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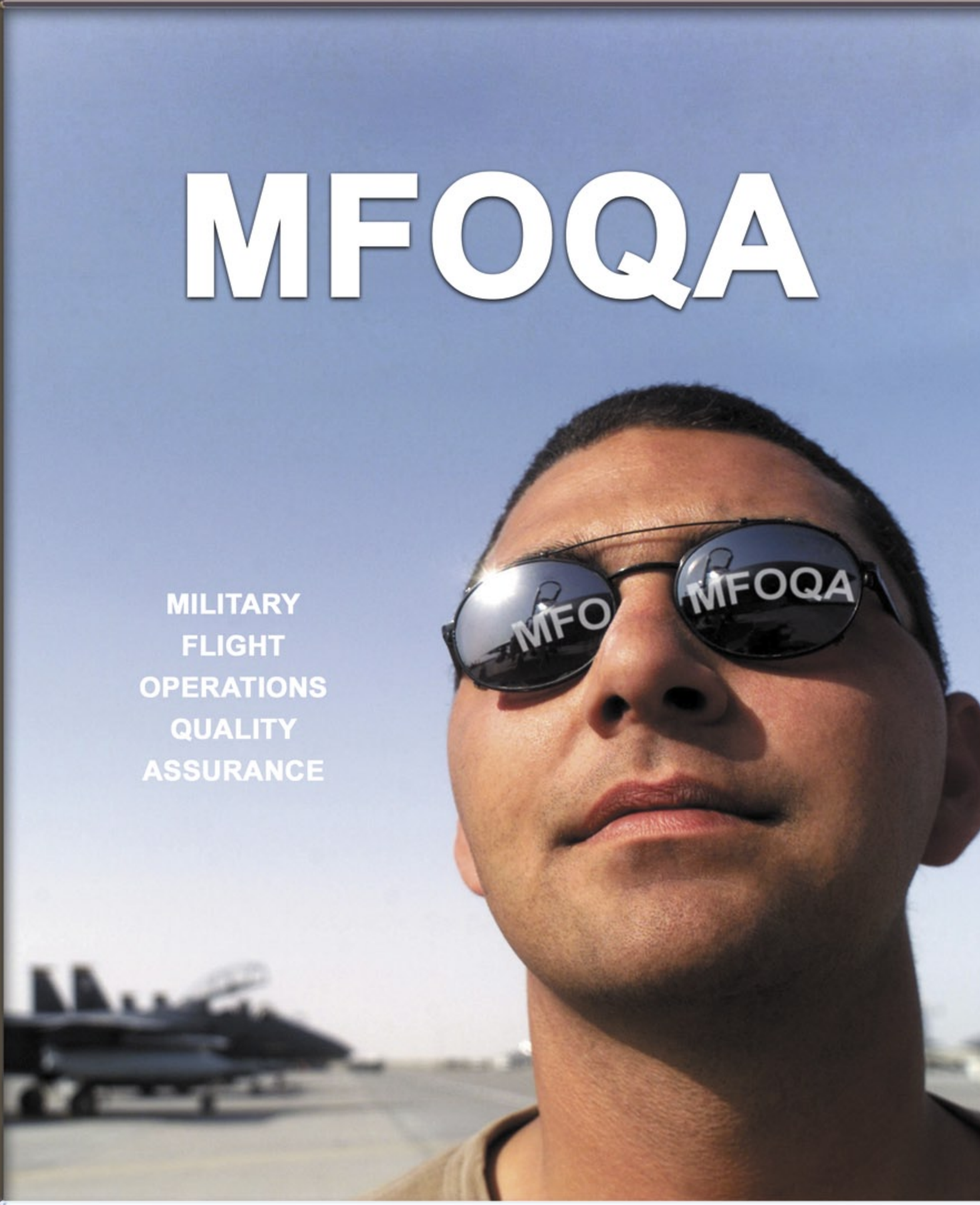
FLYING SAFETY MAGAZINE



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FLYING SAFETY MAGAZINE
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U.S. AIR FORCE

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SAFETY SAGE

Who knows what the future holds?

In some ways, today's Air Force is very different from the organization I knew as a lieutenant. For one thing, we have much cooler toys!

Computers and automation can do a lot to make you safer, but you still have to know your systems to use these tools effectively. Stay vigilant and realize that these tools are there to help you do the job, not do it for you. Our adventures in this month's *Flying Safety Magazine* include the antics of some pilots who forgot this rule and lived to tell their tale.

We also have several articles by AF experts on a program called Military Flight Operations Quality Assurance, or MFOQA. Many of you don't know what that means, and some of you are distrustful … read on and learn! This could be exactly what the future holds, and it might just save your life someday.

Of course, we had to include a few articles just because they were exciting: Have you ever flown solo at night, NORDO, with your head through the canopy? (Motivation, P. 24.) Have you ever been over the desert at 50 feet, 60 degrees of bank with 1,000 feet per minute descent? (Lack of CRM can kill … , P. 26.)

Who knows what the future holds?

The Safety Sage

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

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

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IS THE AIR FORCE READY FOR A "JUST CULTURE" ENVIRONMENT?

"Hi, I'm Capt Black Hat. I will be flying with you today. In case of an emergency, I will grade your first reaction and then I am here to help."

WILLIAM A. KROUSE JR.
Contractor UTRS
AMC A3T MFOQA Analyst

Ah, the dreaded "check pilot." I would sit in the cockpit with apprehension tightening my jaw, just waiting for those 46 words; "Hi, I'm Capt Black Hat. I will be flying with you today. I will take care of my own oxygen. I won't check on or off interphone and in case of an emergency, I will grade your first reaction and then I am here to help." Today, just the memory of Black Hatter evaluations makes my palms sweat.

Since even before I earned my pilot wings, flying in the Air Force has been a no-mistake world. We operate these fantastic flying machines within a punitive, no-mistake culture. Make an error? You're busted. Perhaps even lose your wings. That is, if they catch you making the error.

I've yet to meet a pilot (myself included) who doesn't look back over a flying career and remember missions on which, had an evaluator been on board, he or she would have been busted, "Q3'd" and scheduled for additional training. But evaluators weren't there, and we are still here sharing stories of narrow escapes with other pilots who have "been there" or to close friends we can trust.

We justify not reporting these incidents with self-talk, "hey, I'm a good pilot and even though I didn't formally highlight my error, I did share what I learned with other people who could benefit from knowing about it."

But, how many pilots really benefited from learning about our undocumented minor mistakes?

Of course, pilots aren't the only professionals who live in a punitive, no-mistake culture. Air traffic control, aircraft maintenance, and even sectors of the medical profession suffer the same fate. These professionals also have "under-the-radar" conversations with peers to share and compare experiences. They seek to learn from each other on a private, one-to-one basis rather than risk the admission of error to authorities and potentially jeopardize their careers.

It begs the questions: Has the threat of busting a checkride ever prevented a pilot from making an error? Is it more important to bust a pilot for a minor mistake or to examine the underlying situation, discover what caused the mistake, and then the share lessons learned?

Imagine, instead of a punitive, no-mistake culture, one that promotes the idea of sharing and learning from one another's mistakes in order to create a better and safer professional environment. This type of culture can and does exist today, and is called 'Just Culture.' [1]

Civil aviation, air traffic control and sectors within the medical profession have already begun the process of adopting Just Culture. These professional sectors understand that human error can never be eliminated. They acknowledge that information leading up to and about human errors in the workplace can be used as learning tools, so that others can benefit. In short, Just Culture is a system that affords learning from free-flow discussion of safety incidences; yet, does not tolerate deliberate, reckless or repetitive errors.

The Global Aviation Information Network (GAIN) Working Group E, Flight Ops/ATC Ops Safety Information Sharing, defines Just Culture as "An atmosphere of trust in which people are encouraged, even rewarded, for providing essential safety-related information, but in which they are also clear about where the line must be drawn between acceptable and unacceptable behavior."[2] The co-chairs of the European Air Traffic Management Safety Workshop on Just Culture define Just Culture to mean, "front line operators or others are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but where gross negligence, willful violations and destructive acts are not tolerated."[3]

The time is right for the Air Force to adopt Just Culture. While its pilot training standardization system must continue to hold personnel accountable for reckless behavior, it must also acknowledge that human error does occur. I believe pilot and aircraft safety will be improved when pilots are allowed to openly discuss incidents without fear of retribution, so a process of continuous learning can be set in place within the pilot community.

The GAIN Working Group agrees. Its research found that very few unsafe acts are deliberate.[4] The Safety Targeted Awareness Report (STAR) 008 stated, "A very small percentage of reported incidents (0.2%) involve acts of willful negligence or misconduct." It concluded that a "blaming culture" stymies the sharing of vital safety information due to the threat of retribution.[5]

Their report also highlighted a Danish Air Traffic Control case study where the submission of safety reports went from 15 to 980 per year when laws changed to allow non-punitive, confidential reporting.[6] That's a 644 percent increase in the opportunity to learn from unsafe acts.

The US airline industry, with the assistance of the FAA and NASA, has developed its own anonymous self-reporting system [Aviation Safety Action Program (ASAP)][7] where aircrew, maintainers and dispatchers make confidential reports of errors, with an emphasis on what caused the individual to make the error.

Additional reasons for moving away from a punitive system were pointed out in an article by the Institute for Safe Medical Practices (ISMP). It stated that, in addition to humans being prone to errors, humans also drift away from the normal. This drift is caused by the individuals' perceived consequences of their immediate actions as they

Photo and Photo Illustration by Dan Harman deal with the daily requirements of the system and environmental pressures. It explains, "… decisions about what is important on a daily list of tasks are based on the immediate desired outcomes. Over time, as perceptions of risk fade away and workers try to do more with less, they take shortcuts and drift away from behaviors they know are safer."[8]

Years ago, the Air Force experimented with removing no-notice checkrides. Then they added them back. Later it lengthened the time between evaluations and then made every commander an evaluator. Through it all leadership insisted aircrews be accountable for their actions. How can the Air Force possibly operate in a "blameless system" without accountability? Just Culture fosters that accountability.

Today's work reality—whether Air Force, civil aviation, or the medical sector—is that we have to "do more with less" and "do what it takes to get the job done." As each of us justifies taking shortcuts or making minor omissions to accomplish our jobs, we lose sight of the risk associated with our actions. Clearly, punitive systems stressing correctness and safety do not support today's work environment of getting the job done faster, more effectively and less expensively.

As the Air Force continues to drive forward-thinking safety initiatives like Military Flight Operations Quality Assurance among others, it's time that they adopt Just Culture.

