UNITED STATES AIR FORCE

FLYING Safety

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

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FLYING Safety

MAGAZINE

Error: On page 18 of the January/February issue of *Flying Safety*, we used an illustration of a B-1 flying low-level over a lake, and we identified it as a "USAF photo." This was incorrect. In fact, it is a realistic painting entitled "Power" by aviation artist Dru Blair. *Flying Safety* magazine regrets the error.

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FSM notams

OXYGEN IRREGULARITIES

Courtesy ASRS *Callback* #247, Jan 00
NASA's Aviation Safety Reporting System

Both pilots and controllers are educated to recognize the effects of oxygen deprivation and hypoxia. This training can be vital in safely resolving oxygen-related pilot incapacitation. Several ASRS reports illustrate:

While at FL250 on an IFR flight plan, my oxygen line became disconnected from the regulator. I could hear the oxygen escaping and thought the regulator had not sealed on the portable tank behind the passenger seat. As I had changed tanks within the past 15 minutes, I attempted to tighten the regulator, but to no avail. I recognized hypoxia coming on, pulled power back, disconnected the autopilot, and lost consciousness. I became conscious at 17,000 feet. The plane was descending and in a bank. I had lost my oxygen supply and had lost consciousness. I landed at the nearest airport. Upon landing, I saw the line to the regulator had come off. I have since found that if the oxygen line is kinked the line will pop off the barbed fitting on the regulator, so in the future I will secure a clamp at this attachment.

Portable oxygen tanks and lines should be inspected and secured during preflight to prevent potentially lethal "kinks" in the oxygen supply.

In another oxygen-related emergency reported to ASRS by an air traffic controller, ATC gave a superlative flight assist to the incapacitated pilot of a high-performance twin-engine aircraft.

Aircraft experienced oxygen problems and [pilot] was disoriented with hypoxia requesting descent from FL250 to 13,000 feet. I issued the clearance but [pilot] couldn't descend the aircraft due to his inability to focus. A flight instructor came to the sector and talked the aircraft into a descent and the pilot recovered, changed his destination to a closer airport, and landed safely.

In a callback to the reporter, ASRS learned that the controller kept the pilot conscious by talking to him and asking questions until a supervisor could locate another controller who was qualified and type-rated in the aircraft involved. This second controller instructed the pilot to disengage his autopilot, which started the aircraft down.

FAA Advisory Circular 61-107 alerts pilots who are transitioning to complex, high-performance aircraft capable of operating at high altitudes and high airspeeds "of the need to be knowledgeable of the special physiological and aerodynamic considerations involved within this realm of operation."

In addition to the guidance provided by AC 61-107, pilots who fly at altitudes requiring supplemental oxygen may want to consider equipping portable oxygen tanks with flow indicators that can be easily monitored within the instrument scan range. Flow indicators can provide an early warning of oxygen system problems—before the onset of debilitating hypoxia.

Read Before Flight: UK ATC Survival Kit

USAF pilots brought up under the US air traffic system may not fully understand their responsibilities.

MAJOR CHRISTIAN H. DOLLWET
HQ AFSC/SEFF

Not too long ago I was talking with a pilot who made the statement that "British military air traffic controllers are the best in the world." The comment caught my attention, as it isn't often that a pilot speaks so highly of our air traffic control brethren. However, as I met and talked to more USAF pilots who had operated in the United Kingdom (UK), they too repeated the same positive comments regarding UK military air traffic controllers. When I asked, "Why are they the best controllers in the world?" the universal response was: "They give you whatever you ask for." These statements not only reflect a professional admiration of the abilities of UK controllers, they also highlight an air traffic system that allows pilots nearly total, unimpeded freedom of movement.

After many of these discussions with pilots about the UK air traffic system, I was given a unique opportunity to take part in a detailed review of UK air traffic and airspace procedures along with senior USAF and RAF air traffic control officers. Following several days of research and discussions, it became apparent that the UK air traffic system is designed with limited air traffic services control requirements for maximum flexibility. This is in stark contrast to the US, where the air traffic system is more rigid and exercises considerably more air traffic services control.

The flexibility designed into the UK air traffic system explains why the majority of airspace in the UK is Class G, or "uncontrolled." Radar Advisory Service (RAS) and Radar Information Service (RIS) are provided to enhance safety when operating in the uncontrolled airspace. It is critical, however, for the pilot to remember one all-important fact: *The pilot has primary responsibility for separation and terrain clearance.* Thus, the UK controller is often able to give you "what you want" because you, the pilot, have the burden of responsibility for maintaining the appropriate clearance and safety margins. RAF pilots brought up under this system understand their responsibilities and the responsibilities of the controller under a given air traffic service being provided. However, USAF pilots brought up under the US air traffic system may not fully understand their responsibilities when operating in UK

Photo by SrA James Harper
Photo Illustration by Dan Harman

Class G airspace under a radar service.

Following my in-depth review of UK procedures, I talked to a few more USAF pilots familiar with operating in the UK. This time I asked them who was responsible for separation and terrain clearance under RAS or RIS. The majority of pilots responded with "the controller is responsible." A big NOT! Hopefully the below information on UK air traffic services and airspace will clarify things and help you fly even more safely in the UK. This information comes from the UK JSP 318A, *Military Air Traffic Services, Edition 2, Change 5*, and is also contained in the UK Military Aeronautical Information Publications (AIP). Both of these pubs should be available at RAF and USAF base operations facilities in the UK.

Airspace Regions

UK airspace is divided into two Flight Information Regions (FIRs). Above each of these FIRs is an Upper Information Region (UIR). These regions are collectively termed the London and Scottish FIRs/UIRs. NOTE: Within the UK, the transition altitude is 3000 feet, except in or beneath the airspace listed in the FLIP planning guide. Airspace below the Scottish Terminal Control Area (TMA) and Aberdeen Control Zone/Control Area (CTR/CTA) use a transition altitude of 6000 feet.

Airspace Classifications

The UK has adopted seven airspace ICAO classifications—Classes A through G. The following paragraphs describe those airspace classes. Controlled Airspace (CAS) is a generic term that describes airspace where pilots are required to comply with ATC and other UK Rules of the Air Regulations. CAS comprises ICAO Airspace Classifications A to E. Classes F and G designate "uncontrolled" airspace.

***Controlled* UK Airspace—Classes A through E:**

- Class A: Comprises all airways, except where they pass through a Terminal Control Area (TMA) or a Control Zone (CTR) associated with a major airport.
- Class B: FL 245 and above.
- Class C: Not yet allocated in the UK.
- Class D: Comprises TMAs and CTRs associated with identified civil airfields and some larger military airfields, along with part of the Scottish TMA.
- Class E: Comprises the Scottish TMA at and below 6000 feet MSL and the Belfast TMA.

***Uncontrolled* UK Airspace—Classes F and G:**

- Class F: Consists of Advisory Routes (ADRs), along which a civil air traffic advisory service is available to participating aircraft. ADRs in the FIR may pass through, originate from, or terminate in, CAS.
- Class G: The remainder, and majority, of UK airspace falls within Class G.

Flight Rules

Flights by military pilots are to be conducted under IFR, VFR or SVFR as appropriate. Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC) refer to the weather conditions encountered during flight. These terms are used to denote actual weather conditions, as distinct from the flight rules under which the flight is being conducted. VMC exists when the weather permits flight in accordance with VFR; IMC exist when weather conditions are below the minima for VFR Flight.

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The UK has adopted seven airspace ICAO classifications—Classes A through G.

A pilot who chooses not to comply with advisory avoiding action must inform the controller.

The following items apply under VFR in the UK:

• Collision Avoidance. Pilots are to maintain safe separation from other traffic.

• Flight Conditions. The aircraft is to remain in weather conditions that satisfy the VMC minima specified. Aircraft flying more than 250 knots indicated airspeed in Class G airspace are required to maintain the following clearances from clouds and flight visibility: (1) Between 3000 feet MSL and FL 100–1500 meters horizontally and 1000 feet vertically with 8 kilometers visibility. (2) At or below 3000 feet MSL–1500 meters horizontally and 1000 feet vertically with 5 kilometers visibility. (*In the UK Low Fly System, at or below 2000 feet AGL, the vertical distance from cloud is 500 feet.)*

The following items apply Under IFR in the UK:

• Outside CAS above 3000 feet MSL, pilots must select cruising levels according to the quadrantal or semi-circular rule as applicable, based on the standard altimeter setting 29.92 inches, unless they are flying in conformity with instructions from ATC. Throughout any period of level flight above the transition altitude, other than at a Flight Level, the aircraft must be in receipt of a radar service, or carrying out a holding procedure established in relation to an airfield.

Radar Services

ATC services are to be provided to the maximum extent practicable, subject only to workload, communications or equipment capability, and applied in accordance with the status of the airspace within which the participating aircraft are flying. UK controllers provide the following types of radar services:

• Radar Control in Class A, B, D or E airspace.

• Radar Advisory Service (RAS) in Class F or G.

• Radar Information Service (RIS) in Class F or G.

Radar *Control*. An air traffic radar service provided in controlled airspace in which *pilots are given mandatory instructions to enable the prescribed separation minima between aircraft to be maintained.* Such instruction will generally be associated with essential details of the conflicting traffic. No changes to heading or levels are to be made without prior approval of the radar controller.

Radar *Advisory* Service (RAS). An air traffic radar service provided in uncontrolled airspace in which the controller will provide the *advice* necessary to maintain prescribed separation between aircraft participating in the advisory service, and in which the controller will pass to the pilot the bearing, distance and, if known, level of conflicting, non-participating traffic, together with *advice* on action necessary to resolve the confliction. Where time does not permit this procedure to be adopted, the controller will pass advice on avoiding action, followed by information on the conflicting traffic.

Under RAS, the following conditions apply:

• The service will only be provided to flights under IFR, irrespective of meteorological conditions.

• Controllers will expect the pilot to accept vectors or level allocations that may require flight in IMC. Pilots not qualified to fly in IMC should accept RAS only where compliance with ATC advice permits the flight to be continued in VMC.

• There is no legal requirement for a pilot flying outside controlled airspace to comply with instructions because of the advisory nature of the service. However, a pilot who chooses not to comply with advisory avoiding action *must inform the controller*. The pilot will then become responsible for initiating any avoiding action that may subsequently prove necessary.

• The pilot must advise the controller before changing heading or level.

• The avoiding action instructions which a controller may pass to resolve a confliction with non-participating traffic will, where possible, be aimed at achieving separation which is not less than 5 NM or 5000 feet, except when specified otherwise by the regulating authority. However, it is recognized that in the event of the sudden appearance of unknown traffic, and when unknown aircraft make unpredictable changes in flight path, it is not always possible to achieve these minima.

