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BASH

Bird / wildlife Aircraft Strike Hazard

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contents

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U. S. Air Force photo by Lt. Col. Ted Williams
Rear Cover:
U. S. Air Force photo by Staff Sgt. Brett R. Ewald
Photo illustration by Dan Harman

U.S. AIR FORCE

The view from Blue 2

COL. SID "SCROLL" MAYEUX
Chief, Aviation Safety
U.S. Air Force Safety Center
Kirtland AFB, N.M.

Say hello to the new guy. I am Blue 2. I'm scheduled to be your wingman for the next year or two. We have pushed from Student Gap and are doping out multiple threats to our mission. You'll get nothing short of my level best to cover your six and build your SA on the threat — the aviation safety threat.

I can't lead you through this fight. That's up to your commanders, your ops officers, your flight leads, ADOs, target arms, instructors, chiefs, line supers … and you. But I will be that sage 2000+ hour guy on the wing who has seen it before, survived the merges and near-midairs, pond crossings and blackout nog approaches, and fired in anger at the enemy. If I say or do SOMETHING to build your SA at just the right moment, I will have earned my post-debrief beer.

Intel says the threat is tough today. It has taken down 13 of our fellow Airman aviators so far this year (as of this writing) — we lost only two wingmen last year. To help achieve safety superiority, watch for these guys on the ATO: mission prep and systems knowledge; training rules and ROE discipline and adherence; ORM, CRM and MRM; and emphasis on knowing your personal limits and increasing your SA. If all that fails, you'd better have your ejection decision down cold before you even step. I'm seeing signs that part of our game plan is lacking.

You will see some changes involving this magazine. You will still hear from the Safety Sage from time to time, but the Sage has slid out to make room for me in the Blue 2 slot. You will see more aviation safety articles written with the aviator in mind. Yes, this magazine is called FLYING SAFETY. Yes, we will continue to write articles for flight safety officers. But it's our Airman aviators who face down the aviation safety risk, so I want to have you back as my target audience. You will read articles by aviators for aviators.

One of the greatest fighter pilots I ever knew, "Book'em" Danno Williams, once told me, "When we can see the fight from God's view as it's happening, you have figured out ACT (air combat tactics)." I knew right away what he meant, but it has taken a career's worth of effort to realize and hone the skill.

Book'em was talking about more than just an air-to-air fight. He was talking about everything about aviation, fighter combat, risk management … pretty much everything we spend our professional lives perfecting. And that includes aviation safety.

I'm Blue 2. I'm hawking the fight, watching for the unseen threat, and here to build your SA on the untargeted group — human factors, BASH, weather, night flying and maintenance concerns. If I do my job right, you'll be in a position to engage and survive. And you will get my best effort.

Blue 2's in. …

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

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Bird Strike Pr

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Bird strikes occur at a rate of about 4,500 annually, with more than two-thirds happening below 1,000 feet AGL. As aircrews, we have a vested interest in avoiding birds. But what steps do we really need to take to mitigate the risk of striking birds? Often, it comes down to checking the Bird Avoidance Model/Avian Hazard Advisory System for the area in which we'll be flying. As long as the bird activity doesn't surpass a certain threshold, the mission can continue.

BAM/AHAS is a great tool, but can you accurately interpret and analyze the data it gives you? I have personally experienced two bird strikes in the F-16, and during both incidents, the bird status was low.

Two main areas of concern exist when it comes to avoiding birds: what crew members can do to make their flight safer and what airport people can reasonably do to clear the area of wildlife.

For aircrew, mitigating the risk of a bird strike starts during mission planning. What time of day are you flying and has there been any bird activity recently? Flying between sunset and sunrise presents a greater risk, not only because of the increased bird activity, but also because visibility is restricted. If you encounter birds, you'll likely pick them up visually at a closer range and have little time to react. Another important environmental consideration is the terrain you'll be flying over. Birds are known to linger around lakes, landfills and parks. If you'll be flying over areas of high bird activity, a good technique is to treat those areas like towers on a low-level route. Avoid areas of high bird activity if possible. If you must cross those routes, mark the location on your map and stress the importance of visual lookout as you approach these areas. Next, look at the training requirements for that type of flight. Does everyone need to re-hack low altitude currency or will a medium-altitude sortie fulfill all necessary training requirements?

Aircrews have two more steps to take to avoid

U. S. Air Force photo by Senior Airman Julianne Showalter

bird strikes, before they step to fly. First, always check AHAS information before you step and before takeoff. AHAS uses soaring and migration models up to 24 hours out to predict bird activity, and combines that information with National Weather Service data within 12 hours to give a more accurate prediction. For the current hour, real-time weather radar returns are used to update bird activity and trends in your area. The closer to your scheduled low-level airspace time that you're able to get the data, the more accurate it'll be. Once you've started your mission, don't forget the last step you can take to avoid a bird strike – vigilance. Constantly pay attention to the amount of birds you see on your route. If you observe more birds than expected, reassess the need to complete the rest of the mission at low altitude.

The one area where you cannot avoid flying low is in the vicinity of airfields. Fortunately, the base can attempt to make the airfield an unattractive location for birds to live and breed. This is where you can make a difference, especially if you work as a safety official. Whether you're taxiing in your aircraft or performing some type of spot inspection, ensure the base is doing everything it can to make the airfield an undesirable habitat for birds. You can also suggest improvements to the Safety Office. There are new techniques to control bird populations which are not common practice at all airfields. The Safety Office is responsible for implementing these changes.

Traditional controls in place at many airfields concentrate on altering bird habitats and eliminating food sources. Grass should be cut to a height of 7-14 inches around all runways and taxiways. Known bird habitats — ponds, tree groves, large hangars and abandoned/overgrown buildings — need to be removed or altered, so they're less attractive to birds. Food sources should be eradicated as well. Ensure landfills and trash collection areas are located as far away as possible from runways. Controlling the insect population is another way to keep birds from congregating in any specific areas. These are all controls that can be implemented on a daily basis through spot inspections and just generally paying attention to the environment around you. Depredation is a last resort, and in some areas, may not be an option depending on state and federal environmental regulations and wing policy.

Base Ops and Airfield Management people are employing new bird control techniques and technology these days: propane cannons, scarecrows, silhouettes and effigies are good deterrences because they are moved around each day to prevent the wildlife from becoming accustomed to them.

In the future, lasers that scare away birds at ranges up to 2,000 feet could be effective at scattering a population before the birds set up a permanent home. They are also mobile and could be used to eliminate birds not in the immediate vicinity of the runway. Final testing and evaluation of these systems is being conducted on this valuable tool. Animal experts are even training Border collies to chase birds that show up on golf courses and airports, and some airports around the world credit the program with greatly decreasing the bird population.

Aircrew and safety personnel play an important role in keeping the skies around their airfields safe and free of birds to the maximum extent possible. This is done by ensuring control measures already on the books are being followed and by updating BASH programs with new equipment and technology as they become available. When those measures fail, smart decisions made while airborne to fly higher might just make the difference between a safe flight and an IFE.

We'll never be able to completely avoid hitting birds, but by making smart decisions on the ground and in flight, we'll be able to share the skies with them without degrading our mission.

Strike Stats for the Operator

Figure 1. Strikes per Month, 85-07

LT. COL. TED WILKENS
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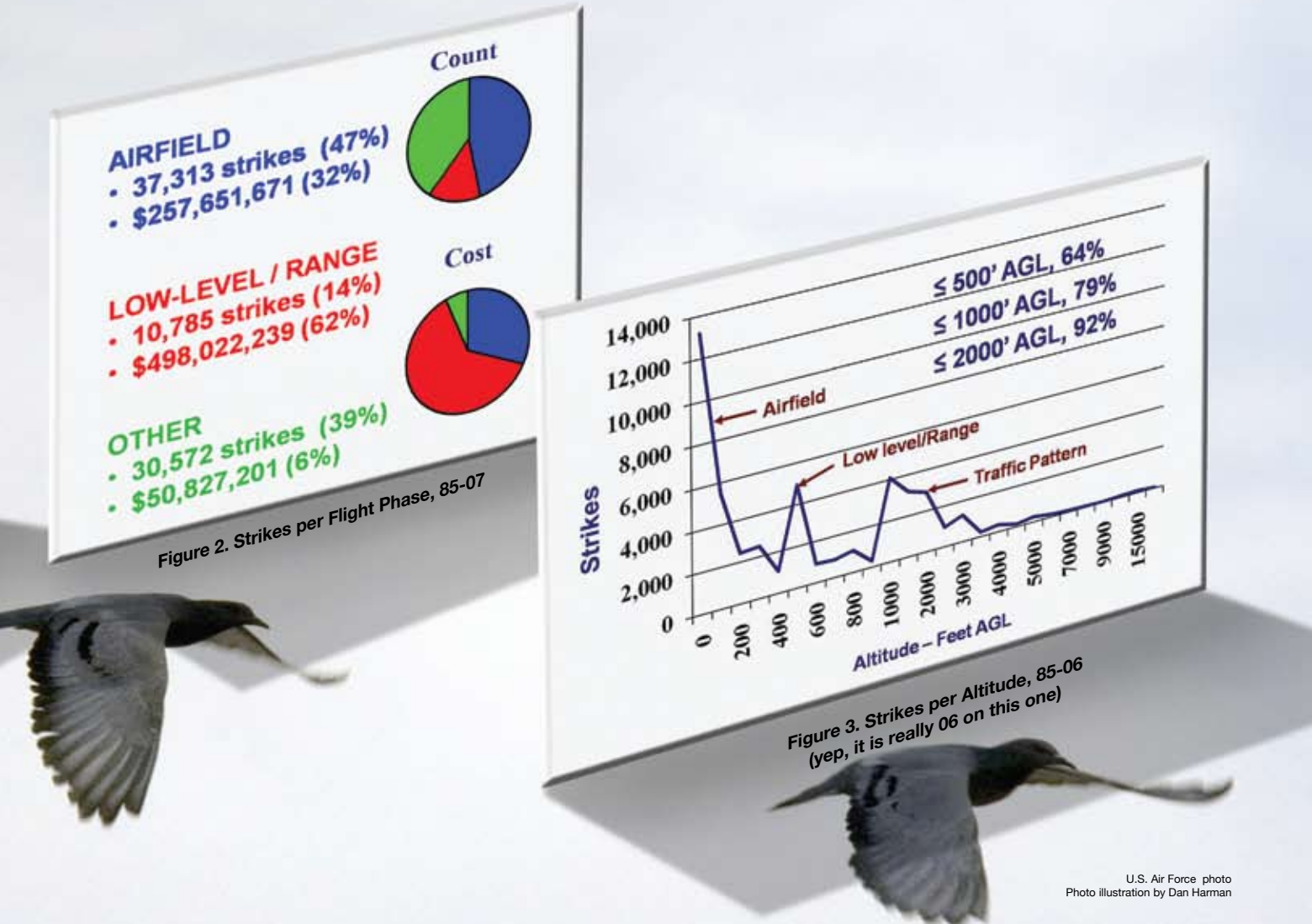
Statistics are probably the favorite part of my job on the BASH Team … not! Actually, not even close; I was kidding. I was extremely happy to receive a "C" in my college statistics class. Let's discuss wildlife strike statistics and what they really mean to you when flying. Your knowledge of basic strike statistics can help you develop smarter risk management decisions in the air.

The Air Force maintains the largest database of wildlife strikes within the DoD. This is no small feat … it takes a dedicated team from operators to maintainers, airfield managers to air traffic controllers, up to and including contractors. Unit agencies take part in hazardous wildlife mitigation and have pivotal roles — civil engineers, security forces and public affairs make contributions on a daily basis in pursuit of strike reduction to our assets and injury to our personnel. Realize our wildlife strike database exists only because personnel at the operational level input the required information. Our database is only as accurate as the person who enters the data.