Notes:

[1] Just Culture" is an algorithm developed and held under copyright by the Just Culture Community (www.justculture.org). The Just Culture algorithm is designed to support system safety by facilitating open communication within an organization, while working within a system of accountability that supports safe behavioral choices among staff.

[2] Global Aviation Information Network (GAIN) Information Sharing Working Group E, Flight Ops/ATC Ops Safety Information Sharing; "A Roadmap to a Just Culture: Enhancing the Safety Environment;" September 2004, http://204.108.6.79/products/documents/roadmap%20to%20a%20just%20culture.pdf (1 November 2006), page 4.

[3] Dr. Erik Merckx, Mr. Roderick van Dam, Message from the Joint Chairmen of the Workshop, European ATM Safety Workshop on Just Culture, 16 Oct 2006

[4] GAIN: Flight Ops/ATC Ops Safety Information Sharing; "A Roadmap to a Just Culture," page vi; "only around 10 percent of actions contributing to bad events are judged as culpable"

[5] European Regions Airline Association, "Safety Targeted Awareness Report from the ERA Air Safety Work Group, STAR 008 V1 - June 2006

[6] GAIN: Flight Ops/ATC Ops Safety Information Sharing; "A Roadmap to a Just Culture", page vi.

[7] Refer to HYPERLINK "http://www.faa.gov/safety/" http://www.faa.gov/safety/programs_initiatives/aircraft_aviation/asap/ for details

[8] Institute for Safe Medication Practices, "Our Long Journey Towards A Safety-Minded Just Culture Part II: Where We're Going," Sept 2006.

AFSC/SEF Editorial Note to Commanders:

I thought I would offer some food for thought to our commanders out there (and those commanders to be).

Have *you* allowed a "punitive, no-mistake culture" to survive in your unit? Having spent the majority of a 20-year career as an evaluator, I know of only one rationale for a "one-item bust" and that's a violation of the "Big 3:" a breach of safety, a lack of air discipline, or allowing a dangerous situation to develop unchecked. The first two are clear indicators the individual is either unaware of the rules or places himself above them, and the third indicates a fairly sufficient lack of situational awareness. In any case, there are clearly problems that warrant an unsat and additional training. "Minor errors" may not even result in an individual downgrade much less a "bust;" however, cumulative minor errors may be an indication of a less than fully qualified individual. **My point is that as commanders, be highly involved in the selection and certification of the individuals you choose to be evaluators. Do not be tolerant of the "one mistake" check pilot, and do not allow such a culture to exist in your unit.**

The premise of this article is to foster an environment (a culture if you will), where pilots and flight crew are willing to share their mistakes to create an overall safer environment. I urge you as Air Force leaders to help foster this culture. Know the difference between a "mistake" and a "crime." **As leaders, we need to be tolerant of mistakes and help foster a culture of sharing and learning from them**--that's how we become better and safer aviators. **Willful violation of the rules should not be tolerated under any circumstances.**

Photo and Photo Illustration by Dan Harman

Photo Courtesy of Author

Fixing A Disturbing Safety Trend This Year
A Message from the Aviation Safety Division Chief

COL WILLIAM "WILLIE" BRANDT
AFSC/SEF

As I write this article for *Flying Safety* we are rapidly approaching our 60th Anniversary this September as an independent service, and I have now been in the job as the Air Force Aviation Safety Division Chief for going on 10-months. As I look back at our past, it is painfully evident we have come a long way from our humble 1947 beginnings. In 1948, our first full year as the United States Air Force, we had 1,783 Class A-equivalent mishaps for a rate of 40.18 mishaps per 100,000 flying hours, 620 destroyed aircraft, and 619 fatalities. If you do the math that's almost five Class A mishaps per day, and more than three aircraft destroyed with three fatalities every other day! Over the past 60-years, continual improvements in our training, engineering, equipment, and safety innovations have brought us a very long way. Only human error remains to be conquered as a leading factor in mishaps (more on that in a minute).

I was privileged to be sitting at the controls as last year, you set some absolutely stunning safety records for U.S. Air Force aviation safety: the lowest Class A mishap rate in USAF history at 0.90 mishaps per 100,000 flying hours (the first time ever below 1.00); the lowest number of aviation and aviation-related fatalities in USAF history with one (the tragic loss of an incentive ride passenger who succumbed to asphyxiation during the sortie); and the fewest destroyed aircraft in USAF history at eight. Contrast that with the above 1948 statistics and you can truly be proud of what you've accomplished! We even exceeded Secretary Ruhmsfeld's challenge to the services to reduce preventable mishaps by 50%, by reducing our two most critical metrics: destroyed aircraft and fatalities by 75% and 99% respectively (we narrowly missed the Class A metric by a mere 4% having reduced our rate by 46%). So, where do we go from here? How do we top last year's amazing performance?

This year, after a very concerning start, we are once again on track with last year's records and stand a good chance of lowering our statistics in all but one of the three areas: destroyed aircraft. We are only half way through the fiscal year, and already we have equaled the number of destroyed aircraft from all of last year!! I have long been a proponent that the true measure of an aviation safety program is not just the number of Class A mishaps, but actually is the number of destroyed assets and loss of human life. **To me, those statistics are the most telling and are the irreplaceable loss of combat and combat-support power. Our assets and people are our global power projection and if we destroy them, we do the enemy's job for them.**

There is a disturbing trend this year in our destroyed aircraft statistics: the human element. In five of the eight destroyed aircraft we have experienced thus far this fiscal year, human mistakes were either directly responsible for, or a direct contributor to the mishap. To put it another way, without our own preventable errors, we would have only three destroyed aircraft—ALL due to mechanical engine failure. I think we could all live with that.

I say this not to point a finger of blame, for in each case these truly were mistakes, and "but for the grace of God" go the rest of us. But all five of these mishaps WERE preventable. If you don't believe me, go back and look at the Blue Four News summaries from this year and I think you'll find we have been our own worst enemy in this arena. Questionable decision making, questionable risk assessment, and inattentive flying.

If you want to take this further, many of us in the fighter community lost a valued friend and fellow aviator this year to a tragic and preventable combat mishap in Iraq. While this doesn't show up in our safety statistics, one can't help but notice we have another destroyed aircraft and a saddening loss of life. What makes it tough, like our destroyed peacetime aircraft, this one was preventable as well. So how do we start to fix this?

I'll end with a note to **squadron commanders: you need to be responsible and accountable for your safety programs**. Safety is a commander's program. You own it, you choose your persons to run it, you set the tone and standards for your squadron, and you either "walk the talk" or you don't. The best aviation safety programs I have seen to date all have one essential element: "eye to eye" commander involvement. I challenge you to "get in your folks face" and let them know your standards, your guidance, and that you hold them accountable. Set and enforce the standard and I guarantee you'll see a change.

Check 6,
Willie

MFOQA—How We Got Here And Where We're Going

KAY ARMSTRONG
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Military Flight Operations Quality Assurance is the analysis and trending of aircraft flight performance and system data to proactively enhance safety, operations, training, and maintenance functions. It supports our Safety Center goals of risk identification and mitigation by providing tools for commanders to establish a baseline for normal operations, as well as reduce unnecessary operational risks while detecting precursors to aviation mishaps. The leading MFOQA goal is mishap reduction through the identification and mitigation of risk inherent in flight operations. MFOQA also increases operational efficiency and readiness through improved training effectiveness and the support of maintenance functions, resulting in the preservation of our Air Force resources.

The concept of MFOQA implementation in the AF began in the late '90s, as the benefits of flight operations data analysis were being felt in the civil aviation community. The Joint Service Safety Chiefs in 1999 endorsed the exploration of the concept, with the AF, Army and Navy each volunteering to evaluate its potential on a different mission-type platform. The AF Safety Center and AMC launched an evaluation of C-17 flying operations in Sept 2001.

Surprisingly (or maybe not), initial data analysis identified a flight regime where pilots appeared to revert to old habit patterns when accomplishing C-17 assault landings, especially at night. The C-17 is flared with an application of power rather than a pull on the stick, but a large percentage of the excessive-G landings in the C-17 appeared to come from this faulty technique. Once this issue was identified to the appropriate functional levels and corrective actions were implemented (the publication of a C-17 Approach and Landing Guide and increased assault landing requirements,) a steady drop in the rate of excessive-G landings was validated through continued MFOQA analysis.

Meanwhile, OSD also began advocating the MFOQA process for the military. In the fall of 2002 the OSD Office of Personnel and Readiness recommended the Services implement MFOQA as a mishap reduction initiative. In May 2003 Secretary of Defense Rumsfeld challenged the military to reduce the mishap rate by 50 percent, and in Aug OSD directed the Services to fund MFOQA as a facet of the mishap reduction effort.

Concurrently, AFSC is teamed with AETC to initiate MFOQA analysis on the T-6. Six months of coordination and groundwork preceded the start of data analysis in September 2003. Again the analysis process proved its worth when it validated corrective actions AETC had implemented a month earlier. The command had modified several flight maneuvers to reduce the amount of time spent 'light in the seat' in an effort to reduce excursions into a low oil pressure regime. MFOQA analysis not only showed the maneuver modifications had the desired effect, analysis also showed a direct correlation between the number of turns in a spin and low oil pressure readings. The spin maneuver was further modified and the low oil pressure rates dropped even further.

PBD 705, Mishap Reduction Initiatives, was issued in Dec 2004 and directed the Services to fund MFOQA, with the AF dedicating $72.4M between FY05 and FY11. AF/A3 quickly established an MFOQA Task Force, consisting of MAJCOM and Air Staff representatives, to distribute the directed funding and establish the MFOQA process in the Air Force. By the time OSD issued a memo in Oct '05 outlining the Service-wide MFOQA implementation requirements, the Task Force had allocated funding for process development and aircraft modification and drafted an AF MFOQA policy and instruction. (You can find a copy of the OSD policy memo on the AF Safety Center website – click on the MFOQA button.) Currently in our third year of aircraft upgrades, analysis continues on the C-17 and T-6, preparations are in place to launch the analysis process on the C-32 and C-40, and the AF MFOQA policy and instruction are in the final steps of the coordination process.

USAF Photo by SrA E.H. Littlejohn / Photo Illustration by Dan Harman

Now that we've reviewed the historical development of MFOQA in the AF, let's look to the future and where we are going. There are many aspects to consider – how the analysis is accomplished, location of platform analysts, which platforms will implement the MFOQA process, and long-term sustainment of the effort.

The first aspect, how the analysis is accomplished, will be standardized across the Air Force. A web-base analysis system is under development. After the flight data is retrieved from the aircraft the data files are made available to a data retrieval server, which sends each file to the appropriate platform data server to run through the analysis software. The platform analyst reviews and validates the analysis results daily and then makes the results available to the users. Data users (initially MAJCOM functional areas and unit commanders) can then access the results through the AF Portal.

