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SAFETY sage

FOD IN THE AOR

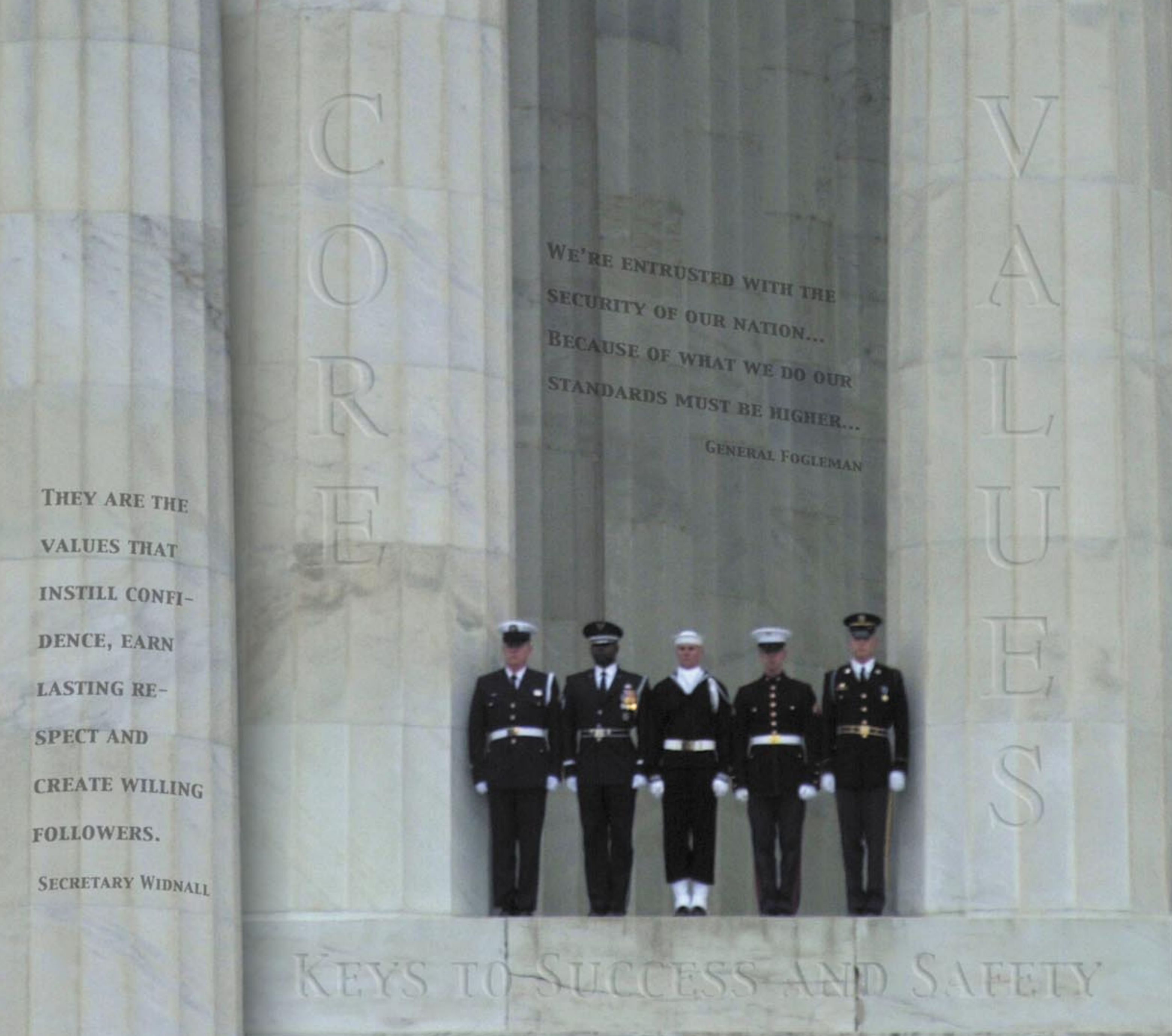
MAJ RICH DOYLE
Chief, Wing Safety
Deployed

FOD (Foreign Object Debris/Foreign Object Damage) is a term that should be familiar to all airmen, not just those with duties that take them near aircraft. Foreign Object Debris is basically tools, materials, hats, jewelry, rocks, dirt, etc., allowed into an area where it *may* cause damage to aircraft or other equipment. When that debris actually *causes* damage, it becomes Foreign Object Damage. Every year the USAF spends tens of millions of dollars repairing equipment damage due to preventable FOD incidents. Money is secondary to the unnecessary risk imposed on personnel due to the FOD incident and the negative impact to the mission. If an aircraft is down due to a FOD incident, it may as well have been caused by the enemy, because that asset is not out there dropping bombs or delivering supplies.

The most publicized FOD incidents are caused by maintenance or operations personnel leaving tools, parts, checklists and flight publications in or near a jet engine intake. The jet sucks them in and you instantly have a FOD incident that could cost hundreds of thousands of dollars. FOD should concern us even more when deployed than at home station. We face the same Ops and MX issues, but we have to deal with more rocks, dirt, sand and mud. Debris dragged onto the ramps, taxiways and runways is the number one FOD problem. Due to the expeditionary nature of the airfield, the flightline experiences significant vehicle traffic due to security and airfield equipment maintenance. That traffic is responsible for the vast majority of the debris dragged onto the flightline. We can all play a part in minimizing this problem while driving on the flightline.

- Do not leave prepared surfaces unless absolutely necessary. (No mud bogging!)
- Drive OVER, not around the metal FOD Shakers and accomplish vehicle FOD checks
- Park on concrete, asphalt or airfield matting surfaces as much as possible
- Do not cut across the aircraft parking ramps

Currently all aircraft deployed here are props, and thus less susceptible to a FOD ingestion incident than a jet, but many of our transient cargo aircraft are jets, so we must protect those assets. Additionally, you never know when a fighter aircraft may have to divert in here due to weather or an aircraft malfunction. Most fighter aircraft are extremely susceptible to FOD ingestion. CE and OSS/Airfield Management can only do so much to keep our ramps and runways clean, they need the help of all airfield users. Help them out, exercise FOD awareness to keep us safe and mission capable.



US Army Photo by Sgt Cory Montgomery
Photo Illustration by Dan Harman

TSGT JAMES E. TAYLOR
373 TRS/Detachment 16
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Over the past two and a half years as an AF Field Training Avionics Instructor, I have become increasingly more familiar with the Air Force's Core Values "Integrity First, Service Before Self, and Excellence in All We Do." The values' deeper meaning and consequences of ignoring the principles that they are based upon have become clearer to me. Core Values must be considered in every action and decision made by every AF individual. These values are more than a goal, they are a necessity to ensure a safe and successful outcome to our duties as military professionals. As students pass through my classroom, I have a chance to discuss and observe their perceptions of the AF, what it means to them to be AF members and exactly how much they know about our Core Values.

One difficulty faced by all AF instructors is the "The School House Weave," which is the act of integrating AF Core Values and Operational Risk Management (ORM) into every fifty-minute lesson taught. Instructors are required to use active learning techniques to illustrate and ingrain our Core Values and ORM into our students. Normally, "Integrity First" leads the charge in every aspect of aircraft maintenance training. I can't count the number of times I have used the non-use of technical data as an example of a breach of one's personal integrity. These breaches may put an aircrew member or another maintainer's life at risk. Everything we do as military members requires us to use and adhere to all Core Values.

Our level of understanding, when it comes to our Core Values, could use some work. Let's look at our Core Values, what they consist of and how they can be used to support our mission.

Integrity First

Integrity is a trait of one's character, a conscious effort, a need to do the right thing in all situations. With that idea in mind, a breach of integrity is a choice and can never be an accident. If your inner voice tells you something is not right with a decision or action, listen to it! No one can be faulted for using his or her integrity to make a decision. At times, the tempo of our duties rises and the pressure to make things happen faster takes over. At those times we must keep an eye on the decisions we make and the actions we condone in the name of the mission. When trying to justify questionable decisions, ask yourself, "Is this honestly the best direction to go in this situation?" "Do I want to be accountable for the outcome of my decision if something should go wrong?" If either of these answers is "No" or even questionable…STOP and re-think the decision.

Service Before Self

Service before self is one of the most misunderstood aspects of our Core Values. It is often misused and misquoted to prove a point, or to force an action on the part of a subordinate. In all actuality, service before self means following the rules, respecting others and putting desires and wants that conflict with the needs of the AF on the back burner. We must maintain discipline and bearing in all situations regardless of our wants, desires or inner feelings. Successful completion of any mission is dependent on the ability of all participants to focus on the objectives at hand, and not have their actions or judgments clouded by things that may interfere with getting the job done. Bottom line, mission comes first!

Excellence In All We Do

Excellence in all we do is exactly that, a habit of doing things right and doing them to the best of our abilities every day, and teaching our subordinates to do the same in every situation they may face. To quote Aristotle, "Excellence is an act won by training and habituation. We do not act rightly because we have virtue or excellence, but rather we have those because we have acted rightly. We are what we repeatedly do. Excellence, then, is not an act, but a habit." Making excellence and safety a habit, instead of an occurrence, will add to your unit's ability to achieve and change the overall organizational climate, which will raise unit morale and foster teamwork.

As a supervisor, it is your duty to ensure the information and ideas of what Core Values consist of are presented to your subordinates daily, and more importantly, seen by them in every action and decision you make.

The disregard of our values is a very serious problem and should be dealt with every day at every level, not just when someone crosses the line and actually makes the "big mistake." If a "mistake" was made, and attributed to a breach of our Core Values, is the perpetrator of that "mistake" entirely to blame? Shouldn't the blame be placed on the entire unit? Numerous lives have been lost and millions of dollars wasted due to the blatant disregard of technical data, cutting corners and "common practice" safety violations. Are these mistakes? Not actually. I like to call them failures, failures of the entire system when it comes to instilling our Core Values into our people.

By knowing our Core Values, their meanings and how to implement them within our units, and by imparting that knowledge to those around us, as well as living them ourselves, we set the example for others to follow. By setting that example we are setting ourselves up to succeed and building the foundation for a safe and productive AF. Bottom line, the less we have to worry about failures attributed to not adhering to our Core Values, the more time we have to focus on our mission and to achieve that mission on time, on target and safely.