• Information on conflicting traffic will be passed until the confliction is resolved.

• *The pilot remains responsible for terrain clearance*, although air traffic service units providing a RAS will set a level (or levels) below which a RAS will be refused or terminated.

Radar *Information* Service (RIS). RIS is an air traffic radar service provided in uncontrolled airspace in which the controller will inform the pilot of the bearing, distance and, if known, the level of the conflicting traffic. *No avoiding action will be offered. The pilot is responsible for maintaining separation from other aircraft whether or not the controller has passed traffic information.*

Under RIS, the following conditions apply:

• RIS may be requested under any flight rules or meteorological conditions.

• After the initial warning, a controller will only update details of conflicting traffic at the pilot's request, or if the controller considers that the conflicting traffic continues to constitute a definite hazard.

• The controller may provide radar vectors for the purpose of tactical planning or at the request of the pilot. However, vectors will not be provided to maintain separation from other aircraft—*separation from other aircraft remains the responsibility of the pilot. Pilots are not required to accept vectors.*

• The pilot must advise the controller before changing level, level band or route.

• RIS may be offered when the provision of a RAS is impracticable.

• Requests for a RIS to be changed to a RAS will be accepted subject to the controller's workload; prescribed separation will be applied as soon as practicable. If a RAS cannot be provided, the controller will continue to offer a RIS.

• For maneuvering flights that involve frequent changes of heading or flight level, RIS may be requested by the pilot or offered by the controller. Information on conflicting traffic will be passed with reference to cardinal point. The pilot must indicate the level band within which he wishes to operate and is responsible for selecting the maneuvering area, but may request the controller's assistance in finding a suitable location. The controller may suggest repositioning on his own initiative but the pilot is not bound to comply.

• *The pilot remains responsible for terrain clearance.* Air traffic service units providing a RIS will set a level (or levels) below which vectors will not be provided, except when specified otherwise by the regulating authority. Note: Military air traffic service units are authorized to disregard the levels below which vectors will not be provided for aircraft performing radar to visual recoveries to an airfield within 20 miles of that airfield.

General Operating Procedures

Military pilots are only required to comply with ATC instructions when flying within specific airspace as identified in the UK AIP and RAF FLIPs. Where compliance with ATC instructions is optional, a controller may assume that a pilot receiving an air traffic service (ATS) will comply with such instruction unless he states otherwise.

When providing radar services, controllers should take account of airspace restrictions, known high ground or obstructions and radar clutter, shadow and suppression.

Outside of CAS, pilots wishing to receive ATS must first establish verbal agreement with the controller. Should the pilot fail to specify the type of service required, the controller is to ask which service is required before providing any service. Having confirmed the identity of the aircraft, the controller must state the type of the service being provided and advise the pilot of subsequent changes in the type of service.

Terrain Clearance. Responsibility for terrain clearance rests with:

• The *controller*, if Radar Control is being provided in controlled airspace.

• The *pilot*, if a RAS or RIS is being provided in uncontrolled airspace. However, at Air Traffic Service Units, a level (or levels) are set, below which RAS is to be refused or terminated. The levels are to be based on Area Safe Altitudes, Sector Safe Altitudes or, if available, Diverse Vector Charts. When it is known that a pilot is operating below a Safe Altitude, the controller concerned may remind him of his responsibilities.

Descent To Low Level. When a pilot receiving a radar service requests descent to operate low-level, the controller is to pass the appropriate Regional Pressure Setting (RPS) in mb/ins and clear the pilot to descend to his safety altitude. The appropriate service may be provided down to the level specified in local orders.

UK Definition: *En Route Pilot "Safety Altitude."* Calculate the "Safety Altitude" for a particular route or exercise area by adding 1000 feet to the MSL

continued on next page

Separation from other aircraft remains the responsibility of the pilot.

altitude of the highest obstacle (rounded up to the next 100 feet) over which there is any possibility of the aircraft passing. If the flight is to take place over mountainous terrain—defined as terrain 3000 feet MSL or higher—that 1000 foot increment is to be increased to 2000 feet. When severe turbulence is anticipated, give consideration to increasing the safety altitude even more to compensate for hazardous conditions that are likely to occur. For instance, where areas of turbulence associated above mountains and lee-waves are forecasted—or known to be present—an inflight clearance of 5000 feet above mountains that are up to 5000 feet in height or above the surrounding terrain is necessary. For higher mountains the clearance should be at least equal to their height above the terrain.

Radar Service Limitations

In situations of limited or degraded radar performance, the controller cannot provide traffic separation and/or traffic information to the full extent associated with normal radar services. Among several other considerations, radar services will be limited when the aircraft is being flown too close to the lateral or vertical limits of solid radar cover or within 10 NM of the edge of the radar display and when the aircraft is close to areas of permanent echoes or weather returns. Primary radar "solid coverage" is generally regarded as that portion of the radar's coverage within which a target of small reflecting area may be expected to paint satisfactorily. When limited radar service is to be provided, the controller is required to warn the pilot of the circumstances causing the limitation. Where feasible, the warning is to be given before the service becomes limited. Thereafter, the pilot is expected to take the stated situation into account in his general airmanship.

When flying in "their" country, "their" rules apply.

Lower Airspace Radar Service (LARS)

LARS provides transit radar services to military and civil aircraft up to FL 95 outside CAS making use of existing Air Traffic Service Unit (ATSU) resources wherever possible. The service is normally available during the published operating hours of participating units within either 30 NM or 40 NM of each unit. Individual areas of LARS responsibility are detailed in military and civil aeronautical documents. Where adjacent areas overlap, arrangements for the transfer of LARS responsibility are to be specified in local ATC orders or letters of agreement. The radar services provided by a LARS unit within the above parameters are RAS and RIS.

Summary

The information and concepts provided here are intended to inspire some discussion on the subject, but this article is *not* meant to take the place of studying source documents. Additionally, don't limit airspace discussions just to the UK. As a global air force, we need to have an understanding of the variations in air traffic services and airspace procedures that exist throughout the world.

Detailed mission planning for global operations is a *must*. Visit the local air traffic control entity or base operations for information. Or, try a search of authoritative web sites. If available guidance is lacking, or conflicts with other Department of Defense publications, resolve the issue *before you deploy*. Don't forget: It is your *duty* to send in a publication change request if a correction is required!

A few key things to remember:

• When flying in "their" country, "their" rules apply.

• Minimize confusion by using standard, internationally recognized ICAO phraseology and make requests that fit standard air traffic rule sets.

• Most importantly, *don't* be lulled into a false sense of security because a host nation air traffic controller clears you for what you requested, especially in a non-standard type situation. The controller may not fully understand the request or he may incorrectly expect that you have a clear understanding of the clearance. Know what you are requesting and receiving, and if there is doubt about a clearance, don't accept it—clarify it.

FLY SAFE!

The author expresses sincere thanks to Major Randy Davis, USAF, and Squadron Leader Tim Owens, RAF Strike Command, for their inputs to this article.

Photo Illustration by Dan Harman

J.S.T. RAGMAN

The aviation world was focused on a 747 pilot, a typhoon, and a collision on takeoff roll. I was focused on myself, an altimeter error, and 299 people aboard a 777. Same day, same hemisphere, two pilots, two errors, one lucky, and one not so lucky.

My first flight safety article had been published fifteen years earlier. I had "talked the talk" and "walked the walk" on flight safety for twenty-plus years, and I had covered the flight safety bases in the Air Force business, as well as the airline business. I routinely left my ego at home with my wife and two sons. I had taught "error management" at a major airline for two years, and I had long ago accepted and internalized the reality that I was human, that I would make errors, and that job number one was to catch those errors before the consequences kicked in. I had indeed made, and caught, many an error.

I was comfortable. I would make errors. I would catch errors. Such was life. As I sat in my hotel room and viewed the rescue scenes on television, I realized that perhaps I had become too comfortable. Sure, I would make errors. But, I would catch my errors. There would be no consequences.

Until the "big one." Rolling down a closed runway on takeoff roll. Or flying with an improper altimeter setting, on radar downwind, in instrument conditions, in mountainous terrain. I was the lucky one. The face staring at me from the television screen had not been so lucky.

We had encountered a TCAS-system problem earlier in the flight. As a corrective action, we had selected my transponder as the primary. We had completed the In Range Checklist passing through 18,000 feet on the descent. The altimeter remained 29.92 inches of mercury. Transition to local altimeter would be as directed by local air traffic control. The ATIS had broadcast an altimeter setting of 978 millibars. We had both dialed in 978 on our nifty, high-tech, electronic flight instruments. We were cleared to 4000 "feet" with an altimeter setting of 979 millibars. I was the flying pilot. I selected 4000 feet and reset the altimeter to 979 millibars.

And now for the error: I had reset the altimeter to 979 millibars, but I had not punched the altimeter reset knob to transition from 29.92 inches to 979 millibars. We were in the descent, in the soup, with my flight director taking me to my 4000 foot altitude setting, at 1250 feet per minute.

An amber "standard" caution appeared on my primary flight display. I never saw it. An amber "baro disagree" caution appeared on our center display. Neither of us ever saw it. I passed through 3200 MSL on my fellow pilot's altimeter. He never saw it. I was a few hundred feet and a few moments from terrain, and approach control never saw it. My transponder was primary, and incorrectly showing us at 4000 feet.

The jumpseater caught it. I punched my altimeter reset knob, noted my altitude at 3200 MSL, disengaged the autothrottle, kicked off the autopilot, and climbed to 4000 MSL.

I had made many an error in my day. I suspect I have made several errors each time I have headed out to fly. And I had caught them all. Until today. I had not caught this one. A checklist had not helped. The high-tech instrumentation had not helped. The air traffic controller had not helped. The crew concept had not helped.

I have always viewed complacency as a four-letter word of the worst kind. Lives are at stake. Complacency kills. Yet I had become complacent. But in an odd way, I had not become complacent *to error.* I knew I would commit them. Rather, I had become complacent *in my belief* that I would always catch those errors. Not so.

As I continued to view the rescue efforts amidst the typhoon, my mind wandered back through twenty-plus years of flying. This has been my "big one." This had gotten my attention, it had frightened me. I began to run through the excuses: Circadian rhythm, back side of the clock, long flight, mixing C-130 systems/procedures and 777 systems/procedures, non-standard ATC procedures, an inattentive fellow pilot, the transponder line in the chain of events.

The excuses were just that: Excuses. My mind came to rest on the ramp at Vance Air Force Base, Enid, Oklahoma, 1980. I was the student. Major Anderson was the instructor. His words were ringing true: "If you ever find yourself in an aircraft in which you are not thinking about this flight, this moment, you will be missing something: Altitude, airspeed, heading, bingo fuel, something. Think: This flight, this moment."