Where are the analysts located? This may vary from command to command, but the current concept of operations has the analyst sitting at the MAJCOM. This way, analysis results are quickly disseminated to the appropriate functional area. For instance, if the analyst sees 20 percent of the aircraft at a particular base in the AOR landing hot and long, A3 may confer with the location commander to see if there is an issue locally causing this landing deviation. However, if the hot and fast landings are distributed across all bases, MAJCOM training personnel may need to investigate the underlying cause.

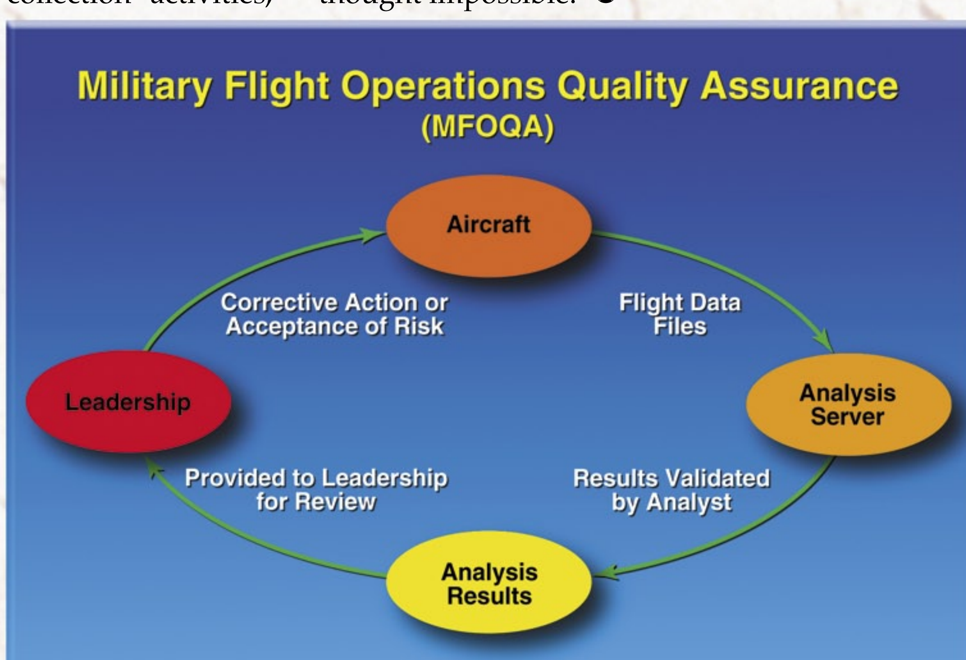
As for the third aspect, the plan is to implement MFOQA analysis on any aircraft that can provide the necessary data. This is where it gets tricky. Through our review of current technical capabilities we've discovered some platforms provide the data through existing data collection activities, where as others need a minor modification or addition (i.e., simple software upgrade, installation of an inexpensive data collection device, or simply the purchase of recording media.) Some platforms require a larger modification effort, such as a major software upgrade and/or a hardware modification. In addition, a few platforms will incorporate MFOQA data collection requirements in their fleet modernization plans.

OSD directed the implementation of the MFOQA process on all new aircraft, and on all fielded platforms where technically and fiscally feasible. MFOQA Task Force participants reviewed the capabilities of newly fielded aircraft, existing capabilities on legacy platforms, and plans for platform modernizations, then identified 20 platforms as suitable for MFOQA development.

The F-22A and F-35, as modern, digital aircraft, should enable the MFOQA data collection process as designed. The C-130J will implement MFOQA analysis with the data currently available, whereas the C-130, KC-10 and C-5 will include MFOQA requirements in their AMP and re-engine upgrades. The C-17, T-6, C-32, C-37, C-40, KC-135, F-16 and UH-1 were allocated PBD 705 funding to facilitate data collection improvements ranging from the purchase of recording media to software upgrades to major recording capability modifications. The CV-22, B-1, B-2, and several UAVs produce the data parameters needed for MFOQA analysis, though the actual data collection and retrieval processes are not necessarily in place.

Lastly, let's look at sustainment. Task force decisions call for the Air Force Safety Center to retain a centralized management authority. We will maintain the MFOQA publications outlining process requirements, and POM for analyst manpower as well as sustainment functions for the analysis hardware and software. The analysts, though funded through the Safety Center, will remain at the MAJCOM to facilitate analysis results distribution, while the Safety Center will pull together the analysis results from individual platforms, looking for issues that may affect the AF as a whole.

The overall goal of MFOQA is to make AF flight operations safer and more efficient, and thus more effective. Implementation of the MFOQA analysis process provides a level of insight previously thought impossible.



Task Prioritization In The Evolving Tactical Environment

CAPT NICK "BONIS" HUET
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USAF Photo by SSgt Tony R. Tolley
Photo Illustration by Dan Harman

The wingmen freshly emerging from the fighter and attack Formal Training Units (FTU) are required to perform more demanding in-flight tasks than their predecessors in the same weapon systems. With the introduction of new avionics such as improved radars, advanced targeting pods, and Fighter Data Link (FDL), the fighter pilots of today are forced to cipher through more information than ever before. This increases their attention on the multiple "drool buckets" of the cockpit, and reducing the amount of time they spend looking out the nice big window.

In the Eagle community, we pride ourselves on being the owners of air superiority, and the keepers of the air-to-air training rules. For those not familiar with the AFI 11-214 Training Rules (TR) governing the safety of simulated air combat, here's the skinny. These rules pertain to every aspect of air combat training that can actually be regulated for safety purposes. They highlight weather restrictions for different maneuvering categories, bubble restrictions (how close you can get to an opposing aircraft), low-altitude ROE, altitude block adherence, terminate/knock-it-off procedures and many other facets of the training environment. These rules, by their nature, exist mainly to mitigate two opposing aircraft from hitting one another--they do not provide guidance or regulation to keep like formations safely de-conflicted. Although a set of Air Force Instructions dealing with element de-confliction would be nearly impossible to write and implement, it's a sobering topic worthy of constant review and discussion. The ever-improving cockpits of today's fighter aircraft only make this topic more pressing. The probability of like-element mid-airs goes up drastically due to task saturation and reduced positional Situational Awareness (SA) of what's going on in the aerial arena due to sensor-array fixation.

"Iron 72 locked group bull's-eye 270/30, 25,000 hostile." "Iron 72, Darkstar, locked west group." "Iron 71, fox three middle group, crank east … Iron 72 drop lock, target east group 15,000." "Iron 72."

The above communication excerpt is a fictitious example of the bane of an Eagle wingman's existence; letting your bro's down because you didn't find your sort and failed to target the appropriate group. In this hypothetical scenario, our wingman, callsign Iron 72, will be most concerned with being debriefed on his tactical performance during this particular intercept. But, the outcome could be much worse than a wrist slap from his flightlead. Imagine the outcome if this inexperienced wingman collided with his flightlead due to task saturation, sensor-array fixation and lack of positional SA. This is a very real and scary threat facing the fighter pilots of today, and it's not limited to the air-to-air arena. With improved radars, air-to-ground targeting pods, advanced instrumentation and moving map displays; the fighter jocks of today must remember to continually update their SA of the outside world as well as that of the tactical environment (located primarily on their displays.) It's a challenging feat to say the least, especially for a young wingman primarily concerned with finding the right target and not letting down the rest of his element.

As technology progresses in current fighters, and new frontline aircraft like the F-22A Raptor and Joint Strike Fighter emerge, pilots must remember to balance tactical awareness via sensor manipulation with "old school" external SA. This in-flight prioritization must be continually driven into the craniums of all tactical aviators, and be the baseline fundamentals for each MWS's tactics and standards. This concept becomes even more pressing when dealing with large force employment scenarios where some of the participating aircraft are FDL capable while others are not.

With the improved SA that data link affords today's fighter pilots, it can become very easy to find yourself comfortable in a de-confliction scenario that once made the hair stand up on the back of your neck. Improved instrumentation, and the use of data link, can be a great asset, but don't rely too heavily on it when dealing with de-confliction. During more than one LFE mission at Red Flag, or similar training environment, I have mistakenly believed I was safely de-conflicted from opposing aircraft--only to get "dusted off" by a jet that wasn't being broadcasted on the link, and I didn't pick up on radar. In most of these cases, the de-confliction issue was caused by me being outside my altitude block, and under the assumption that no one else was around. These mistakes are frustrating due to their simplicity. It's even more frustrating being on the other side of the coin. While I have caused a few scary conflicts due to my own buffoonery, I have also sucked up some seat cushion as other jets almost speared my aircraft while I was flying safely within the constraints of my altitude block. This all too common phenomenon warrants a continuous adherence of the training rules, as well as a "grass roots" approach to instructing and mission briefing. The lesson in all this being: no matter what you see on your displays, no matter how high you believe your SA to be, always remember to stick to the basics and adhere to the training rules, and keep your cranium on a swivel during even the most benign phases of flight.

Here are some points to ponder for folks looking to take some nuggets of advice away from this article. Remember, as the number of Low Observable (LO) assets entering the inventory such as the F-22A Raptor increases, the easier it will be for these aircraft to unknowingly become a conflict to your element. Further complicating the problem are the ingress speeds of aircraft such as the Raptor. It can exceed Mach-two, over twice as fast as strike trains of F-16s or F-15Es. These increased speeds, coupled with their ability to elude radar, make them not only a formidable asset to our combat Air Forces, but also a formidable threat to friendly aircraft. The improved sensor arrays of these new jets can effectively increase the SA of their pilots, but they don't currently share this with the rest of the assets in theater. F-22As currently employ using an FDL network that is only shared amongst their elements. Although future software will allow them to broadcast this to the rest of the link-capable air packages, in its current state their FDL only benefits them. The result is a LO aircraft with a mind-boggling amount of displayed information being fed to the pilot, keeping his eyes inside the cockpit as opposed to the outside world, all while he is overtaking friendly forces at speeds in excess of Mach-one.

Sound like the unsolvable problem? The intent of this article is not to intimidate mission commanders by highlighting the de-confliction issues they may face. Nor is the intent to draw attention from the real mission at hand: killing people and breaking things. It is simply a reminder to reiterate the mindset that has kept us the strongest, and most lethal, Air Force to ever take to the skies. Get the mission done in the safest matter possible.