The Air Force has made great strides in ensuring wildlife data are recorded and identified accurately. Normalizing 20 years of strike data, the Air Force sustains about 3,300 wildlife strikes and averages $19 million damage annually. Strike numbers have gradually increased over the years, but can be attributed to improved awareness, easier strike recording and entry, effective wildlife management, and enhanced environmental protection, resulting in elevated bird populations and increased operations tempo. Air Force aircraft experienced 4,790 wildlife strikes in FY07 that caused over $25 million in damage, including one destroyed aircraft. Fortunately, no one was seriously injured during the course of these mishaps.

A lot of people don't understand why so much strike information is requested when filling out an AFSAS Class E BASH report. Accurately reporting and identifying wildlife struck by our aircraft, and where and when the strike occurs, enables us to specifically research, develop and enhance programs which will effectively and efficiently target and mitigate the hazard. Understanding when and where you fly can potentially impact your mission. Our data clearly identifies two definitive strike periods occurring around the same time each year. Spring and fall migrations are noticeable between March through May and August through October,



U.S. Air Force photo
Photo illustration by Dan Harman

respectively. (See Figure 1)

Immature birds with reckless flying habits account for increased strike numbers in the fall. Nearly 50 percent of all strikes occur in the airfield environment but only account for 30 percent of damage costs. Aircraft in the pattern normally fly slower with reduced power settings, and fortunately, a majority of the birds struck are smaller and of less mass. Almost 15 percent of all strikes occur in the low-level or range environment but account for over 60 percent of damage costs. These aircraft are usually flying faster with increased power settings, and unfortunately, most of the birds encountered during this phase of flight are of larger soaring species. Roughly 40 percent of all wildlife strikes go unnoticed. Most of these strikes are not accounted for during the flight and are usually found during the postflight walkaround or by maintainers well after the flight has terminated. Little damage to the aircraft is found. (See Figure 2)

Did you know 64 percent of all Air Force wildlife strikes occur below 500 feet AGL? Ninety-four percent of all strikes occur at or below 3,000 feet AGL. What do these numbers mean to operators? It means the chances of having a bird strike drop dramatically above 3,000 feet AGL. It also means you should consider climbing above 3,000 feet AGL or your MSA if able, when working an IFE or are holding. (All bets are off, though, during migration season or in known areas of thermal activity where birds will exploit altitudes to their advantage.) (See Figure 3)

It never hurts to check the Bird Avoidance Model or Avian Hazard Avoidance System for advice about where wildlife movement might be heaviest along your route of flight. AHAS is now set up to provide additional information about which model (BAM, NEXRAD, Migration or Soaring) is driving the overall risk forecast.

If this article hasn't satisfied your craving for BASH statistics, check out your BASH Team's Web site at http://afsafety.af.mil/SEF/Bash/SEFW_stats.shtml for more stats. This site is accessible from .mil-addressed computers. Similar statistics can be accessed from the public Web site at http://www.afsc.af.mil/organizations/bash/statistics.asp.

You can even run your own stats on AFSAS with an authorized account. Call your BASH Team at 505-846-1440/5673/5674/5679 (246 DSN prefix) for additional information or a personalized query.

Coyote Strike

1ST LT. CHRISTOPHER JACKSON
391st Fighter Squadron
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It was a dark, cold Wednesday night, and I was on my way out of the squadron. I'd been looking forward to a night of relaxation after a full day of flying and debriefing.

All of a sudden, a voice from the ops desk asked, "Jackson, you are full up on the safety brick, right?" I looked up, and it was the squadron flight safety officer. I answered, "Pretty much." It was true. I had done all of the interviews and briefs and had attended the ACC program manager's safety course at Dyess AFB, Texas. However, I had never been out on my own, let alone at night.

I got a quick night-orientation from one of the former safety guys, and I was off on my own. The previously scheduled safety officer got thrown into a last-minute flight. What could possibly happen with only three hours left in the flying hour window? Then, after all the safety guys had left, the safety brick started to blast with crash net communications I'd never heard before. Crash net is a system of phones to alert all the necessary emergency, command, and control agencies should an in-flight emergency arise.

The supervisor of flying in the tower told me that that an F-15C had hit a coyote on the takeoff roll. All kinds of worst-case thoughts raced around my head — mainly those associated with a coyote carcass destroying an engine or landing gear. The SOF said the jet was airborne, dumping fuel, and was getting a night vision goggle battle damage check. Base operations was also checking the runway for FOD from the coyote or the jet.

I jumped in the safety wagon, threw on the yellow roof light, and was off to respond to my first in-flight emergency. Base ops personnel were on scene and had already closed part of the runway, searching for airplane and canine parts. They also took photos of what they found. It was quite impressive to see how an F-15C at 130 knots can rip the back end right off an apparently solid coyote. I got a look at all of the coyote remains, but now it was time for the F-15C to come back to land after adjusting its gross weight.

I lined up the safety wagon with all of the emergency response vehicles. The safety vehicle is equipped with all the necessary radios and gear needed to document any major emergency response. I found myself feeling important all of a sudden. In a fighter squadron with over 25 lieutenants, it's fairly easy to consider yourself just one of the lowly snack officers (SNACKOs) in the squadron, even if you're a fighter pilot. However, now was my big chance. I was acting as the fighter

U.S. Air Force photo by Lt. Col. Ted Wilkens

wing commander's representative that night.

The jet landed uneventfully. The fire chief and his rescue crews looked over the jet and terminated the emergency. It was pretty interesting and exciting, even after witnessing IFEs from the inside of the cockpit. Aside from driving over a red line (fortunately, a maintenance troop was the only witness) and parking incorrectly when I returned to the F-15C model ramp, the emergency response seemed to go well.

Now I had to begin the safety part of the investigation to determine what damage, if any, had occurred. I talked to the pilot who said he had seen an animal break across the runway as he was near rotation speed in his airplane. Though he had very limited experience with air-to-ground threats, he knew the coyote presented a unique and hazardous threat to his jet. His lightning-quick reactions prompted him to get his nose wheel off the ground. He judged the four-legged animal would impact the jet at the nose gear. Surprisingly, the coyote missed the nose gear, but the pilot thought he might have clipped the mangy mongrel with another part of the jet. He notified the tower and took appropriate actions for a flawless recovery of the aircraft.

After checking the jet over, no one could find a tuft of hair, guts, or even blood. I gave the pilot a ride back to his maintenance debrief and had him fill out an IFE worksheet. I also asked him to fill out a bird strike form, since it was the closest thing I could find to a wildlife strike.

I thought my night was then complete. However, out of nowhere, my safety cell phone rang. Command Post said the wing commander wanted to talk to me. Did I screw something up? I promptly called him and reported that his jet, the prized 366th Fighter Wing Flagship, was home safe with zero damage after the coyote strike. "Well, Lieutenant, I think we got lucky this time," he said. I got a feeling of a job well done from the wing king himself.

There was only one thing left to do. I asked the pilot if he wanted the remains of the coyote. "Are you serious?" he replied. "Well, base ops doesn't know what to do with it." I said. "Maybe you can put it up in your bar as the Wild Boar's first air-to-ground kill," I said jokingly. So we picked up the Boar's new furry friend. I've been told it was later stuffed for display.

That was it for the night, except for a hot brakes emergency response, but that was nothing, after all of the previous excitement!

Flying in Combat

Is the Enemy Our Greatest Threat?

1ST LT. JUSTIN BALLARD
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Many of us have deployed to OIF and realized within a few flights that we face some unique challenges that may or may not have anything to do with aviating in combat. Some of these are dust storms that arise from nowhere, flash thunderstorms, heavy traffic, and airspace restrictions that make little sense to anyone but ATC. One consideration that most of us rarely have to deal with, outside of the AOR, is flying among UAVs, helos and various aircraft from the U.S., as well as Allied Nations. These differences take us even further out of our comfort zone and pose a unique and difficult challenge to everyone's overall safety. With this in mind, here's a situation that occurred on my last deployment.

My crew and I had just flown our C-130 on a typical 12-hour day, better known as the "pain train." We were tired, but still alert and on task. As usual, we had fought ATC for a while to get landing clearance between other aircraft departing and arriving, as well as the airfield attacks that are all too common. As the navigator, I was on the radios and gathered the paperwork from the crew. After landing, the tower allowed us to back taxi on one of the runways to get to our parking spot, a standard procedure due to some taxiway maintenance. About halfway down the runway, we heard the tower clear a fighter to land. We were on the runway that was the normal landing runway, but it was closed to departures and arrivals and used as a taxiway. The fighter got clearance to land on the other runway and seemed to be no factor.

The flight deck was relatively calm and quiet due to the checklists and radio calls winding down. We were about 100 yards from turning off of the runway and onto the taxiway to park, when I heard the co-pilot go out on the radio: "Aircraft on short final, aircraft on short final, GO-AROUND, GO-AROUND NOW!" I snapped my head up, jumped up to the window and tried to get a handle of what was going on. I saw a fighter aircraft pulling up hard to miss us. I'm not sure exactly how close the fighter aircraft was to us, but I do know that it was close enough that I could read some of the writing on the side of the aircraft. Our co-pilot declared that the aircraft was clear over the radio, and we continued to taxi.

Although we had just been amazingly lucky and

U.S. Air Force photo by Tech. Sgt. Keith Brown

we should've all been a bit nervous, the entire crew stayed on task and kept our heads. We parked, ran the engine shutdown checklist, and got ready to deplane. That's when the weight of what had just happened hit us like a ton of bricks. I realized how close my wife and kids were to collecting my SGLI.

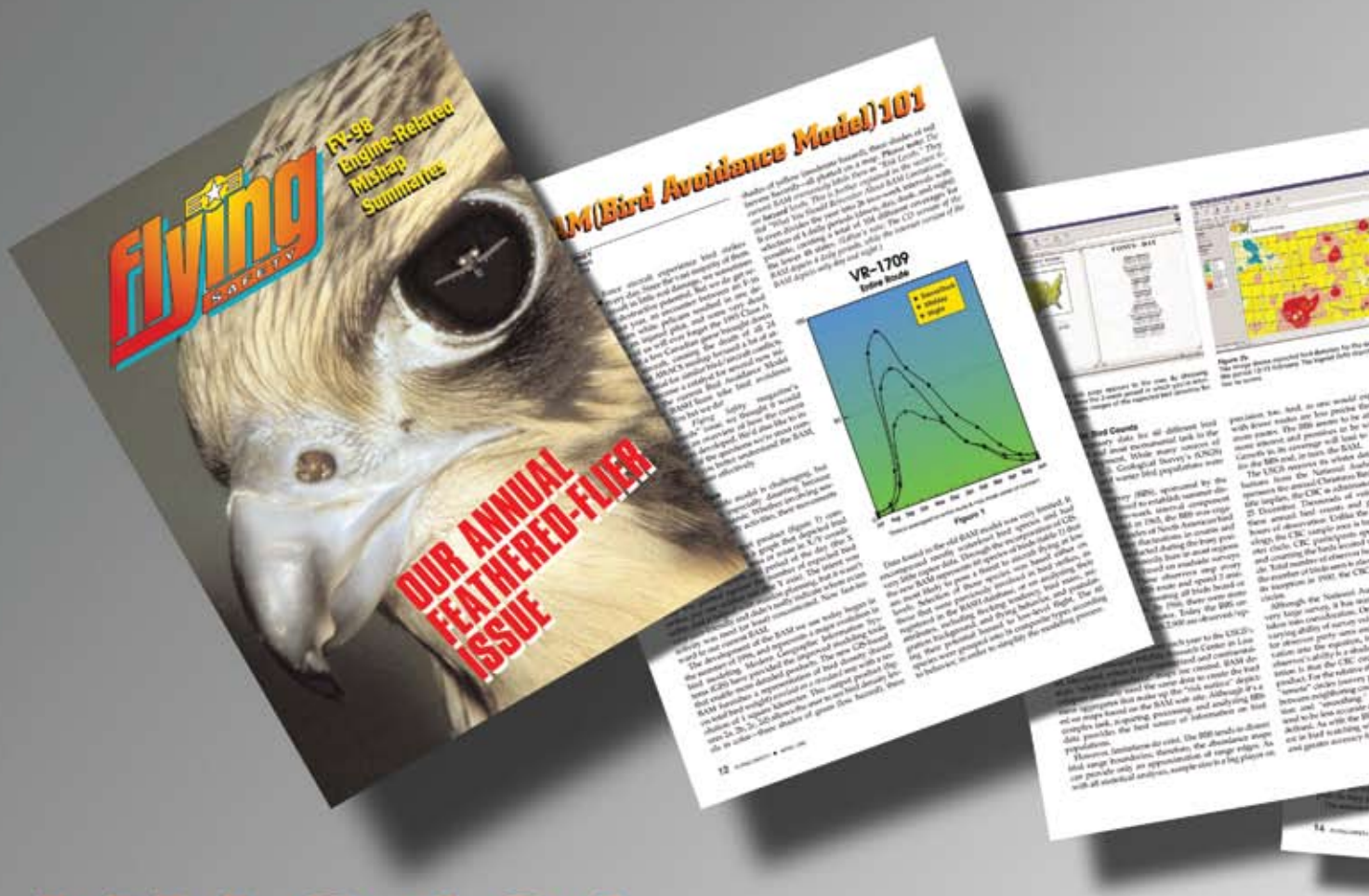
Now, I have been under enemy fire, and I've had some scary things happen as a result of flying in combat, but I had really never felt as if I was actually in any form of imminent danger until now. I began to sweat and feel sick to my stomach, and then it quickly turned from fear and sickness to anger. The aircraft commander decided to file a HATR. The whole ops building was in an uproar about the incident, and the commander was already on the phone.