THEY PROVIDE A COMMON GROUND AND COMPASS BY WHICH WE CAN ALL MEASURE OUR IDEALS AND ACTIONS.

SECRETARY WIDNALL

You Can Change The Future

FIVE EASY STEPS TO BUILD A SOLID TRENDS PROGRAM

USAF Photo by SSgt Cherie A. Thurlby

LT COL LEN LITTON
71 FTW/SE
MAJ MIKE MONGOLD
32 FTS/ADO
Vance AFB, OK

What if we could proactively prevent the mishap from occurring?

Play. You have just completed the daily airfield inspection and are returning to the safety office to finish up some paperwork. Just maybe you can finish up one of your many ongoing safety investigations today. Then the "brick" screeches out its emergency tone. The voice on the radio calmly informs everyone that "there is an in-flight emergency in progress on a T-37 landing on runway 17C in five minutes, no additional information is known at this time." You quickly turn the flight safety truck around and fall in line with the responding emergency vehicles. En route to the runway, you wonder if this is going to be one of the many "routine" emergencies you have seen, or will it be something more serious; you pray for the former.

The "brick" squawks for the second time; the voice on the radio informs you that the T-37 solo student is experiencing a flap malfunction. The hairs on the back of your neck start to stand up. The tower announces on the crash net, "T-37 emergency aircraft is next to land 17C." The next thing you see is black smoke billowing up from the approach end of the runway. As you get closer, you see the emergency aircraft has landed short of the runway and the pilot is egressing. You respond to the scene to ensure the pilot is safe and the mishap site is secured. Thank goodness, no one is hurt, but this is a serious mishap. Not to mention that word every FSO dreads to hear: "REPORTABLE."

To all the FSOs out there, I'm sure this scenario sounds familiar. In the safety business we spend a great deal of our time in a "reactive" mode. Reacting to IFEs becomes second nature. Completing event and mishap investigations becomes old hat, in addition to putting out all the other "fires" that come our way. Nothing is wrong with that; our investigations and reporting process serves the Air Force well. However, what if we could proactively prevent the mishap from occurring? What if we could look into the future and "see the next mishap coming"? Here at Vance AFB, we are attempting to do just that. Our Flight Safety Mishap Trend Analysis program is designed to serve as the proverbial "crystal ball," allowing us to proactively prevent the next mishap and ensure you never read about us in the daily safety summary.

Let me guess: Your first question is "why," and your second one is "how." The answer to the first one is "because the regulation says so." AFI 91-202, *The US Air Force Mishap Prevention Program*, paragraph 5.5, states, "Full-time safety staffs at all levels should develop locally-oriented mishap analysis programs to evaluate mishap statistics and identify trends." The answer to your second question is located in... 91-202? No, won't find it there. What about 91-204? No, nothing there either. The answer is: No matter how hard you look, you won't find anything that tells you how to go about developing a mishap analysis program.

So, are we done before we even get started? Well, here at Vance we have built a program tailored to our needs that may assist you in developing your own program.

Step 1: Identify Data

This is the most important step in developing a solid trend program. The cornerstone to any trend program is to identify the correct data to analyze. With the abundance of spreadsheets and databases today, you can easily be overwhelmed by the sheer amount of data at your fingertips. You must ask yourself, what data will allow you to analyze the root of your processes? Once you have determined what data you want to collect, you have to decide what source you will use for your data. Some items to consider when selecting your data source are accuracy, timeliness and accessibility. Accuracy goes without saying. Timeliness refers to how quickly and how often the data is updated. For example, data that is updated semi-annually does not meet your needs if you wish to analyze your processes monthly. Accessibility refers to how easy it is for you to gain access to the data you require. In some instances, the data you want may not be currently tracked. In those situations, you will need to work with the process owner or build your own process to collect the required data. At Vance, we chose to use the following data: In-flight emergencies, Product Quality Deficiency Reports (PQDRs), monthly reportable mishaps, aircraft maintenance write-ups and Hazard Air Traffic Reports (HATRs).

Step 2: Collect Data

The key consideration during this step is to determine the time interval for your analysis. Some organizations will require weekly gathering and data analysis, while others can be accomplished monthly, quarterly, semi-annually or annually. The best time interval for your organization is dependent on how quickly your data can point to a developing trend. For Vance, we chose to complete a monthly trend analysis.

Step 3: Analyze the Data

This can take many different forms. Some data lends itself to being statistically analyzed. On the other hand, you can best assess other types of data simply by using your experience and knowledge to identify developing trends. When analyzing data from a statistical aspect, you do not need a staff of statisticians and accountants. Most spreadsheets and databases will provide you with the basic analysis, such as determining means and standard deviations. The major pitfall in this step is to avoid getting so deep in analyzing data that you lose sight of your objective. You will most likely be analyzing multiple sets of data, and you will not have the manpower or the time to analyze every bit of data in tremendous depth. I recommend analyzing to a level where you can first identify a developing trend. This allows you to process multiple sets of data at the same time and to determine which areas require your further attention and investigation. For example, at Vance during a one-month period, we found the T-1A monthly reportable events (per 1000 hours) exceeded the five-year standard deviation. Upon further analysis, we found that three separate smoke-in-the-cockpit events were the cause of our higher than normal rate. Our Flight Safety NCO investigated, determined the cause and submitted his findings to be included in the monthly "Flight Safety Trend Analysis" letter, in addition to submitting a tech order change to update the maintenance manual.

Avoid getting so deep in analyzing data that you lose sight of your objective.

Stop reacting to the mishaps. Make the mishaps react to you!

Step 4: Develop Product and Distribute

The goal of this step is to develop a product that can be used at all levels of your organization from the commander down to the newest airman or lieutenant. This product can take many different forms, and you can tailor it to the needs of your organization. At Vance AFB, we produce a monthly "Flight Safety Trends Analysis" letter. The first two pages are an executive summary. This includes the status of follow-up actions from previous trends letters and the monthly statistical averages of the items listed in Step 1. It also identifies if a trend was or was not noted. Each item in the executive summary is hyperlinked to more detailed data that is included later in the trend letter. For example, the executive summary may state, "Our statistical average for T-37 IFEs for the month was 4.5 events per 1000 flying hours, which is within the five-year historical standard deviation, no trends noted." This information is great for the Wing/CC, but the SQ/CC may want to dig a bit deeper and understand the actual IFEs his squadron experienced. He can click on the hyperlink, and it will take him to a list of all the IFEs for the month, with a graph showing historical IFE rates, current monthly IFE rates, and upper and lower control limits.

Now that you have the letter completed, you need to distribute it. We e-mail a copy of the letter to all the key players on base such as the Wing, Group and Squadron commanders, simulator operators, maintenance, and squadron flight safety officers. We also post the past as well as the current trends letters on our Flight Safety web page for anyone who wants 24/7 access.

Step 5: Follow Up

Normally, trends that are identified during the analysis cannot be investigated and a conclusion drawn prior to publishing the monthly trend letter. Therefore, there needs to be a tracking and follow-up process. As discussed earlier, the executive summary lists follow-up actions from previous trend letters. If a more detailed explanation is required, it will be included in the data analysis section. On-going follow-up items are tracked on a spreadsheet. The spreadsheet lists what actions are being investigated, when they were identified, and the current status. When an item is closed out, the trend letter that discussed the closeout of the item is listed.

Rewind. Play. You have just completed the daily airfield inspection and are returning to the safety office to finish some paperwork. Maybe you can finish up one of your many ongoing safety investigations today. Then the "brick" screeches out its emergency tone. The voice on the radio calmly informs everyone, "There is an in-flight emergency in progress on a T-37 landing on runway 17C in five minutes, no additional information is known at this time." You quickly turn the flight safety truck around and fall in line with the responding emergency vehicles. En route to the runway you wonder if this is going to be one of the many "routine" emergencies you have seen, or will it be something more serious; you pray for the former.

The "brick" squawks for the second time; the voice on radio informs you that the T-37 solo student is experiencing a flap malfunction. The hairs on the back of your neck start to stand up. The tower announces on the crash net, "T-37 emergency aircraft is next to land 17C."

Stop. Wait a minute; hold on here. In the first place, this scenario never happened. Because of a trend you identified in the flap system, your FSNCO focused on the problem and found that the flaps were not tracking at the same rate due to faulty parts. He discussed his finding with maintenance personnel, and a PQDR was submitted and the problem fixed. As a result of your trend letter, the T-37 squadron's Stan/Eval monitors are giving the Tweet students flap system emergencies during morning stand-ups. In addition, the simulator operators have developed profiles to allow students to experience and recover the aircraft during flap system malfunctions. Finally, your squadron supervision identified the tail numbers associated with this problem, so the crews stepping to the jet are aware of possible flap system problems. The squadron supervision also ensured that the jets are not scheduled to be flown by solo students.

If you are like most FSOs, you like this potential outcome better. First, no paperwork! Second, no busted jet and no one hurt. You see, we can change the outcome. Stop reacting to the mishaps. Put a solid trend analysis program in place in your wing or organization and make the mishaps react to you!

Combat CRM

USAF Resource Photo
Photo Illustration by Dan Harman

A THOUGHT-PROVOKING QUESTION, AND AN ANSWER

LT COL ROBERT R. SINGLETON, USAFR

Aircraft Commander Crew Briefing Guide, Item Number 14. Crew Coordination: "If anyone has a question or a concern, speak up. If you do not like what you see or hear, simply call 'Time Out.' We will stop what we are doing, go straight and level at a safe altitude, and address the issue."

Arrival Briefing, Item Number 5. Missed Approach Intentions: "If anyone sees a reason to go around, simply state 'Go around.' It will be a non-discussion item. We can talk about it on down-wind."

The standard briefs. Through countless crew combinations. Through countless missions. With the standard responses. Questions or concerns were addressed. "Time-Outs" were called. Go-arounds were called. Countless crewmembers lived the crew resource management (CRM) lesson that four, five or six minds were generally better than one mind. Four, five or six sets of eyes and ears generally saw and heard more than a single set of eyes and ears. Incidents and accidents were averted. Lives, limbs, and sheet metal were retained. All was well.

