad situation worse. We had previously discussed runway length, our operative systems, and that there was no need to get on the brakes early — so we didn't. We later learned from maintenance that the blown tire was a result from an anti-skid malfunction — with no correlation to our emergency or crew actions.

As an avid football fan, I've had my share of experience with "Monday-morning quarterbacking." Looking back on the incident, there are a few things I'd like to highlight.

First of all, don't allow yourself to get complacent. There are no such things as routine sorties. With our aging aircraft, high ops tempo, and ever-changing environment, things will go wrong; you have to be ready for anything.

Second, take your training seriously. In the KC-10, we don't practice engine-out ops in the jet — only in the simulator. Thanks to great sim training and lessons from experienced sim instructors, we were well-prepared and our emergency was fairly uneventful. I consider any emergency a success when you can walk away from it and say, "Yeah, it was just like the sim."

Third, don't underestimate the importance of teamwork and crew resource management. Throughout the whole flight and back on the ground, our flight engineer and boom operator played crucial roles in safely recovering the aircraft.

Finally, remember that Murphy's Law is always in effect; consider every possible situation (i.e., better coordination with thrust reversers on landing roll and anticipating the need to find the takeoff warning horn circuit breaker). Though it's impossible to think of every scenario, if you can bind your mind at full throttle, your training will take over, and the rest will come naturally.

# Deceptive Communications

**CAPT. PHILLIP VARILEK**
39th Airlift Squadron
Dyess AFB, Texas

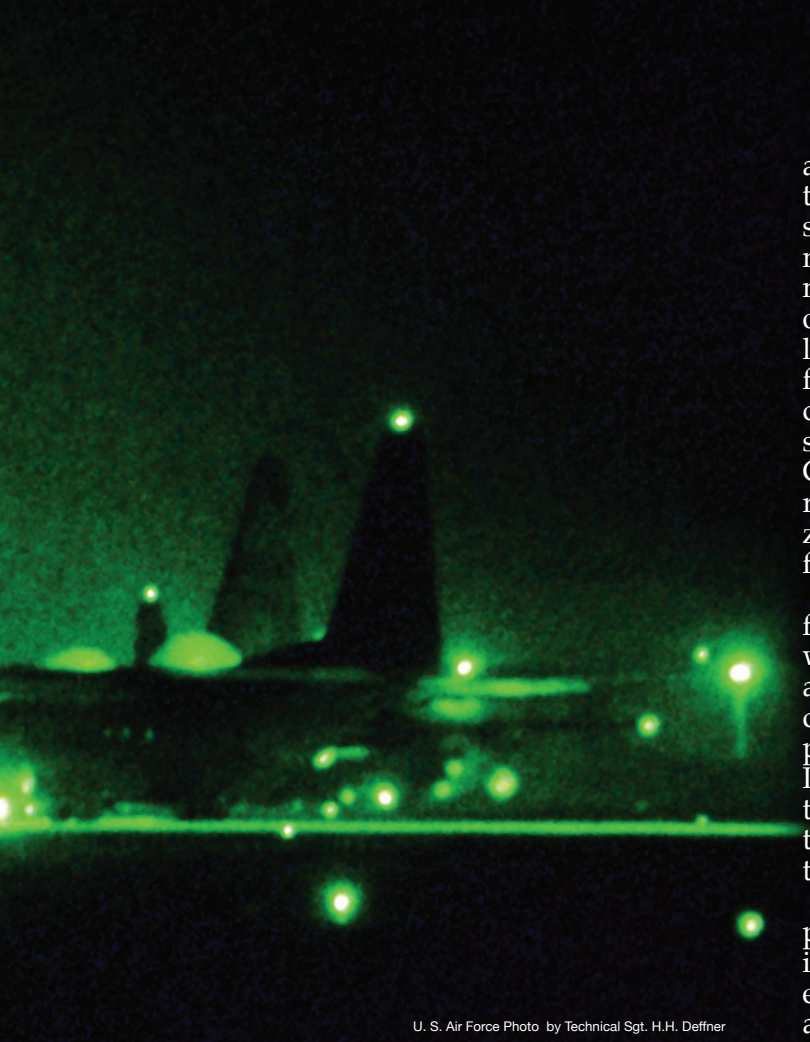
This article addresses the principles of crew resource management and operational risk management in a combat environment. Although no recordable incident took place, the crew encountered multiple obstacles that hindered the success of an AirEvac mission and threatened the lives of the crew and medical staff onboard. Had CRM and ORM been sacrificed, prevailing obstacles would've led to mission failure and possibly the death of a wounded soldier relying on transport to a medical facility.