If it weren't for the co-pilot in our aircraft being on his game and having a good sense of situational awareness, up to seven lives could have been lost, two aircraft destroyed, and several missions delayed or cancelled because of it. The first lesson is that even after the day is just about done, one must stay alert and vigilant until the aircraft is in the chocks, the last checklist is complete, and the crew is safely inside their living quarters.

The second lesson is that although we were all flying in a combat environment and all task-saturated, we must never forget the basics and get complacent about where and how we fly. It's difficult to do, but we must stay vigilant. Just because you've gotten the same clearance every day for the last month, it could change at any time. Another lesson is that we can't let the idea of combat aviating and the adrenaline rush that follows haze our faculties and allow us to do silly things, like not looking outside of the aircraft and seeing a big plane with engines running in your landing path.

Sometimes it's better to be lucky than good, but you can't rely on luck. What we can rely on is our training and our ability to use the tools imparted to us by our trainers. Situational awareness is essential in increasing our day-to-day survivability as we risk our lives doing what we do.

Maintaining the standards set by our commanders and performing the tasks we practice is very important, especially when in combat with other distractions. Safety is paramount and should never be set aside. Our country, our careers and our lives depend on us watching out for each other and making the daily attempt to keep the entire operating environment safe for everyone. It's not just the right thing to do — it's the law.



AHAS 101

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Imagery courtesy U.S. Air Force Safety Center
Photo illustration by Dan Harman

Dig into the *Flying Safety Magazine* archives and you'll find an article entitled "BAM 101" from April 1999. Then Lieutenant Curt Burney authored this excellent in-depth article detailing the capabilities of the Bird Avoidance Model. Highlights from the article still hold true today; it should be occasionally reviewed as a good primer to the most basic of bird movement models. While this historical model was developed for flight scheduling and civil engineering environmental studies, it can also be utilized by operators to offer a complete "birds' eye" view of environmental attractants and potential wildlife movement along a proposed route of flight. The BAM can be found at http://www.usahas.com/bam.

Many advances in our ability to detect potentially hazardous wildlife have been made since 1999. The Avian Hazard Advisory System was originally designed to complement and incorporate the BAM. AHAS recently received major improvements based on user comments. Algorithms were modified to better depict what was happening in the current hour, graphic appearance was improved for better utility, more area types are now available for query, a live update function was added eliminating screen refresh requirements, and more risk computation information is being offered for better risk management. It has become the world's premier bird forecasting model. Now it's time for AHAS 101.

AHAS gathers and combines data from filtered NEXRAD weather radar output, National Weather Service Forecasts, the Migratory Bird Forecast Model, the Soaring Bird Forecast Model, and the BAM to predict bird movements. AHAS provides CONUS bird strike risk for IR, VR, and SR routes; ranges; MOAs; military (and some civilian) airfields; and alert areas. Specially modified unit Web pages may be requested to create a one-stop page for operational supervision and crews alike. The AHAS can

be found at http://www.usahas.com.

Once accessed, AHAS opens directly to a central query page. Users can check for news and other important information within the gray tabs at the top of the Web page or insert the required query information on the left side of the page. AHAS will produce its prediction once the search criteria of date, time, area type and output choice are entered. Query output can now be viewed in three different formats, depending on user requirements or preference. Most operators appreciate the no-nonsense tabular display used exclusively in the past. Table output remains the same with one exception: a column was added to indicate the driving model for the overall risk. Selecting the map output function will default all readings to the BAM. Once the map output is selected, a query may be refined using all of the mapping features available in this historical model. Remember to refresh the map after selecting legend choices or the identify tool. The Google Earth output is only available on Google Earth-enabled computers. AHAS risk levels are displayed within the polygons surrounding the area type selected. No driving model for the overall risk is displayed on this output – just color; green indicates Low, yellow indicates Moderate, and red indicates Severe. Both tabular and Google Earth outputs offer live update capabilities, eliminating the need to refresh the screen when new data becomes available. Neither the map nor Google Earth outputs are available for unit-specific Web pages or alert area search criteria now, but will soon be available. Remember, AHAS is not precise enough to be used to determine airfield Bird Watch Condition codes, but can be used to offer insight into what might be flying on or near the aerodrome.

Information from AHAS may be requested for four distinct time periods: current hour, future hours within or equal to 24 hours outside of the current hour, future hours greater than 24 hours, and historical. Current hour risk is based on observations made by the NEXRAD weather radar system or data from the Migratory & Soaring Models. Trend data indicates changes in bird activity as detected by NEXRAD radar returns but may not be substantial enough to change the overall risk. Future hour risk within or equal to 24 hours outside the current hour is based on the Migratory & Soaring Models (with imbedded NWS data) or the BAM. These models predict conditions favorable for hazardous bird activity. Future hour risk greater than 24 hours and historical risk is based on data from the current version of the U.S. BAM.

Current hour queries access and utilize NEXRAD output, updated every six minutes, to monitor large scale migratory bird activity in the contiguous 48 states. Risk from the Migratory & Soaring Models is also considered. The most severe risk predictive model is displayed as the final risk: NEXRAD, Migration, or Soaring. BAM data may be displayed if no other inputs are available – NEXRAD or NWS link is not available. Font format in the risk column is important. All capital letters indicate data was derived from one of the three predictive models. All lower case indicates data was derived from the historical BAM.

Future queries within or equal to 24 hours outside of the current hour access and incorporate NWS weather observations into the Migratory & Soaring Models. These models are run twice daily using the most current weather observation. The Migratory Bird Model predicts the likelihood of migration of known concentrations of large birds given current and forecasted weather conditions. The Soaring Bird Model predicts the likelihood of soaring birds based on calculating thermal depth and U.S. BAM data. As with current hour queries, BAM data may be displayed if no other inputs are available.

Future queries for greater than 24 hours or historical requests access only BAM data. The BAM is based on bird species present during a specific daily time period in a particular area for one of 26 two-week periods in a year. Observations of 60 key BASH species over a 30-year period are graphically displayed. Key datasets, to include the Audubon Society's Christmas Bird Count, U.S. Biological Survey's Breeding Bird Survey, bird arrival and departure data for the conterminous U.S., and data specific to a particular bird species is included. Common behavior of species groups is modeled for dawn, day, dusk and nighttime periods. Burney's "BAM 101" article can be found at http://afsafety.af.mil/SEMM/pdf/fsmapr99.pdf.

Figure 1. AHAS Central Query Page

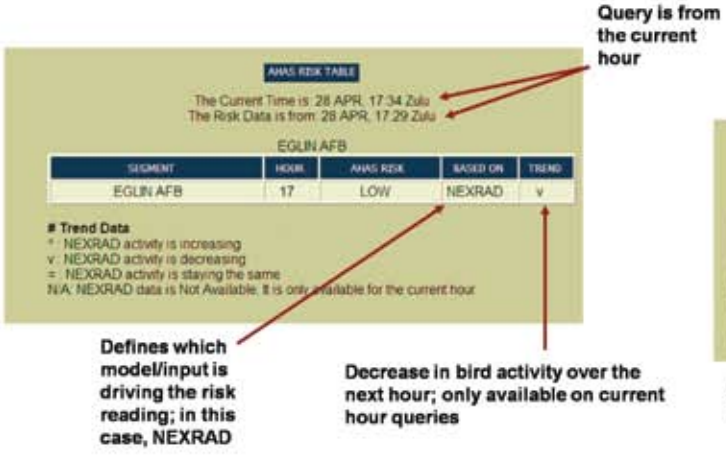


Figure 2. Current Hour Query

Ideas sometimes outpace current technical capabilities. DeTect, Inc., the contractor responsible for AHAS operation and enhancement, is exploring several more improvements to the system. They research the ability to provide limited historical AHAS-forecasted data to better understand trend analysis in requested areas. Years of archived digitized NEXRAD data of actual bird movements may someday replace historical manual bird counts. AHAS will incorporate BAM and improve on its functions, which should become more and more transparent within the system. NEXRAD systems already run clutter suppression algorithms, ensuring radar data accuracy, and DeTect, Inc. will be accepting higher resolution NEXRAD Level II data in the near future to better differentiate biological targets from other returns. A complete PowerPoint instructional briefing on AHAS operations is available for download at http://www.usahas.com/evalAHAS/downloads/.

Your operational feedback is necessary to continue to make this product better. Keep your questions and comments coming. Contact your BASH Team at afsc.sefw@kirtland.af.mil or DSN 246-5673/5674/5679/1440; DeTect, Inc. can be reached at usahas@bellsouth.net.

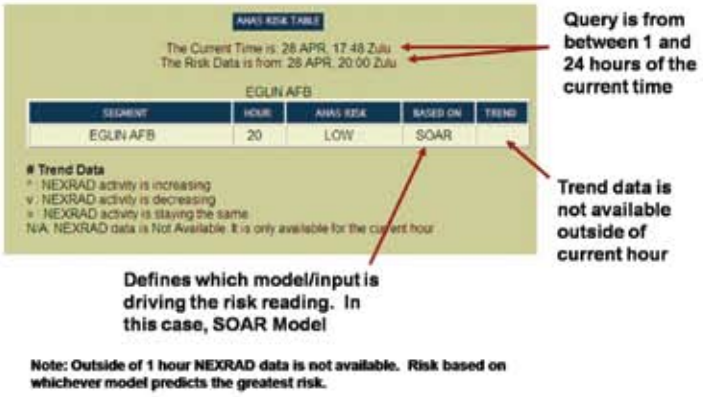


Figure 3. Query w/i or Equal to 24 Hours Outside Current Hour

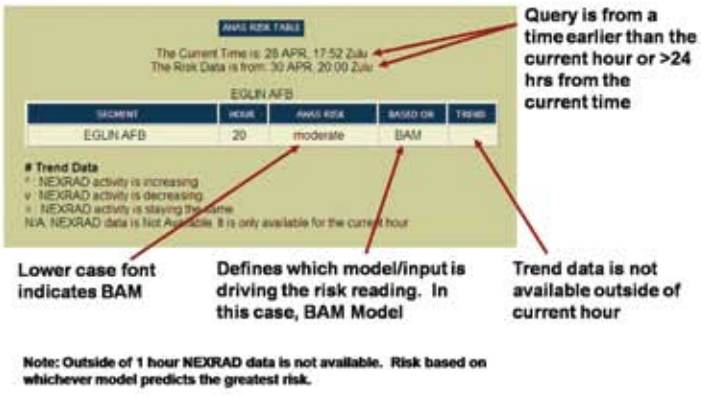


Figure 4. Query Greater Than 24 Hours or Historical

U. S. Air Force photo by Abner Guzman

LT. COL. JOEL WITTE
Air Armament Center
Eglin AFB, Fla.