Flying is inherently dangerous. Technologies of the future, while oftentimes affording the improved outcome of any given air battle or strike mission, can also hinder even the simplest administrative aspects of a mission. Continue to preach the basics, reinforce the training rules, and think outside of the container when employing with new assets. The fewer aircraft we run into each other, the more we'll have to take it to 'em in the AOR.

The Importance Of Monitoring

CAPT MIKE GUISCHARD
58 SOW/SEF
Kirtland AFB NM

Human factors are an increasingly important area of aviation safety today given the rate of technological increases in our airplanes. These technological advances allow for a greater degree of automation in our airplanes than ever before. Automation has generally been received well by both civilian and military flight crews. Human factors basically describes our interaction with the automated hardware that reduces our workload. However, the same flight crews that have applauded automation have not taken the time to understand how we interact with the hardware … or how it may induce dangerous situations.

Increased automation in airplanes *does* translate into lower workloads. With higher levels of automation, more time is available to devote to other tasks. Task prioritization is enhanced. It would be ridiculous to have an automated function in your airplane that causes a particular task or event to become more work intensive than accomplishing it manually. But … there is always a "but." Earlier, I told you that we have not taken the time to understand how we interact with automation (other than just saying we like it and we want more of it.) What we don't understand from a human factors perspective is that automation requires MONITORING. And sometimes, it seems as if that monitoring is more bothersome than simply accomplishing the task yourself. Furthermore, monitoring is something that we as humans, do not accomplish very well. In fact, as time progresses the effectiveness of monitoring decreases. This is where aircrews get themselves into trouble. The amount of workload may not decrease substantially given that part of the time we are freeing up—now needs to be devoted to monitoring the automation! If a particular (now automated) task used to take ten minutes, it does not follow that we now have ten minutes of free time. Part of that time must be spent monitoring the automation, so you may only free up eight minutes. To further illustrate, take the idea of cruise control. You take a road trip to Las Vegas that takes nine hours in a vehicle without cruise control. During those nine hours, you divide

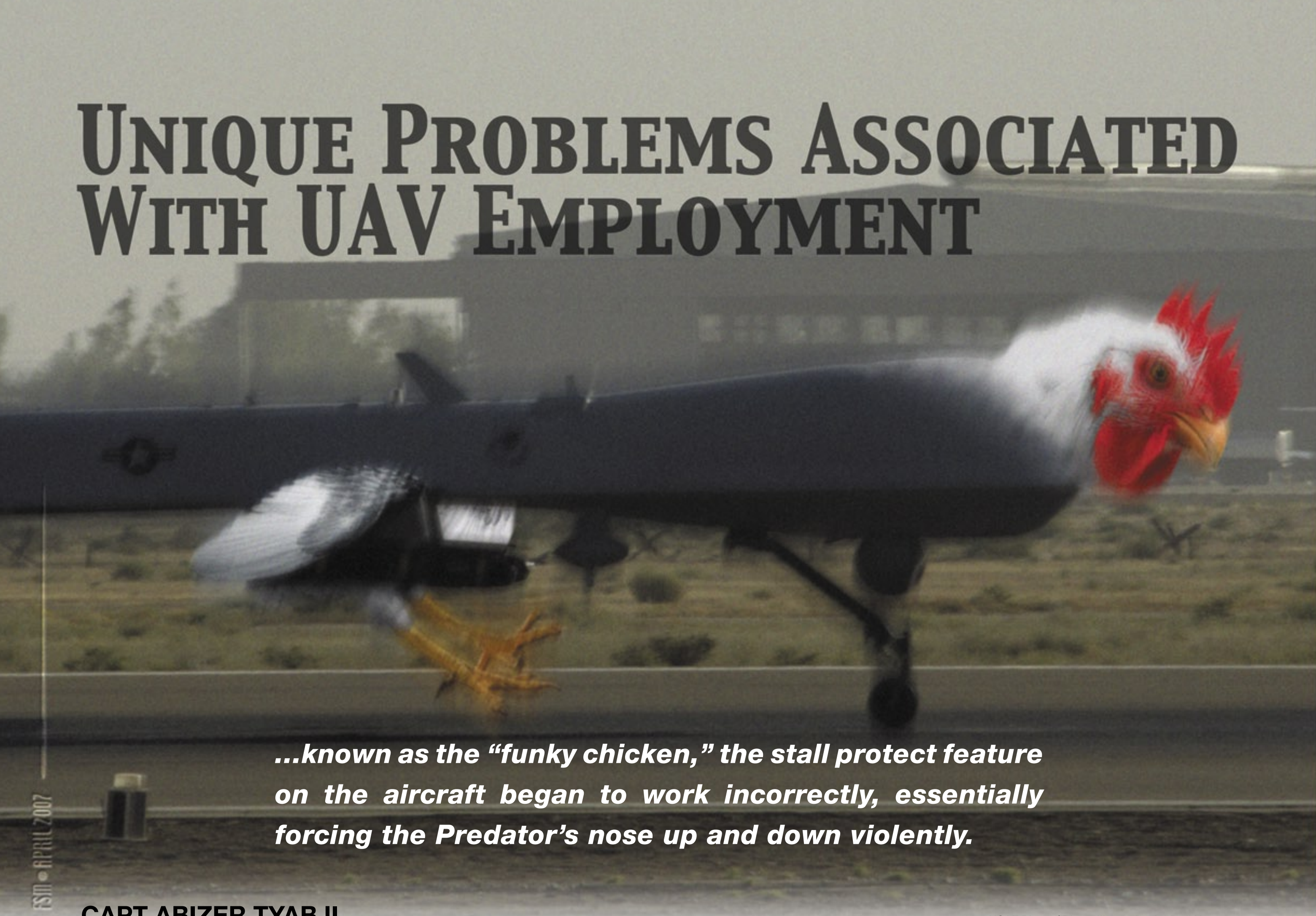
USAF Photo by TSgt Keith Brown

your attention between the traffic, highway signs, police cars, hazards and your vehicle speed. If you buy a car with cruise control and use it to drive to Las Vegas, it does not follow that you now only have to devote your attention to everything except your speed. You still glance down at your speedometer occasionally to see if you are traveling at the proper speed. Granted, you are looking at your speedometer less than without cruise control, but part of your time is now spent monitoring the cruise control.

To demonstrate the absolute importance of monitoring your flight deck automation, I would like to share a story. I was part of a crew deploying from Japan to the Philippines for a three-week exercise. It was a fairly straight forward trip, consisting of three hours of airways over water. We had a very experienced crew with instructors and evaluators occupying all the flight deck crew positions. We climbed to 17,000 feet, and set the autopilot. To occupy ourselves, the flight engineer pulled out his Dash One, and we began discussing various aircraft systems. To be sure, this was a low workload situation. The only things we had to do were monitor the autopilot (course and altitude), give our position reports, and try to stay awake by answering the engineer's questions. About one hour out from landing we passed over a NAVAID on an island north of the Philippines. As we passed the station, I happened to glance at the Distance Measuring Equipment (DME) and noticed the min DME read 3.1. This momentarily confused me since I expected to see something less than 3. Naturally I looked at our altitude, and saw that we were at 19,000 feet. This was not what I expected to see, so I stared at the altitude trying to reconcile what I was seeing with what I thought I knew. My mind could not overcome the discrepancy. I glanced down at my flight plan to see the last clearance I had written down. Sure enough, it said 17,000 feet. I looked at the altitude again, and saw we were level at 19,000 feet. I never announced the discrepancy to the crew, as I finally came to the assumption that I must have missed a clearance to climb to 19,000. It was a good altitude for the direction we were traveling, and it made sense. After getting into radar contact with Manila Center, the controller queried us as to why we were at 19,000 feet. The pilot replied that we were at 17,000 feet. Then I told him we were in fact at 19,000 feet. Silence ensued. I assume the pilot was experiencing the same mind block I had experienced—trying to reconcile what he saw (19,000 feet) with what he thought to be true (17,000 feet.) After the uncomfortable silence ended, the pilot announced that the autopilot was not engaged. During the next few minutes we figured it out. At some point during the flight the autopilot had kicked off, and we had climbed exactly 2,000 feet. We had failed to monitor the autopilot. With the autopilot disengaged, the aircraft had climbed through opposite direction traffic at 18,000 feet and leveled at exactly 19,000 feet. We had continued giving our position reports for 17,000 feet, and we were extremely lucky we didn't experience a mid-air collision since Oceanic Control thought we were at a different altitude. When I first noticed the altitude discrepancy, the fact that 19,000 feet made sense influenced my decision not to speak up. Had I seen 18,500 or 19,400 a red light immediately would have gone off in my brain, and I would have said something. 19,000 feet, although completely random and accidental, is where the airplane wanted to fly.

Bottom line: You must monitor the automation in your airplane. Automation is a good thing, freeing up time to devote to other critical tasks. But remember, part of that free time must be spent monitoring the equipment that helps you do your job. Finally, remember that monitoring is something that humans don't do well, and our ability to monitor effectively decreases as the length of time spent monitoring increases. Fly safe!

Unique Problems Associated With UAV Employment



...known as the "funky chicken," the stall protect feature on the aircraft began to work incorrectly, essentially forcing the Predator's nose up and down violently.

USAF Photo / Photo Illustration by Dan Harman

CAPT ABIZER TYABJI
57 WG
Nellis AFB NV

Some would say that luck is the random occurrence of fortuitous events. Others have said that anyone with the right aptitude and fortitude will create their own luck. While events that happen in aviation are potentially random, as long as pilots can control as many variables as possible, they can successfully create their own luck. The key is to know and understand their respective airframes inside out. Recently, in the United States Air Force, Unmanned Aerial Vehicles have grown in popularity, and are being used on an ever-widening scale. While the advent of this new technology is fabulous, it also comes with its own perils.

Pilots in manned airplanes face an array of decisions in order to combat different emergencies. Pilots controlling unmanned airplanes face similar issues, while at the same time being introduced to a whole slew of new issues that few have considered. During the past seven years, the UAV average mishap rate has been an astounding 4.28, which is quite high compared to the Air Force Mishap Rate average during that same time of 1.12. The purpose of this article is not to justify why the UAV mishap rate is so high, but to discuss challenges UAV pilots face that are different from those of conventional aircraft pilots. The different aspects that will be discussed include degraded Situational Awareness (SA), poor pilot/airplane interface, CRM issues, as well as reaction time. These factors all contribute to extra challenges that UAV pilots face.