The 746th Expeditionary Airlift Squadron was a squadron of C-130Hs chopped to CENTCOM from Dyess AFB, Texas. One responsibility of the squadron was to posture an aircraft and aircrew as an "A" Standby Force, with the capability of launching within one hour. One day in August, an aircraft launched on an emergency med evac mission to Tarin Kowt, an unsecured field in austere Afghanistan.

The aircrew typically had a low ORM score with a new aircraft commander being the limiting factor. Despite occasional stumbles in CRM early in the deployment, the crew recently reached an efficient operating level and was focused on executing the critical mission. Though the ALFA Standby Force was alerted 14 hours into the "eligible for alert" window, any presence of complacency was overshadowed by enthusiasm.

Upon arrival at the aircraft, Tactics and Intel briefed the crew, while the medical crew director presided over the reconfiguration of the cargo compartment. With a systematic routine, complimented by efficient CRM, the aircraft was ready to taxi well within time constraints. However, the benefits enabled by proficient ground ops were negated by a cargo ramp malfunction, resulting in a delayed takeoff. Though this maintenance setback was frustrating, hindsight would show it as a minute impact to the overall mission.

Once airborne, we had a 4.5-hour transit, providing the aircrew with time to discuss their tactical approach. Although occupied by Coalition Forces, a secure perimeter wasn't established around the landing zone. Intel also briefed possible hostile activity within the area. "Blacked-out" ops, aided by night visions goggles, would be used on the approach to the infrared lit dirt landing zone. Unfortunately, Tarin Kowt is surrounded by heavy terrain, and there was negligible moon illumination and minimal cultural lighting to aid in field acquisition. The navigator would prove to be an invaluable resource as the only crew member aboard familiar with the field and its surrounding environment.



U. S. Air Force Photo by Technical Sgt. H.H. Deffner

However, before descent into these unforgiving conditions, we had to establish communications with Tarin Kowt.

Typically, coordinating clearances into an airfield doesn't pose significant risks to an experienced aircrew. However, attempting to establish communications with a closed facility an hour earlier than expected can result in an undesirable situation. After continuous efforts on multiple frequencies, we entered a hold at an altitude driven by terrain and threat considerations. Despite tensions generated by the absence of two-way communications, the first transmission we received troubled the crew even more than the initial radio silence. A suspicious voice replied with an unfamiliar callsign and a thick Arabic accent. The suspect authority also issued the following nonstandard clearance: "You are cleared for whatever you want." Obviously, instruction wouldn't be accepted from a source that couldn't be authenticated. After assuming this encounter was a feeble attempt of deception by insurgents and being unable to contact a legitimate agency, the crew decided to divert to Bagram Air Base due to fuel considerations. While exiting the last orbit, an acknowledgement was finally received by an English controller at Tarin Kowt. The touchdown zone of the airfield was identified with extreme difficulty, despite using NVGs.

Shortly after leaving the security of high altitudes and committing to a tactical penetration descent, the crew observed a spotlight sweeping the black skies. Already within lethal range of surface-to-air missiles, there was limited maneuvering airspace to mitigate this threat due to the surrounding hazardous terrain. We had not visually acquired the IR LZ lights despite having positive position assurance from the GPS. After avoiding the search light, the crew was able to precisely navigate via the aircraft self-contained navigation system in tandem with a GPS-moving map display, but a low approach was required to acquire the LZ visually. The touchdown zone of the airfield was identified with extreme difficulty, despite the use of NVGs.

While attempting to keep the references in sight for a return low-altitude tactical approach, the crew was suddenly distracted by small-arms fire on the airfield boundary. Although not aimed at our aircraft, a precision maximum effort landing was imperative to deny the enemy another opportunity. Intensity in the cockpit thickened due to the several threats already encountered, the extreme concentration required to execute an assault landing on NVGs to a dirt runway, and the lack of outside lighting.

While using efficient CRM and within safe approach parameters, the landing was made without incident. They unloaded the patient under the cover of darkness, without shutting down the engines and through coordinated efforts between aircrew and ground support. After minimum turn time on the ground, a reverse departure was executed to deny the previously encountered small-arms fire.

Climb out to altitude and the final 45-minute leg was uneventful. Again, slight resistance was encountered upon arrival at Bagram Air Base due to the saturated maximum-on-ground capacity. Initially, we were instructed to hold by Bagram Approach. However, after placing justified emphasis on our callsign, an amended clearance was received, and the aircrew was given priority to land. Once on the deck, the critically wounded soldier was released to Bagram medical personnel.