Simply put: I had not been thinking "this flight, this moment." I was relaxed. I was on downwind. I was looking forward to the layover. And I was indeed "missing something."

It got my attention. It was a lesson I do not want to learn again.

This moment, this flight.

("J.S.T. Ragman" is the pen name of a C-130 pilot and unit commander in the Air Force Reserve. He is also a Boeing 777 pilot for a major airline.)

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

THE DANGER OF GETTING HIGH WITHOUT FLYING

FREDERICK V. MALMSTROM, PH.D., CPE
USAF Academy

When I began researching the topic of a street drug named "Ecstasy," my first reaction was, "Omigawd, not *another* one!" In ten years of experience as a clinical psychologist in the prison system, I saw there is practically nothing that people won't stuff into any orifice, bathe in or shoot up their veins in the endless quest to get high. I once had a patient who mainlined peanut butter and subsequently lost three fingers to gangrene.

Our armed forces mean business when it comes to drug abusers.

Ecstasy Is Now A Culture

Yet, this Ecstasy is no ordinary street drug—it's a culture. It deserves special mention, if only for the reason that both the USMA and USAFA have recently—and sadly—found it necessary to court-martial, dismiss from service and sentence to Leavenworth, several cadets who were abusing this drug. Yes, our armed forces mean business when it comes to drug abusers.

I was surprised to find that the most popular variant of Ecstasy (3,4 methylenedioxymethamphetamine, or simply MDMA if you ever have a need to know) was first synthesized and patented in Germany as an appetite suppressant as early as 1912. However, it wasn't until 1 July 1985 that the Drug Enforcement Agency declared MDMA a Schedule 1 Controlled Substance. That's a roundabout way of saying in the U.S.A. Ecstasy is *illegal*

How Out Of Control Is Ecstasy?

The *New York Times* reports that around one million tablets are smuggled into the U.S. every day. Illegal use of Ecstasy has skyrocketed since the early 1990s, and the armed forces aren't immune from having their share of illegal abusers. Ecstasy is an amphetamine, with sister drugs like MDE ("Eve"), MDA ("Love"), PMA ("Death"), MDEA and MBMB. These are all popularly known as "Rave drugs" or "club drugs" because they are frequently gobbled in mass quantities at all-night parties or "Raves." A moderate 75-150 milligram pill dose is reputed to give the user a high lasting from one to three hours. MDMA is definitely the "young man's drug of choice."

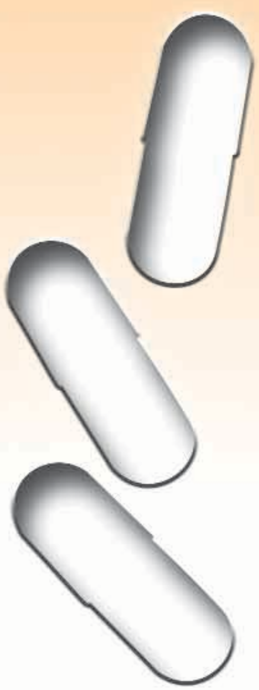
Ecstasy Is Harmless? Says Who?

For the past 10 years or so there's been a popular but unfounded belief by the lay public that these Rave drugs are relatively harmless and only promote feelings of euphoria, social closeness and mild LSD-like hallucinations. Is this so? Have we *finally* found that wonder pill which promotes only peace and harmony? If that were truly the case, then we could do away with our armed forces. ("Brave New World" revisited?)

I'm downright suspicious of that claim, if only because my long-term personal knowledge of drug abusers says that any kind of amphetamine is bad news. Amphetamines always have their subsequent letdown period. *I've had patients who took as long as two years to recover from their amphetamine abuse.*

Amphetamines are all "designer" drugs, a trendy way of saying the molecule doesn't exist in nature–it's created in the laboratory. Hence, since the body has no natural defenses against these molecules, there are bound to be major and unknown side effects. Indeed, my MEDLINE search of over 1200 journal articles states over and over that the long-term effects of Ecstasy abuse are just beginning to be seen.

Despite that advisory, quite a bit is known about Ecstasy's *short-term* effects—on animals. Rats and monkeys on MDMA have been known to behave



impulsively, ignore danger, experience spontaneous ejaculation and prefer huddling together (social closeness?) more frequently. These are certainly ingredients guaranteed to get a human party launched quickly.

But amphetamines do have narrow medical uses, and in exceptional circumstances amphetamines have been prescribed to members of the armed forces. In 1942, Commander Joe Rochefort, USN, was prescribed amphetamines for several weeks while he was busy breaking the Japanese Navy General Operational Code, JN25b. And during the 1990 Gulf War some Coalition aircrews were prescribed carefully monitored doses of amphetamine to bolster their alertness and extend their duty days. Even so, most pilots politely declined this offer.

What Does Ecstasy Do To The Body?

Like all stimulants, MDMA cranks up the body's idle speed. That's why people who overdose sometimes die of runaway hyperthermia (raised body temperature) and tachycardia (accelerated heart rate). Like all amphetamines, MDMA gives the typical "Weekend High" followed by the "Midweek Letdown." I've listed in Table 1 some of the known effects of human MDMA abuse.

Annually, there are about a dozen deaths in the US attributed solely to Ecstasy chemical overdose. In addition, there are perhaps three yearly deaths per 10,000 in the 18-25 age group, persons who die because of behavior changes while under the influence. I found a few reported cases of exceptional bonehead abusers. One was killed while "automobile surfing" (use your imagination!) and yet another elected to climb a high-voltage tower (Famous Last Words: "Hey fellas, watch me!").

MDMA Abuse Is Easily Detected

In the short run, our medics can easily test for MDMA abuse with a simple urine or blood test. More tellingly, examiners can also determine anyone's history of MDMA abuse with hair sample analysis. Hair sample analysis is quite sensitive, dipping down into the nanogram per milligram ranges. Merely going "cold turkey" won't disguise past evidence of Ecstasy abuse.

Conclusion: This Stuff Is Downright Dangerous.

I was disappointed to learn there are no known experiments on the effects of MDMA on flying—or even on driving. There ought to be some controlled studies, but alas, there aren't. It is possible that many general aviation mishaps have been brought on by MDMA abuse, and that will present a real problem for future NTSB investigations. But in the meantime it goes without saying that any military flyer who abuses MDMA or any other amphetamine is guaranteed immediate, permanent grounding. (What the legal system does with the abuser is another chapter.) None but the insane passenger would look forward to flying with an overconfident, impulsive, hallucinating pilot. Or a paranoid, depressed, clumsy one.

TABLE 1

Immediate Effects of MDMA ("Ecstasy")
Euphoria or joy

- Feelings of closeness and camaraderie
- Increased sexual arousal
- Hyperthermia (raised core body temperature)
- Impulsivity
- Bizarre and risky behavior
- Mild but pleasant hallucinations
- Increased reaction time
- Elevated blood pressure

Short-Term Withdrawal Effects from MDMA ("Ecstasy")

- Depression
- Paranoia and unfounded suspicion
- Ataxia (inability to control fine motor movements); clumsiness
- Anxiety
- Hostility and unsociability
- Diaphoresis (uncontrolled sweating)
- Flashbacks
- Disrupted sleep patterns

Long-Term Effects of MDMA ("Ecstasy")

- Addiction
- Brain Edema (swelling)
- Hepatic (liver) damage
- Permanently decreased Verbal IQ
- Brain lesions (scarring)
- Parkinsonian-symptoms (the Shakes)
- Tachycardia (irregular heart beat)
- Convulsive seizures

Merely going "cold turkey" won't disguise past evidence of Ecstasy abuse.

The Angry Side of Mother Nature

The winds picked up en route and we were facing a headwind component of 70 knots.

LT LES FIERST, USN
VAQ-131

It was June 29, 1999, and our squadron was in its second day of local flight operations at MCAS Iwakuni, Japan. After completing a TRANSPAC just four days earlier and, having one local instrument round-robin under our belt, my crew was ready to tackle a Prowler 1500 foot "mid-level" on the JNTR Orange route.

Weather on the previous day was terrible. Being based out of NAS Whidbey Island, WA for the past four years, it had been a while since we'd seen thunderstorms and constant downpouring rain for hours on end. We were used to getting the nice, lazy, overcast showers.

This particular day the weather was pretty good. Ceilings were about 060 BKN with a 100 OVC layer on up to FL270. No rain was present in the area and metro was forecasting weather to be the same until midafternoon, when thunderstorms were forecast to return.

Our crew briefed up the low-level with a backup plan of flying to Yokota AFB and shooting an ILS approach before returning to Iwakuni. We launched at 0900 and proceeded on our way to the Kochi VOR to get onto the route. About ten minutes into the flight it became evident that the ceilings on the route and the forward visibility were not going to work for us. I radioed Fukuoka Control and put our change of flight plan on request.

After getting a decent view of Mount Fuji and shooting the approach, we headed back to Iwakuni at FL240. The winds picked up en route and we were facing a headwind component of 70 knots. We weren't that concerned since my pilot and I calculated an on-deck fuel of 5.0. After all, the weather was still forecast to be good and our divert "bingo" fuel was 3.2. Then approach control informed us that the weather had rapidly degraded to 005 OVC, three-quarters of a mile visibility, with standing water on the runway and thunderstorms in the vicinity. Hmm, we muttered, at least things are going OK up here. Just then, ice began to show up on our aircraft. Moderate rime icing formed on the wings and our "comfortable" fuel 60 NM east of Iwakuni began to look tight. We descended to 6000 feet and broke out Hiroshima airfield at our right two o'clock. Our fuel consumption increased at the lower altitude and we nibbled into our reserves a little more. Then, to add insult to our shaky fuel state, weather at our divert closed in, precluding it as an option. Consequently, our request for a PAR "full stop" had a definite note of finality. We also advised approach of our intent to make a field arrestment.

Photo by Lt Cdr Dave Adams
Photo Illustration by Dan Harman

After being vectored for what seemed like an eternity and seeing numerous lightning strikes, we were set up for a ten mile PAR straight-in at 3000 feet. I checked our gas on the approach and we were down to 3.8. My thoughts were, "I hope we make this because I'm not sure where we're going to go if we don't!" The PAR minimums for RWY 02 are 300-3/4 and we were going to need all of it. As we approached 3 NM at 1200 feet we were still IMC and my pilot's ICS became intermittent. The poor ICS made him sound like the teacher on the Charlie Brown cartoon, and I had to have him repeat his calls several times. This was extremely distracting for all of us, but especially to him while he flew what would be one of the most difficult approaches of his career. At two miles we were cleared for the arrested landing with no field in sight. Finally, after passing through 500 feet, I could break out the water beneath us, but still no airfield ahead. The rain was coming down hard and, at a mile, still no joy. As I actuated the windshield air, at three-quarters of a mile we broke out the runway environment by seeing the REIL lights. After what sounded like "secure the air" from my pilot I let go of the switch only to have my pilot request it again. Between one half and a quarter of a mile, the runway came into view and we touched down for an uneventful trap. As we taxied back to our line the field was closed due to less than half a mile visibility.