Tactile sense to a pilot is extremely important. Even though engine instrument indications may appear normal, the slightly off-kilter sound that comes from an engine can give the pilot valuable insight into predicting a future problem. Cockpit sights, sounds, and smells are extremely important to building a pilot's SA and emergency awareness. Pilots of Air Force UAVs are deprived of these indications, and the SA associated with them. To combat the lack of tactile aircraft feel, UAV pilots need to be extremely disciplined in ops checks, and keep on top of instrument indications. That is all they have to indicate the health of the airplane. Because of the lack of tactile feel, emergencies can appear more suddenly, and catch pilots unaware. Also, because of the limited camera angles that UAV pilots have, overall SA of airspace is degraded. Keeping on top of all tools, including radio traffic and Link 16, will keep the UAV pilot in the loop.

The next problem facing UAV pilots, especially in the Predator community, is an extremely poor pilot-to-airplane interface. Predator pilots have to navigate a series of obscure menu pushbuttons to access different airplane functions. These menu pushbuttons are not always logically laid out, and can be time consuming. It is extremely inadvisable for a Predator pilot to memorize keystrokes—one pilot, attempting to key in predetermined keystrokes, accidentally shut down the engine by just pressing one wrong button. While there are currently no good solutions to solve this issue, two items come out of this. First, Predator pilots need to have a very good feel for where every item is in the menu structure. Secondly, they need to be involved in future aircraft development, and work with engineers to build an interface that mimics one of conventional airplanes.

One issue that is unique to UAV pilots, and probably not discussed outside the community, is boredom. UAV missions tend to be long, and very monotonous. A common term heard throughout the community is 'Groundhog Day,' because missions tend to be similar, and not terribly exciting. Certain parts of missions, especially transit time between targets, can be grueling and long for UAV pilots. Because of the lack of tactile feel for the aircraft, the pilot can become disengaged. This can obviously lead to a dangerous situation. Once again, discipline is an important factor in keeping the pilot involved with the UAV. Good CRM and good communication with the sensor operator are paramount. Keeping up a good crosscheck, as well as constant scans for traffic, are essential for aircraft safety.

Probably one of the most significant challenges facing UAV pilots today is reaction time. While no formal studies have been accomplished to judge how long it takes from the beginning of an emergency to the loss of an aircraft, in my personal experience, it's much quicker in the UAV than manned airplanes. As discussed earlier, with the lack of tactile feel, emergencies can take UAV pilots by surprise. In many of the Predator Class A mishaps, the pilot only had 10-14 seconds from initial indications to loss of the aircraft. Part of this comes from the satellite link with the UAV. There is a several second delay from pilot input until it makes its way to the aircraft. That, coupled with the aircraft flying an uncommanded position, makes handling sudden EPs precarious. If the aircraft is moving to an uncommanded position, the most important thing for a pilot to do is get control of the aircraft and get the autopilot functions turned off. In the Predator, this is accomplished by use of the landing configuration button (reflected in the recent DASH-1 changes, and the addition of a "loss of control" checklist.)

With only one engine on the Predator, any sort of engine malfunction automatically becomes perilous. The main concern with engine malfunctions, as discussed above, is controlling the airplane with a satellite link. Because of the time delay in talking to the aircraft, landing the airplane with that link becomes nearly impossible. That, coupled with the fact that most active-duty Predator pilots are not landing qualified anymore, adds to the situation. While manned aircraft typically have the option to land at an emergency airport, or (worst case) bail out; Predator pilots only have the luxury of keeping the airplane away from populated areas, and making a long straight-in approach. Even with a successful landing, the chances of airplane recovery are slim in the AOR, where most non-training missions are flown.

So far we've talked about several limiting factors that inhibit a UAV pilot: lack of SA and tactile feel, poor pilot interface, and lack of reaction time. There was recently an incident in my squadron that effectively demonstrates the above items, and honestly, it is only by sheer luck we didn't lose the aircraft. The pilot was flying the Predator in our AOR at FL220. He was preparing to Fence-In when suddenly, the whole screen started to do what is known as the "funky chicken." In actuality, what had happened is ice froze over the AOA vane, making the AOA readings inaccurate. Because we were receiving inaccurate AOA readings, the stall protect feature on the aircraft began to work incorrectly, essentially forcing the Predator's nose up and down violently. It took the pilot seven seconds to react to these indications, which is good considering his degraded SA; he wasn't totally sure what was going on. He correctly applied the Landing Configuration button, centered the control stick, and hoped for the best. With the delay in satellite link, the pilot didn't try to over-control the airplane, but hoped that it would center out on its own. In similar cases, the airplane went "lost link" (didn't have control with the pilot) and was lost in eight seconds. In this case, the aircraft continued to do the "funky chicken" for 30 more seconds until it evened out its pitch oscillations. Then, the airplane settled in a 10 degree nose-low attitude enabling the pilot to recover the aircraft.

While the pilot did an excellent job of diagnosing the problem, the UAV still needed a certain amount of "luck" to recover itself. As we move forward in the expansion and development of Air Force UAVs, our goal is to make the pilot controlling the airplane, from literally thousands of miles away, as in tune with the airplane as a pilot sitting in the cockpit.

Editorial Comment by SEF: This article speaks well for Predator safety. However, when comparing Global Hawk and Predator UAVs, future development requires a good balance between automation of basic aircraft control and enhanced human-machine interface to facilitate timely pilot intervention.

Military Flight Operations Quality Assurance

The leading MFOQA goal is mishap reduction through the identification and mitigation of risk inherent in flight operations.

Kay Armstrong

USAF Photo by James Haseltine

The Accident Prevention Crystal Ball: MFOQA

Photo Illustration by Dan Harman

Anonymous

In May of 2003, the Secretary of Defense challenged the Department of Defense to reduce flight mishaps and accident rates at least 50 percent by the summer of 2005. To meet this challenge, the Air Force responded by adopting a predictive strategy to mishap mitigation called Military Flight Operations Quality Assurance (MFOQA).

The United States Air Force defines MFOQA as a program for the proactive analysis of flight data to detect precursors to aviation mishaps and identify mitigation procedures. In other words, identify the cause of operational deviations or aircraft system malfunctions prior to mishap or accident occurrence. An aircraft accident prevention "crystal ball" if you will. This program's fundamental approach is to collect data on aircraft systems, components, and pilot procedures to create trend information, and identify where future mishaps will occur. Much optimism surrounds this endeavor as it presents a paradigm shift from our historic reactive approach to accident prevention. Although our past efforts to reduce flight mishaps have provided considerable success, accident rates have since plateaued at an unacceptable level.

Over the last 50 years there has been a marked reduction in the frequency of aviation accidents, suggesting that military aviation has become safer. According to the National Defense Research Service, however, this fact also reveals that while accidents are less frequent than in past years, recent improvements in aviation safety have slowed and appear stagnant. Although the current mishap rate is relatively low, not implementing new prevention strategies will ultimately have a corrosive affect on military aviation and combat readiness.

"Next generation" aircraft introduced to the operational Air Force cannot afford accident rates similar to their predecessors. The astronomical costs of materials and repair demand more effective accident prevention measures. Aircraft such as the F-22 and Joint Strike Fighter have been developed with efficiency in mind. Their superior capabilities will equate to increased lethality, and therefore, allow for a smaller force size. These leaner forces will be devastated should they be subject to our current accident rate. Consequently, the Department of Defense is relying upon MFOQA's predictive strategy, and proven success in the commercial aviation industry, to provide the necessary response to mishap prevention, and ultimately lower accident rates.

According to the Flight Safety Foundation (FSF), the airline industry introduced FOQA in the 1990s to facilitate a reduction in mishap rates. By tracking previously unmonitored aircrew deviations (such as hard landings and improper braking technique), airlines could now focus on these trends, and amend their training procedures to eliminate such errors. Originally, this data was collected via mechanisms similar to the crash-survivable voice recorders found in virtually the entire commercial airline fleet. Retrieving the desired data was usually labor intensive and took considerable time to process, so it hampered trend analysis. As technology evolved, so have the methods to collecting critical flight data.

As previously addressed in the June 2003 issue of *Flying Safety*, success of the MFOQA program revolves around an advanced data collection process. Sensors and data recording devices can now be modified to monitor virtually any system of an aircraft, as well as pilot inputs. Unlike older generation flight recorders, analysts now use Quick Access Recorders (QAR) that consist of very high speed, secure computer software. If desired, filters can be installed to track only specified events that are of special interest to a particular flying organization. Once gathered, the information is displayed in a graphic format, and can be tailored to desires of the user (i.e., specific aircraft, date, location, etc.) Animation is also available to allow analysts greater insight to a specific flight operation. These capabilities are available for the sole purpose of allowing the user to better identify the root causes of mishap events.

Although the MFOQA program primarily focuses on flight data predicating a mishap event, data collected during "day-to-day" operations can be utilized to support various accident mitigation programs. Due to the immense data collected during a single sortie, analysts need to disseminate and funnel the information into appropriate categories to make their job more manageable. Pilot induced errors can be tracked and analyzed by knowledgeable aircrew members to determine trends and modify procedures. In addition, data can be fed to other information programs, such as the Aircraft Structural Integrity Program (ASIP), Engine Structure Reliability Program (ENSIP), and Reliability Centered Maintenance (RCM). As Lt Col Armstrong stated in her article, long-term trend information and analysis is there to provide insight to a flying program's overall strengths and weaknesses.

MFOQA programs present a new approach to aviation safety. The collection of objective data, without human intervention, can help identify dangerous trends. Then, we can intervene to prevent accidents. The predictive strategy of MFOQA provides a departure from the reactive approach to mishap prevention, and will, hopefully, be the catalyst in reducing accident rates.

AFSC/SEF Editorial Comment by Kay Armstrong, Contractor, UTRS, AF MFOQA Project Manager:

As emphasized by the author, MFOQA is a proactive approach to mishap prevention that focuses on the operational causes of accidents. Deviations from established flight operations expose aircrews to a certain amount of risk. MFOQA analysis identifies and quantifies the depth and breath of the deviations and allows commanders to assess the level of risk faced by the unit.

MFOQA and other data monitoring programs are dependent upon an efficient and effective data collection process, as described by the Aircraft Information Program (AFPD 63-14.) The life-cycle sustainment puzzle is held together by the synergistic effect of programs such as MFOQA, ASIP, ENSIP, and RCM. Together, these data analysis processes provide leadership insight into the operational readiness of the fleet.

Figure 1

MFOQA IN ACTION IN AETC

MR. TOM HALLETT
559 FTS
(T-6) Safety Office, Randolph AFB

Fortunately for AETC and the T-6 flying community, MFOQA is alive and well, and has been for a few years now.