This "there I was" experience doesn't address a specific aircraft mishap, but demonstrates the application of CRM and ORM as observed personally by the co-pilot on the evacuation mission. The aircrew applied expertise originating with Intel and Tactics before departure, concluding with competence with aircrew and AE personnel upon arrival at Tarin Kowt. A reversion to micromanaging or any other breakdown in CRM wouldn't have allowed us to survive the complexity of the mission or the numerous threats encountered. And despite limited preparation time to accurately assess each hazard, the significance of the mission quantified the heightened risk. As demonstrated by the success of the mission, these principles were used in the prevention of a mishap versus their traditional role as a tool in investigating a mishap.

# Near Midair in the

**ANONYMOUS**

There I was, flying on my 30th mission out of Diego Garcia in the KC-135 Stratotanker. The missions were notoriously boring. Typical sorties last between six and eight hours with the entire duration taking place under "due regard." That's right, no controlling agency to talk to and nothing to do but keep an eye on the weather. The lack of traffic deconfliction wasn't a problem since a crew might be lucky to see one other airplane other than their scheduled receiver during their entire two-month deployment. Let me rephrase that — the lack of traffic deconfliction was usually not a problem.

The constant shifting between day to night flying turned the crew into zombies after a few weeks. This was the second consecutive deployment to Diego Garcia for the co-pilot and boom operator, with about three weeks spent at home between two-month deployments. This meant that although my crew was intimately familiar with the missions we were flying, it took us about half as long to reach complete and total boredom. As the aircraft commander, I had experimented early on during the deployment with taking short naps, alternating with the co-pilot. After catching the co-pilot asleep during my sleep turn more than once, I made a command decision to put an end to the power nap rotation. Taking off with a near-maximum gross weight was enough to keep us on our toes, but once we were airborne and leveled off at our cruise altitude, complacency quickly set in.

Our maintenance teams did a great job on our planes. We rarely, if ever, had any problems. There was no terrain to worry about in the middle of the Indian Ocean. Flying without radar control in "due regard" for the entire mission meant we were pretty much free to deviate along our planned route of flight as we saw fit, without coordinating with anyone. This was truly an environment where the only thing that could possibly pose a threat to the crew was the crew itself.

The mission started as usual. The crew was alerted as it was getting dark outside. It was going to be one of those flights that terminated as the sun was coming up. After takeoff, the crew got comfortable and prepared for the eight-hour mission: four hours out, passing about 80 thousand pounds of JP-8 to our receiver, and four hours back. We had long since run out of discussion topics. The standard boxed lunches were hard to even look at by this point in the deployment. Most of the flight was spent in silence. The occasional "Hey, wake up, co!" broke the silence more than once. Then, something unexpected happened. About three hours into the flight, one hour before our scheduled refueling, I heard "Traffic, traffic" come from the traffic collision avoidance system. As the co-pilot snapped his

U.S. Air Force Photo by Staff Sgt. Angelique Perez

head toward the center display, I looked outside to see if there was indeed some other airplane out there. By the time we realized that it wasn't a false warning, the TCAS was directing, "Climb, climb." I simultaneously disengaged the autopilot, started an aggressive climb, and monitored the vertical speed indicator to see what rate of climb it called for to clear the other plane that was on a collision course with us. Within another five seconds, we heard the TCAS call, "Clear of conflict." The co-pilot dialed the scale of our TCAS display in close to see exactly how close this other aircraft had come, since we couldn't see it outside. We had probably missed a midair collision in the most desolate part of the Indian Ocean by about 500 vertical feet.

On the bright side, keeping the crew awake was not a problem after our resolution advisory. We accomplished the rendezvous with our scheduled receiver, gave them their get-home fuel, and made it back to base safely and uneventfully. Knowing that most, if not all, of the other tanker crews at our location faced the same problems with fatigue and complacency, I knew I had to share my experience with them, so that they would learn from our close call. Most of the other crews were just like us — they hadn't seen another airplane in the sky during their 200 or so hours of flying out of Diego. They all admitted to having struggled with fatigue and complacency on their long and uneventful missions.

The lessons I had learned on that flight have stayed with me. In addition to remaining vigilant at all times, proper use of operational risk management can help avoid catastrophe. In this case, a simple risk management assessment could've helped my crew identify where the most significant threat to our safety would come from — complacency. Our situation was one in which the crew was very experienced, extremely familiar with the mission we were tasked with, and perfectly capable of carrying out the mission. However, the amount of flying we were doing and our erratic sleep schedule led to significant fatigue. This only exacerbated the problem of complacency.