There I was (a fairly long time ago) flying the C-17 out in the system back before deployments, back when Prince Sultan Air Base and Northern/Southern Watch were still around. My crew and I deadheaded from the states to Ramstein to pick up a used-to-be-broke C-17 to be followed by a cargo/pax pickup in Egypt and return to the states. When we arrived, the bird was still broke, well, sort of. It had a fuel leak in one of its Aux tanks. With waiver in hand, TACC pushed us from Ramstein to Rhein Mein for fuel cell maintenance. Not a bad trade: Egypt for Frankfurt. We got fixed and expected to be on our way home. No chance — we got picked to take our newly fixed "good" bird down to Rota NAS, Spain and give it to another crew who had been stuck with a bad jet for several days. Again, not bad, spend some time in Spain and then go home. Well, this is where my story really starts.

Hangar flying is one of those sometimes lost, sometimes refound lessons that proved it's worth its weight in gold on this trip, plus it's a lot easier to think about a situation at 1G and 0 knots. When we arrived at Rota, we gave our jet to the crew that was waiting to go downrange to Kuwait and went into crew rest. After a few ZZZs, I was wandering the halls at billeting and ran into the aircraft commander who had supposedly taken my aircraft. He related that they didn't get very far before having a problem. Twenty minutes into climb out, one of the two fire bottles on the right wing indicated that it had depressurized. The crew discussed the issue and decided it was wise to RTB to Rota and try to get it fixed, since flying around with less than the prescribed safety equipment seemed to be a bad idea.

Maintenance came out to the jet, determined that the empty bottle was probably caused by a bleed air leak directly on the fire bottle, resulting in the pressure relief squib letting go and releasing the extinguishing agent inside the wing. But, by the time the bottle could be replaced and the suspected loose bleed air fitting could be tightened, the crew had long run out of crew duty day to complete the mission. Then he told me that TACC was probably going to alert my crew for the mission at the conclusion of our crewrest. Woohoo! Didn't think we were going to be anywhere near that part of the sandbox on this trip nor collect any hostile fire pay or tax-free. Sounded good to me.

Now, knowing that I'd be doing what he just tried to do, given the same scenario, I asked if he and his crew would have done anything differently? He thought about it for a little bit and passed on some good points:

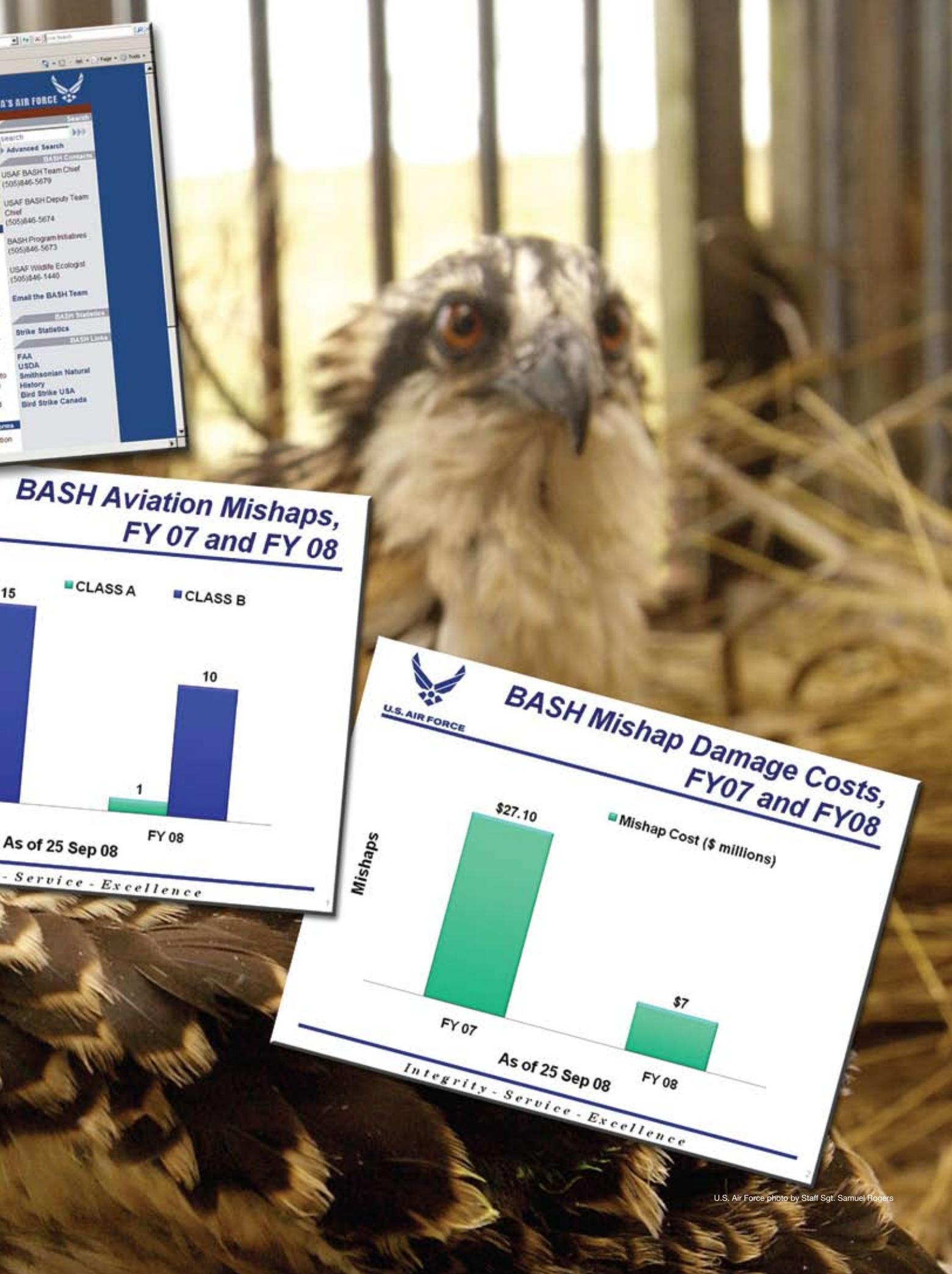
1. The decision to RTB with less than a full set of fire bottles was a good idea — you never know when Murphy's law will catch up with you. The C-17 has four fire bottles, two per wing, giving the crew a chance to fight an engine fire on each wing with two blasts of agent. The bottles cannot be used crosswing; therefore, with one bottle gone, there's only one bottle left for engines 3 and 4.
2. What caused the bottle to let go? The bottle is protected from thermal expansion by a diaphragm that relieves pressure when the agent's temperature exceeds 205 degrees C. How did it get that hot? Might suspect fire, bleed air leak or just a faulty diaphragm or indicator. The Manifold Failure Detection System didn't indicate any type of bleed air leak failure.

continued on page 30

2008 BASH Campaign

Bird / wildlife Aircraft Strike Hazard

http://www.afsc.af.mil/organizations/bash/index.asp



U.S. Air Force photo by Staff Sgt. Samuel Rogers

THE EFFECT OF WEIGHT ON AIRCRAFT

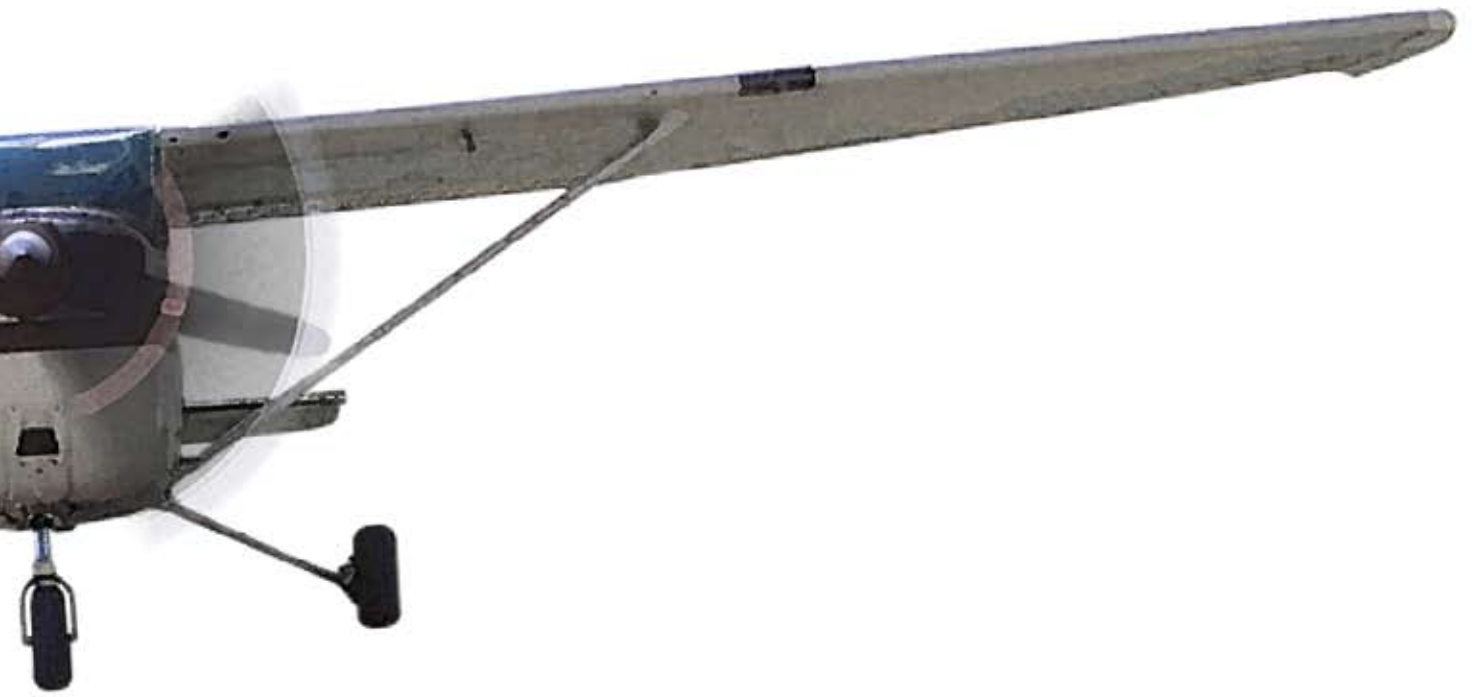
CAPT. ERIC HANLEY
9th Special Operations Squadron
Eglin AFB, Fla.

This article is about a flight I was on back in the spring of 1998. I was working for American Flyers Flight Training School, Long Island, New York, completing my Certified Flight Instructor training. I had logged about 220 hours of flight time in multiple small single-engine aircraft, to include Cessna 152, 172 and a Piper Warrior. A friend asked if I wanted to go to Connecticut for the proverbial "100 dollar hamburger," and I accepted. The pilot was a new private pilot with about 75 hours logged. The two passengers that would accompany us were a rated CFI with more than 800 hours and a non-pilot. The weather for the day was clear skies over Islip, about 80 degrees and winds out of the east. We were going to fly a Cessna 172 with extended range fuel tanks.

Total weight of the four occupants was about 585 pounds. We had very little baggage. To this day, the pilot maintains he ran the Takeoff and Landing Data and swears we were below max gross weight. Looking back on the events of that day, I would beg to differ.