Although I (Mr. Tom Hallett, retired USAF Lieutenant Colonel, T-6 Initial Instructor Cadre) have been the AETC Analyst since September 2004, a demonstration project was conducted at Randolph AFB from May 2003 to January 2004 to evaluate the capabilities of a MFOQA program to support safety, training, and maintenance functions. The test also evaluated the program's capability to objectively manage and monitor risk. Over 2,500 flights were analyzed. Coincidently, while the demonstration was progressing, an ongoing AETC study implicated certain flying maneuvers which may have caused several low oil pressure excursions. Specifically, in September 2003, a fleet-wide flight crew information file (FCIF) modified how spins, nose-high recoveries, and stability demonstrations were to be flown. The ongoing MFOQA data analysis validated the suspected low oil pressure excursions were occurring during the pre-modified maneuvers, and the data analysis demonstrated a direct correlation between the number of spin rotations and decreasing oil pressures. This analysis convinced leadership to modify the spin maneuver and change the Advanced Handling Characteristics (AHC) demonstration sortie profile for instructors. Follow-up data analyses showed a significant decrease in low oil pressure excursions. Additionally, a by-product of these analyses highlighted a lack of regulatory and supervisory guidance for aircrews regarding maximum bank angles when operating close to the ground during the final portions of Emergency Landing Patterns (ELPs). Subsequent policy changes increased pilot awareness of these ELP risks and invariably improved flight operations safety.

Today, I work out of the 559 FTS (T-6) Safety Office at Randolph AFB and strive to provide timely aggregate and individual feedback to squadron

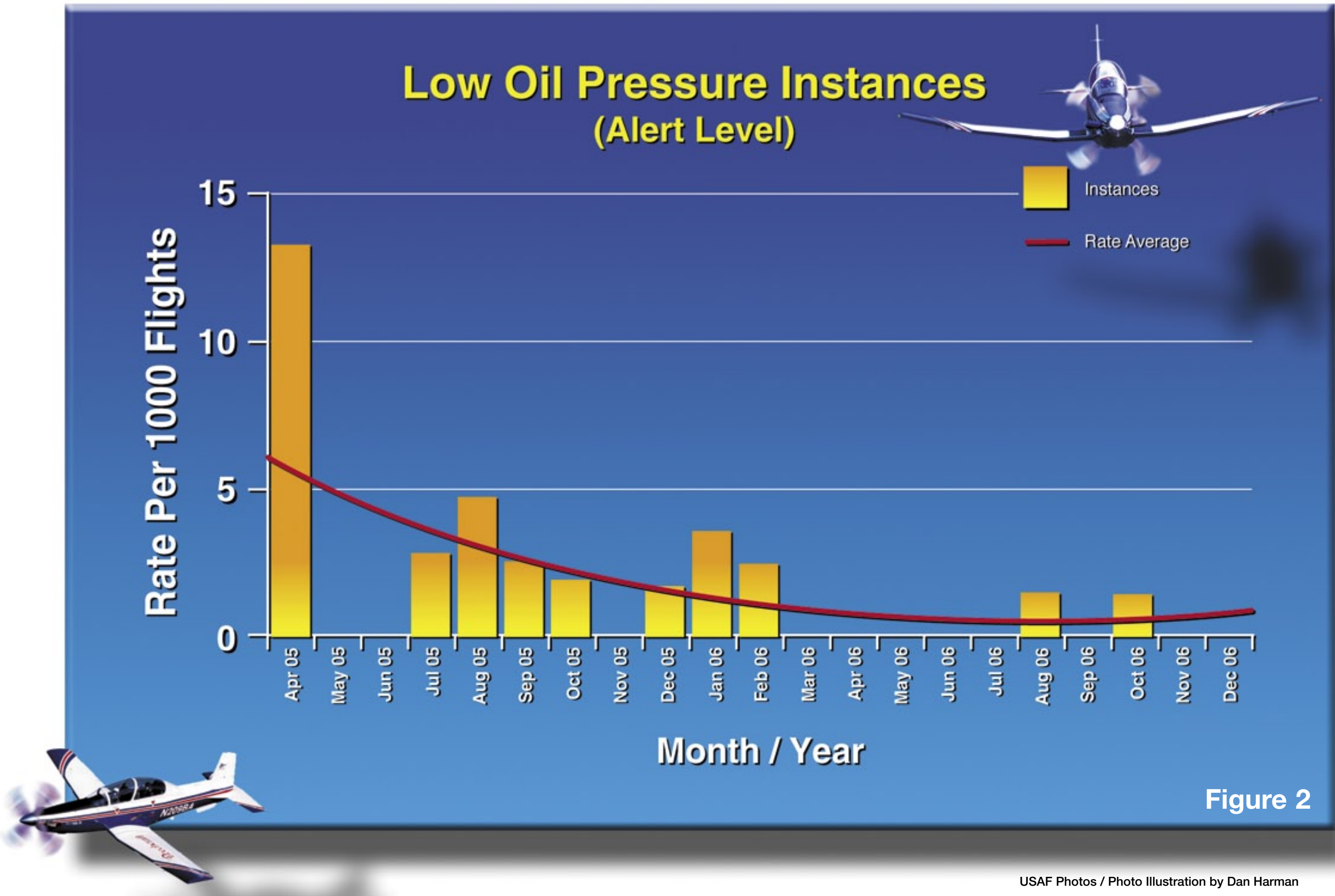


Figure 2

USAF Photos / Photo Illustration by Dan Harman

Data analysis demonstrated a direct correlation between the number of spin rotations and decreasing oil pressures.

leadership and instructors alike. I look for trends with aggregate (pilot de-identified) analyses, generally looking at a week's worth of flying at a time. My validated analysis results are forwarded to the operations officer for action to ensure any requisite aircraft inspections have been accomplished and aircrews made aware of any flying operations transgressions. Additionally, it's not uncommon, and generally on a weekly basis, for an instructor or maintenance supervisor to ask me for same-day assistance to, for example, replay a complex or confusing flying maneuver or validate the extent of an aircrew's reported over-speed or over-G. The analysis software tools allow for a variety of end products, from raw data, graphs, and even video replays. Here are a few examples: Figures 1 and 2.

Occasionally I'm a guest speaker at squadron Continuation Training (CT) meetings, highlighting any recent flying trends or suggesting techniques to avoid new or recurring instances of operations limits exceedances. Additionally, I produce a quarterly AETC MFOQA Summary, normally highlighting command program updates and the most "triggered" flying exceedances. These summaries are sent to all T-6 flying units. I also facilitate a quarterly HQ AETC Steering Committee Meeting, attended by pertinent directorate and 19AF representatives, and designed to highlight overall program direction and to discuss recent flying trends.

Although T-6 MFOQA processes currently are employed only at Randolph AFB, the program is set to expand to all T-6 bases beginning in late 2008. T-6 flight data recorder hardware/software modifications will allow for higher fidelity and greater quantities of recorded data. Additionally, with the move to a user-configurable and web-based data analysis tool, all T-6 flight data will be more accurately analyzed with results allowing my recommendations to be made accurately from an aggregate fleet perspective.

As you can see with the AETC MFOQA processes, we've had a head start as compared to other commands and major weapon systems, and continue to strive to be the USAF flagship MFOQA program. This MFOQA stuff works!!

USAF Photo by SSgt Bill Thompson / Photo Illustration by Dan Harman

CAPT DAVID A. BOPP
317 AG
Dyess AFB TX

… The C-130 shutters to a halt. The flight deck settles and goes still. Nobody says a word. After what seems an eternity of silence, the aircraft commander looks at me and says, "Why did you let me do that? Why didn't you call go-around?"

It was our crew's second deployment together. We had lived in the same 12-foot by 12-foot cell for about 175 days that year. My AC was a Major in the Reserves. He had several thousand hours in the C-130 and had been an instructor for just under a decade. Our Navigator was a Lt Col with several thousand hours and was an instructor for one of the major airlines. I was a 1st Lt copilot with about 600 hours in a C-130.

We considered ourselves mission hackers. We had learned all the tricks to getting the mission done in the AOR. We had it down. After several deployments with the same dudes, you don't even have to talk anymore. You can finish the other guy's sentences for him most of the time.

The AC never cut corners when it came to running a safe crew. He was relentless on things like wearing helmets and body armor, drinking water, getting enough food, and sleep. We would discuss EP's when we had free time on the plane. I can remember thinking that some of the checklist items were just tedious, and I didn't think we should have to do them every time. But, like a good supervisor, he set the example and I fell in line.

We were alerted that night, just like we had been every other night for the last 80 missions. It was another standard mission, a double run up north. It had become routine to say the least. We were more than familiar with the locations, and didn't expect anything different than the last 10 times we had been to that airfield.

USAF Photo by SSgt Lance Cheung
Photo Illustration by Dan Harman

The first half of the mission was normal. We were just about to make our last stop "in the box." The descent went well, except we were high on final, and the AC discussed landing long. I never bothered to clarify what the AC meant by a long landing. I just accepted the fact that he knew his limits and wouldn't push them. He never had before.

The next thing I knew the aircraft was passing midfield and I remember everything going into slow motion. The crew just sat silent, and watched as the feet remaining markers went under us. I could feel the tension of the crew building up as the five board went past, then the four board, and finally the three board. We touched down a couple of feet past 3000 feet remaining marker. The pilot used full brakes and reverse to stop the aircraft … with about 200 feet of runway left in front of us.

I remember how the AC looked at me after we stopped. He looked shocked and disappointed, as if I was the one that landed long and almost went off the end the runway. "Why didn't you call go-around?"

Why *didn't* I call go-around? That's a tough question. Like any situation, there are probably many reasons. The first was the AC had never gotten us into a situation requiring a crew input of that magnitude before. The pilot had golden hands, and we were used to it. I had flown with him on countless missions, and had seen him do amazing things with a C-130. He seemed immune to situations like this one.

The second reason was his crew management. He was very CRM and safety-oriented. He included the crew in all aspects of flight, not that he needed our inputs. And, he used ORM to manage the risks and keep things as safe as the mission would allow. I think the crew became lax under such caretaking. We were so used to him making things work out, that we stopped backing him up.

A third reason might be the difference in rank and experience. I was a low time 1st Lt copilot, while he was a high time Major and instructor. I held him up to a standard that was not achievable. I had the belief that he was not capable of making mistakes. Besides, what input could I possibly give to him? And, if there was an input, who was I to give it?

Well, now that I'm an instructor, what did I learn from that event? The first thing I learned is that copilots can make up at least three pathetic reasons for not doing their job and trying to dodge responsibility. The AC had covered it many times, and had definitely empowered the crew to make the go-around call. We had discussed enough EPs and other scary situations to know that was what he expected from me. Perhaps that's the reason why he was disappointed with me that day.