The importance of vigilance and safety extends beyond the personal safety of the crew members and the preservation of the aircraft that they fly. If we had collided with that single airliner over the Indian Ocean, there would've been a good chance that our receiver would find himself in serious trouble. Hopefully, they would've been able to find a piece of solid ground to put their plane down on, but as isolated as we were, there would be no guarantee that they would've made it back to base. Remember, Air Force aircraft tasked with providing close air support or with delivering much needed supplies impact many more than just themselves if their mission can't be accomplished due to an easily avoidable mishap.

# The Unexpected

**CAPT. E. YANCEY WALKER**
98th Flying Training Squadron
USAF Academy, Colo.

U.S. Air Force Photo

Regardless of airframe, when students are in training, the potential exists for the unexpected to happen. In these situations, the Air Force places faith in its instructors to use their foresight to prevent, or expertise to resolve, potential disasters. To use the cliché, instructors should expect the unexpected … at all times. In the 98th Flying Training Squadron at the U.S. Air Force Academy, more affectionately known as "The Wings of Blue," free-fall instructors have to consistently be on guard, not only in the airplane, but also as they hurl themselves out of it and towards the ground at over 120 mph.

During a recent deployment to Gila Bend, Ariz., the squadron bore witness to one of the more graphic examples of how quick reaction and ingrained knowledge can turn what could have been a potential disaster into merely a "close call." From a spectator's standpoint, this incident started similar to others in the squadron, with everyone's hands over their eyes, as if misplacing their salute, searching the sky for three things: a good reserve parachute, a departed main and a freefalling free bag. As a corollary to this phenomenon, this also served as the bat signal to beckon the safety staff to the drop zone to meet the jumper and discover, what Paul Harvey would call, "the rest of the story."

Following closely behind the medic, our group flight safety officer and I made our way across the tarmac to the landing area. I arrived shortly after the reserve parachute touched down. Approaching the pea pit, I realized the jumper who had just cut away was actually one of our most experienced instructors. After shaking off the adrenaline rush through some sighs of relief, he walked with us back and relayed, simplistically, why he decided to execute plan B with his parachute and what exactly caused the rips in his jump suit. As we neared the shack, he concluded his story with, "Oh, and I got it all on video."

The instructor, a master sgt., queued up the video and plugged the cables into the TV. The opening scene began normally with the instructor climbing out on the camera step of the UV-18B, Twin Otter. On this particular jump, he was acting as videographer and air coach to a slew of jumpers in GI flight suits, attempting to complete a seven-way star. As a little background, these GI flight suits readily identify the squadron's "Wings of Green" team: upgraders in training, with no one jumper possessing more than 100 total skydives. This jump was also one of the first that did not require an instructor as part of the formation. These fledglings were on their own, with the instructor merely watching as adult supervision as they attempted to fly.

The jumpers positioned themselves in the door, and with a quick ready, shake, go the four-way base left the aircraft. The instructor peeled off the back of the airplane and maneuvered to place the formation in the center of his sights. Periodically, he checked above himself to judge the progress of the jumpers diving onto the base. He was also ensuring that none of them were acting as the proverbial meat missile, on an uncontrollable collision course towards either him or the formation.

They looked good. One by one, all seven made it into frame, five of them actually taking grips in the circular formation, and the other two looking desperate as they struggled to fly into the formation before break-off altitude at 5,500 feet AGL.

As the sky dive continued, the formation began to go into what could most familiarly be described as harmonic oscillation. Now, even if the two outliers could make it to the formation, the build-up of kinetic energy would barricade their entry. As I peered on the inevitability of what I knew was coming, I held my breath. Freefall time was getting longer, so I knew altitude was getting scarce; the jumpers were going to break out any second.

On cue, approaching 5,500 feet, several of the jumpers gave the prebriefed wave-off signal, turned 180 degrees from the formation and transitioned into their tracking body position. To those unfamiliar with skydiving, a jumper's tracking body position emulates the delta wing concept. Skydivers sweep their arms back to their sides, cup their hands, roll their shoulders and peg their legs slightly more than shoulder width apart. By doing this, they gain the most horizontal travel per vertical foot and ensure they have sufficient separation from other jumpers as they deploy their parachutes. This maneuver also ensures that all skydivers vacate the center of the formation in which the videographer will descend and pull.