Until my most recent discussion with the finest instructor with whom I have ever flown—a smart guy; a well-liked guy; an airline pilot, an Air Force flight examiner, Chief of his wing's Standardization and Evaluation section. He had just returned from an eight-month deployment to the Persian Gulf and Southwest Asia, in support of OPERATION ENDURING FREEDOM and OPERATION IRAQI FREEDOM. And he was concerned.

His anecdote: Pitch-black, no discernable horizon, low-level, high-speed, tactical approach to a night vision goggle, maximum effort landing. In combat. With possible small arms and man-pads in the vicinity. A discussion on the flight deck between pilots and navigator regarding the accuracy of the end-of-runway latitude and longitude coordinates. A loadmaster uncomfortable with the nature and tone of the flight deck discussion. The loadmaster calls, "Go around," due to his discomfort with the discussion. What does the aircraft commander do? Does he press on, trusting his mind and his eyes? He can see the touchdown point. He trusts the coordinates' accuracy. Or does he respond as per the peacetime CRM habit and execute the Go-around, thereby exposing his aircraft, his crew and the mission to further likelihood of hostile fire while maneuvering for a second approach, lacking the critical element of surprise on the second attempt?

On the night in question, he opted to press on for the successful landing. However, his concerns followed him home months later. Simply put, he asked, *"When is a crew a democracy, and when is it an autocracy?"* He continued, "Is our CRM mindset leading to a 'dumbing down' of the decision matrix to the 'narrowest comfort zone'?"

In my interviews of recently returned OPERATION ENDURING FREEDOM and OPERATION IRAQI FREEDOM units, his question prompted the most thought-provoking days, and the most insomnia-interrupted nights. How, indeed, do we reconcile fundamental notions of CRM with the imperatives of combat?

How do we reconcile fundamental notions of CRM with the imperatives of combat?

Desperately in need of sleep, seeking any escape from insomnia, I took the standard shortcut to shuteye, and began reading the applicable AFIs. I started with AFI 11-290, *Cockpit/Crew Resource Management Training Program*. The AFI states, "CRM program goals are: Maximize operational effectiveness and *combat capability*, and preserve Air Force personnel and material resources." (Emphasis added.) Furthermore, the AFI states, "While CRM programs…have been geared toward the operational flying environment, the potential exists to adapt fundamental program principles to any task or functional area requiring cooperative or *interactive time-critical efforts*." (Emphasis added.)

From the first words, *combat capability* is the goal. With the second and third words, we learn that time-critical is a key influence upon the crew resource management imperative.

Had he executed the Go around in a hostile environment, would the aircraft commander have enhanced or imperiled *combat capability*? Given the *time-critical* nature of the physics involved (barber pole airspeed, straight line to the touchdown zone), coupled with the possible threat of small arms and manpads in the vicinity, was the aircraft commander's decision compatible with the AFI 11-290 "CRM program goals" outlined above?

A further review of applicable publications was unable to find any guidance regarding the decision matrix following a crew-directed "Go-around" call, as was the case in this particular instance. The review did, however, find guidance regarding the related "Crew Resource Management Assertive 'Time Out' Statement." According to the applicable AFI 11-2 series, "As soon as possible after a 'Time Out' has been called, the aircrew will take the following actions: Safety permitting, stabilize the aircraft, the initiating crewmember will voice his/her concerns to the crew, the aircraft commander will provide all other crewmembers with the opportunity to voice inputs relative to the stated concerns, after considering all inputs, the aircraft commander will direct the aircrew to continue the current course of action or direct a new course of action." The discussion concludes with: "NOTE: The aircraft commander is the final decision authority."

Three points are clear in this guidance.

• First, a sincere effort should be made to listen to, respect and resolve crewmember concerns in a collective fashion.

• Second, the effort is clearly *time critical*.

• Thirdly, a point that so often goes unspoken, the aircraft commander is the final decision authority.

Back to the questions. And *an* answer. There is no difference between peacetime and combat CRM. A crew is a democracy in the input phase, and it is an autocracy in the output phase. Aircrew members provide inputs (democracy). Four or five minds, four or five sets of eyes and four or five sets of ears are indeed assets. The aircraft commander provides the output in the form of a decision (autocracy). An aircraft commander may *choose* to defer to the "narrowest comfort zone," or he may *choose not* to defer. Peacetime or combat.

While there is indeed no difference between peacetime and combat CRM, *the combat experience most certainly will provide many lessons* that can be applied to our understanding of CRM, both peacetime *and* combat.

Beginning with the Crew Briefings (Combat Lessons in italics):

Aircraft Commander Crew Briefing Guide, Item Number 14. Crew Coordination: "If anyone has a question or a concern, speak up. If you do not like what you see or hear, simply call 'Time Out.' *If, in my judgment, time and circumstance allow*, we will stop what we are doing, go straight and level at a safe altitude, and address the issue. *If time and circumstance do not allow, I will exercise my judgment, and make the required decisions. Once that decision is made, I will expect your support in its execution."*

Arrival Briefing, Item Number 5. Missed Approach Intentions: "If anyone sees a reason to go around, simply state 'Go around,' *and, time permitting, your reason for the 'Go-around' call. I will be primed to execute the Go-around on your call, unless, in my judgment, a Go-around would pose a greater threat to flight safety than continuing the approach and landing; in which case, I will expect your support in the approach and landing."*

The revised crew briefings address the three points noted in the above AFI 11-2 series discussion: a *sincere effort* to listen to, respect and resolve crewmember concerns; the *time-critical* element; and the aircraft commander's final decision authority.

Information is the raw material for decisions. If all aircrew members share the same information, the likelihood of similar decisions is increased, or, absent similar decisions, the acceptance of contrary decisions is more likely. In this instance, did the loadmaster know that small arms and man-pads might be in the vicinity? Did the loadmaster know that the aircraft commander wanted to make one approach, and only one approach? Did the loadmaster know that a Go-around might expose the crew, aircraft and mission to additional hostile fire risks? Did the loadmaster know that the aircraft commander had visual with the touchdown point? Did he take part in preflight "what if" exercises?

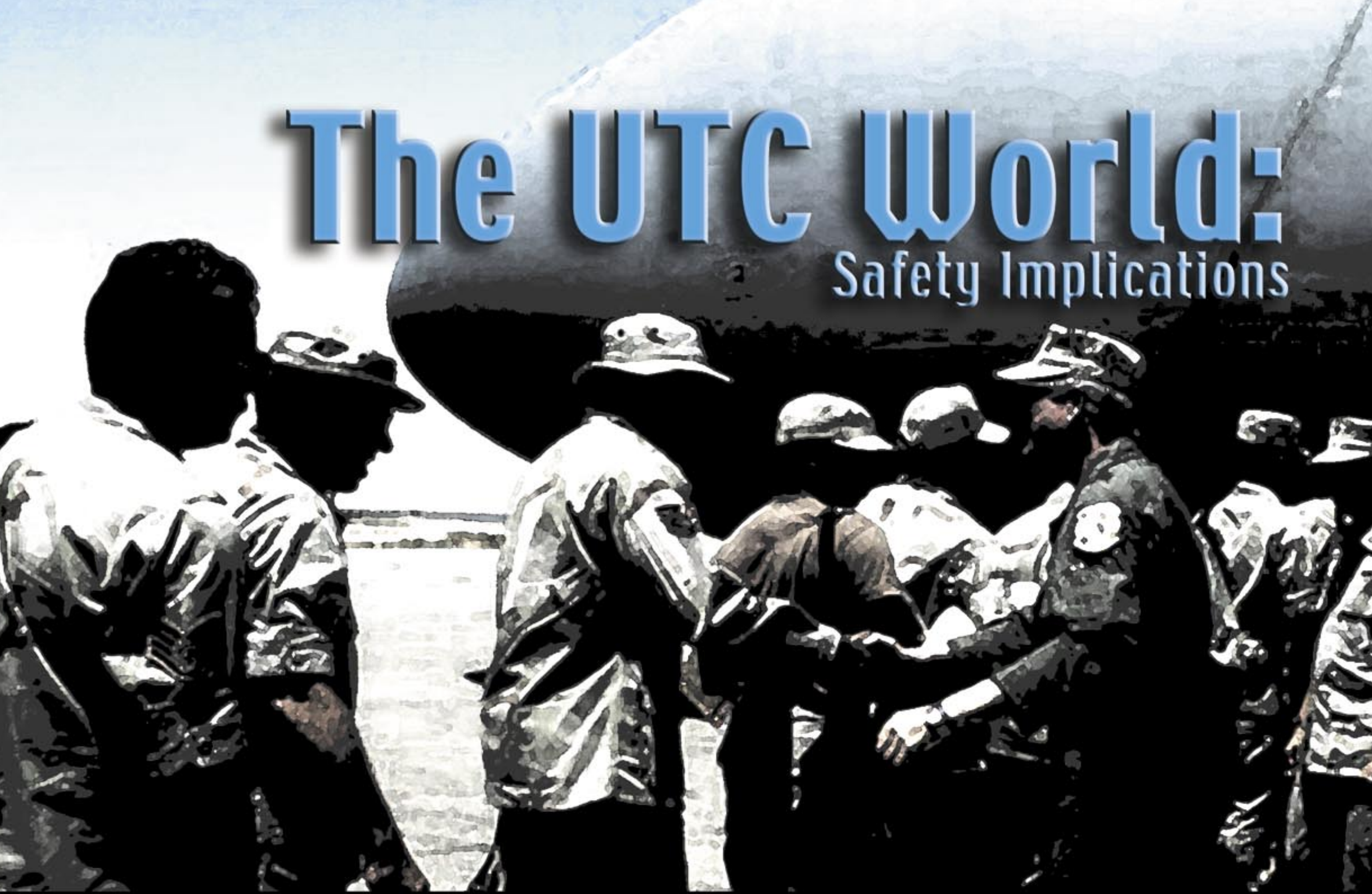
In a peacetime scenario, is a loadmaster's short final "Go-around" call, with reported strong windshear at the departure end of the runway, any different than my good friend's combat scenario? Would a loadmaster's peacetime short-final "Go-around" call, with a weather radar depiction of red/magenta over the departure end of the runway, be any different than my good friend's combat scenario?