After clearing the active, I checked the fuel gauge and saw 3300 pounds staring at me. My thoughts quickly went to what we'd be doing if we didn't break out. I remembered seeing Hiroshima at 6000 feet and figured it would have been the only suitable alternate by weather standards, but with little familiarity with the field and the challenge of foreign controllers staring at us, it was not an option I was comfortable with.

In hindsight, I can't object to our decision to go to Yokota since we had plenty of gas to begin with and the weather was forecast to hold up for a while. Sometimes weather changes suddenly and as professional aviators we need to react. Our crew coordination was good despite the communication problem our pilot was experiencing.

Often we find ourselves operating in new areas and we take Mother Nature for granted. She can change her mind quickly and become very challenging and unforgiving. Good, thorough divert field briefs and crew coordination are a must during these situations. And remember, always fall back to the basics of aviate, navigate, and communicate. Fortunately, we landed at our final destination. Next time, we may have to divert to a field we can't pronounce and we're barely familiar with.

My thoughts were, "I hope we make this because I'm not sure where we're going to go if we don't!"

Acceleration Atelectasis

CAPT WILLIAM BRAY, MC, FS
CAPT LAWRENCE SPINETTA
1st Fighter Squadron
Tyndall AFB FL

Symptoms include shortness of breath, rapid breathing, cough and chest pain.

Oxygen can be a pilot's best friend when experiencing any number of inflight emergencies, including smoke in the cockpit and sudden cabin depressurization. Using oxygen for long periods of time, however, can lead to post-flight symptoms, including cough, shortness of breath, chest pain and post-flight oxygen-absorption ear block. Under some conditions, prolonged oxygen use can lead to the development of a condition known as *acceleration atelectasis*. Breathing 100% oxygen for an extended period, coupled with repeated high-G maneuvers while wearing a G-suit, may cause breathing difficulties and temporary lung injury. It's a relatively uncommon occurrence with minimal long-term concerns, but bears mention in light of a recent physiologic occurrence here at Tyndall.

The Merck Manual of diagnosis and therapy (http://www.merck.com/pubs/mmanual) defines atelectasis as a "shrunken, airless state affecting all or part of a lung." The most common symptoms include shortness of breath, rapid breathing, cough and chest pain. Although usually not incapacitating, military aircrew experiencing temporary lung injury from acceleration atelectasis could certainly have difficulty completing their required flight duties. Single-seat fighter pilots are at the most risk. F-15C, F-16 and A-10 pilots fly high-G profiles on most training sorties. Fortunately, acceleration atlectasis doesn't happen frequently.

Tactical Navy and Marine Corps jets are configured to deliver 100% oxygen (95% oxygen and 5% argon for on-board oxygen generating systems [OBOGS]) at all times. They fly with 100% oxygen for protection against rapid decompression and to ensure a closed oxygen system in case of water entry (e.g., the catapult doesn't work properly on a carrier launch and they're thrown into the ocean). Navy and Marine aviators rarely experience anything more than mild symptoms. Navy Lieutenant Will Gotten, a former F-18 pilot and exchange F-15 pilot, referred to his experience with atelectasis as the "G cough."

Here's the Tyndall experience: On a recent student sortie, a pilot flew a G-intensive mission with 100% oxygen selected. After landing, the pilot experienced "chest discomfort" and was unable to take deep breaths. After finding it difficult to climb stairs, the pilot notified the flight surgeon. A chest X-ray and exam revealed some of the tissue

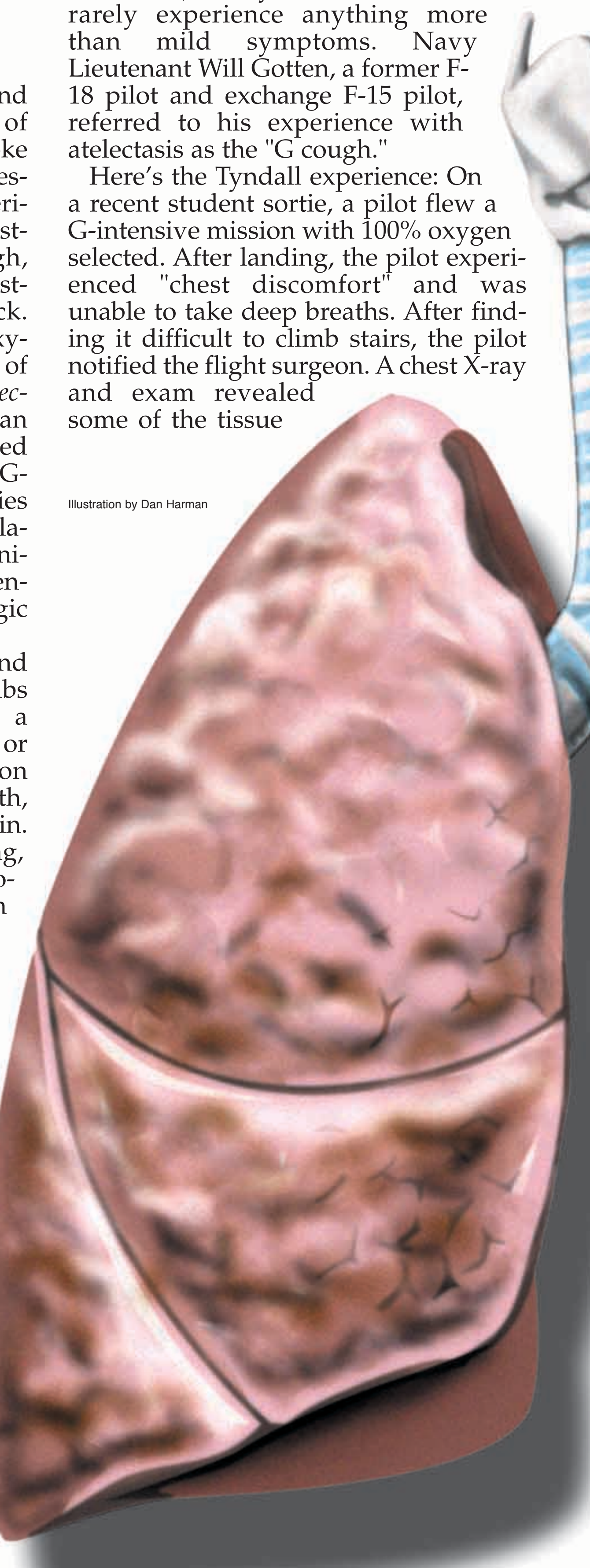
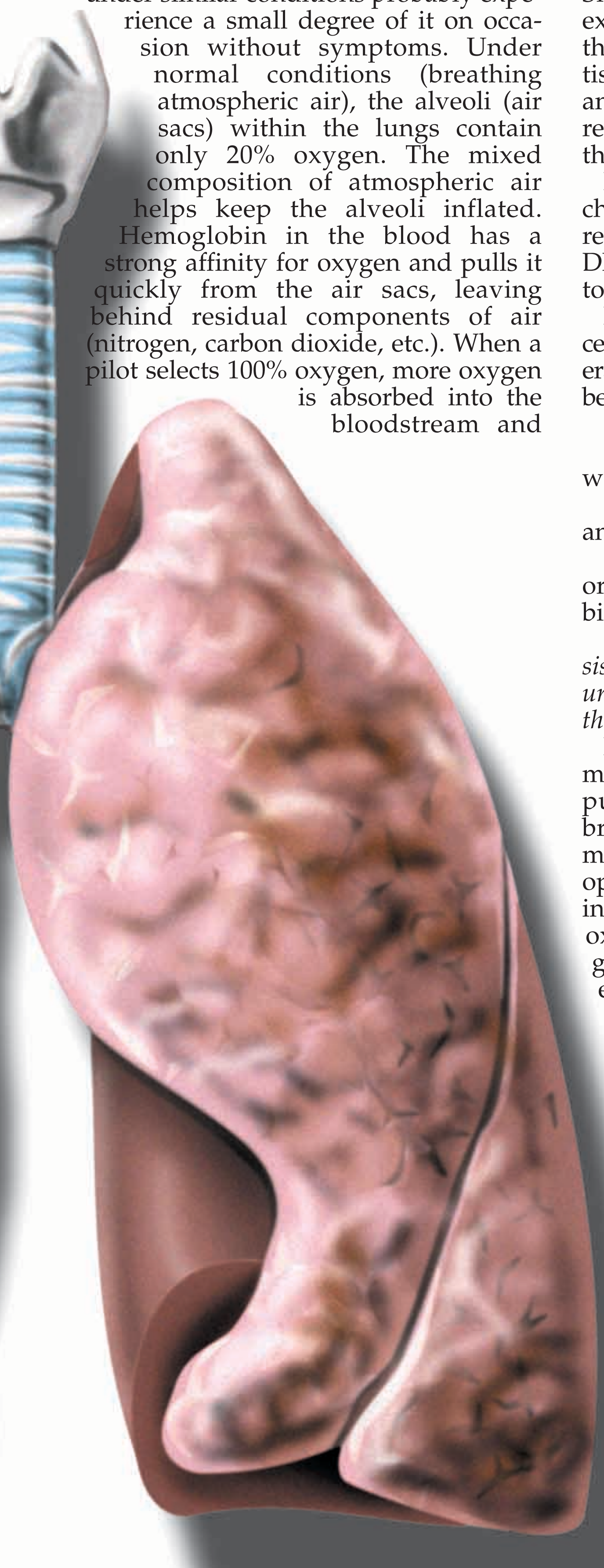


Illustration by Dan Harman

at the bases of the pilot's lungs had collapsed, decreasing the amount of surface area for gas exchange.

Young healthy lungs can tolerate a certain amount of this, and most pilots under similar conditions probably experience a small degree of it on occasion without symptoms. Under normal conditions (breathing atmospheric air), the alveoli (air sacs) within the lungs contain only 20% oxygen. The mixed composition of atmospheric air helps keep the alveoli inflated. Hemoglobin in the blood has a strong affinity for oxygen and pulls it quickly from the air sacs, leaving behind residual components of air (nitrogen, carbon dioxide, etc.). When a pilot selects 100% oxygen, more oxygen is absorbed into the bloodstream and less of the atmospheric air is available to keep the alveoli inflated. Repeated, sustained high-G maneuvers induce enough downward force on the lungs to exert an additive effect on the process. Simultaneously, the inflated G-suit exerts an upward force on the lung, further compressing it. The result is lung tissue that collapses much like a sponge and remains so until "normal" air is restored and deep breathing reopens the airways.