Computing takeoff/landing distance in the mind of a private pilot is important, but to a lesser degree than one might think. There are very few stations on a small fixed wing aircraft where cargo or passengers can be loaded, so the emphasis on criticality of loading is frequently missed. As far as the private pilot is concerned, 99 percent of the time, he or she will be in center of gravity limits, as well as maintain a weight below the max gross weight of the aircraft. Only a few variables need to be considered, to include number of passengers, baggage and fuel. The consideration of airfield length and width is normally not even looked at during preflight planning, as most small single-engine aircraft can operate with very little runway length. The runway was not a factor for our flight as we had over 5,000 feet available. The charts for a Cessna 172 are located in the pilot's operating handbook, which is extremely simple compared to a C-130 1-1. When the pilot runs these charts, the variables that are most emphasized are temperature, weight and winds. For the private pilot, TOLD is something that's determined with little explanation as to the effects of the above stated variables on aircraft performance.

Start and taxi were uneventful, and we were subsequently cleared for takeoff. The occupants were seated as follows: new private pilot in the left seat (the pilot in command), the non-pilot in the right seat, followed by myself and the CFI in the back seat. Again with hindsight being 20/20, this was about the worst possible seating arrangement possible. As we *slowly* accelerated down the runway, I heard the pilot say, "There's 55 knots, rotate." I distinctly remember saying, "We're screwed." For normal Cessna 172 operations, you rotate at 55



U.S. Air Force photo
Photo illustration by Dan Harman

knots and normally become airborne around 60-65 knots. Being as heavy as we were, I knew the 55 knot speed wouldn't work. I was right. We lifted off and achieved only 5-10 feet of altitude, when the stall warning came on, and we settled back to the runway. We touched down and lifted off a total of four times before the pilot elected to stop the aircraft on the runway. We stopped on the departure end numbers. We then taxied back for another go. I emphasized to the pilot not to rotate until 75 knots, and once that speed was reached, we climbed out normally. The first part of the flight went normally until we crossed the Long Island Sound and noticed some weather ahead over Connecticut. The pilot elected to reverse course and go home. As we crossed back over Long Island, the pilot unintentionally lost 600 feet of altitude and forced a small twin-engine commuter aircraft to maneuver to avoid us. The subsequent tower discussion finished with the controller instructing our pilot to call "this number" when we arrived on deck. Once we landed and taxied in, the three passengers literally kissed the ground.

So what can we take away from this excursion? The first lesson is that of private pilot training. As my first evaluator told me when I received my private pilot license, "You now have your license to learn how to fly." Well, again, I'm not sure that was the soundest advice as evidenced by the pilot in this story trying to "learn to fly" and almost killing himself and three others. Student pilots need training on how weight will affect the performance of the aircraft, as well as how to mitigate changes to loads. Also, incorporating a more thorough lesson of drag during ground effect would have proved useful. If the pilot had understood the concept of ground effect, he could've lowered the nose and accelerated before trying to climb out. Another and self-deprecating thing to take away from this example is the magic and unfounded 75 knots air speed. I had absolutely no basis for saying 75 knots, other than it sounded like it would work. I had flown that particular aircraft before and knew it handled differently because of the additional weight.

So the moral of the story: there is no way to compute TOLD for that type aircraft, and a lot of pilot skill comes into play when attempting to make an aircraft fly when it doesn't want to.

That day we just got lucky. Another major mistake we made that day was having a brand new pilot at the controls, basically by himself. Either the CFI or I should've been occupying the right seat. Having the only non-pilot there didn't help the pilot, and if either the CFI or I had been there, we could've aided the pilot during both the takeoff and the subsequent altitude deviation.

We made a lot of mistakes that day, thankfully none that produced a mishap or fatal results. The lessons we need to take away from this are potentially lifesaving and cannot be overemphasized. Teaching proper TOLD calculation is critical to safe flight and should be stressed more during student pilot training.

Emergency Comms

ANONYMOUS

While leading a two-ship of A-10s for a close air support training mission, I descended the formation below the MOA for a simulated troops-in-contact situation. As I came off target for my last pass at approximately 1,000 feet and almost 90 degrees of bank, the cockpit started to fill with smoke. I immediately rolled wings level, started a climb and made a knock-it-off call, and informed the flight of my smoke-and-fume situation.

The smoke had a toxic smell, burned my eyes, and was becoming very intense. I quickly ran the smoke-and-fumes elimination checklist from memory, but it wasn't getting any better. The smoke made it difficult to see in or out of the cockpit.

My wingman confirmed that I was still wings level and headed in the right direction. I informed him that I had run the smoke-and-fumes elimination checklist and the smoke wasn't dissipating. He asked me to confirm one of my switches and he was spot on. I had accidentally put a switch in the wrong position when applying the smoke-and-fumes elimination procedures. Once corrected, the smoke quickly cleared, but the odor was still intense, and my eyes were watering from the fumes.

Now was my first chance to scan the cockpit, and I noticed the No. 1 engine oil was below limits. I brought the throttle to idle in accordance with the checklist and was able to get the oil within limits. I had my wingman read the oil system malfunction checklist to ensure I hadn't overlooked anything. Then, I declared my emergency with Approach Control, switched to tower to coordinate my arrival and ensure the emergency information was correctly relayed from Approach. While I did this, I had my wingman coordinate with the SOF. He informed him of the emergency, the checklists run and current status and game plan. I landed uneventfully from a straight-in approach.

The lesson I learned from the above situation was the importance of good communication during an

U. S. Air Force photo by Airman 1st Class Kenny Holston

emergency. As flight lead, I quickly communicated my problem following the knock-it-off call and again when I discovered the oil was out of limits. This allowed my wingman the opportunity to offer better mutual support and to help think through my emergency. Instead of struggling with the smoke and possibly jettisoning the canopy, I kept the wingman in the loop. I didn't rush to declare an emergency and avoided multiple questions from ATC that I wasn't ready to answer. Lastly, I reduced my task load by having the wingman coordinate with the SOF, while I spoke with tower.

The communication from my wingman was outstanding. He initially stayed off the radios and allowed me to work the problem. Later, when it was appropriate, he wasn't afraid to offer a suggestion when I told him the smoke wasn't clearing. His input was critical in handling the emergency. When I told him I was bringing the engine to idle for the low oil pressure, he again kept quiet and just thought through the situation. His thorough radio call to the SOF included my initial indications, checklists run and results, and finally a game plan.

The communication from ATC and SOF was minimal, just like you would want. My calls to ATC and the wingman's call to the SOF provided all the information they needed to do their jobs. This was important because they have a responsibility to assist in an emergency, and if they're kept in the dark, chances are they're going to start asking questions. And it will probably be at the worst possible time. You, in the emergency aircraft, have now lost some control of your situation. It's much better to push information to outside agencies than have them continually trying to pull information from you.

While this mishap proved to be an example of good communication, I've also experienced really poor examples of communication during emergency situations. Take, for example, those times when you inform the RSU controller that you have an emergency, so you can enter their pattern or get a chase ship, but get way more than you expected. The controller feels obligated to question you on every step of the checklist. Then they start offering suggestions for recovering the aircraft. SOFs can be guilty of this also. This comm jamming can be very distracting, reducing the pilot's situational awareness and overall hampering the situation.

The exact opposite of the above examples can also happen. The SOF or RSU controller that does nothing and confirms nothing can have equally poor outcomes. Let's assume there's an emergency in progress, but the pilot hasn't communicated anything to outside agencies. In this case, the SOF or RSU then needs to start pulling information and not be so passive. If they recognize the emergency is being poorly handled, they should speak up. They can't assume just because it's a qualified pilot that everything is being handled correctly. The SOF and RSU have the advantage of being ground speed zero to make more rational decisions, and they also have all the necessary publications.

As with any communications, you should always strive for C4 comm … clear, concise, correct, and cool; especially during an emergency. Clearly and concisely state your emergency. Correctly communicate to the SOF what systems you've lost and what indications you have.

What does the emergency pilot expect from their flight lead / wingman, RSU or SOF? What's expected of the emergency pilot? When does too little or too much communication detract from handling the emergency situation? You ask a single-seat fighter pilot what they want to hear from their wingman and some still expect nothing but "Lead, you're on fire." So what's the answer? It depends. The difference between good and bad communication during an emergency situation can be very small, but the outcome can be enormously different.

This is a photo of the 1918 Spanish Influenza Virus that killed 500,000 people in the United States and 50 million people worldwide. It is believed to be of swine-avian origin.

Photo by Dr. Terrence Tumpey and Cynthia Goldsmith
Courtesy of Centers for Disease Control

Beyond the Strike Hazard

MR. DANIEL P. SULLIVAN
U.S. Air Force Safety Center
Kirtland AFB, N.M.

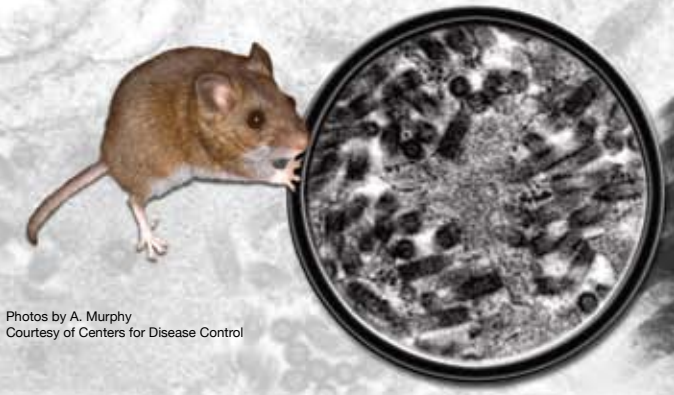
U.S. Air Force photo
Photos by Cynthia Goldsmith and Jackie Katz
Courtesy of Centers for Disease Control

When Air Force personnel think of hazardous wildlife, most automatically think of Bird/wildlife Aircraft Strike Hazard and the effects it has on flight operations. However, zoonoses (infectious diseases transmittable between animals and humans) with a wildlife reservoir are a threat to human health throughout the world. Due to the attractiveness of many airfields to wildlife, increased exposure to dangerous pathogens may occur during implementation of BASH procedures. Possible exposure is not limited to wildlife control personnel — outdoor recreationist and routine home maintenance activities are also potential avenues for infection. According to Taylor, et al. (1)(2001), who in 2001 catalogued 1,415 known human pathogens, 62 percent were of zoonotic origin. More than 60 transmittable bird diseases (some of which are fatal) were associated with geese, pigeons, European starlings, and house sparrows. Mammals can carry and transfer diseases to humans, such as Rabies, Hantavirus, Leptospirosis, Tularemia, and Plague. Many other emerging diseases, such as Severe Acute Respiratory Syndrome, Monkeypox, Ebola Fever, West Nile Virus, and H5N1 Avian Influenza, also have a wildlife component (2)(Friend 2006).

Avian Influenza (H5N1)

Avian influenza is an infection caused by avian (bird) influenza (flu) virus. There are many strains of avian influenza, but most concerns revolve around Avian Influenza A (H5N1), an influenza A virus subtype that occurs mainly in birds and is highly contagious among individual species, leading to high bird mortality. Although human infection of Avian Influenza A is rare, cases of human infection have occurred since 1996. According to the World Health Organization, more than 330 people from 12 countries have been infected with the H5N1 virus since 2003; of these, 61 percent have died. Human infection has been confirmed in countries such as Iraq, Djibouti, Egypt and Turkey. With the exception of one case (Vietnam), it's believed that all H5N1 human cases resulted from contact with infected birds or surfaces contaminated with excretions from infected birds. Sixty-one countries have documented the H5N1 virus in captive or wild animal populations. To date, H5N1 has not been detected in any captive or wild birds in North America. However, most experts believe it's just a matter of time before the virus reaches North America by species migration or contraband.