The second thing I learned was to establish limits for myself. Not only to establish those limits, but also keep the crew informed of those limits so they can help keep me out of trouble. Some things I always brief now are our commit to landing point, and a defined go-around point for each runway. That way, when things start to go bad, they can keep me from talking myself into a really bad situation.

The last thing I learned is to keep the crew empowered. I remind them often to be on the lookout for things that are dumb, dangerous, or different. It's tricky to keep them in the game when things are going well, or when they don't have very much experience.

That event really woke me up. I still stay in touch with my AC. He taught me a lot about flying the C-130 and crew management. The most important thing I learned from him was to set the example. As an instructor, hundreds of eyes are constantly watching you—to see what is important and what can be overlooked. If you want to set a standard of safety in your community, you have to walk the walk.

MOTIVATION

CAPT CHRIS "YETI" PERKINS
35 FS
Kusan AB, ROK

What drives you? Why do you get out of bed in the morning? Why do you hit the snooze button on the alarm clock three times, leaving only 15 minutes to get out the door and to work? Why do you go five over the limit all the way to the gate? Why do you turn wrenches, sit in the tower, or fly planes? Do you perform to the best of your ability? Do you work an hour late, or count the seconds off the wall clock to get out the door five minutes early? Are you always preoccupied with something else you'd rather be doing? Are you focused on the mission? Who are you, what motivates you, how does that impact the people around you? Why do I ask these questions?

I ask these questions because I believe you have to examine and know yourself before you can begin to understand those around you. Introspection and self-examination; every shop in the Air Force has a checklist they run prior to an inspection to see if they are up to par and completing their mission. I can't answer these questions for you. I'm not an inspection agency. I can't tell you if you are messing up. I'm just a guy with experiences I've learned from. A smart person once said, "Learn from the mistakes of others, because you certainly cannot live long enough to make them all yourself."

There, I've said it; hopefully I have your interest. So now it's story time. What motivates me? Of course the answer is … it depends! And it changes to meet the scenario. I grew up in Alaska, where flying in an airplane was really the only way to get anywhere. A Cessna on floats or a Super Cub on tundra tires is like the pickup truck (with a lift kit) in the Mid-West, or a taxi in New York. My folks swear that from the time I was in diapers I told people I was going to be a pilot. I loved the freedom, the adventure, the perspective, and the challenge of flight. I got my first job in high school to pay for flying lessons. I went to college to design airplanes, and found out that with an ROTC commission, I would be eligible for flight training. There is some motivation for good grades!

I earned a pilot slot and reported for flight training to fly the T-34C in Pensacola. This Navy exchange program was a six-month Air Force appreciation course; nonetheless it is a highly-competitive process where you are tested daily. I wanted to fly fighters. I had to excel. I had to try to be the best.

I managed to earn a coveted slot in the T-38A. In the process, I was faced with the challenge of upgrading from a light single-engine turbo-prop, to a supersonic twin jet. Again, another

USAF Photos Courtesy of Author / Photo Illustration by Dan Harman

competition to earn a fighter. Then six rides away from graduation and earning my wings, I had the standup EP that hadn't been covered … on my night solo ride.

Unbeknownst to me, or the other three pilots who had flown the jet since it had been through a major maintenance action, the ejection seat was not attached to the aircraft. Sure, the seat was there, everything looked like it was where it was supposed to be. Problem was--the seat wasn't bolted into the jet. While initiating a pushover, after a maneuver to burn down fuel to landing weight, the aircraft experienced negative G. The seat, not being bolted, slid up the rails just as if I had initiated an ejection. The canopy piercer and my helmet shattered the canopy. As the seat rode up my grip on the control stick pulled it back, causing positive G to put me and the seat back inside the jet. Plexiglas from the canopy shelled out the left motor. Since the seat moved, it disconnected the oxygen and communication cords.

So there I was, 25 miles from the field, at night, no canopy, single-engine, and NORDO. The mantra in undergraduate pilot training when faced with an EP is "Maintain aircraft control. Analyze the situation. Take the appropriate action. Land as soon as conditions permit." Did I say this to myself? Heck no! But I was going to fly the jet until it wouldn't fly, dig into my checklist to see if I could fix anything, follow all the NORDO procedures, and get to terra firma ASAP!

I didn't hurt until I landed. Once my wheels chirped on the runway, my left shoulder felt like it had been thrown under a bus. There was blood all over the cockpit, down the side of the jet, and all over me. I'll never forget the shocked look on the face of the fireman who chocked my tires. His eyes were bulging like baseballs protruding from his face. I got to experience my first ambulance ride.

The doctors flushed my eyes and started stitching up my lacerations. When they sat me up, my squadron commander was in the room. Oh cr*#! Up to this point, I hadn't thought about the fact that I'd brought a jet back with six-figure damage. I was just happy to be home! The med techs put me in a wheelchair and rolled me down to X-ray to check my shoulder. When they rolled me out, the OG was there. Oh cr*#! I'm only six rides away from graduation; am I ever going to get to fly again? The first words he said were "Are you okay, how you feeling?" What he said next immediately changed my perspective.

"Son, I'm just glad you get to call your mother tonight, and I don't have to." Oh man, that is going to be harder than what I just went through … So why do I get out of bed every morning? Because I love my job, I get to fly and lead F-16s … I even get paid for it. Why do I spend long hours at (and after) work studying? Initially, it was because I wanted something. Somewhere along the line, that evolved into self-preservation. That night it changed because I want to come home to my family every night. Now it's because I want my flight to be lethal, and bring all the pilots in my flight home to their families, and not need to expose another flight to the threat in my target area. I've also learned to enjoy teaching. What will this evolve to? Time will tell. Experience has motivated me to strive to always continue to better myself.

What motivates you?

USAF Photos / Photo Illustration by Dan Harman

Back To The Basics

CAPT CHARLES. D THROCKMORTON IV
436 AW
Dover AFB DE

"So there I was …" that's how all these stories start, right? I feel like I should be standing around the bar or at the OPS desk telling this story, rather than sitting in front of my computer. But I guess the message is more important than the medium. Back to the story. I was a new first pilot in the mighty C-5B on my second real world mission. It was the standard profile: leaving Dover and flying direct to the stage, minimum crewrest followed by a direct leg to a downrange location, with a lovely moonlit return leg to the stage later that night. Like I said, it was my second mission so I was trying my best to keep up with all of the Aircraft Commander's (AC's) requests as we set off on our downrange leg to off-load cargo and passengers. Between the radios, charts and all the other information that needed to be loaded into the FMS, I was pretty busy (… standard). As we got closer to the border, things settled down and we were confident that we had everything ready to go. "The calm before the storm" if you want to think of it that way. We had a plan, and were confident we could get the mission done. For those guys who operate out of downrange locations everyday, I know you are probably thinking, "What's the big deal?" Well in case you didn't notice, Freddy is no fighter jet, and maneuvering in a congested tactical environment can be rather sporty. It's best to get as much done in advance as possible in order to preserve your sanity for later.

After you finally get "in-country" and relay your requested approach is when the fun usually begins. As many of you have already experienced, you never get your requested approach (probably not your back up, for that matter) when arriving at a downrange location. Because of this, the copilot and jump seat are often very busy during the final few minutes loading new points in the FMS and making all the required radio calls/position reports. Just for fun, the local C2 agencies always make you repeat your calls a few extra times—just to add that little extra stress. As mentioned above, this was my second mission and I was just trying to keep the headset fire under control (we don't wear helmets). I was not really clearing or backing up the AC on flying the plane. Additionally, I was distracting the jump seat pilot with questions about how to "load points," and "change this." That left only the pilot looking outside the cockpit. I am pretty sure that's why Instructor Pilots always called the students the Situational Awareness (SA) killers, right? This is OK for a second, but not for an extended time. Especially in the AOR where radar is at a minimum and the sky is full of helicopters, Hercs and other rapidly moving objects (some of which have no human on board.)

We finally got everything squared away and proceeded to turn inbound on the approach. Everything was actually looking pretty good. We set up for the tactical arrival (yes, even Fred can play tactical sometimes) and turned inbound. It was a clear day and we spotted the field easily. The AC maneuvered for a base turn and began to configure the airplane. Just as the AC went to lower the nose and make a bid toward the runway, TCAS issued a Resolution Advisory (RA). Instantly, all eyes went outside and started scanning for the traffic. Suddenly I spotted a white blur that turned out to be a Predator Unmanned Aerial Vehicle (UAV) pass just below the right side of the aircraft—no more than a couple hundred feet below us. The AC looked at me and asked if I had seen the UAV before. "No" was my immediate reply, of course. We all cleared base and final one more time, and made the turn toward final and the airfield.

After the uneventful landing and rollout, we taxied clear and queried tower about what had just happened. Their response was just as disheartening as the event itself. Basically they just said "Oops, sorry about that." We sat on the flight deck after engine shutdown, and talked about what had just happened. We all agreed that we were just as responsible as the other guys because we had been distracted and were not clearing as well as we should have. Don't get me wrong, it's great to load points and approaches into the FMS for SA, but don't let those "nice to have" things distract you from the things that you have to do—like flying the airplane and clearing! Back in Tweets I had an old-head reservist IP that always used to say, "Aviate, Navigate, then Communicate—always in that order." I always knew what he said made sense. I just thought I was capable of doing it without worrying too much about it. But on that day, I was reminded of my limitations as a normal human being.

The real lesson to be learned from all of this? The basics always apply ... no matter what country, or continent, you are tasked to fly in. Whether you are flying a local transition flight back at home station or a tactical mission in the combat zone, do not let complacency or task saturation take you away from the basics you were taught by your first instructor. Always take care of flying the airplane first. Navigate the aircraft in accordance with your flight plan, or as directed, and then communicate with ATC and other traffic as required. ✈

Lack of CRM can Kill

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USAF Photos Courtesy of Author
Photo Illustration by Dan Harman

I've been told the odds of having a Class A are akin to those of winning the lottery. And much like winning the lottery, I knew that an accident could never happen to me. It took a near mid-air collision for me to appreciate the fine line between life and death in the world of aviation.

From my perspective, the incident started two months before OPERATION IRAQI FREEDOM when I was assigned to refine the plan for a potential assault on Iraq. I would be copilot on flight lead for the assault force. Objective: secure the oil refineries, storage facilities and docking stations along the Al Faw Peninsula. As Iraq's only sea access, these facilities accounted for 90 percent of Iraq's oil export capability. The Iraqi regime undoubtedly knew the strategic importance of these facilities, and we fully expected the buildings to be rigged with explosives and blown at the first sign of invasion. With that in mind, we began planning a combined-joint assault with American-British forces to decisively capture the peninsula using over 50 aircraft and 1,000 special operations and commando ground forces. With two months to plan, we covered every contingency we could imagine, and if it's any measure of thoroughness the briefing was 208 PowerPoint slides long.