For the Tyndall pilot, a follow-up chest X-ray later in the week showed resolution of the atelectasis, but he was DNIF for a few days while his symptoms resolved.

In addition to prolonged use of high concentrations of oxygen and increased accelerative forces, the following can reasonably be considered risk factors for atelectasis:

- Smoking
- Illness that has lowered resistance or weakened the aviator
- Lung disease, including emphysema and bronchiectasis
- Use of drugs that depress alertness or consciousness, such as sedatives, barbiturates, tranquilizers and alcohol

To combat the risk of acceleration atlectasis, aircrew should quit smoking, resist the urge to fly when sick and limit alcohol use the night prior to a sortie.

Flying with Combat Edge (CE) also may help prevent atelectasis. Positive pulmonary pressure from pressure breathing for G (PBG) during high-G maneuvering tends to keep your alveoli open. Additionally, CE pressure breathing won't automatically give you 100% oxygen. With NORM (not 100% oxygen) selected, the CE regulator is very efficient and continues to aspirate ambient air during PBG to a maximum of 80% oxygen-rich. In other words, Combat Edge doesn't saturate your alveoli with oxygen. This, combined with the positive pressure, helps prevent your air sacs from collapsing.

Although 100% oxygen is available, pilots may want to sensibly limit their 100% oxygen consumption when not needed. If extended 100% oxygen is required or desired, consider limiting high-G maneuvers. As always, consult a flight surgeon if you experience breathing difficulties during or after a flight.

He was DNIF for a few days while his symptoms resolved.

Pressing the Limits

While AFIs guide our conduct in the air, they don't cover everything.

LT COL ALVIN A. BRUNNER III
338th Combat Training Squadron
Offutt AFB NE

"A man's got to know his limitations."
Harry Callahan (of *Dirty Harry* fame)

There isn't a pilot around who hasn't pressed or outright busted "the limits," either intentionally or unintentionally, at one time or another while flying an aircraft. "The limits" can be anything—an engine ops limit, G limits, weather minima, etc. What's funny is that the consequences vary widely—from a minor nuisance that could cause embarrassment to one that could kill you. So, how does one treat "the limits"?

Since there are so many limits to consider in aviation, I want to focus on those involving judgment. Air Force Instructions guide our conduct in the air and set a framework for our judgment. It's judgment that can get us into the most trouble. Not to belittle those physical limits of engine and airframe, but pilots generally regard such limits as absolutes which they only occasionally—and unintentionally—exceed. If those limits are intentionally exceeded, it's the result of a desperate situation which forced some conscious decision making. It's these situations that require our flying judgment, and these are the kinds of limits I'm talking about—ones that demand a conscious, cognitive process. While AFIs guide our conduct in the air, they don't cover everything, and they don't replace sound judgment or airmanship.

A personal example: I was a young RC-135 instructor evaluator, well-seasoned and hitting the top of my skill and expertise. The crew and I were returning to Kadena from another long operational reconnaissance mission. All was routine; only some broken clouds over the field at about 5000 feet AGL. On the one hand, I was confident and I had an experienced crew to back me up, so I was complacent. On the other hand, I was tired. The combination led to poor

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

attention management, which in turn left me behind on my descent to the field. I was very high on final at eight NM. Of course, the last thing I wanted was to prolong our already lengthy flight time. Besides, my pilot pride was on the line.

One thing the RC-135 can do very well is quickly lose altitude due to its increased drag, and my gut (skill and experience) told me I could still make the field. So with gear, flaps and idle, I took my crew on a "space shuttle" approach. During this time, both Approach Control and my copilot asked if I needed to do a 360 on final to lose altitude. Each time I insisted we would be fine. My Crew Resource Management skills had obviously faltered, since I failed to detect the grave concern in my copilot's voice or that of my silent navigators. Allow me to continue the tale of this near-debacle …

I had to ensure I had the engines spooled up, on power, on speed, on glidepath and on course at 200 feet AGL; otherwise, I'd have to go around, after a big "I told you so" from my copilot. But fortune smiled, and I made a smooth landing. Once we cleared the runway, I thought about what had just transpired, turned to the copilot and yelled "Don't you ever try that! That was one of the more stupid things I've done." I'd just realized I hadn't shown my copilot and crew "superior skill;" I had only shown them my poor judgment.

So what can be learned from this and any of a myriad of stories that could be told about pressing the limits of personal skill and judgment? Simple: Remember the old adage, "A superior pilot uses his superior judgment to avoid those situations requiring his superior skill." In other words, a superior pilot knows the rules, regulations and restrictions. Furthermore he sets some personal limitations for likely situations. This is a very common practice for instructor pilots teaching Undergraduate Pilot Training or Replacement Training Unit/Formal Training Unit students.

For example, as I mentioned before, if my RC-135 isn't in the slot at 200 feet AGL, it's go-around time. Naturally, this will vary with different situations, aircraft and weather. That 200-foot slot limit is for day VFR when my "karma" is good. If it's been a long day, or it's the second go of the day, then it changes to meet the circumstances. But remember, these are my limits.

So how does one figure out what his personal limits are? Again, the answer is simple: Experience. And the best source of such experience is talking to crusty old pilots and reading various flying articles like this one. As the saying goes, "Learn from others' mistakes; you won't live long enough to make them all on your own." Talk to your fellow aviators. Discuss various situations they've encountered, or ones that might occur, and find out how to best handle them. This can be done in the bar or ready room. It's especially appropriate during mission planning. If you do this you'll be on your way to becoming a better aviator.

Not only is it sound planning and common sense, but it's also ORM without all the regimen. Know what you're going to do ahead of time for various situations, because "A man's got to know his limitations." ✈

"A superior pilot uses his superior judgment to avoid those situations requiring his superior skill."

New Frontier for Human Factors

Only a small percentage of all USAF mishaps have dedicated human factors investigations.

MAJ TRACY DILLINGER
LT COL TOM LUNA
HQ AFSC/SEFL

Readers of *Flying Safety* know the Safety Center periodically reports the percentage of human factors (HF) involvement in USAF mishaps. We have become accustomed to seeing 60-80 percent as the range of human factors "causes" in mishap research and articles, based on Safety Center data obtained from safety investigation reports. Yet only a small percentage of all USAF mishaps have dedicated human factors investigations.

For example, in FY00, 933 flight mishaps and events were reported; there were 22 Class As, 84 Class Bs, 397 Class Cs and 430 Class Es. However, this total of 933 represents only *Flight* mishaps/events. There were 173 Weapons mishaps, 1674 Ground off-duty mishaps and 1402 Ground on-duty mishaps. Grand total: 4182 mishaps/events. Of those, only the 22 Class A Flight mishaps and five of the Class B Flight mishaps (27 total) had a properly detailed HF investigation and analysis. This is less than 1% of the 4182 total. What is the importance of the HF data that hasn't been collected? It's impossible to say, but looking back over the last ten years in flight, HFs played a causal role in 64% of all Class A mishaps. Even more attention-worthy, over 90% of all the Flight mishaps involving fatalities in the last ten years were caused by human factors.

Unfortunately, since we don't routinely collect or report the HF data on mishaps/events other than flight Class A mishaps, we really don't know the extent of HFs in our other mishaps and events. Yes, we all know human factors are there, but we won't know which human factors, the significance of these factors or ways to proactively address those factors—unless we investigate them. Collecting this data would help with identification of trends and deficiencies that would help us plan, educate and train our people.

Clearly, there is a need in the safety community to investigate and analyze HF data. This means we need to expand the formal investigation of human factors to include our ground, space and missile operations. And in the flight community the investigation of HFs in Class B, C and E mishaps definitely needs to occur. We all know the difference between a Class A

and a Class C can be a nano-second or pure luck. This is a new frontier for human factors—all mishaps, of all categories, from all types of settings.

Why aren't human factors more widely investigated? There are several likely reasons. The "bible," AFI 91-204, *Safety Investigations and Reports*, only explicitly directs HF investigations for Flight Class A and B mishaps. Most investigators are uncomfortable investigating HF and need better, not more, training in this area. Often, investigators are reluctant to ask for an HF consultant (this generally means a flight surgeon, aerospace physiologist, clinical/aviation psychologist or pilot physician). And lastly, investigators need a better tool to guide them in the HF investigation process.

How should we begin to work towards this enormous task, given decreased manning, increased tempo and generally limited expertise and experience? The Human Factors Working Group here at the Safety Center has come up with a multi-pronged approach.

First, the aviation module of the Safety Automated System, or SAS, will be coming on line this spring. This data entry system can be accomplished over the internet, at the desk, by any FSO. It is a logic-tree format, guided investigation. System software developers have been working this for a long time—it should be user-friendly, informative and easy. Of course, there might be a bug or two, but overall, it will be a drastic improvement over the current system.

Second, training will expand. This means making sure people know how to investigate HFs, and how to use the SAS and the USAF HF taxonomy. Investigators will also need to know how to recognize when they need an HF consultant, and know how to get one. This training will be built into all safety courses, including the Flight Safety NCO Course, Flight Safety Officer Course, Aircraft Mishap Investigation Course, Aircraft Mishap Investigation and Prevention Course, Chief of Safety Course, and Mishap Investigation Non-Aviation Course, as well as the 1SXX (Safety) CFETP and 4MOXX (Aerospace Physiology) CFETP.

Third, expansion of HF investigations will progress in a step-wise manner. Flight mishap classes A, B, C, and E will begin concurrent with AVSAS implementation. HF investigations for ground A, B and C on-duty mishaps will begin later, with the new ground PAS module. Those will be followed by Ground A and B off-duty HF investigations. The final grouping will be for Weapons classes A and B. Full implementation is targeted for Sep 04. Sequential implementation will allow periodic progress reports and mid-course corrections.

And lastly, guidance in AFI 91-204 will be updated to reflect expanded HF investigations. Basically, through improved training and the new SAS tool, we should ultimately have information we can all use to improve our HF investigations.

Implementation of the HF project will enable the USAF to more effectively address, through the development of dynamic prevention programs, the single largest source of USAF mishaps. If you have any questions about the HF project, please call the HF Working Group POC, Lt Col Don White, HQ AFSC/Life Sciences Branch at DSN 246-0880 or the HQ AFSC Flight Surgeon, Lt Col Tom Luna at DSN 246-0830.

The difference between a Class A and a Class C can be a nano-second or pure luck.