The probability of contracting the H5N1 virus while collecting bird strike remains is relatively low; however, due to the increasing prevalence and spread of the virus, proper handling procedures have been instilled by the Centers for Disease Control and the WHO. Links to the CDC and WHO Websites can be accessed through the BASH Webpage: http://afsafety.af.mil/SEF/Bash/SEFW_new.shtml. The CDC also offers interim guidance for cleaning aircraft exteriors after collisions with birds in Avian Influenza A-affected areas.



Photos by A. Murphy
Courtesy of Centers for Disease Control

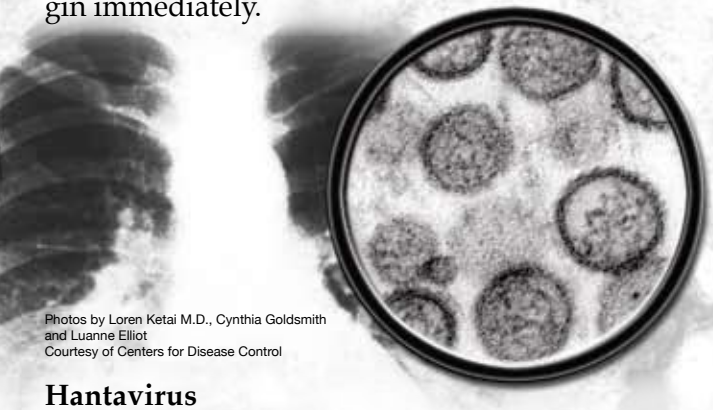
Rabies

Rabies is a viral disease of mammals. Birds, insects, fish and reptiles will never have rabies. Rabies is most often transmitted to humans by the bite of an infected animal or by exposure as saliva enters a scratch, open cut or mucous membrane (eyes, nose, mouth). Some animals *almost* never get rabies, such as wild rabbits, squirrels, chipmunks, rats and mice. The majority of cases reported to the CDC involve wildlife species, such as raccoons, skunks, bats and foxes. According to the CDC, the principle rabies hosts today are wild carnivores and bats.

The virus infects the central nervous system causing encephalopathy (disease of the brain) and ultimately death; however, rabies is both preventable and treatable. Modern day vaccines prove to be nearly 100 percent successful and death only occurs when individuals are unaware they have been infected and fail to seek medical attention.

In humans, the symptoms of rabies usually occur within a week after exposure. In rare cases, symptoms may not occur for over a year. A distinctive sign of rabies infection is a tingling or twitching sensation around the area of the animal bite. As the infection progresses, symptoms may include irritability, muscle spasms, confusion, hallucinations, seizures, weakness, paralysis, difficulty speaking and increased production of saliva or tears. In the advanced stage, symptoms include double vision, problems moving facial muscles, abnormal movements of the diaphragm and muscles that control breathing, difficulty swallowing and increased production of saliva. Rabies is almost invariably fatal after neurological symptoms have developed.

There are several guidelines you should follow if you've been exposed to rabies. Wash the wound thoroughly with soap and water, and seek medical attention immediately. Try to capture the animal without damaging the head or risking further exposure. **Do not** let any animal escape that has possibly exposed someone to rabies. All wild animals must be tested for rabies if human exposure has occurred. Depending on the species, it can be observed or tested for rabies to avoid the need for rabies treatment; this includes bats with skin contact. If a rabies-suspected biting animal cannot be captured and tested, human treatment should begin immediately.



Photos by Loren Ketai M.D., Cynthia Goldsmith and Luanne Elliot
Courtesy of Centers for Disease Control

Hantavirus

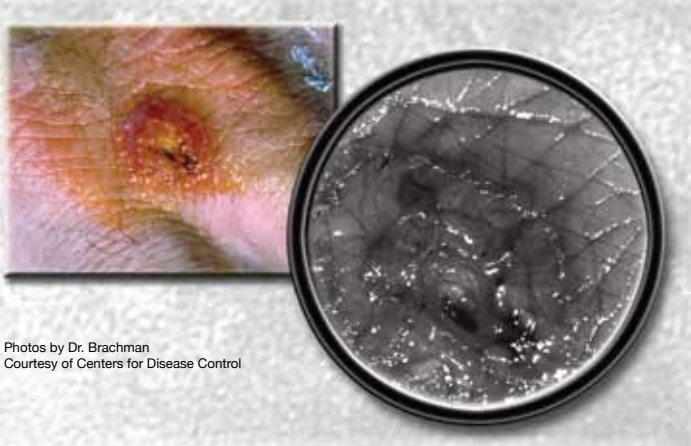
Hantavirus Pulmonary Syndrome is a deadly disease contracted via exposure to rodents. Humans can contract the disease when they come into contact with an infected animal or their droppings and urine. Infection can occur by breathing dust contaminated with saliva, urine or feces of an infected rodent. Infection can also occur if contaminated dust gets into broken skin or a mucous membrane (such as an eye), if food or water is tainted by an infected animal, or from the bite of an infected rodent.

The disease came into focus in North America in 1993 when a major outbreak occurred in the four corners region of the United States (New Mexico, Colorado, Utah and Arizona). During this outbreak, 13 people died from the virus. Even with intensive medical therapy, more than 50 percent of the diagnosed cases have been fatal. As seen above, the virus is not restricted to the southwest, and precautionary measures to avoid infection should be taken where deer mice and white-footed mice are found. Other known carriers include the cotton rat and the marsh rat; other carriers may exist. The disease begins as a flu-like illness (fever, chills and muscle aches), but it can rapidly progress to a life-threatening condition marked by respiratory failure as lungs fill with fluid.

Persons working in an environment inhabited by mice, such as storage sheds, hangars, garages or where rodent nests or droppings are found, should take steps to mitigate possible infection. If you must work in an area where contact is possible, follow these recommendations from the CDC:

Photo Illustration by Dan Harman

1. When opening an unused cabin, shed or other building, open all the doors and windows, exit the building, and allow the space to air out for 30 minutes.
2. Return to the building and spray the surfaces, carpet and other areas with a disinfectant. Leave the building for an additional 30 minutes.
3. Spray mouse nests and droppings with a 10 percent solution of chlorine bleach or equivalent disinfectant, allow to sit for 30 minutes, and then using rubber gloves, place the materials in plastic bags, then seal and dispose of the bags in the trash or incinerator. Dispose of gloves and cleaning materials in the same manner.
4. Wash all potentially contaminated hard surfaces with a bleach or disinfectant solution. Vacuuming should be avoided until the area has been thoroughly decontaminated and then should only be done (the first few times) with adequate ventilation. Surgical masks may provide some protection.



Photos by Dr. Brachman
Courtesy of Centers for Disease Control

Tularemia

Tularemia is a potentially serious illness caused by the bacterium found in animals, such as rodents, rabbits and hares. Symptoms of tularemia may include sudden fever, chills, headaches, diarrhea, muscle aches, joint pains, dry cough and progressive weakness. For persons infected by handling animal carcasses, symptoms can include a slow growing ulcer at the site where the bacteria entered the skin and swollen lymph nodes. If the bacterium is inhaled, pneumonia-like illness can occur. In the U.S., most people acquire tularemia from arthropod bites, particularly tick bites, or from contact with infected mammals, particularly rabbits. If diagnosed early, doctors can usually treat tularemia effectively with antibiotics. Failure to consider tularemia during illness can lead to the misdiagnosis of a patient. About one-third of untreated people die, but nearly all survive when treated.

People who work in a high-risk occupation or in an area where tularemia is endemic should consider taking measures to reduce possible infection. Most people contract tularemia through a tick bite, so if you're in tick-infested areas, wear long-sleeved shirts, tuck pants into socks, and use insect repellent. After coming in from the field, check all clothing and inspect your entire body for ticks.

Hunters and people who handle wild rabbits should wear gloves and protective goggles. Wash hands thoroughly after touching an animal, avoid handling animals that appear ill, and cook all meat thoroughly.

Photos by Jim Gathany and P.E. Rollin
Courtesy of Centers for Disease Control

West Nile Virus

West Nile Virus is an illness contracted through the bite of an infected mosquito. Wild birds are the principle host of WNV. The mosquito becomes infected when they feed on infected birds. The virus can potentially cause serious illness in some people and is fatal to certain species of birds, most notably from the Corvidae family (crows and jays). According to the CDC, about 1 in 150 people infected with WNV will develop serious illness, such as West Nile Encephalitis, West Nile Meningitis, or West Nile Poliomyelitis. Milder symptoms of the disease include fever, headache, body aches, nausea, vomiting, swollen lymph glands or a rash. Eighty percent of infected individuals with WNV will effectively fight off the illness and show no clinical signs of the disease.

As of December 2007, human infection has occurred in 43 states with the highest number of human infections reported to the CDC occurring in Colorado (555), California (379), North Dakota (367) and South Dakota (207). People over the age of 50 have a greater chance of developing serious illness. Among those who develop severe illness, fatality rates range from 3 to 15 percent and are highest in the elderly.

There is no treatment for WNV infection. In severe cases, hospitalization and intensive supportive therapy is warranted and may involve intravenous fluids, respiratory support, airway management and prevention of a secondary infection such as pneumonia.

The best way to reduce your chances of WNV infection is by avoiding mosquito bites. Use insect repellent when mosquito activity is high (dusk to dawn). Use a U.S. Environmental Protection Agency-registered insect repellent that contains DEET or picaridin, and limit the amount of exposed skin by

wearing long-sleeve shirts, pants and socks. Mosquitoes can bite through thin clothing, so for extra protection, spray insect repellent on clothing. Some people may have a reaction to certain chemicals in repellents, so before using a product, test repellent on a small area of skin before applying liberally.

Controlling mosquitoes around your work place and home will decrease your chances of infection. Mosquitoes lay their eggs in standing water, so limit the number of breeding places by draining these sources of water. Drain water at least once a week from pots, birdbaths, swimming pool covers and buckets found around your property. Repair screening on windows and ensure young children are protected during times of high mosquito activity.

Photos by Dr. Fred Murphy and Sylvia Whitfield
Courtesy of Centers for Disease Control

Tick-borne Diseases

Ticks can be found in most of the U.S. and may carry serious diseases. Besides Tularemia, tick-borne diseases include Lyme disease, Rocky Mountain Spotted Fever, Colorado Tick Fever, Southern Tick-Associated Rash Illness, Anaplasmosis, Babesiosis, Ehrlichiosis, Powassan Encephalitis, Q Fever, and Tick-borne Relapsing Fever.

Lyme disease is the most frequently reported tick-borne illness in the U.S. People are infected with Lyme disease after a bite from an infected black-legged tick (also known as a deer tick), western black-legged tick, or lone star tick. Some species of ticks can transport several different pathogens to humans. In addition to Lyme disease, the black-legged tick can transmit Anaplasmosis and Babesiosis. The Lone Star tick has been linked to Ehrlichiosis and Southern Tick-Associated Rash Illness, while the American Dog tick is a carrier of Rocky Mountain Spotted Fever and Tularemia.

Symptoms of Lyme disease can vary because it affects different parts of the body; not everyone with the disease will have all the signs and symptoms. One distinguishing, but not absolute, sign of the disease is a rash resembling a bull's-eye ring that usually appears around the site of the tick bite. However, some infected individuals never develop the rash, while others are unaware of a tick bite altogether. Other symptoms include fatigue, fever, chills, headache, muscle and joint aches, and swollen lymph nodes. Left untreated, the infection will lead to more distinct symptoms such as Bell's Palsy (loss of muscle tone on the face), severe headache and stiff neck, heart palpitations and joint pain. Late stage symptoms include arthritis in large joints, neurological disorders and numbness in extremities.