As the skydivers fanned out, the instructor focused on one particular upgrader that had documented trouble executing this tracking maneuver. All seemed well, so he turned his attention back toward the center, performed a couple altitude checks, and waited for his deployment altitude at 2,500 AGL, 100 feet lower than the upgrader's pull altitude. As the instructor approached his altitude, he reached to the bottom of his container and hurled his pilot chute into the wind. In an instant, the pilot chute extended the suspension lines and the parachute sniveled out of the deployment bag. Watching it through inflation, the instructor saw the blue and white canopy open about 45 degrees off, heading to the left. The instructor, who, just a few years before, had been patrolling the streets of Iraq, would describe the next 15 seconds as the scariest of his life.

Less than 50 feet below him, the instructor watched the last second of an upgrader's parachute deployment. The parachute opened off, heading to the right, and the instructor was now staring down the ram-air cells of the green and white canopy, closing rapidly. Knowing the inevitability of the situation, but refusing to quit fighting, the instructor grabbed for his rear riser to turn away, but it was too late. I watched the next seconds in disbelief, comforted only because I knew what neither the instructor nor the upgrader knew at the time — everyone would make it out safely.

The high definition video camera gave me a focused shot of the micro-fiber suspension lines, as the instructor's body sliced through the lines between the upgrader hanging below, with his green and white canopy above. The force of the collision caused the instructor to pendulum upward. A mixture of green and white parachute cells now replaced the last glimpse of blue sky as the instructor became engulfed. In a macabre sense of irony during this entanglement, one could almost read verbatim the words on the brightly orange-colored placard that adorned every parachute canopy: "!Warning! 1. Training and/or experience are required to lower the risk of serious bodily injury or death." After wrestling momentarily, fate smiled on the situation, and the same pendulum swing that had flung him into the canopy, reversed its momentum; his body swung clear and experience kicked in.

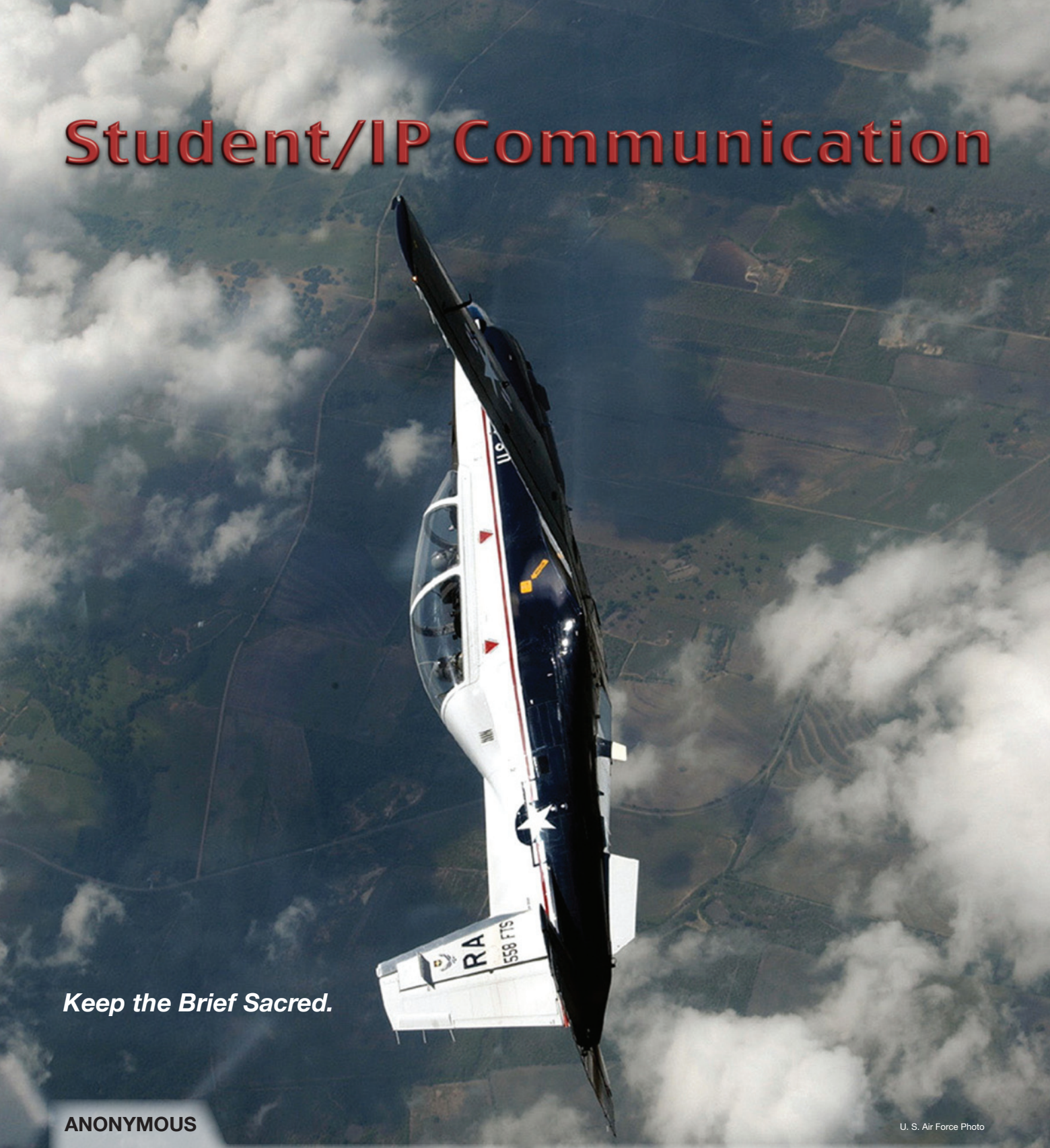
Having practiced his routine for just this emergency, the instructor quickly pulled his breakaway handle. I watched the freefall rush he experienced manifest itself as the upgrader and the discarded canopy seemingly floated away. Knowing that he had sufficient vertical separation, the instructor then deployed his reserve. The light blue canopy inflated. It was at this point where the personnel on the ground, myself included, became spectators, curious about the reserve deployment, yet completely unaware of the nearly fatal collision just avoided.