Safety Investigation Boards and Mishap Risk Assessment Values

RON MC GREGOR
HQ AFSC/SEFE

Have you ever been a member of a Safety Investigation Board (SIB)? If so, you already know first-hand how much work is required to thoroughly investigate a mishap. You also know the Air Force will unequivocally support your investigation to ensure its success. To this end, the Air Force routinely dedicates significant resources to this process, whether it's funding to make something happen, experts to perform on-scene or laboratory analysis, physical labor to perform the "dirty" work, administrative equipment and support to accomplish the paperwork or simply advice or answers to your queries. Make no mistake about it; everyone wants to see you succeed with your investigation!

But what's a *successful* investigation? At a minimum (and I mean just barely passing here), you need to figure out *what* happened and *why* it happened—but that's like only filling out most of your Form 1040 and waiting for the IRS to tell you whether you owe more money or are due a refund. You definitely want to finish this job yourself! After figuring out the "what" and the "why," you need to develop feasible and effective recommendations to prevent the recurrence of this mishap, and these recommendations must logically flow from, and be substantiated by, your investigation. In reality, the entire effort and usefulness of a SIB can usually be summed up and measured by its *recommendations*, since they are what drive people into action.

But here's the sad part: Class A and B aviation SIBs develop approximately 200 recommendations every year, and at any given time there are roughly 400 recommendations being evaluated or in various states of completion. Of course, just about all of these recommendations place some demand on limited resources for implementation. And in a world of limited resources, not everything is going to get funded—including some very worthy recommendations from SIBs!

To avoid the frustration of spending what seems like countless hours over the course of a 30-day investigation to come up with recommendations that are not acted on, you need to formulate effective recommendations that offer real value. Everyone must compete for the same limited resources. Your recommendations must offer greater value than recommendations from other SIBs and offer greater benefits than other programs and initiatives not related to safety.

With so many open recommendations on the books, we are going to begin analyzing them based upon the principles of operational risk management (ORM). Although this has been occurring to varying degrees within the MAJCOMS, a much more formalized process will be implemented in the near future. The intent of the new process is to provide a defined structure for formally assessing the risks, costs and benefits associated with each recommendation. Additionally, it will provide the framework for prioritizing recommendations, thus focusing our attention on those recommendations that are judged to be of the most value.

We here at the AF Safety Center are currently crafting a change to AFI 91-204, which will formally charge SIBs with assessing risk(s) as part of the safety investigation. We'll also incorporate training into the formal courses taught here (FSO, AMIC and BPC), so the risk assessment process is uniform. This transition won't occur "overnight," and we will provide assistance to SIBs during the changeover.

Here's how the new process will work. As part of an aviation SIB's responsibilities, they will be required to specifically *identify the hazards* they have discovered during the course of their investigation. As a reminder, recall that a hazard is merely "any real or potential condition that can cause injury, illness or death to personnel; damage to or loss of a system, equipment or property; or damage to the environment." So how will hazards be identified? They'll be identified in two ways. First, they will be discussed and analyzed as part of the report's narrative (i.e., Tab T in a formal report or Tab 15 in an Abbreviated Formal Report) and then they will be listed, just prior to the SIB's Findings. Formally identifying and analyzing these hazards should focus the SIB specifically on the areas requiring mitigation actions. It should also force the SIB to develop recommendations that specifically address these identified hazards. In addition, these hazards should be apparent in the Finding sequence since they obviously played a role in the mishap under investigation. If the SIB has done its job, there should be a logical connection between the hazards discussed and analyzed in the narrative of the report, those hazards listed just prior to the Findings, the Finding sequence and, finally, the Recommendations. They should all work together.

Also as part of the new process, the SIB will *qualitatively assess the mishap potential or risk associated with each identified hazard*. This is a straightforward process whereby one determines the probability of a hazard resulting in a mishap and the likely severity of that mishap. The combination of probability and severity determines a hazard's mishap potential, or what is called its Mishap Risk Assessment Value (MRAV). Confused? An example will help clarify the concept.

Let's assume we've been assigned to investigate a mishap involving a training aircraft where the student pilot landed with the gear in the retracted position. Our investigation has determined that the gear was free of mechanical defects, properly assembled, properly maintained and fully functional. Further, we'll assume that our investigation has led us to identify "failure to command landing gear extension" as one of our hazards. Using Figure 1, let's suppose that an examination of the gear's design, related cockpit controls, usage history, and the design and history of similar landing gear in similar applications has led us to conclude that the probability of this hazard resulting in a mishap is "Occasional." In the context of determining an MRAV, probability and severity terms have already been defined and we've learned that "Occasional" means that this hazard will result in a mishap several times during the life of the fleet. We also considered "Probable" and "Remote" but concluded they are not reasonable assessments because we've learned that they have respectively been defined to mean "will occur regularly" and "unlikely, but can reasonably be expected to occur."

In a similar manner, we determined that the severity of the most reasonable credible mishap resulting from this hazard is "Marginal," which is defined to mean "could result in injury or occupational illness resulting in one or more lost work day(s), loss exceeding $20K but less than $200K, or mitigable environmental damage without violation of a law or regulation where restoration activities can be accomplished." For a training aircraft, a gear-up landing will most probably result in a mishap of this severity. Combining a "Marginal" severity with an "Occasional" probability, we arrive at an MRAV of 3C/11 which equates to a "Medium Risk."

So far, we've identified the hazard and qualitatively assessed its mishap risk potential or MRAV. Now it's time to *develop recommendations to mitigate risk*. You might think that we just begin brainstorming potential fixes, and that's partly true, but there's a method to this madness. The development of recommendations actually follows what's called the "order of precedence." This is a simple concept which recognizes that not all fixes are created equal. Of highest priority, one should look for potential design fixes to mitigate the identified hazard. Design fixes are the most preferable solution because they can often completely eliminate the hazard—but admittedly these fixes also often have

One should look for potential design fixes to mitigate the identified hazard.

Figure 1

Mishap Risk Assessment Values

Probability	Severity: 1: Catastrophic	2: Critical	3: Marginal	4: Negligible
A: Frequent	1	3	7	13
B: Probable	2	5	9	16
C: Occasional	4	6	11	18
D: Remote	8	10	14	19
E: Improbable	12	15	17	20

1-5: High Risk | 6-9: Serious Risk | 10-17: Medium Risk | 18-20: Low Risk

continued on next page

the highest up-front costs. After design fixes, in descending order of priority, one should look for potential fixes that incorporate safety devices, provide warning devices or, lastly, develop changes to procedures and training. Applying this methodology to our gear-up landing mishap we could recommend the following:

• Design: Implement a fixed gear

• Incorporate Safety Devices: Implement an auto-extend system

• Provide Warning Devices: Implement cockpit warning lights, tones or voice

• Develop Training and Procedures: Improve the written checklist, or its use, via training with instructors and in simulators

Certainly there may be other equally viable recommendations as well, but these are sufficient for purposes of illustration. At this point, a SIB may want to examine their recommendations and self-evaluate them to determine their effectiveness and whether they are really meaningful and valid recommendations, or whether they are likely to be "dead on arrival" at the MAJCOM.

Since implementation of a fixed gear completely mitigates the identified hazard of "failure to command landing gear extension," this is a great recommendation from a safety perspective. However, the dollar costs to implement and the performance penalties associated with a fixed gear may more than offset the benefit. Although it will be the assigned OPR/OCR's responsibility to specifically determine costs and benefits, the SIB may want to have some knowledge of them before recommending implementation of a fixed gear.

Looking to our second option, implementing an auto-extend system, we can perform a similar self-critique. This type of system utilizes logic that looks for specific parameters, such as low power and airspeed (as in the case of some Piper Cherokee Arrows) or low altitude, airspeed and GPS data (i.e., near an airport), to determine if the gear should be down. Other schemes could be developed as well, but a system of this type would only prevent most gear-up landings. Of course the possibility still exists that a malfunction may occur with this new equipment, but assuming its installation on our training aircraft, the mishap risk potential, or MRAV, would be reduced to Marginal/Improbable or 3E/17. Here the mishap severity has remained the same, since we would still expect the outcome of a gear-up landing mishap to be the same, but the probability of occurrence has been reduced. Overall, a very good safety recommendation, but its costs and benefits will also have to be considered.

Jumping ahead to our last option of developing training and procedures, we've probably discovered that the step, "Landing Gear—Down" already exists in the Before Landing Checklist. In this case we would probably readily convince ourselves that cosmetic changes to this checklist have no intrinsic safety benefit, but instilling checklist discipline through improved training may be beneficial. Assuming a rigid training program is implemented to instill checklist discipline, we would probably find that the mishap risk potential, or MRAV, for a "failure to command landing gear extension" hazard in our training aircraft is still Marginal/Occasional or 3C/11. In a case where the MRAV is the same prior to and after implementing changes, you really have to ask yourself if this is an effective recommendation. In some cases it may be because the associated costs are low, but you should also be asking yourself if you could develop a better recommendation.

As part of the new process, the SIB's responsibilities are to (1) articulate identified hazards in the final report, (2) determine each hazard's severity and probability to produce Mishap Risk Assessment Values and (3) develop feasible recommendations. Although you will not be required to do so, you'll probably want to judge whether your proposed recommendations have merit and are of value by self-evaluating them. Ultimately, a detailed evaluation will be performed by the recommendations assigned OPR/OCRs to determine their costs and benefits. If insufficient resources are available to accomplish a recommendation, the results of this evaluation will be used to determine the relative priority of this recommendation. In reality, the OPR/OCRs have three options at this point: use the evaluation to justify a request for additional funding; redirect funding from another project; or accept the existing risk and continue with operations. Hopefully, your recommendations will make the cut and make a difference!

This new process is being implemented for several reasons. We want to know exactly what the hazards are that the SIB has identified. Discussion of these hazards in the report's narrative and a qualitative evaluation of their MRAV should result in improved Findings as well as recommendations specifically targeted to mitigate these identified hazards. Certainly, the development of recommendations should also follow the order of precedence to ensure the formulation of the most effective recommendations. For MAJCOMS, the proposed process provides a structured method to assess the relative value of individual recommendations, a tool to easily communicate this value between other using MAJCOMS and a basis for prioritizing recommendations. In an environment of limited resources, the MRAV is necessary to successfully compete with other programs and initiatives not related to safety.

Again, not everything is going to get funded, but if a strong enough case is made for the recommendations in the SIB, they can make the cut.