Lyme disease is curable with antibiotics. The challenge remains in the proper and early diagnosis of the disease. A test is used to determine if your blood has made antibodies for the Lyme disease bacterium. Adding to the difficulty of diagnosis, it may take three to six weeks before antibodies are detected in the blood, so testing too early can result in a false negative. Talk to your doctor if you have symptoms of the disease or have removed a tick from your body. If possible, put the tick into a wet paper towel and place in a zip-lock plastic bag. Sometimes tests can be done on the tick to check if it's a carrier of a disease.

Summary

Managing wildlife species on an airfield, working inside or cleaning contaminated structures and many outdoor recreational activities are possible sources of zoonoses exposure. Prevention of exposure to these animal-related illnesses requires some knowledge of the animal carrier, vector, and/or the pathogen itself. Knowing that many of these pathogens can be passed to humans through an insect bite is the first step toward prevention. Proper application of an effective insect repellent will greatly diminish chances of contracting many of these illnesses.

Outdoor recreationists and wildlife biologists are most at risk, but there have been many cases where individuals have contracted Lyme disease from ticks in residential landscapes. A seemingly benign activity, such as picking up a struck animal on the runway, can expose an individual to serious diseases. Common sense hygienic precautions, such as using disposable rubber gloves and thoroughly washing hands after handling wildlife (both dead and alive), can prevent the transfer of rabies from animals to humans.

Should you refrain or cut back from outdoor recreation? Absolutely not. Should you educate yourself and your family about zoonotic diseases and preventative measures? Absolutely.

1. Taylor LH, Latham SM, Woolhouse ME. Risk Factors for Human Disease Emergence. Philos Trans R Soc Lond B Biol Sci. 2001; 356:983–9.

2. Friend, Milton, 2006, Disease Emergence and Resurgence—The Wildlife-Human Connection: U.S. Geological Survey Circular 1285, 388 p. World Wide Web accessed March 8, 2007, at URL http://www.nwhc.usgs.gov/publications/disease_emergence/index.jsp

Photo illustration by Dan Harman

Habit Pattern on the Flight Deck

ANONYMOUS

One of the behavioral elements that makes an individual a good pilot is the ability to consistently complete a set of objectives. It's the ability to complete a set of checklist steps in the right order, the same way, every time, that makes a pilot successful. However, what happens when these habit patterns get interrupted? What happens when an aircraft emergency takes you out of your normal sequence in the aircraft? In these cases, your best behavioral ally can become your worst enemy.

After studying a variety of aircraft mishaps, an abrupt change in the normal sequence of events on a flight deck can cause even the most experienced pilot some difficulty. More experience in a particular aircraft could be a greater hazard when an unforeseen circumstance takes you out of the normal flow of events. The more times you complete a sequence of tasks, the more you expect and rely on that sequence to stay the same. You expect one task to lead you to the next, and the next until you have landed. However, when an event takes you out of your sequence, it may be difficult to remember to go back and accomplish the next step. That's why mishaps frequently occur out of abnormal, but benign circumstances. A C-17 sortie I experienced as a co-pilot is a great example of this potentially deadly behavior pattern.

As a co-pilot in the C-17 who became mission ready in the era following Sept. 11, 2001, I found myself thrust into combat situations early on in my career. In fact, my 4th flight in the C-17 was into Afghanistan. I was forced to learn quickly and adapt to the new flying environment of Southwest Asia.

During one of my early trips into Afghanistan, I was with a relatively experienced crew. The IP had several thousand hours total time and was very experienced in the C-17. The co-pilot was one of their T-37 instructors during pilot training and was on their own C-17 aircraft commander upgrade mission. Therefore, I felt very comfortable watching and learning as this duo flew around in the AOR.

On one particular mission, we were scheduled to fly from Camp Snoopy in Doha, Qatar to Kandahar, Afghanistan to resupply the base with a few pallets of food. Since we had already been flying in the Middle East for a few weeks, we learned nothing new during that day's intel/tactics briefing. There was always the threat of MANPADs and AAA fire anywhere in Afghanistan, and we were no strangers to these threats. We felt prepared to face any danger during our mission; however, it was the most innocuous threat that day which nearly led to disaster.

The flight from Qatar to Afghanistan was unevent-

U. S. Air Force photo by Master Sgt. Kevin J. Gruenwald

ful. It was only after we started our approach that we began to encounter trouble. It was customary to fly a steep spiral approach over the airfield to transition from the en route system to landing. The IP was the pilot flying and with the aircraft commander upgrade student not flying. I was sitting in one of the additional crew member seats to watch their procedures and back them up. As the IP began her steep spiral approach into the airfield, everything seemed to be going as briefed. Then, as we began our second and last circle over the field, we noticed a bright light a few miles from the field that appeared to be tracking our aircraft. We were being spotlighted. This is the event that distracted the crew and broke our normal sequence of events for landing.

Once the crew realized that we were being spotlighted, we all looked outside attempting to determine the exact location of the light so that we could brief Intel after we landed. However, as we were all looking outside, the aircraft was still descending at 4000-5000 feet per minute toward the ground on the approach. As a result of this distraction, the IP started to get behind the approach, and it became difficult to manage the descent rate and approach angle. The approach that had started out easy had become far more difficult. Eventually, we ended up on an angling final, well above a normal glide path, with the crew channelizing their attention on saving the approach.

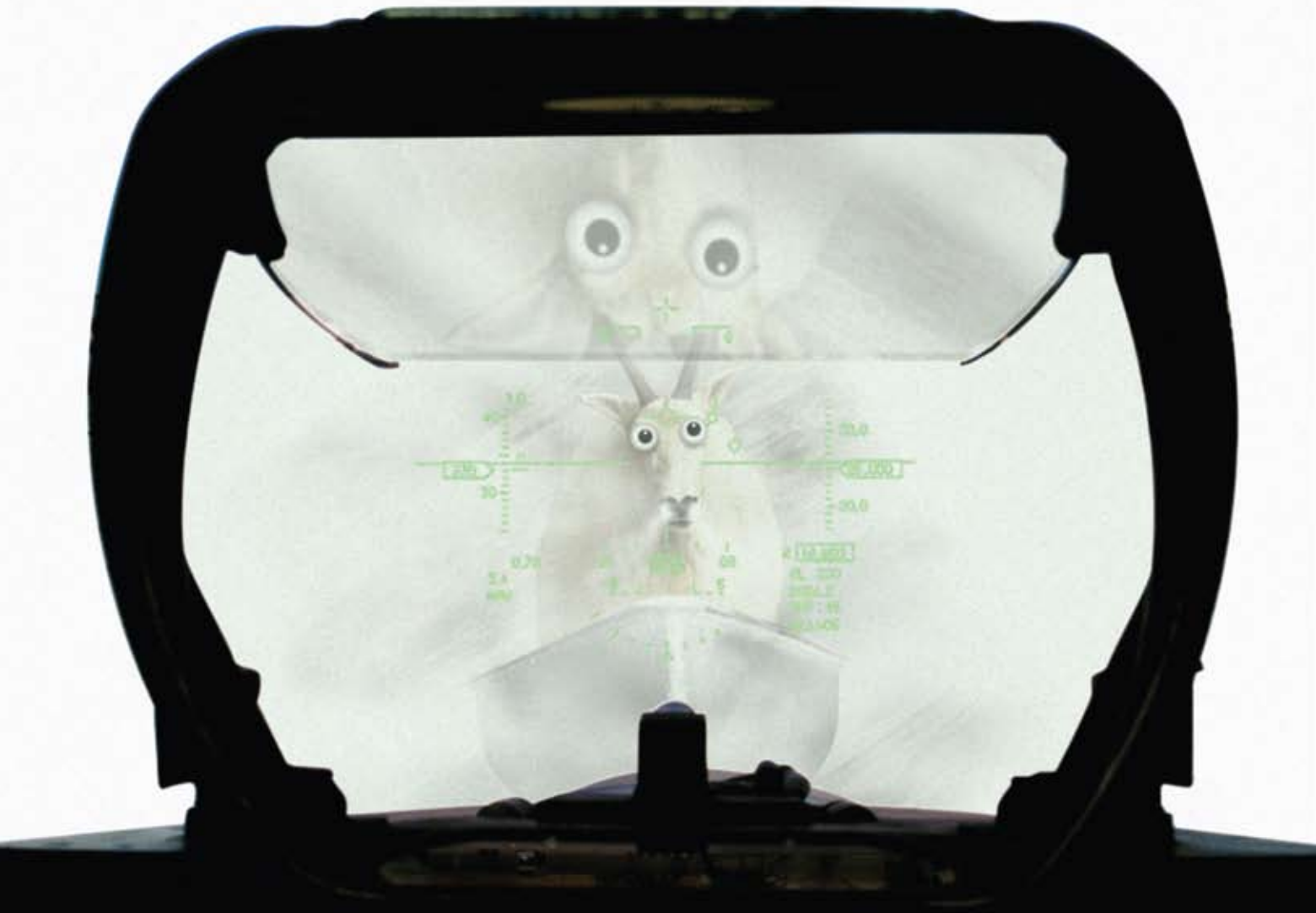
Early on in Operation Enduring Freedom, it was an unspoken rule that you needed to land on your first approach. Your first approach allowed the enemy to know your location, and therefore, a second approach may expose the aircraft to targeting by enemy fire. There was significant pressure to put the aircraft on the ground the first time.

The pilot made every effort to recover from the errant approach, totally focused on that task alone. As a result, the IP recovered the aircraft to a normal landing approach by about 400 feet AGL. The crew then began to relax and continued with the approach. Suddenly, at 250 feet AGL, our Ground Proximity Warning System alerted us to a potential danger. "TOO LOW, GEAR," it shouted at us. As we all simultaneously realized that the gear was still up, the co-pilot slammed the gear handle down, and the pilot lessened the approach angle to allow enough time for the gear to be down and locked before touchdown. Shortly before touchdown, the gear was confirmed down. After completing the landing, we had some time to discuss what had just happened.

Our first mistake was allowing the entire crew to look outside at the spotlight to determine its location. None of us had been spotlighted before; otherwise, we would have realized this was a non-event. Our second mistake was allowing the spotlight to break our landing sequence of events, which eventually caused us to forget about completing the Before Landing Checklist. The checklist would have reminded us to put the gear down. Our last mistake was to not go-around early on before we got behind on the approach, or definitely when we realized that the gear wasn't down. Although the second approach may have exposed our crew to some additional threats, the biggest threat was damaging the aircraft by landing with the gear still in the well.

As a result of this event, I added a step to my personal landing checks. I now verify the landing gear and our landing clearance at 1000 feet AGL. It's a step that I make every effort not to forget, even when things are going wrong. I brief my additional crew members that helping the crew to remember this step is their only job, even in an emergency situation. This last-chance safety check has made me a more confident and better pilot overall. I also make every effort to encourage my students to develop their own last-chance safety checks as well.

Even the most experienced pilots can be thrown out of their normal rhythms by random events. Therefore, when an unplanned event takes you out of your normal habit patterns, acknowledge the distraction or resolve the situation, then continue with your normal patterns — this will keep you from turning a bad situation into a potentially deadly one.



"What's a Boat Doing Way Up Here?"

MAJ. TIM STRETCH
944th Fighter Wing
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U.S. Air Force photo
Photo illlustration by Dan Harman

Have you ever seen Gary Larson's "The Far Side" cartoon in which two pilots are wondering what a mountain goat is doing "way up" in the clouds? That cartoon used to make me laugh — until a similar event happened to me!

I was part of an F-16 three-ship on a typical Air Combat Maneuvering training mission. My role as No. 3 was "bandit," to fly as a single Red Air adversary against the two other Blue Air fighters.

We briefed the sortie and knew that the weather would be a factor. When our flight entered the overwater airspace, we encountered a solid cloud deck about 2,000 feet above the water. There also was a solid overcast ceiling at about 15,000 feet. In between these two cloud decks, the area was clear and the visibility was unlimited. I could actually see a horizon in all directions. Flight lead confirmed we'd use the briefed fight floor of 5,000 feet. We accomplished

a "G-check" to test proper operation of the G-suit inflation and positive pressure breathing equipment. The G-check was also a chance to practice my L-1 straining maneuver, and served as a reminder that I was about to enter a dangerously high G environment. My adrenalin was flowing, and I felt eager to hear those two words: "Fight's On!"