After the essential personnel viewed the video, the rumblings of what had just occurred began to turn into commotion. Our director of operations quickly thought of how he could turn this incident into a learning experience. He cancelled ops for the day and called a safety meeting. The 135 total personnel packed out their gear and gathered in a dining facility designed for only 30. Without much more than a word, the video was played as a preface. By capturing something this drastic so vividly, the video had conveyed what no amount of words would have ever been able to. It ended, and only a few words of summation were spoken. The instructor showed his jump suit, the resulting burns from the suspension lines, and the minor abrasions he sustained on his leg. Then in an unnaturally composed manner, he briefly spoke to the importance of fundamentals and emergency procedures in such a high-speed environment.

The upgrader that was known to have struggled with his tracking had been the culprit. As the best guess scenario, they determined that during his track, the upgrader conducted an altitude check on his wrist-mounted altimeter. When doing so, he went into an inadvertent turn and swung 180 degrees back toward the center of the formation. Either due to a late deployment or excessive snivel, the upgrader's canopy inflated at a lower than expected altitude. Lastly, the off-heading opening completed the mishap triad, and the midair collision occurred.

If this had been two aircraft, millions of dollars would have been lost, an SIB would have been convened, and the entire Air Force would have been alerted. However, as with so many other "close calls," this one, fortunately, just serves as a warning and a reminder. A warning in that it shows instructors that students, even if qualified, don't always possess the proficiency to guarantee proper execution every time. An instructor must always be on guard. A reminder — emergency procedures aren't designed for everyday use, but rather for the rare instance where the unexpected becomes the threatening. It's in this instance that preparedness turns into reaction, and disasters become "close calls."

# Student/IP Communication




U. S. Air Force Photo

## *Keep the Brief Sacred.*

**ANONYMOUS**

I had been a flight commander for about eight months, and had a pretty good feel for the job. I had also come to know the time crunch that occurs just before briefing a sortie. Everyone needs you to weigh in on something: "Can I fly this IP with that student?" "Can you sign off on my ORM?" The possibilities go on.

When I was simply a line IP, there were almost zero interruptions. You were essentially off on your own with your student. I know that it sounds like we don't keep the brief "sacred" in the SUPT environment. Every effort is made to do so, but due to the daily time crunch, some briefs start late and others are sometimes interrupted. Flight CCs and

flight schedulers are the ones most often affected.

My brief started late, and we were interrupted, due the CAP status of a student and the IP requirements that are stipulated as part of the plan to get him off CAP. This was my student's first aerobatic ride. He'll perform a normal contact profile with the addition of an aileron roll, a loop and a split S. After the motherhood, I brief specifics on the aero. The words that come out of my mouth and seal the fate of my impending over-G are something to the effect of, "Classically speaking, most students don't pull enough G as they attempt to go over the top in the loop. You want to get on the G quickly and hold that 3-4 G pull." In a normal brief, following my statement concerning quickly getting on the G, I would make some reference to respecting the ops limits and not "snatching" the stick; however, this was one instance where the brief was interrupted. Some question was asked, I answered the question, the interrupting party left, and I commenced the brief. My memory wasn't perfect; however, I think all of the stars aligned, and I went right into the explanation of a split-S, without ever referencing the caution on "snatching" the stick and over-G'ing the aircraft. Looking back, that demonstrated lesson number one: never allow anyone to interrupt your brief. It's a slippery slope. And for the rest of your time flying with them, they'll always think it's OK.