"Democracy vs. autocracy." A great question. I hope this answer meets the logic test. There is no difference between peacetime and combat CRM. Democracy is the input phase, autocracy is the output phase. There are, however, valuable lessons to be learned from my good friend's combat experience and conundrum:

- Peacetime or combat, information is the raw material for decision-making.
- Peacetime or combat, a sincere effort should be made to resolve crewmember concerns.
- Peacetime or combat, the time-critical element must be respected.
- Peacetime or combat, the aircraft commander is the final decision authority.

A final review of the briefing guides turns up a gem of a find: There is no Crew Debrief Guide. If there were such a guide: *Item One, Crew Resource Management, Any Comments or Questions?* ✈

There is no difference between peacetime and combat CRM.



The UTC World: Safety Implications

LT COL ROBERT R. SINGLETON, USAFR

We deployed, and fought, as a UTC package.

From the Command Vice: "We are no longer a wing-based Air Force; we no longer live in a wing-based world. We are now a UTC (Unit Type Code)-based Air Force; we now live in a UTC-based world."

I first heard those words from the two-star in June of 2001. The experiences of OPERATIONS ENDURING FREEDOM and IRAQI FREEDOM have demonstrated the truth in those words. We did not deploy as a wing, or as a group, or as a squadron. We deployed, and fought, as a UTC package. In some instances, we deployed as a 181-person UTC package. In other instances, we deployed as a two-person UTC package. We deployed without commanders, section chiefs, or shop supervisors. And we deployed solo to fill sister unit UTC shortfalls.

We deployed to an Expeditionary Wing, comprised of various, disparate UTC packages; thrown together for the first time, not for an exercise, but for the "Real McCoy." We deployed to a "Joint Force" location: A Marine airfield, with Army rotary aircraft, Air Force fixed-wing aircraft, an Australian tower, Air Force airfield managers, host nation support teams, and a myriad of transiting allied/coalition forces.

There are safety implications to the UTC world. They start with job proficiency. Every member must be fully proficient in his duties. Home station units can no longer afford to "carry the load" for a marginally-competent individual. For a very simple reason: The home station unit cannot deploy with the individual in a two-person UTC package. Home station cannot pair a strong individual with a marginally-competent individual as a two-person UTC package, if that two-person package is expected to

USAF Photo/Photo Illustration by Dan Harman

provide twenty-four hour performance on two, twelve-hour shifts. Each person must be fully proficient. To accept less than full proficiency is to put safety at risk.

The safety implications carry through from proficiency to standardization. Mere job proficiency is not enough to avert safety mishaps. The proficiency must be "standard" proficiency. A home station unit that follows the credo, "This is how we do things around here," is inviting safety breaches when they deploy a UTC package "over there" to work with a half dozen other UTC packages, all of whom have followed the same credo. The "Real McCoy" is being fought "over there," not "around here." It is being fought side-by-side with other units, services, and allies who operate most safely when they operate in a standard fashion. The peacetime home station goal should be, "We do things standard around here."

The UTC world must recognize safety implications of the fog and friction of war and that "standard" is likely to be an elusive travel-mate. Different home stations, different major command philosophies and emphasis items, different uniforms, and different languages.

The potential for misunderstandings and crossed-signals is substantial, and the commanders and supervisors to whom we traditionally turn in such instances are several thousand miles to the west, nowhere in sight. The human relations challenge, the interpersonal communications challenge, and the conflict resolution challenge, rest solely on the shoulders of the individual. Home station units cannot afford to "carry" anyone not up to the challenge of human relations, interpersonal communications, and conflict resolution. The home station unit will not be there to intervene and smooth the ruffled feathers. Safety will be imperiled.

The safety implications recognize the UTC communications loop may never come full circle. The home station supervisor or commander charged with the professional development of his personnel may never learn of the duty performance, adherence to standards, and human factors traits displayed by the personnel in his deployed UTC package. The safety implication: the proficiency, standardization, and/or human factors shortfalls may never be identified; and someone, somewhere, may pay a safety price. Solution: increased home station, pre-deployment, vigilance and accountability.

The Wrap. We live in a UTC-based world. Events of the last few years have proven it to be so. We do not deploy as wings, groups or squadrons. We deploy without our commanders and supervisors. We deploy into a "Real McCoy," populated by a dozen other UTC packages, wearing different uniforms, and speaking different languages. Fog and friction abound. Safety is imperiled. Job proficiency, standardization, and human factors skills are at a safety premium. Make it so.

The UTC world must recognize safety implications of the fog and friction of war.

1…2…3…AND OUT

LT COL GARN H. HARWARD
Directorate of Aerospace Safety
***Aerospace Safety*, October 1963**

The pilot advised the center that he would try to out-distance the front.

Too many Air Force accidents result from a progressive chain of events any one of which might have been only a minor inconvenience, but, when added up, produce the inevitable: catastrophe.

The files contain many examples: A flight of fighters, low on fuel, overflying one or more possible landing fields to get to home base. A T-33 flying into a rapidly increasing headwind undetected by the pilots. A turning point over a large base but a decision to press on. These examples led to flameout and punchout.

Others are more insidious. The loss of an engine on a four-engine aircraft may not be a great cause for alarm. It is, however, the first indicator of a potential accident. Investigators contemplating the debris of what was an airplane, have laboriously traced back through a chain of events to a point where the flight could have ended safely, although not, perhaps, at its intended destination.

The selections to follow may seem unnecessary but they are presented because accidents, preventable and resulting from a series of deteriorating events, continue to occur.

An empty C-124 was en route from the northwest on a night IFR flight to the southeast. Assigned flight altitude was 11,000 feet, later lowered to 9000. The pilot had been briefed that weather south of the Montana area would improve.

Approximately three hours after takeoff, Number 2 lost power and the manifold pressure (MP) dropped to 18 in. Except for the low MP, the engine continued to operate normally, so it was decided to run it at reduced setting to take advantage of the power available.

At this time the aircraft was southeast of Billings, Montana, and the pilot called Denver Center to get the latest weather along the flight route. He was advised that all suitable airfields within the area were at or below minimums. Meanwhile a fast moving front was approaching Denver. With this information, the pilot advised the center that he would try to out-distance the front and land in Oklahoma where C-124 maintenance was available.

Two hours later Number 3 began to backfire violently with an immediate loss of oil and was quickly feathered. Since the power output of Number 2 was negligible, two-engine cruise was established and a course set up direct to the nearest suitable airfield.

Since the aircraft was moving in the same direction as the fast-traveling front, the pilot knew he could expect a rapid decline in weather conditions in advance of the front. He was right. Weather at the first field recommended by the Center dropped below landing minimums thirty minutes prior to ETA. Another airfield 200 miles east was selected with weather 200 to 300 feet above minimums. When contact was made with area radar at the second field, the pilot was advised that the weather had gone below minimums with gusty winds.

Destination was now changed to a third field farther south where the WX was reported clear with 15 miles visibility, but with high gusty surface winds.

One hour from the new destination Number 4 began to backfire. Power was reduced. Now the situation stacked up something like this: Number 3 inoperative, Numbers 2 and 4 at reduced power. The pilot had one thing going for him—he had maintained 8000 feet with a safe indicated airspeed. From this point it was possible to maintain a 100 fpm descent at l50K. The center radar immediately cleared all lower altitudes. As the aircraft approached 4000 feet, power was restored to Number 4 with no difficulty and destination GCA was contacted for vectoring to a successful two-engine approach and landing. After touchdown, Number 2 engine had to be shut down.

After some five hours of hectic flight, the aircraft was safely on the ground. No one thought to measure the depth of the sweat in the cockpit

A four-engine aircraft was flying at 11,000 feet on the coastal route to Alaska when an engine began malfunctioning and had to be shut down. Terrain elevation was approximately 5000 feet. About 45 minutes later, at an altitude of 7000 feet, another engine had to be feathered.

Now the aircraft was descending at 100 fpm and an intercept was made by the Coast Guard. When the intercepting aircraft lost the transport in clouds, the pilot was advised to divert to another base 30 minutes farther, but over water.

The pilot was now faced with the alternative of an additional 30 minutes of flight over water, or a flight over mountainous terrain but 30 minutes shorter. His decision was to continue over the mountains. A few minutes later the aircraft crashed at the 5000-foot level and nine lives were lost.

Another sad-ending story started with loss of engine oil just eight minutes from a suitable Air Force base where a landing could be made. The flight plan was changed to a new destination some 400 miles away, which had adequate maintenance. Approximately 30 minutes later, the oil leak increased and the affected engine was stopped. The aircraft at this point was one hour and 30 minutes from the revised destination. The pilot proceeded to the destination without any other difficulty, arriving over the station at 7000 feet. During the instrument approach the second engine backfired, followed by heavy white smoke. The prop was feathered to reduce the fire potential. Since the aircraft was near the airport with sufficient airspeed and altitude for maneuvering, a successful landing was possible. Yet after entering the traffic pattern, the aircraft was diverted to another nearby airport, which had a longer runway. While proceeding to the final destination five miles away, the third engine lost power and caught fire. There was no question as to the final destination at this point.

A pile of molten metal was the result of what started to be a common occurrence of one engine malfunction. Not necessarily skill or know-how, but luck saved the personnel aboard.

Pilots are rightly concerned with mission accomplishment and landing an aircraft at the location where equipment malfunction can be corrected. The prime consideration, however, should be to get the aircraft on the ground safely regardless of location. There is no assurance that after one emergency another will not occur. Too many crews have learned this the hard way.