Rank in the Cockpit

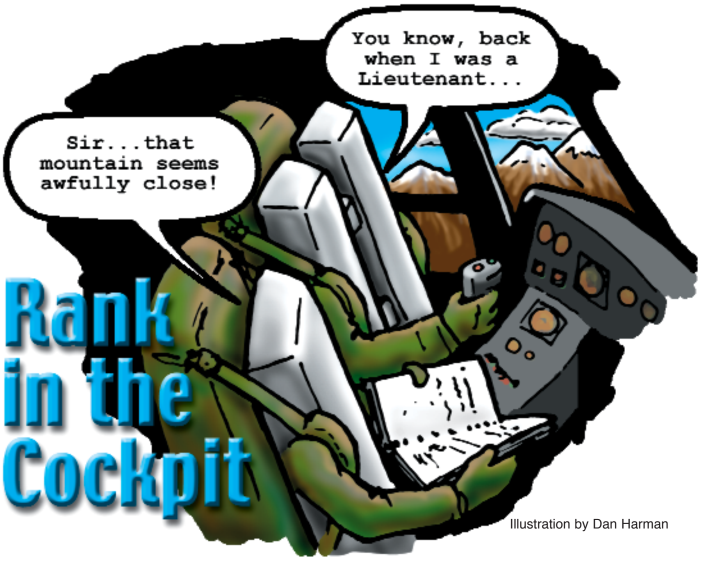


Illustration by Dan Harman

SFC STEVEN ROBERTSON
140th Aviation Regiment
California Army National Guard

Courtesy US Army *Flightfax*, October 2000

("Cockpit/Crew Resource Management (CRM): The effective use of all available resources—people, weapon systems, facilities and equipment, and environment—by individuals or crews to safely and efficiently accomplish an assigned mission or task. The term 'CRM' will be used to refer to the training program, objectives and key skills directed to this end. MAJCOMs may implement their programs as either 'cockpit' or 'crew' resource management, based on their respective missions." From AFI 11-290, *Cockpit/Crew Resource Management Training Program.* Ed.)

Through the course of my career, I have met some top-notch individuals, pilots and enlisted crewmembers. As a flight engineer riding in the back of helicopters, I literally put my life in the hands of the pilots at the controls.

Back in the late 1980s and early 1990s, the US military realized that human error accidents, left unchecked, would consume irreplaceable lives and valuable airframes. Hence, the *Aircrew Coordination Program* was instituted throughout Army aviation. One of the goals of the program was to take junior crewmembers/aviators who were timid or shy, and teach them how to interact as a team during all stages of a mission. The other part of the goal was to take senior pilots or ranking individuals, and teach them how to receive input and assistance from all members of the crew without undermining authority or creating an atmosphere of hard feelings. Terms like "direct assistance" and the "two challenge rule" were introduced. These concepts apply to *all* members of the crew. Thorough briefings before and after a flight are essential to positive crew performance and successful missions.

Many times after a mission has been completed, I'm approached by crewmembers who report that they are unhappy with how the mission went. Sometimes they're unhappy enough to request they not be scheduled with that particular aviator again. When I ask them if they expressed their concerns during the debriefing, the answer is invariably "no." The reasons usually are expressed as "Well, he outranks me" or "He has more experience than me" or "He is just an overbearing individual, I just can't get a word in without getting verbally beat up."

There have been times during my flight experiences when I asked an aviator to stop doing something I didn't like, and rank had nothing to do with it. *My life had everything to do with it.* Some of these experiences include missed radio calls from ATC, flying unsafe maneuvers, and paradrop operations in a high-density air traffic environment.

After some of these flights, I've had pilots come to me and say they were glad that I let them know when I was uncomfortable with what was going on during a flight. There were no reprisals or badgering, just a handshake and a thank-you. They may not remember, but I do.

Pass It On

I try to remember to continue to pass my knowledge on when teaching new crewmembers aircrew coordination. We need to do a better job teaching junior aviators and crewmembers to speak their minds freely in the aircraft.

From some things I've seen recently, I'm not so sure we are doing a good job teaching that. It may be that some don't know when they should speak up.

In my office, I have a case study of a B-52 accident. The pilot in command was the Wing Standardization Instructor Pilot. He had a three-year history of performing unauthorized maneuvers in aircraft. Leadership at all levels, including the flight surgeon, had failed to take corrective action. The results were tragic.

At our facility, we have a wide variety of safety magazines from other branches of the service, as well as the Army's *Flightfax*. When I read about accidents involving very experienced crewmembers, I wonder why. How could things have gotten so bad that a mishap like that occurred? We must be vigilant. Treating each crewmember with respect and valuing their opinions are elements of a successful flight. Taking appropriate direction from the PIC is also essential for a safe flight.

(At the time this article was written, SFC Steven Robertson was a CH-47 Standardization Flight Engineer and Platoon Sergeant, Co H, 140th Aviation Regiment, California Army National Guard.)

A Slice of Humble Pie

Photos by TSgt Michael Featherston and TSgt David McCleod
Photo Illustration by Dan Harman

I started to believe I was bulletproof and could handle almost any situation.

MAJ JOE WOLFER
97 AMW/SE
Altus AFB OK

I've read "Been There, Done That" articles in safety magazines for the past 12 years. Many of these stories, written by aviators like myself, have been both enlightening and informative. I've often asked myself in the past, "I wonder if I'll make a mistake bad enough to force me to write a story." Well, I finally had an incident which answered that question.

As a new Instructor Pilot (IP) at the C-17 Schoolhouse, I was starting to get comfortable with the training mission and local procedures. I felt my lack of instructor hours in the C-17 was balanced by my tour as a T-37 First Assignment IP. I started to believe I was bulletproof and could handle almost any situation.

The sortie started out like a normal C-17 Aircraft Commander Initial Qualification mission. These sorties typically include night air refueling, followed by night assault landings on a 3500 feet long runway with a 400,000-pound aircraft. The students on this sortie were former C-141 instructors/evaluators. After completing the night aerial refueling portion, we came back for multiple approaches and landings for both students. I had the student who needed more pattern work in the seat for the first full-stop assault landing. As we started our first approach, the winds were approximately 30 degrees off runway heading at about 20 knots, standard for Altus.

Because of the winds, the student was having trouble maintaining runway centerline on final. I was providing instruction and offering help. We were both so focused on maintaining proper centerline control that I didn't make the important "300 feet" call. This call is pivotal because it warns the pilot flying that the necessary power input at 50 feet AGL is coming up. This power input cuts the sink rate from about 1000 to 360 feet per minute and prevents the aircraft from landing short of the runway. Even though the aircraft wasn't completely stable I allowed the student to continue because I felt he would gain valuable experience from this crosswind landing. As we were rapidly approaching the runway, the student was fighting to maintain centerline placement. At my "50 feet" call, the student didn't apply any power at all. My hands were at the base of the throttles, so as I said "Power," I pushed on the throttles myself to ensure we made the runway. We landed about 200 feet down and left of the centerline with a correction to the right.

The next 20 seconds got very interesting. I didn't know it at the time, but because of our late power input followed by a firm touchdown and bounce, the aircraft's automatic ground spoilers had retracted. Spoiler extension decreases stopping distance two ways: first, they help improve brake effectiveness by reducing lift, and second, they add aerodynamic drag. Well, little did I know on this night, on this landing, I would be operating without them.

Meanwhile, the student and I were attempting to maintain runway centerline. Once I was satisfied we wouldn't go off the side of the runway I noticed we were not decelerating as we should. I said "Brakes," to make sure the student was applying the brakes. Still nothing was happening, so I applied brakes. We were smoking down the runway at over 100 knots. Since this was an assault landing, we were quickly running out of time and runway.

To make matters worse, the student had improperly rotated the throttles back to the reverse setting. The C-17 throttles are safeguarded from moving beyond the "Idle Reverse" setting until the electronically controlled throttle gates are released. Once these gates are released, the pilot can select Max Reverse. If the throttle gates aren't released, you'll be in "Idle Reverse" and "Max Reverse" will be unavailable.

So on this dark and gloomy night, we were along for the ride with the engines in Idle Reverse and the end of the runway rapidly approaching. The student was pulling back against the throttles as hard as he could, trying to get Max Reverse while, over in the right seat, I could tell by engine noise that the engines were still in Idle Reverse. Now, I'm not the smartest guy around, but I did know the combination of poor brake response and Idle Reverse would not stop us before the rapidly approaching runway end. I knew what was happening with the engines, but I couldn't afford the time needed to tell the student how to correct the problem. I pushed forward on the base of the throttles to take pressure off the gates, and I stood on the brakes for all they were worth.

With less than 1000 feet remaining I heard the engines spool up. We started to rapidly decelerate, but was it going to be enough? It was going to be close. Fortunately fate was on my side, and we stopped with less than 200 feet remaining.

What did I learn that night and how can it help you? I've thought long and hard about that landing. I came away with a few ideas and a fresh perspective. I believe these lessons can be applied to more than the standard instructor/student relationship.

1. **Don't let the student/fellow pilot go past *your* personal limits.** Never let a student put you in a situation you can't recover from. I thought my instructing skill would keep us out of trouble. The standard rule at the schoolhouse is if a student is unstable at 500 feet, he doesn't get to land. I thought I was better than your average bear and I could handle it. I almost proved myself wrong.

2. **Use your entire crew.** This applies to multiple crew aircraft. That night, after we taxied clear of the runway, the other crewmember sitting in the spare seat said, "Hey, I noticed the spoilers retracted once we touched down." Sure would have been nice to know that at the time. It would have helped me analyze the situation and deploy the speedbrakes. I usually look down inside the cockpit just to make sure the spoilers deploy, but that night I was just trying to stay on the runway. I now make it a point during the prebrief to instruct the other student to monitor the spoilers on all landings.

3. **Never overestimate your student/fellow pilot.** This is true for any sortie. Just because you're flying with an IP or Stan/Eval person doesn't mean he/she won't make a mistake. You need to back each other up, regardless of where you are in the aircraft.

4. **Never overestimate yourself.** Don't be lulled into complacency by your experience. Just because you've been in a similar situation and feel comfortable doesn't mean it won't repeat itself.

After I got back to the squadron, I checked the C-17 performance data. Our landing distance almost doubled with spoilers retracted and Idle Reverse power. Take my word for it, fellow aviators. Even if you're not hungry and you haven't asked for it, someday you might get your own slice of humble pie.

Since this was an assault landing, we were quickly running out of time and runway.

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

Death and Destruction In A Parallel Universe

You'll soon be able to read the annual HATR (Hazardous Air Traffic Report) round-up in the pages of Flying Safety magazine. Until then, and in the interest of risk management—and potentially saving your bacon!—we bid you pay attention to the following HATR-worthy events.

HATR-Worthy Event Number One

The strat airlifter was fragged for an early departure in support of a Distinguished Visitor (DV) mission at an unfamiliar airfield. Maintenance problems the morning of the mission forced a tail number swap to a different aircraft and, to facilitate an on-time departure, the aircraft commander (AC) did flight planning while the rest of the crew preflighted the new aircraft. The AC finished mission planning and arrived just a few minutes before scheduled departure time, surmising an on-time takeoff was still possible with just a little extra hustle.