Initially, the mission went as fragged. UAVs performed recon, EA-6Bs rolled in to jam, and AC-130s provided the primary pre-assault fires backed up by A-10s and British Tornados. A minor issue with pre-assault fires delayed our time-on-target, but we were cleared to the objective only 15 minutes late. The primary assault package consisted of seven MH-53s, and the infiltration was predominantly successful.

Of course there was the one MH-53 that got stuck in the mud. Or more accurately, the vehicle it was carrying got stuck half-way out and the crew couldn't push it off or pull it back in. Thankfully, the AC-130 and A-10s combined fires to keep truck-mounted enemy from engaging the stranded helicopter.

Another near miss occurred when Chalk 7 landed on a subterranean bunker. I must say that my two months of satellite imagery study paid off—I had obviously found the flattest, driest bit of land for them to land on. Interestingly enough, the Iraqis thought we had planned to land on their bunker, and were so awed by our presence that they came out with their hands up. Eventually all seven MH-53s made it back to the pre-designated marshalling area more or less as planned.

Once the sites were secured, we spent the remainder of darkness ferrying reinforcements to the front lines. At this point our mission was simple: every five minutes we would launch a three-ship element to carry reinforcements to one of two landing zones near the original targets. This provided 10-minute separation between arrivals at each of the LZs. For added separation, we created two distinct hold points on the Kuwaiti side of the border for any element whose LZ was unavailable when they arrived. If the hold point was occupied, elements were to hold on course 10 miles short of the hold point until cleared by the preceding element lead. The routes into the two landing zones were separated by two miles, and de-conflicted in altitude with the northern route at 100 feet AGL and the southern at 300 feet AGL. As long as everyone followed the plan we couldn't foresee any conflicts.

The wind started kicking up sand. Within a few short minutes dust hung thick in the air, dropping our visibility down to less than a quarter mile.

A CH-47 was overtaking us on the right. His rotor path was ten feet above and directly over ours; and his fuselage was less than 25 feet from our tip path.

I'm not entirely clear on *every* detail from this point on, but here are the basics. The three earlier events—the pre-assault fires, the stuck MH-53, and the landing on the bunker—all delayed the initial assault from departing the objective on time. In turn, this delayed the British from bringing their initial wave of reinforcements as scheduled. The cumulative effect should have resulted in a steady state with one element in the holding pattern and one in the landing zone; that is until the ground forces discovered a problem with one of our new LZs. The ground forces redirected traffic, but by the time our first reinforcement aircraft cleared the new LZ the air stack had grown.

We now had an element in each objective, an element in each holding pattern, and a third holding on each course. Due to line-of-sight disruption of our radios, we had already departed the re-supply point before we discovered the severity of the backup. We found ourselves holding on the southern route with two other elements stacked in front of us. Fortunately, one element immediately cleared the LZ, leaving a single element on approach, a second enroute to the hold point, and us as the only traffic on the southern route.

We initiated our holding pattern ten miles from the primary hold point at our briefed altitude of 300 feet. This would keep us clear of all traffic except for the element behind us, and we had about eight minutes remaining before they were scheduled to launch. Of course … that's when the weather started closing in.

The wind—which had been fairly calm until this point—started kicking up sand. Within a few short minutes dust hung thick in the air, dropping our visibility down to less than a quarter mile. I continued to fly while the aircraft commander sorted out the rapidly developing traffic flow problem. That's when I saw something out of the corner of my eye that I couldn't quite believe: a CH-47 was overtaking us on the right. His rotor path was ten feet above and directly over ours; and his fuselage was less than 25 feet from our tip path. I shoved the stick forward and left diving away just as I heard the right scanner frantically yell "BREAK LEFT." The aircraft commander was screaming "I have controls!" But with the CH-47 looming in my windscreen I simply couldn't force my hands to relinquish control. I was so fixated on avoiding the mid-air collision that I continued to push us left and down as we shot through 50 feet at 60 degrees of bank with 1,000 feet per minute sink. The MH-53 is amazingly maneuverable, but the aircraft commander still had his hands full when I finally let go of the stick.

After the heart-pounding recovery, we turned to the south, climbed back to 300 feet, and I resumed control of the aircraft. That's when I realized--but failed to verbalize--that I had spatial-D. Fortunately our flight engineer was on top of his game and talked me through the now incredibly difficult maneuver of straight and level flight. It took a bit of prompting, but I eventually re-caged my gyros. I continued heading south while the aircraft commander coordinated the traffic flow over the radio. Simply put, he ordered the element behind us to remain on the ground until released on his authority. They acknowledged. We continued to hold south, now very wary of traffic.

When the element in front of us called "Clear of the LZ," the mission commander relayed the message to the element behind us and simultaneously cleared them to launch. They responded with their location: holding over the designated hold point. They had blindly overtaken us en route! I am convinced to this day that had we not been holding

USAF Photos Courtesy of Author / Photo Illustration by Dan Harman

south of course because of the first near-miss, we would have had a second incident with perhaps more disastrous results. But the mission continued rather uneventfully from this point on, and every aircraft in the formation recovered safely.

Even beyond a healthy respect for life, I learned a lot more from this sortie than from any other flight in my career. To boil it down to a few tidy packages, I learned the value of radio communications, flight discipline and Crew Resource Management.

Had the British 47s maintained altitude and course as briefed, there never would have been an issue. That being said, both deviations were quite understandable given their limited systems and the rapidly deteriorating weather. We discovered in debrief that their avionics were configured for homing rather than tracking to the holding point. And with reduced visibility, the crews decided it was no longer safe to fly at 100 feet AGL. Still, a simple radio call might have prevented the situation or increased our vigilance. This was a breakdown of both flight discipline and radio communications.

Equally disturbing was the breakdown of radio communications and flight discipline between our own elements. When we, as flight lead, directed the second element to remain on the ground, the directive wasn't followed. Due to confusion about flight lead's intent or a temporary lapse in flight discipline, the second element launched without permission and overtook us enroute to the LZ. Again, communication and flight discipline seem to go hand-in-hand.

Then there is CRM in its many guises. Given the big helicopter in my windscreen, I failed to consider the ground. The pilot on the other hand, saw the ground rushing towards his windscreen. My blindness to any danger besides the CH-47 meant that I fought him for the controls. To make things worse, I subsequently failed to announce my spatial disorientation. On the positive side, the crew quickly recovered my senses through good CRM.

As if these weren't good enough examples, debrief revealed another series of links in the error chain. That's when I learned why the right scanner was so late in warning us of the CH-47: he dropped his comm-cord. From the time he saw the converging traffic emerge from the dust cloud it took seven seconds to find the switch and make a break call. This loss of CRM—the result of lost comm—almost killed us. A similar breakdown occurred with Chalks two and three behind us. While they saw the overtaking CH-47 long before I ever did, they never announced traffic over the radio.

We were fortunate that night, thrice. Due to failures of flight discipline, radio communications, and CRM; we had a near mid-air, nearly collided with the ground, and the second flight element blindly overtook our own. Effective and consistent CRM, strong flight discipline, and positive radio communications could have prevented all three of these near-misses; they might also prevent your next class A. However, a future failure in any of these areas could leave you where we found ourselves: relying on sheer luck and an overexcited stick actuator to cheat death.

On a more somber note, that same night we witnessed a less fortunate crew. During hot gas, we noticed an explosion a few miles north. We assumed it was an Iraqi rocket and rechecked our chemical defense gear. It was only later we learned a US CH-46 on a parallel mission had crashed—controlled flight into the ground. No survivors. I can't help but think, "There but for the grace of God go I." And I'll never forget the fine line that separates on the one hand—a mildly interesting story, and on the other—death.

USAF CLASS A FLIGHT MISHAPS

FY07 Aviation Mishaps (Oct 06-Mar 07)	**FY06 Aviation Mishaps (Oct 05-Mar 06)**
18 Class A Mishaps (14 Flight)	**16 Class A Mishaps (10 Flight)**
0 Fatalities	**0 Fatalities**
8 Aircraft Destroyed	**4 Aircraft Destroyed**

02 Oct	✈	A C-21 departed runway near approach end and caught fire.
02 Oct		An F-15E had multiple bird strikes; damage to #2 engine and left wing.
26 Oct	✈	An F-16C caught fire on takeoff; pilot aborted.
27 Nov	✈	An F-16C CFIT (IAW CSAF guidance; currently a non-reportable loss under DoDI 6055.7)
04 Dec	✈	An F-16D experienced engine failure.
18 Jan	✈	A T-38C had multiple bird strikes; pilot ejected.
19 Jan	✈	An F-16C encountered engine failure on a training sortie.
22 Feb	✈	A T-38C departed controlled flight during BFM.

- A Class A mishap is defined as one where there is loss of life, injury resulting in permanent total disability, destruction of an AF aircraft, and/or property damage/loss exceeding $1 million.
- These Class A mishap descriptions have been sanitized to protect privilege.
- Unless otherwise stated, all crewmembers successfully ejected/egressed from their aircraft.
- Reflects all fatalities associated with USAF Aviation category mishaps.
- "✈" Denotes a destroyed aircraft.
- "✶" Denotes a Class A mishap that is not in the "Flight" category. Other Aviation categories are "Aircraft Flight-Related," "Unmanned Aerial Vehicle," and "Aircraft Ground Operations".
- Air Force safety statistics are updated frequently and may be viewed at the following web address: http://afsafety.af.mil/stats/f_stats.asp
- **Data includes only mishaps that have been finalized as of 19 Apr 07.**

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AVIATION

WELL DONE AWARD
UNITED STATES AIR FORCE

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.

Captain John A. Chester
35th FW
Misawa AB, Japan

Captain John A. Chester was awarded the Aviation Safety Well Done Award in recognition of his exceptional contributions to aviation safety while assigned as an F-16 Aircraft Commander, 14th Fighter Squadron, 35th Fighter Wing, Misawa Air Base, Japan. On 17 August 2006, Captain Chester was flying his F-16 aircraft as part of a Red Air 4-ship Weapons Instructor Course support ride at Nellis AFB, NV. Prior to the start of the fourth engagement, Captain Chester realized his aircraft was rapidly losing fuel and declared an in-flight emergency. He quickly flew a spot-on random entry simulated flameout pattern, landed normally and shutdown immediately on the runway with 200 pounds of fuel remaining. Captain Chester's swift actions and innovative skills were directly responsible for the safe recovery of a multi-million dollar asset.

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