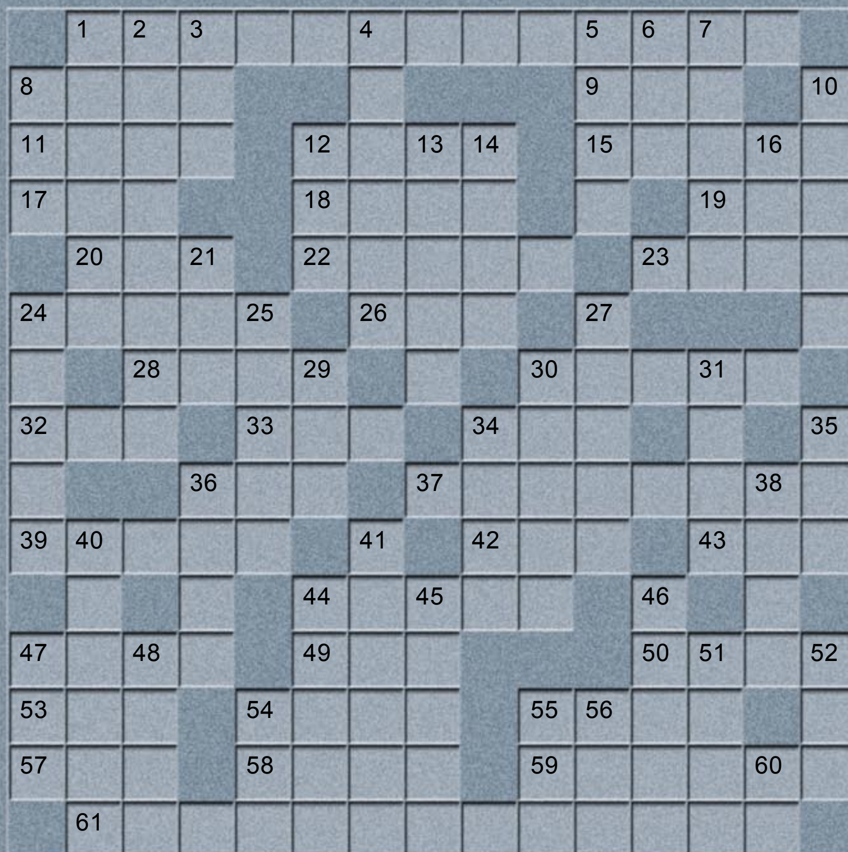
Editor's Note: What is your divert plan if your airplane develops problems inflight? Is it the closest airfield or home plate? We would love to hear your story!

A few minutes later the aircraft crashed at the 5000-foot level and nine lives were lost.

Resource Data Courtesy of Gordon Dupont
HQ AFSC Photos by TSgt Michael Featherston
Photo Illustration by Dan Harman


N CEMETERY
FACTORS
Complacency
Pressure
Lack of Communication
Organizational Culture
Lack of Awareness

Mid-Air Collisions Crossdown Puzzle



By 1Lt Tony Wickman, USAF
Alaskan Command Public Affairs

ACROSS

1. 37 ACROSS necessity to avoid mid-air collisions
8. Indian prince
9. Vehicle
11. Prayer ending
12. Test
15. ____ of attack; pilot concern in flight
17. USAF org. at Hanscom AFB, MA
18. Aircraft system used to avoid mid-air collisions
19. Actress Gardner
20. Cont.
22. State
23. Brigade
24. Pseudonym
26. Greek goddess of the dawn
28. Bullfight cheers
30. Bungler
32. Possess
33. Chevy Astro vehicle
34. ___ Paulo, Brazil
36. Snakelike fish
37. Place where mid-air collisions occur
39. Fiend
42. Military pay statement (abbrev.)
43. Music genre
44. American Idol judge Crowell
47. Seventeenth letters of the Greek alphabet
49. Federal org. concerned with the nation's security
50. Pain
53. Federal org. concerned with illegal immigrants
54. Green Hornet's sidekick
55. Misfire
57. Machinery need
58. Military org. in former Yugoslavia; Operation Joint Endeavor
59. Modifies
61. Number one tool to avoid mid-air collisions

DOWN

1. Female
2. What a pilot must do in some mid-air collisions
3. Jettison
4. What pilots sometimes do that leads to mid-air collisions
5. Air traffic system to help avoid mid-air collisions
6. Bond writer Fleming
7. Church instrument
8. 1979 Fields film Norma ___
10. Worst result from a mid-air collision.
12. Flightless bird
13. Movie star
14. Fannie and Sallie; financial loan corps.
16. 56 in Old Rome
21. Oriole great Ripken
24. See & ____; tactic to prevent mid-air collisions
25. Number of Dwarfs in Snow White
27. Dental item
29. Actor Mineo
30. Fashion designer Donna
31. Rip
34. LGM-30G (Minuteman III) home
35. Liveliness
36. Ages
38. Dough
40. Communal
41. Detroit player
44. Mistake
45. Aboriginal Polynesian race in New Zealand
46. Site of Operation Uphold Democracy
47. ___ Grande
48. Capital of Norway
51. TV psychic Miss ____
52. Asner and Harris
54. North Korean leader ____Jong Il
55. Federal org. concerned with flight safety
56. Model Carol
60. Medical worker (abbrev.)

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.

LT COL JEFFREY H. GUSTAFSON
44th Fighter Squadron
Kadena AB Japan

On 29 April 2003, Lt Col Jeffrey H. Gustafson exhibited the highest standards of airmanship and courage while handling a complicated and dangerous inflight emergency. He was flying a training sortie in local airspace when the right fuel boost pump on his F-15C Eagle failed, followed by failure of both the emergency boost pump and emergency generator. He expeditiously accomplished all required steps in the emergency checklist, but an electrical fire started in a wire bundle, resulting in smoke filling the cockpit and failure of critical navigation instruments and aircraft systems.

Lt Col Gustafson skillfully navigated his F-15C by visual references to a divert base in deteriorating weather conditions while isolating the electrical fire. During the approach, the aircraft experienced simultaneous failure of both engines 1000 feet above the ground. Realizing his position above a densely populated area, Lt Col Gustafson selflessly maneuvered his aircraft toward water and prepared for ejection. With critical airspeed and altitude rapidly diminishing, he quickly and expertly performed procedures to restart the aircraft's engines. Upon engine restart and regaining thrust, but with total electrical failure, Lt Col Gustafson executed a flawless straight-in approach and landing with successful accomplishment of an approach end arrestment, saving a $35 million aircraft. Furthermore, his superior airmanship, discipline and skill were paramount in enabling emergency crews to remove his aircraft from the runway for another inbound emergency.

Fighting Aircrew Fatigue...And Mishaps

Photo Illustration by Dan Harman and Dave Baer

DR. JOHN CALDWELL
Air Force Research Laboratory
Brooks AFB TX

In May of 2003, Secretary of Defense Donald Rumsfeld called for a 50 percent reduction in the number of military mishaps and accidents. His call came after a seeming wave of operator mistakes resulted in an escalation of senseless non-combat fatalities and injuries throughout the DoD. Mr. Rumsfeld made it clear that "world-class organizations do not tolerate preventable accidents" whether they occur on duty or off duty, in active-duty personnel, the Guard and Reserve, or in DoD civilian employees. Accordingly, he appointed David S.C. Chu, the Undersecretary of Defense for Personnel and Readiness, to lead a widespread effort to reduce mishaps in all facets of military operations. In his original memo, Mr. Rumsfeld wrote, "We owe no less to the men and women who defend our Nation."

Answering the Call

In response, the Air Force has initiated a variety of efforts to enhance the safety and effectiveness of Air Force personnel and operations. Among these are strategies aimed at reducing aircraft mishaps as well as both on-duty and off-duty motor vehicle accidents. Since both types of safety hazards are caused more often by human error than by equipment and/or structural failures, the primary remedies in these areas are focused on reducing risks by modifying behavior. Key to the accomplishment of positive results will be implementation of effective risk-reduction training followed by complete command support of better and safer work environments.

Fatigue As A Pervasive Risk Factor

In examining the various contributors to many of the life-threatening, disastrous mistakes that ultimately cost the DoD millions of dollars and numerous lives each year, the role of operator fatigue was clear. With regard to operational aviation accidents, the HQ Air Force Safety Center says that almost eight percent of the Air Force's reportable Class A mishaps have been at least partially attributed to fatigue over the past three decades. With regard to off-duty injuries and deaths, the U.S. National Highway Traffic Safety Administration (NHTSA) estimates that each year approximately 100,000 motor-vehicle crashes (about 1.5 percent of all crashes) are principally due to driver fatigue. Conservatively, it has been estimated that fatigue is responsible for 1500 annual fatalities or four percent of all traffic crash fatalities. At least 71,000 people are injured in fall-asleep crashes each year, and many of these victims are U.S. military personnel. The annual total cost of these crashes has been estimated at $12.5 billion. Such statistics make it obvious that an aggressive fatigue management program is urgently needed to mitigate the risks posed by overly-tired Air Force personnel both in the air and on the ground.

Fatigue Problematic In Military Aviation

Fatigue is particularly problematic for crews flying and maintaining modern Air Force bombers, fighters and transport aircraft. As was often reported by the media during OPERATION ENDURING FREEDOM, the combination of "24/7" operations, military manpower reductions, increased ops tempo and an ever-increasing tactical reliance upon continuous and sustained operations, have increasingly stressed the basic biological capabilities of our military personnel. Even before the war, evidence was mounting that aircrew fatigue was a very real problem. In fact, almost half of the Army pilots surveyed in one study said that they had at some point fallen asleep while "at the controls/in the cockpit." Similar results would no doubt be obtained from Air Force pilots if they were studied, especially since fixed-wing Air Force sorties are typically far longer than those flown by their rotary-wing Army buddies. In either case, it is clear that something has to be done to address the growing mismatch between mission demands and human capacity before fatigue-related incidents, accidents, injuries and fatalities spiral out of control.

Knowledge Is Power

After analyzing the situation, members of the Fatigue Countermeasures Program at the Air Force's Research Laboratory (AFRL) initiated a specially-tailored, comprehensive training program on how to manage fatigue in military aviation operations. The AFRL group previously had a long history of developing tools and strategies to facilitate optimal crew work/rest schedules, enhance off-duty sleep quality, overcome shift lag and jet lag, and sustain alertness in high-intensity operations, but there had not been a clear mechanism for ensuring that its products were available to the flight surgeons, commanders, pilots and maintainers who needed them the most. Secretary Rumsfeld's challenge provided a timely stimulus to correct this problem by preparing and offering a quarterly Military Aviation Fatigue Countermeasures Course at Brooks City-Base, TX. This two-day course is designed for a wide range of operational aviation personnel who don't necessarily possess any previous knowledge of sleep and fatigue management. Military pilots, aircrews, flight surgeons, maintenance personnel, schedulers, safety officers and others are all welcome, and thus far, attendance (and feedback) has been outstanding.