After four dynamic, high-speed, high-G ACM engagements, I determined I had enough gas for just one more setup. I built some range and airspeed for the final engagement. As I accelerated to 500 KIAs and gained approximately 10nm of separation from the fighters, I had a brilliant idea … I would perform an Immelman back into the fighters, thus changing altitude from low to high, and hopefully gain an advantage for the last merge. What I did next put me right into a Class E spacial disorientation event.

My Immelman was performed at over 9 Gs. I didn't stay on top of my G-strain, and as the blood rushed out of my brain, my vision suffered, and everything started going white. So I hunkered down on my G-strain, which forced the blood back into my brain, and I regained my vision. I pulled to the horizon and finished what I thought was my Immelman. What I didn't know was that while visually impaired, I had actually over-pulled and nearly performed a loop. This is when the spatial D set in: I thought I had executed an Immelman which ends with a roll upright — my roll to "upright" actually rolled me inverted.

Something didn't feel right (because I was upside down). But because I was descending, the jet was still under 1 G, so I was experiencing the normal upright 1 G feeling, although I was inverted. My brain was telling me I was right side up, because I never recognized the pull through the Immelman into a loop. Since it didn't feel right, I instinctively tried to confirm my attitude and recover. Looking outside, I could see the horizon. The problem was, I couldn't tell which way was up due to the cloud layers both above and below me. I transitioned to instruments inside the cockpit to confirm my attitude. My main ADI indicated I was inverted. I felt that couldn't possibly be correct because my brain was still telling me that I had performed an Immelman and was right side up. I looked at my standby attitude indicator, but it had tumbled during my maneuvering and was useless. I made a slow aileron roll from inverted, to right side up, to inverted again, trying to determine my attitude. I checked my altitude and noticed I was still above the floor, but I didn't understand why I was descending when I felt I should be climbing. I was so spatially disoriented, I thought about ejection if I couldn't quickly figure something out. Then, while still flying inverted, a small fishing boat (Gary Larson's mountain goat) appeared briefly through the clouds. For a split second, I thought "What the heck is a boat doing way up here in the clouds?" It was then that I recognized my spatial D, rolled upright, and recovered.

I "knocked it off" and returned to base. After landing, I told my squadron leadership about the event. There would be some valuable lessons learned. Lucky for me, I got to personally brief those lessons at the next wing safety meeting.

My three main points (SOS grad) pertained to training rules, anti G-strain, and recovery from unusual attitudes. First, I unknowingly broke an ACBT training rule in 11-214. It states that among other weather requirements, you must have a "discernible horizon." I never really thought about what "discernible" meant until this event. You need to know which way is up and which way is down. Sounds pretty basic, but it took a disorienting event to make me understand the importance of that training rule.

Second, my G-strain was not sufficient for the maneuver I performed. I never had problems with Gs in the past, but no matter how experienced you are, G-onset can be fast and fatal if you aren't ready. This event occurred on our fifth ACM engagement; I was getting tired and my G-tolerance was weakened. Also, I was complacent and didn't perform my G-strain correctly. I reviewed my tapes with a flight surgeon, and it became clear to me that my breathing technique went from textbook during the first few sets to poor on that last set. Instead of easing off of the Gs, I simply elected to strain harder while maintaining maximum G. Bad move. I should've eased off like I was taught to do in centrifuge training. It's imperative to recognize that our ability to sustain Gs can seriously degrade with fatigue, especially during missions like BFM and ACM. For me, a 9 G Immelman was not a smart tactic on my fifth ACM set. Know your limits and fly the jet accordingly.

Third, while spatially disoriented, I trusted the "seat of my pants" sensations instead of the instruments. My brain was telling me I was upright due to the expected maneuver, but my main ADI indicated (correctly) my inverted attitude. The brain can be a very powerful liar and has caused numerous physiological mishaps. It takes an enormous amount of fortitude to crosscheck all of your instruments, analyze the situation, and recover the aircraft based on logic instead of feel. You can't just blindly trust your instruments (as evident from my standby ADI), but if looking outside doesn't help, realize that your brain may try and dissuade you from trusting a perfectly functioning ADI.

As a final note, if you ever experience spatial disorientation, remember to tell your safety representative. If it could happen to you, it could happen to anyone else. We can all learn from others' experiences. Hopefully you can learn from my encounter on the Far Side and won't have to rely on mountain goats or fishing boats to determine which way is up.

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3. The fire bottle had to get hot somehow. Take away any potential source of heat if you don't need it. In other words, given the opportunity again, he would have just isolated the right wing bleed air manifold.

This all sounded reasonable enough to me and with thoughts of how much beer this unexpected trip was going to buy me, I left him to his crewrest and prepared for my mission.

Takeoff out of Rota was uneventful. Past Sigonella, hang a right over Egypt, cross over Saudi Arabia and turn north into Kuwait. No problems at all. Offload some pallets, onload some pallets, fire the jet back up and take off from Kuwait.

Then I had déjà vu! About 20 minutes into flight we got the Agent A Low light on the right wing, just like the previous crew did. There was no Chapter 3 emergency procedure for fire bottles inexplicably discharging in flight and as of 2007, there still wasn't. Thinking back to my earlier conversation, I reached up and isolated the right wing manifold. It was dark, but the weather was clear, and I had no immediate concerns about icing. I knew we could stay pressurized with just the left wing manifold, so no worries there, either. We decided to level off at about FL200 and come up with a game plan. The loadmaster scanned the right wing, but could see little in the dark.

We decided there were three options at this point: divert to Prince Sultan Air Base in Saudi Arabia where we knew we could get maintenance; continue along our route and divert into Sigonella and get maintenance; or turn around and land back at Kuwait and wait for the maintenance repair team.

First, we tried PSAB, but the Saudis wouldn't let us land there without diplomatic clearances, unless we used the "E" word. Well, I wasn't quite sure that this required declaring an emergency, so we talked about making it to Sigonella, another 3½-hour flight from where we were, and I again went back to the hangar flying that we did earlier. Flying around for significant periods of time without all the safety equipment just didn't pass the good judgment test for me. One option remained: RTB Kuwait. A half hour later, we were uneventfully on the ground and had taxied to park. The loadmaster did a quick inspection of the right wing, and before I was even out of my seat, he was saying I had something to come look at. An eight-foot long panel on the lower skin of the right wing was swinging in the breeze — with a softball-sized hole in the middle of it. The fire bottle had not just discharged by outgassing through a thermal diaphragm this time; it had violently blown its connective ducting down through the bottom of the wing. Flying around with holes in the wing isn't the most comfortable feeling in the world. It was at that point that I was really glad I had made the decisions I had.

Multiple parts had to be replaced, to include the bleed air ducting that had ruptured, the fire bottle and its plumbing, and the lower wing access door. It cost us an extra week in Kuwait, but who knows what it could have cost us if it weren't for taking the time to talk about an unusual malfunction and what to do about it.

Hangar flying is worth its weight in gold.

Class A Flight Mishaps

FY08 (Through Aug. 14, 2008)

	Class A Mishaps		
	FY08	Same Date in FY07	Total FY07
ACC	7	5	8
AETC	6	5	5
AFMC	1	0	1
AFRC	3	1	1
AFSOC	0	0	1
AFSPC	0	0	0
AMC	4	2	3
ANG	3	5	5
PACAF	1	1	1
USAFE	0	0	1
AF at Large	0	1	1
Total	25 / 1.43	20 / 1.11	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
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 03	B-1B		No. 2 engine damaged
May 21	T-1A	✈	Landed short of runway
Jul 21	B-52H	✈	Aircraft crashed in ocean; 6 fatalities
Jul 30	F-15D	✈	Crashed during Red Flag exercise; 1 fatality

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
Aug 01	MQ-1B	✈	Aircraft crashed
Aug 12	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 Aug. 14, 2008).**

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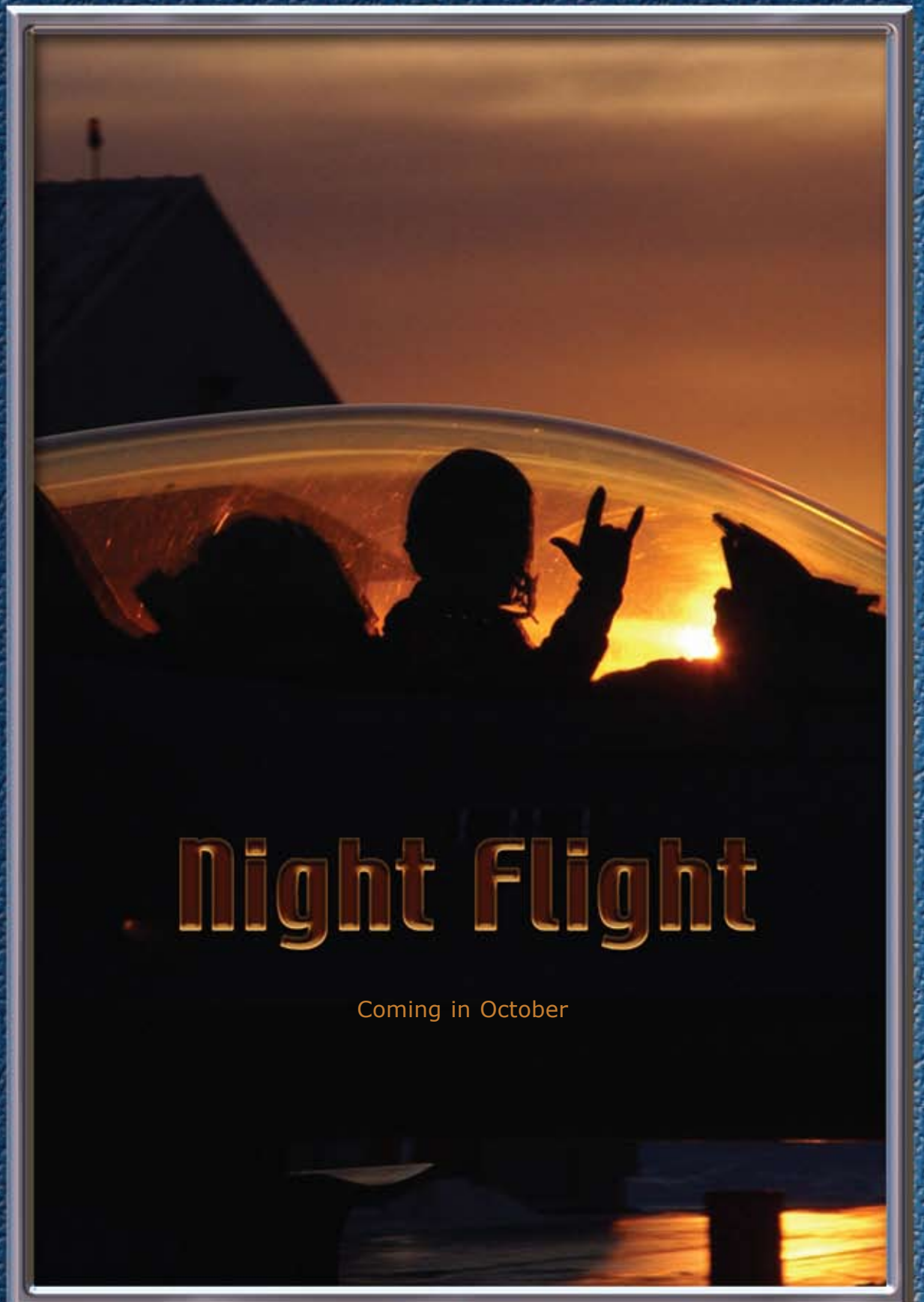
Night Flight
Coming in October