After the step brief, we go to life support, taxi out, take off, hit the MOA, run through a standard contact profile, and then are set to start in on the aero. Part of the SUPT instruction business is adequately assessing the abilities of your student. In mixed company, I'd never say that you put each one of them into a predetermined container, but you do. You have the "ultra-intelligent, yet ultra-timid" container, the "x-airline pilot/F-16 guard slot/golden hands" container, and lastly the "watch-out-for-this-guy" container.

The student I was flying with this day had a military aviation-related background. His dad had flown for 20 years in the Navy. He listened closely to what you said, and did exactly what he thought you wanted him to do. He would've fallen into the "take-orders-and-don't-ask-questions" container. This is where lesson number two comes in: always keep the student's outlook and the way he's going to react to what you say in the back of your mind. This guy was a loaded gun when I gave him only half of the brief on how to fly a loop in this aircraft. Now if I had been flying with a student from the "ultra-intelligent/ultra-timid" container, nothing probably would've happened. This was essentially the second link in the chain — I didn't have adequate SA on what this guy was capable of.

Back to the flight. The student performed a good G exercise and pulled in the neighborhood of 4.4 Gs. He had experience in the aircraft. I had given him a nice demo. I pulled 3.7 Gs on my loop. Now it was his turn. So this was the beautiful moment when he asked, "All right Sir, are you ready for this?" My mental reply was, "Of course I'm ready for this. This is a loop — how crazy can it be?" But at the same time, the way he questioned my readiness caught my attention. I sat up in the seat, got adjusted, and positioned my hands behind the stick. The phrase "Be ready for anything" came to mind. After the preparation, I replied, "Yeah dude, I'm ready; let's go." Little did I know that this guy had been warming up his biceps in the front seat for the quickest and deepest pull in history. He reefed back to 7.68 Gs for 1/16th of a second. He is a relatively thick, tough guy, and for all that I was worth, I couldn't stop him from pulling as hard as he did. The symmetric limit for the T-6 is 7 Gs. However, due to some questionable wing longerons, our limit had been temporarily dropped to 5.5 Gs. My meter in the back showed 7.1 Gs and his showed 6.5 Gs. By my meter, we had over G'ed by 1.6.

Discrepancies are pretty common due to the fore and aft position of the G meters, and MX won't adjust as long as the pulls are within 1.0 Gs of each other. The G meter associated with the data recorder is even further aft in the aircraft. That partly explained the different readings. (It would be nice if the tolerances were tightened up a bit.) If this SP had been solo after the limit had been returned to 7.0 Gs, he could've pulled his 6.5 Gs and actually registered 7.68 Gs on the data recorder. He would've over G'ed, cleared his meter, RTB'ed and never would've known anything wrong had happened.

Back to the flight and the third lesson: the guy essentially told me that he was going to over-G the aircraft right before he did it. He said, "All right, Sir, are you ready for this?" What he was actually saying was, "I've never done this before, but I'm about to expand my personal envelope of experience, and you'd better have your game face on." This is the point where I could've briefed him on the possible dangers and averted the situation. I hadn't, however, put together the pieces of the puzzle that were in 1/16th of a second going to become blatantly obvious.

It was my boss's words a couple weeks later when he was talking about students that brought all of this to mind. He said, "Right before the student tries to kill you, he'll tell you that he's going to do it." I thought back to every "dangerous" student situation that I've ever seen, and knew he was right. That student gave me the heads up that he was venturing into what for him was the great unknown.

The moral of the story: keep the brief sacred, know the dude who you're flying with, and most importantly, listen not only to what the guy is saying, but also to what the guy is trying to convey.

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.