The Counter-Fatigue Course

This course outlines the dangers of fatigue in military aviation and related operations, the mechanisms underlying fatigue, common causes of overly-tired personnel, and techniques for optimizing alertness in military environments. Participants receive instruction on the design of crew work/rest schedules and the use of a new computerized scheduling tool. A short overview of research topics is included to show how the scientists study field-relevant problems and to educate attendees on considerations involved when conducting short studies like surveys at their home organizations.

Sign Up

No prior education in fatigue management, sleep or circadian rhythms is required, and the total cost to participants is only $120.00 (to cover breakfasts and lunches, as well as take-home course-related materials). The next course will occur April 21-22 in San Antonio. Since advanced registration is required to ensure there is adequate classroom space, course materials, etc., interested DoD personnel should contact Shirley.Boucher@brooks.af.mil prior to April 9, 2004. For those unable to attend the April course, the next class will be taught in September.

Outline of Upcoming Course Topics

DAY 1

Part I: Overview of Fatigue
- Definitions
- Measuring fatigue
- Extent of fatigue problems
- Reasons for fatigue
- Effects on readiness

Part II: Causes of Fatigue
- Sleep deprivation
- Circadian factors
- Jet lag and shift lag
- The nature of sleep
- Sleep cycles
- Sleep disorders
- Sleep restriction
- Poor/good sleep habits

Part III: Countermeasures
- Adjusting to new time zones or work shifts
- Avoiding sleep restriction
- Nutritional considerations
- Hypnotics to promote sleep
- Stimulants to sustain wakefulness
- Strategic napping
- Rest breaks
- Body posture
- Exercise
- Other strategies

DAY 2

Part IV: Managing shift work
- Sound shift scheduling
- Scheduling tools

Part V: Research
- Examples of operationally-focused fatigue-management studies and consultations
- Tips for planning your own project
- The importance of ethical human-use considerations

Part VI: Wrap up
- Questions from the audience
- Help with specific operational problems

GOT FEEDBACK?

We'd like your opinions on *Flying Safety* Magazine—what you like, what you don't like, what you'd like to see on these pages.

At our Web site (http://afsafety.af.mil/; see the link under "Education and Media") we've set up an interactive survey where you can register your views. Please take a couple of minutes to go there and answer the questions. It's quick and anonymous, and it will greatly help us to tailor this magazine to what you want and need.

Thanks!

HQ AFSC Photo by TSgt Michael Featherston

The Accident That Wasn't

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

CAPT THOMAS PFLUG
Director of Safety and Risk Management
Nebraska Wing CAP

The National Transportation Safety Board (NTSB) is currently investigating an accident involving a Cessna 172 flown by the Nebraska Wing, Civil Air Patrol. The NTSB's preliminary report follows:

The pilot was an instrument rated CFI with over 2000 hours of flight time (over 1200 hours in type). The flight originated at Omaha Millard airport. Weather at the time of the accident was reported clear with winds from the north-northeast at 17 knots gusting to 25 knots.

The airplane departed at 0930 CST for a local orientation flight with the pilot and two AFROTC cadets on board. The accident occurred at approximately 1020 CST as the airplane attempted to land at Millard after the first leg of the orientation flight. As the airplane was about to touch down on runway 12, witnesses reported a gust of wind appeared to lift the airplane's left wing. The airplane skidded across the runway until its right wing tip struck the ground and a runway light. The airplane then cartwheeled through the grass and across the parallel taxiway, coming to rest adjacent to the taxiway. Investigators found no evidence of pre-impact mechanical failure of any airplane components. The pilot was killed in the crash and the cadets were critically injured.

Probable cause of the accident was the pilot's inability to control the airplane in the gusty crosswind.

Thankfully, this is an accident that didn't happen. But, it could have. Conditions similar to these existed prior to a recently scheduled AFROTC orientation flight, and the CAP pilot had a decision to make: fly in weather conditions that he could probably have handled, or leave the airplane in the hangar, and send the cadets home without a ride.

He made the right decision. The airplane's designated crosswind component is 15 knots. With a direct crosswind of 17 knots gusting to 25, he couldn't legally fly the CAP airplane. He knew the regulations, he knew the airplane, he knew himself, he knew the right thing to do, and he did it. He left the airplane in the hangar.

He made the right decision. He left the airplane in the hangar.

Could he have flown the airplane that day without incident? He had flown in gusty crosswinds before and never bent any metal. Would this day have been different? We'll never know. But, we do know that one live pilot, two healthy AFROTC cadets, and one undamaged airplane will be flying in the future. Credit the pilot's knowledge, decision-making skills, and courage for this accident that wasn't.

How about you? Make it your personal commitment to know the regs, know the airplane, know yourself, know the right thing to do, and do it!

Tools and Equipment Management

USAF Photo

SMSGT WILLIAM MILLER
86 AMXS/MXAAF
Ramstein AB, Germany

We need to eliminate the use of uncontrolled tools in the aircraft environment.

The key to doing maintenance properly is a solid foundation built on following the published rules, guidance from leadership, trusting fellow workers and applying integrity. Using an unaccountable tool and/or equipment item in conjunction with aircraft maintenance did not cause someone to pay the ultimate price this time. But what it did cause was a ground incident costing our fighting force thousands of dollars in repair cost to a primary flight control surface. It also took a valuable air asset out of commission, reducing a commander's flexibility for intra-theater refueling. We need to eliminate the use of uncontrolled tools in the aircraft environment, and we need to promote the purpose of the composite tool kit (CTK) program. This applies to everyone, regardless if it is on- or off-equipment maintenance. A lesson has been learned in the world of tools and equipment management.

Here is our story. The shop responsible for painting our aircraft had acquired a special tool to improve their way of doing business. Because of this tool, the specialists would no longer have to wait for the crew chief to install the tool every time it was required. This lean-forward approach by the paint shop is what quality is all about, improving the old way of doing business—making things better. The improvement process had been implemented—right? Well, yes and no. Time spent waiting for the tool installation was dramatically reduced, but the shop sub-optimized other processes, and failed to ensure other rules were followed.

- Rule one: CTK rules not enforced; i.e., tool not etched and NO accountability and control in place.
- Rule two: General safety requirements not enforced; i.e., support equipment tool had no red streamer attached and mostly painted gray from overspray.
- Rule three: Leadership failed to

ensure training and certification on the proper use of the tool; i.e., aircraft forms documentation not complied with, placement of danger tags on appropriate switches and controls not complied with, and the manual hydraulic shutoff valve not moved to the closed position.

Once the paint shop completed their tasking, the aircraft was released back to the flight line. The crew chiefs had to perform operational checks using aircraft engines to verify previous maintenance. Reviewing the AFTO Form 781 forms binder they found no hazards preventing the engine run, and moved on to the next phase of the preps. The crew chiefs accomplished the general safety walkaround with no discrepancies noted…remember that missing streamer? However, the one thing they did not notice during the twilight hours was an installed rudder lock. The engine runs were accomplished without incident, and the hydraulic system was de-pressurized using the rudder power system in conjunction with the movement of the rudder pedals. What do you think was damaged during the operation of those rudder pedals?

You guessed it—the rudder. What can we learn from this damaged flight control surface incident? Well, here are three elements that aircraft technicians should consider prior to and while performing their assigned duties:

- **Leadership**...must specifically address situations where known violations of tool and/or equipment usage rules occur, and encourage the right philosophy about CTK programs compliance. Leadership must also ensure appropriate cross-utilization training takes place when a new process is implemented. This prevents sub-optimization of other processes. Leaders must mentor their people on the values of trust and integrity and what is expected from each technician, trainer and certifier.
- **Trust**... Aircraft technicians must trust and rely on each other to carry out certain tasks, i.e., forms documentation and placement of danger tags. Technicians must trust that others will attempt to protect them from harm and act like professionals in everything they do. Aircraft technicians need to be able to trust their training, trainers and certifiers and, more importantly, their leadership to ensure these things are correct.
- **Integrity**... If an aircraft technician has the opportunity to use an uncontrollable tool and/or equipment with little or no apparent chance of being caught, but decides not to because there is a rule prohibiting it, then integrity is present. In this example, the reason the technician does not use the tool is not because he/she is afraid of repercussions, but because the technician understands the purpose of the CTK program and believes in what it stands for...that's integrity.

Group these three elements together and it boils down to everyone in aircraft maintenance must scan their area of responsibility for the way we conduct our jobs, and look for smarter and safer ways to work. You, the worker, at all levels of the profession, must judiciously apply operational risk management (ORM) principles even during simple tasks. Leadership at all levels must ensure their workers meet job qualification standards before they hit the flightline, as outlined in the workers training plan. Conduct that 623 interview!

The bottom line, no matter whom you are, all tools and/or equipment used in aircraft maintenance must be accounted for and controlled. This includes support equipment such as tech orders, safety locks, and yes—even rags. Because, in the critical environment of aircraft operations, a lack of following the published rules, guidance from leadership, trusting fellow workers and applying integrity, improper accountability and control of any one item can prove to be disastrous or costly as in the case of our lesson. In our past, someone has paid the ultimate price so we can have the roles today for training or war. Our lesson is just one of many why technicians need to promote and support a CTK program at all levels of aircraft maintenance. Build a solid maintenance foundation in your work center and follow the tool and equipment management rules published in Air Force Instruction 21-101. Again, it is up to all of us to act when something needs to be fixed. If you can't fix it on the spot, elevate the issue to someone who can, but make sure the problem gets the right attention before someone/thing pays the price.

It is up to all of us to act when something needs to be fixed.

OPS Topics

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

A few little things that happened to damage our aircraft that could have been prevented with attention to the rules and guidelines designed to prevent damage.

Loose Belt

An HH-60 was on a normal training sortie when a gunner's belt, dangling outside the aircraft during the flight, damaged the aircraft cargo door. The holes punched in the cargo door skin required the door to be replaced. How did this happen, you might ask? Normal configuration for stowed gunner's belts is on the aft bulkhead and length adjusted to minimum. The attachment point is beside the cargo door and behind the auxiliary fuel tank retaining strap. The crew noticed the damage during a turn and turned the aircraft over to safety and maintenance. The inspection after flight showed a damaged Plexiglas window and dimpled impact points. What do you think happened to allow the gunner's belt to slap against the open cargo door?

Finger in the Hole

A C-130 crew was getting ready for a training sortie, but the aircraft broke. They headed for the spare, and the instructor loadmaster stayed behind to oversee the transfer of the cargo load. The students were getting things ready on the spare and the instructor did his job and followed them up to ensure everything was correct. There was a problem with one of the rail locks and the instructor was showing the students how to fix the problem. Unfortunately, he used his finger to point things out and the locks were moved with his finger in the lock. When he removed his finger the fingertip was bent back at a 45-degree angle.

Many events led to this instructor becoming DNIF for 45 days. How about failing to communicate with all parties involved, putting body parts at risk in areas they aren't supposed to be in and plain old not paying attention to what you are doing? Remember, instructors show students the right way to perform a task, but can also show the wrong way.

Helicopter versus Tree

It was a day VFR combat skills live hoist recovery sortie for an HH-60 crew. The training for the day was excellent and they completed everything they had planned. When they returned home for the day they found damage to all four rotor blade tip caps, three of which were non-repairable. The crew had completed an air-land infiltration of PJs to rescue a survivor, and then did a hoist recovery of the team. The area they had chosen was low-lying palm brush with a *single* pine sapling. I bet you can guess where this is going. The infiltration and extraction went without a hitch and nobody noticed anything during the sortie.

The investigation found that the first tip cap received the most damage and the fourth tip the least. If you looked at the lone pine sapling you would have found damage in the upper branches and treetop. Imagine what blades spinning at approximately 430 knots would do if they hit a stationary object. The rule book, AFI 11-H60 Volume 3, paragraph 4.21.2, states that live hoist training be conducted at the minimum altitude required to accomplish the training, but in no case higher than

40 feet over an obstacle-free area or no higher than 25 feet above the highest obstacle directly below the aircraft, whichever is higher. Aircrews, make sure you keep that ground clearance to the level that completes the mission and returns everyone home safe and sound.

KC-135 versus B-2

A B-2 was on a four-hour training mission that got a bad start and got worse. The sortie was a routine student-training sortie, but due to weather they got a late start and joined their tanker near the end of the AR track. After some unsuccessful attempts to connect due to the student having problems from the sun being in his eyes, the B-2 asked the tanker to turn so they wouldn't have the sun in their eyes. But the tanker made note that they were approaching a turn point in the AR track, and suggested not turning off the track until passing the turn point. After passing the turn there was some improvement in the glare and the B-2 tried again. In addition to the student at the controls of the B-2, the KC-135 had a student boom operator at the controls who was on his last training sortie. Unfortunately the B-2 exceeded the forward boom limits and the boom cocked at the ball joint and jammed against the top of the receptacle. A breakaway was called, and the aircraft were able to separate, but damage was done to the B-2. When the B-2 returned home, maintenance found the top portion of the fiberglass ice shield missing and the top portion of the AR receptacle broken, but hanging on by a wire assembly.

What were the factors in this mishap? There were a few. Neither operator violated standards, but a series of events produced this mishap. First, the sun angle, which was one-hour prior to sunset. Second, the angle of the boom. The boom envelope for the B-2 is 25-40 degrees and 10-18 feet, but this can be restricted even further by the boom operators. Third, the fact that the B-2 engines are imbedded on top of the wing can cause a pitch-up when power is reduced. Fourth, the dynamics of air refueling. It is dangerous, and many factors here alone can cause you problems. Finally, communication. The two aircraft could have communicated better, especially with two students at the controls. Air refueling is a dangerous and risky business which takes a lot of patience, practice, talent and communication to be successful. We do a great job with the ops tempo we have, but when it gets tricky, back off and talk before you have a bad contact that could get real ugly, real quick.

Smoking F-16

As an F-16 initiated an afterburner takeoff, the tower called the aircraft to tell him that a smoke trail approximately two-thirds the length of the aircraft was coming out the back of the aircraft. The aircrew aborted the takeoff at about 170 knots and 6000 feet remaining. Tower called the aircraft again to tell them that the smoke had dissipated. The pilot did just like the book says, and the aircraft was stopped by the BAK-12. Once stopped, the aircraft's left tire blew and both brakes fused due to excessive heat. Once cleared by the fire department, maintenance repaired the aircraft in place and moved the aircraft back to the parking ramp.

What happened? This was the second sortie for the engine after de-preservation from its shipment to the area of operations. This process involves introducing 1010 engine oil into the engine. After shipment and re-installation, the engine must be de-preserved. Part of this process is engine runs at idle, and the engine smokes due to the residual oil. Evidently they didn't get all the oil out prior to this sortie. The investigation team made no recommendations for this mishap, but what could you do to prevent an event like this from happening at your unit?

I Dropped What?

An F-16 was on a training sortie and was to have some fun with a basic surface attack sortie. The pilot set up to drop a single 25-pound training bomb (BDU) on each pass. On his first pass he got a little more than he wanted as a BDU and the left external tank departed the aircraft. As the tank departed the aircraft, it struck the left ventral fin and knocked part of it off as it went by. "Knock it off" was called and lead joined on the aircraft for battle damage checks, and they headed for a straight-in landing at home station.

Maintenance immediately started troubleshooting and found a short in the wires to the weapons station the tank was attached to. After some more troubleshooting and isolation they determined it was either the jettison release remote interface unit (JR/RIU) or the wires leading from the JR/RIU to the weapons station. The JR/RIU was removed and the wires tested fine, so the JR/RIU was sent to the backshop for testing. The test revealed the JR/RIU was indeed bad.

This is one of those mishaps where the stars were all in alignment. In order for the tank to jettison like it did, two separate relays within the JR/RIU had to fail at the exact same time. Normally when a JR/RIU fails it is detected by the weapons specialists during the loading checks and is replaced. All aircraft circuitry was checked and passed, and the aircraft returned to service. A little note for aircrew to be aware during weapons delivery and ensure that what you asked the aircraft to drop is what actually left the aircraft.

Maintenance Matters

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

Bits and pieces! This edition is about hardware, documentation and following tech data. If you don't install the hardware properly, document the work properly, or use the wrong hardware you set the aircraft up for problems. Don't put yourself, the aircrew or aircraft in danger needlessly. Leave that to the bad guys.

Hot B-1B

A B-1B was on a second sortie of the day and had two pop-to-level bomb runs planned. During the second "pop" the central integrated test system (CITS) indicated maintenance codes for gearbox two and four lube low pressure, with an associated minus four augmenter fan temp control. When the aircraft returned from flight, maintenance personnel found damage to the number four engine augmenter section. The damages included partial separation of the augmenter primary seal and complete separation of the associated divergent seal at the eight o'clock position. Plus burn damage to the primary and divergent flaps adjacent to the missing seals.

During the bomb run the crew accelerated in full afterburner from .83 to .92 mach and 1500 feet AGL, initiating a 2.5 G climb to 14,000 feet MSL when reaching .92 mach. Full afterburner remained selected until about 2000 feet below the level-off altitude. Approximate continuous use of the afterburner after the seal separated was about 30-45 seconds.

During the postflight maintenance inspection they found a missing bolt and hinge pin from the upper attach point, and the lower bolt was partially installed and could be turned by hand. The nutplate for the missing bolt was tested and found to have no defects, and still retained its self-locking feature. There was no evidence of material failure, so that means it must have been the maintainer who did or didn't attach the bolt in the first place. The engine had been on the aircraft for 18 months, and this was the fourth flight after a phase inspection. Aircraft documentation showed only one write-up on the augmenter in the last 18 months, the replacement of the augmenter seal at the 12 o'clock position, which was not the section that failed. Be professional maintainers and make sure the hardware is correctly installed and you follow the books each and every time you touch an aircraft.

We Don't Need No Cotter Key!

An F-15 returned from a sortie code 3 due to control problems. The problem was traced back to the replacement of the rudder actuator. The job was completed except for the fact that someone forgot to install the cotter keys on the left rudder actuator drive fittings. There was even a write-up in the 781 series forms stating that the left rudder actuator drive fitting requires cotter keys.

To make matters worse, the write-up for the cotter keys was signed off by a 7-level as "cotter keys installed." The cotter keys are a critical part of the rudder's connection to the actuator. On the F-15 the actuator is hydraulically powered and drives a splined shaft that resembles a gear. The actuator drive fitting fits around the splined shaft and has a matching spline that interlocks with those on the actuator shaft. The drive fitting is connected directly to the rudder. This drive fitting has a narrow gap running parallel to the splines. A bolt and nut then squeeze the drive fitting around the actuator shaft, causing the gap to narrow further and the splines to lock securely together. The cotter key "prevents" the nut from rotating on the bolt, which would release the pressure holding the drive fitting around the actuator shaft and allow the splines to slip past each other.

Remember that the little cotter key may not seem like much, but it can hold the whole aircraft together. When it comes to flight controls you can never be too careful. My main question is if the 7-level did a proper inspection, how did he sign off the write-up as "cotter keys installed" when they weren't? I wonder...

Loose Cap

A B-1B had a short flight and the crew got to practice emergency engine shutdown procedures on a routine training sortie. Shortly after takeoff, the pilots had to initiate an emergency shutdown of the number two engine due to an oil pressure problem. Luckily, they returned without further incident. It's nice to have more than one engine. Maintenance inspected the aircraft and found the oil sampling port check valve was not properly seated. They reseated the check valve and the engine ops checks were normal.

We take oil samples on a routine basis and there have been many an incident, on many different types of aircraft, where the sampling port or oil cap wasn't reseated properly. The routine task can get you every time. Take the extra time to ensure every task is done correctly the first time. The hardware will work as advertised if we treat it right.

Loose Nut = Fire

A three-ship of F-15Es was taking off for some Red Air presentation as part of a wing training mission, and after a normal takeoff, the group headed for the fun. As the flight selected afterburner for a climb, the number three aircraft had to take emergency procedures due to an illuminated right engine fire light. The crew followed the procedures and his wingman checked for any damage. The crew then performed an uneventful single engine straight in approach. So much for his fun.

What lit the fire light? In this case maintenance found the right engine left-hand igniter cable loose from its plug. The B-nut that holds the cable in place backed off at an unknown time and the 18-inch cable dangled freely in the engine bay. The cable then arced against the lower engine panel, setting off a small amount of fluid in the engine bay. The fire was short, but hot enough to light off the detector cable, which had six inches of nomex insulation burned off.