**Major James Howell**
357th Fighter Squadron
Davis-Monthan AFB, Ariz.

The Aviation Well Done Award is presented to Major James Howell, 357th Fighter Squadron, Davis-Monthan Air Force Base, Arizona. On February 28, 2008, Major Howell lead an A/OA-10C flight to the Barry M. Goldwater Range to conduct a medium altitude, close air support mission. Following a two-target strafe pass, he heard a loud pop from the nose of the aircraft, followed immediately by the loss of all pitot static gauges and a "gun unsafe" master caution light. He immediately called "knock-it-off." Without an operable altimeter, airspeed indicator, or stall warning system, Major Howell used known pitch and power settings to keep the aircraft flying. Major Howell's wingman rejoined on the crippled aircraft and reported a large hole under the aircraft in the area of the gun bay. Major Howell coordinated emergency transit through two active weapons delivery ranges and avoided populated areas along the route to the designated emergency divert airfield at Gila Bend Army Airfield. Major Howell conducted a controllability check and initiated an emergency approach into Gila Bend. Although several pieces of debris fell from the aircraft as he lowered the landing gear, he got three down-and-locked and determined the aircraft was controllable at landing speeds. During the approach his wingman called out airspeeds as Major Howell brought the aircraft in for a safe, uneventful landing. Maintenance personnel later determined that damage to the aircraft was so significant that it could not be repaired on site and made preparations to ship it to depot for repair. The outstanding leadership and superior skill displayed by Major Howell under extreme circumstances reflect great credit upon himself, Air Combat Command, and the United States Air Force.

# Class A Flight Mishaps

## FY08 (Through 24 Jul 08)

| | Class A Mishaps | | |
|---|---|---|---|
| | FY08 | Same Date in FY07 | Total FY07 |
| ACC | 6 | 5 | 8 |
| AETC | 6 | 5 | 5 |
| AFMC | 0 | 0 | 1 |
| AFRC | 1 | 1 | 1 |
| AFSOC | 1 | 0 | 1 |
| AFSPC | 0 | 0 | 0 |
| AMC | 3 | 2 | 3 |
| ANG | 3 | 5 | 5 |
| PACAF | 1 | 1 | 1 |
| USAFE | 0 | 1 | 1 |
| AF at Large | 0 | 0 | 1 |
| Total | 21 / 1.29 | 20 / 1.20 | 27 /1.32 |

### Flight Rate Producing

| | | | |
|---|---|---|---|
| **Nov 01** | F-22A | | No. 2 engine FOD discovered during post-flight walkaround |
| **Nov 02** | F-15C | ✈ | Crashed on training mission; pilot suffered minor injuries |
| **Nov 12** | KC-10A | | No. 2 engine compressor stalled; rotor/stator damage |
| **Nov 20** | E-8C | | Hard landing; wing/pylon/gear/radar damaged |
| **Nov 28** | T-6A | ✈ | Dual T-6 midair collision |
| **Nov 29** | HH-60G | | Hard landing during brownout; damaged FLIR, WX radome |
| **Jan 15** | F-16C | ✈ | Aircraft crashed in ocean during training mission |
| **Feb 01** | F-15D | ✈ | Aircraft crashed in ocean during training mission |
| **Feb 20** | F-15C | ✈ | Dual F-15C midair; 1 pilot fatality |
| **Feb 23** | B-2A | ✈ | Aircraft crashed on takeoff |
| **Mar 14** | F-16C | ✈ | Aircraft crashed during student training; 1 fatality |
| **Mar 19** | KC-10A | | No. 3 engine shut down in flight |
| **Apr 02** | F-16D | | Aircraft landed gear up |
| **Apr 04** | B-1B | ✈ | Landed, taxied clear of runway; fire/explosion |
| **Apr 23** | T-38C | ✈ | Crashed on takeoff; 2 fatalities |
| **May 01** | T-38C | ✈ | Crashed on touch-and-go; 2 fatalities |
| **May 01** | E-9 | | Gear up landing |
| **May 21** | T-1A | ✈ | Landed short of runway |
| **Jul 21** | B-52H | ✈ | Aircraft crashed in ocean; 6 fatalities |

### UAS

| | | | |
|---|---|---|---|
| **Nov 29** | MQ-1B | ✈ | Aircraft crashed |
| **Dec 17** | MQ-1B | ✈ | Contact lost; aircraft crashed |
| **Apr 09** | MQ-1B | ✈ | Aircraft crashed |
| **May 02** | MQ-1B | ✈ | Aircraft crashed |
| **May 12** | MQ-9A | | Aircraft crashed |
| **Jun 02** | MQ-1B | ✈ | Aircraft crashed |
| **Jun 12** | MQ-1B | ✈ | Aircraft crashed |
| **Jul 21** | MQ-1B | ✈ | Contact lost; aircraft crashed |

- A Class "A" aircraft mishap is defined as one where there is loss of life, injury resulting in permanent total disability, destruction of a USAF 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.
- USAF safety statistics are online at 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 July 24, 2008).**

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# BASH

## Bird / wildlife Aircraft Strike Hazard

Coming in September 08