This is like so many other mishaps where some piece of retaining hardware was not properly fastened, as there was no visible damage to the igniter or the B-nut, and the aircraft had an in-flight problem. As professional maintainers this does not reflect on our actual capabilities. Make sure you properly install the hardware that keeps the critical components, like igniter cables, in the proper place and prevent a mishap.

Squirrelly B-1B

Another B-1B was on a two-ship night sortie that included low-level, air refueling and transitions at home station. A full day for the aircrew, or in this case, night. The pilots made several contacts with the tanker and noted the aircraft was acting squirrelly. Now, write that up in my aircraft forms and I would need a whole lot more info before I would do anything. The crew landed as planned, and soon found the reason for the aircraft squirreliness. The lower rudder was missing two adjusto-bolts from the center and lower A-frame hinge supports and one adjusto-bolt from the vertical link. The repairs required replacement of the bolts, as well as bushings, and two landing strip panels.

The B-1B design is such that a loss of the lower rudder could result in the depletion of all four hydraulic systems and subsequent loss of the aircraft. If the bolts holding the rudder fail, then the possibility of the rudder leaving the aircraft increases and so does the loss of aircraft or worse, the aircrew. This aircraft had flown over 118 hours since its last phase inspection and all inspections in between had been accomplished with no defects found on the rudder. A search of the aircraft and the area around the aircraft found half of each of the center and lower A-frame adjusto-bolts. The vertical link adjusto-bolt or any of its associated pieces were never found. The two portions of the bolts found in the lower A-frame had instantaneous tension failures with one small area of beaching on one of the bolts. The vertical link was found with the lower bolt still attached to the aircraft and the upper section unattached from the rudder, lying down forward against the aircraft. The normal position of this component is one end attached to the airframe and the other to the lower rudder, acting as the main support for the lower rudder.

The bottom line on this mishap is that critical hardware was not properly installed by maintenance. The last time the rudder was installed a group of three-levels were trained on the task and several shifts were involved. Three-levels need the training, and tasks take longer than one shift, but where were the supervisors to ensure the rudder was properly installed? Maybe they know the guy who checked the F-15 cotter key installation? The aircraft could easily have been lost, and this $31K mishap would have been a Class A mishap with possible fatalities. What if this aircraft had been on a deployment overseas? The potential for disaster was there and maintenance would have been the cause. Prevent, don't react!

USAF

Class A Flight Mishaps

FY04 Flight Mishaps (Oct 03-Feb 04)

7 Class A Mishaps
5 Fatalities
3 Aircraft Destroyed

FY03 Flight Mishaps (Oct 02-Feb 03)

9 Class A Mishaps
3 Fatalities
9 Aircraft Destroyed

09 Oct		A KC-135E experienced a number 3 engine fire.
14 Oct	✈	A T-38 crashed during takeoff.
17 Nov		A KC-10 experienced a destroyed engine.
18 Nov	✈	An A-10 crashed during a training mission.
23 Nov	✈	An MH-53 crashed during a mission. Five fatalities.
31 Jan		A KC-10 experienced an engine failure.
04 Feb		A C-5B had a right main landing gear failure.

Editor's note: 5 Oct C-17 engine mishap has been changed to a Class B mishap from a Class A.

- A Class A mishap is defined as one where there is loss of life, injury resulting in permanent total disability, destruction of an AF aircraft, and/or property damage/loss exceeding $1 million.
- These Class A mishap descriptions have been sanitized to protect privilege.
- Unless otherwise stated, all crewmembers successfully ejected/egressed from their aircraft.
- Reflects only USAF military fatalities.
- "✈" Denotes a destroyed aircraft.
- "✶" Denotes a Class A mishap that is of the "non-rate producer" variety. Per AFI 91-204 criteria, only those mishaps categorized as "Flight Mishaps" are used in determining overall Flight Mishap Rates. Non-rate producers include the Class A "Flight-Related," "Flight-Unmanned Vehicle," and "Ground" mishaps that are shown here for information purposes.
- Flight and ground safety statistics are updated frequently and may be viewed at the following web address: http://afsafety.kirtland.af.mil/AFSC/RDBMS/Flight/stats/statspage.html.
- **Current as of 12 Feb 04**.

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LETTER to the Editor

I am a flight instructor at the Kirtland Aero Club. The November 03 Ops Topics Column mistakenly stated that aircraft operating in Class D airspace are not required to talk to the tower.

According to CFR 14, Chapter 1, Part 91, para 129:
(c) *Communications*. Each person operating an aircraft in Class D airspace must meet the following two-way radio communications requirements:
(1) *Arrival or through flight.* Each person must establish two-way radio communications with the ATC facility (including foreign ATC in the case of foreign airspace designated in the United States) providing air traffic services prior to entering that airspace and thereafter maintain those communications while within that airspace.

From 91.127:
(c) *Communications with control towers.* Unless otherwise authorized or required by ATC, no person may operate an aircraft to, from, through, or on an airport having an operational control tower unless two-way radio communications are maintained between that aircraft and the control tower.

The same lesson is applicable to each scenario: See and avoid!

Dan Sharpes
Aircraft Engineer, ASC/TMAA

Editor's Note: Thanks to our readers for catching our mistake.

	D	E	C	O	N	F	L	I	C	T	I	O	N	
R	A	J	A			I				C	A	R		D
A	M	E	N		E	X	A	M		A	N	G	L	E
E	S	C			M	A	C	A		S		A	V	A
	E	T	C		U	T	T	E	R		U	N	I	T
A	L	I	A	S		E	O	S		F				H
V		O	L	E	S		R		K	L	U	T	Z	
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I	N	S		K	A	T	O		F	A	I	L		D
O	I	L		I	F	O	R		A	L	T	E	R	S
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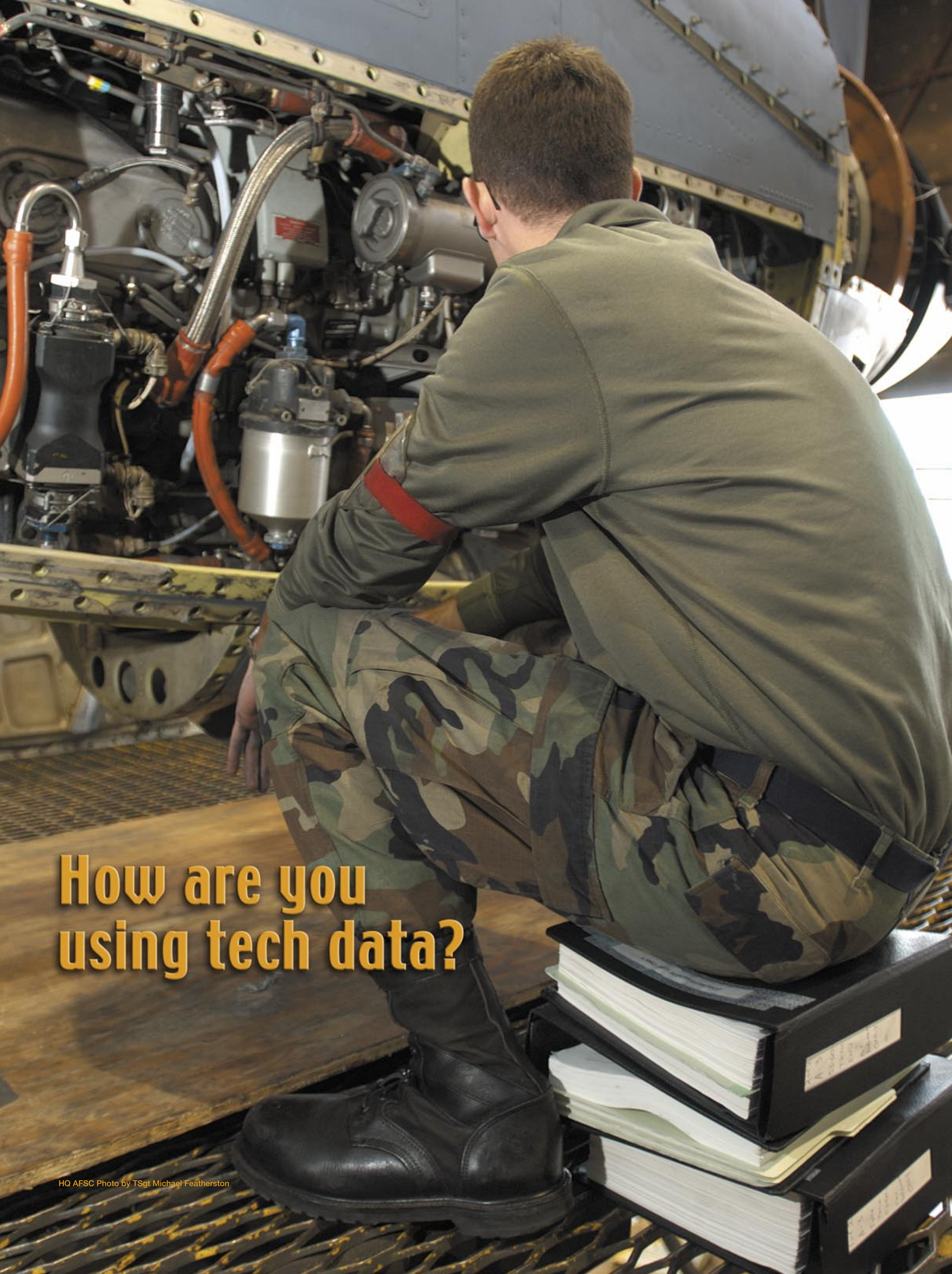
Answers to Midair Collisions Crossdown Puzzle on Page 18.

Error

There was a serious error in one of the charts in the Engines article in the Jan/Feb 04 *Flying Safety* Mishap Review issue. The "Class A & B Power Mishap Drivers" chart (figure 4 on page 23) featured costs in millions of dollars from various "drivers" of mishaps. *Flying Safety* erred in its interpretation of the chart, presenting the drivers as separate bars when the values were supposed to be totals. This was very misleading, and *Flying Safety* regrets this error.

In addition, in Figure 6 on page 25, the value for F-16 Class A mishaps for FY03 was omitted. This should have read 11.

Above is Figure 4.



HQ AFSC Photo by TSgt Michael Featherston