Engine start was uneventful and the crew started running the Before Takeoff checklist as the aircraft taxied for takeoff. A flight control problem cropped up during taxi, but the AC elected to work it while on the go. The crew was so intent on working the flight control troubles—focused overly much on an on-time takeoff and getting the DVs to their destination on time, maybe?—that none of the crewmembers realized their airlifter had taxied past the runway "Hold Short" line. The airlifter's nose was now protruding into the active, just as another heavy was landing. Fortunately, the airfield's Ground Controller was able to establish communication with the crew and directed the airlifter to expedite the active immediately. Which it did. In a parallel universe, however, the two aircraft *did* collide on the runway killing all aboard, including the nearly four dozen DVs.

HATR-Worthy Event Number Two

More perceived mission press involving DVs… The flight of two aircraft was scheduled to transport a flag officer from one forward operating location to another. After repeated unsuccessful attempts to establish contact with Tower to request taxi permission to pick up the DV at Base Ops, flight lead transmitted on Tower's frequency that he *was* taxiing and, then, after picking up the DV, made another radio announcement that the flight was departing the airfield.

In a parallel universe, the flight taking off had a midair collision with a flight of two arriving aircraft, which resulted in the deaths of all crewmembers and several innocents on the ground from falling debris and fire. Since this event didn't take place in that parallel universe, all involved lived to fly another day with neither loss of life nor aircraft.

So what set the stage for potential disaster here? Seems that ATC services were normally very good at this forward operating location (FOL). However, operating at a location little better than a bare-base, full-service support with "all the trimmings" wasn't always available at the FOL. In this case, some unexplained communication problems and scheduled Tower radio maintenance conspired to create a situation where Tower was incommunicado with some flight-ready aircraft during a crucial time.

Granted, ATC procedures for ensuring positive control of aircraft movements in situations where radios were down—not to mention, scheduling radio maintenance when there was no aircraft activity—needed some definite tightening up. But put yourself in this aircrew's situation: Does taxiing and taking off without Tower coordination—and clearance—sound like an acceptable, non-standard procedure to you? Sure hope not…

HATR-Worthy Event Number Three

Conditions were day VFR with light winds (four knots) reported variable from the East. A USAF heavy was positioned on Runway 08 awaiting takeoff clearance. Tower advised USAF heavy they'd be issued takeoff clearance once a commercial heavy landed on the crossing runway, Runway 04.

Soon after the commercial heavy landed, Tower cleared USAF heavy and it began takeoff roll. USAF heavy's flight crew had computed V_R to be 136 knots, but perceived their aircraft trying to get airborne at 105 knots. Then they perceived it settling on the runway. Then lifting off again. Then settling again. One more liftoff and one more settle. During this eternity of seconds—actually, only about 5-10 seconds—the pilot flying the aircraft applied and maintained flight control pressure, doing his best to keep it on the ground until V_R. The aircraft stabilized passing through 112 knots and the flight crew was able to proceed with a normal takeoff and rotation at computed V_R. Once USAF heavy was safely flying and its crewmembers started breathing again, they decided filing a HATR was definitely warranted.

And the major contributor to the thrilling takeoff experienced by this USAF heavy crew? Gold star if you guessed wake turbulence from the just-landed commercial heavy. Regulatory publications contain the following information on wake turbulence:

- For the aviator: You're likely to find an AIM/FAR (Aeronautical Information Manual/Federal Aviation Regulation) manual in your local Base Ops. Section 7, "Safety of Flight," makes reference to wake turbulence and a two-minute separation requirement between aircraft on a crossing runway where projected flight paths will cross. Ground roll doesn't qualify as "flight path," but in this instance, wake turbulence definitely constituted a hazard to USAF heavy's flight.
- For the Air Traffic Controller: One of the ATC "bibles" is FAA Order 7110.65N, *Air Traffic Control*. It addresses controller requirements for issuing separation minima and wake turbulence cautionary advisories, and states in part: "Issue cautionary information to any aircraft if, in your opinion, wake turbulence may have an adverse effect on it." It further states: "Wake turbulence may be encountered in flight as well as when operating on the airport movement area. Because wake turbulence is unpredictable, the controller is not responsible for anticipating its existence or effect." In other words, ATC folks have no greater powers of prognostication than anyone else.

Without regard to pointing a finger of blame, here are the facts as reported in the final HATR:

- The USAF heavy pilot considered the possibility of wake turbulence/disturbance from the just-landed commercial heavy, but believed it would be negligible since they were using a different runway.
- Tower personnel at this airfield were aware of wake turbulence hazards associated with cross-runway traffic, especially from wide-body commercial aircraft on low wind/no wind days.
- Because it was a "heavy" that landed, and winds were very light, conditions the day of the near-mishap were ideal for holding wake turbulence vortices on USAF heavy's takeoff runway for an extended period.

Speculation time: Had the aircraft awaiting takeoff been a Cessna 172 or an F-16, Tower might have issued a wake turbulence cautionary advisory. And that Cessna or F-16 pilot might have seriously considered waiting at least a couple minutes before commencing takeoff. Since it *was* a "heavy" though, and not a small plane awaiting takeoff, it's not unreasonable to conclude that both Tower and USAF heavy seriously underestimated the potential for wake turbulence problems. USAF heavy's pilot stated that had they not been a heavyweight aircraft (300,000 plus-pounds), the resulting wake turbulence would have had catastrophic results.

In a parallel universe, USAF heavy's crew initiated a heavyweight, high-speed abort, which resulted in hot brakes, fire and total destruction of the aircraft. Fortunately, in our universe, USAF heavy's crew lived to file a HATR and tell others about this near-Class A event. We're happy to share their message. ✈

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

Maintenance Matters Presents…*The Complacency Zone*

"Complacency: the quality or state of being satisfied; a calm sense of well-being and security; especially: satisfaction or self-satisfaction accompanied by unawareness of actual dangers or deficiencies." (Webster's Third New International Dictionary, copyright 1986.) Going by that book definition, "complacency" isn't always a bad thing. On the other hand, though, complacency is most often interpreted to be "…self-satisfaction accompanied by unawareness…" Taken to an extreme—been there, done that so many times I don't need *the T-shirt (or the checklist)—sets you and your buds up for a fall. Which is what we offer up again this time: Complacency that results in personal injury and damaged equipment. This month's column marks the third month we've addressed the subject of complacency and decided it warranted greater recognition than as simply, "Complacency Bites, Part Three…" There's a sign post up ahead… Next stop:* The Complacency Zone.

"I Thought You Were S'posed To Do It!" "What? I Thought *You* Were S'posed To Do It!"

The mission was a single-ship, day, surface attack tactics sortie. The mishap pilot (MP), current and qualified in the weapon system, arrived at his designated single-seater with ample time to review the 781s and look the aircraft over. He met his launch crew—likewise, current and qualified in the weapon system—Mishap Maintainer 1 (MM1) and MM2 and, together, the three of them went through standard preflight procedures.

Preflight checks completed, the MP strapped in with the help of one of the MMs, started engines and completed pre-taxi checks. The MP lowered the canopy on the taxi to EOR but it stopped short of fully closed and locked, so he recycled it, raising and lowering the canopy again, but still—no joy. The canopy refused to close. Then there was a new problem: The canopy ceased functioning in both directions, and would neither close nor open. It was clear that this mission wasn't going to happen, so the MP shut down engines and awaited extraction. And we do mean *extraction*.

All efforts to open the canopy were unsuccessful until it became apparent that, short of the MP doing a zero-zero ejection, canopy removal was the only remaining option. A/R shop folks were dispatched and they removed the canopy from the stricken jet, freeing the MP.

So why tell this story? Because complacency bites. And it bit here. The aviator's Dash-one states: "Canopy: Close and lock (light extinguished). *Caution: Lower glareshield and ensure canopy rails are cleared before lowering canopy to prevent damage to the glareshield and/or canopy frame."* And the Crew Chief's preflight workcards contain the words "Remove canopy sill guard." We don't know how much time the jet spent in NMC status, but do know repair costs exceeded $68K. Any questions?

No Biggie, Just A Couple Loose Nuts. Some Of The Hardware Was Insecure, Too…

The mishap aircraft's (MA) forms reflected an elevator trim tab problem and two Maintainers assigned to correct it found the left trim tab out of rig. Re-rigging the trim tab meant disconnecting it to gain access to the inboard and outboard jackscrew rod ends, so the team removed the cotter keys from the rod end bolt nuts, the rod end nuts and bolts, and disconnected the jackscrews from the trim tab. After adjusting the jackscrew rod ends and reconnecting them to the trim tabs with the rod end hardware, the trim tab was still out of rig in the neutral position. Before they were able to finish rigging the MA's left elevator trim tab, both Maintainers were pulled off to work another, higher priority aircraft. Upon return, they made a small adjustment at the trim tab motor, re-paneled the MA and cleared the 781s.

The MA subsequently flew eight sorties free of elevator trim tab problems. Then came the ninth sortie. While in a base turn for landing at 150 knots with flaps at 50 percent, the MA's yokes started shaking violently back and forth. The flight crew slowed the MA further and went full flaps, at which point the yoke-shaking settled appreciably, and they landed the stricken craft uneventfully.

After parking, the left elevator trim tab was seen to be hanging down freely. Once Maintainers were able to get up close and personal to examine it, they discovered, well… The hardware connecting the trim tab to the jackscrew, well… Pretty much the hardware wasn't exactly connected like it should have been…

We're not trying to poke these Maintainers in the eye. However, the lesson to be learned from what could have been a serious mishap is clear: Bad things are sure to happen when you don't follow tech data to the letter. 'Nuff said.

The Value Of MBWA

A few minutes of MBWA ("Management By Walking Around") each day can pay incredible dividends. For instance: You can get away from the office and those pesky telephones, pop-in visitors and the never-ending flow of e-mail. You can walk and exercise muscles other than those that make up your gluteus maximus. Your troops get to see you at times *other* than when they've done bad. *You* get to see your troops working in their native environment and learn for yourself if they're using and following tech data and adhering to established policies and safe working practices. Hmmmm… Safe work practices…

Mishap troop 1 (MT1) and mishap troop 2 (MT2) were working in the upper deck *(The upper deck is comprised of, from fore to aft, the flight station, relief crew area and courier area. Ed.)* of a C-5 that had been off-station for several days. MT1 was taking care of BPO checklist items while MT2 was doing some clean-up.

During the course of the BPO, MT1 went aft of the upper deck courier area to inspect the environmental compartment. Meanwhile, MT2 was gathering items not needed for home station use—pillows, blankets, trash and "expendables"—for removal from the aircraft.

A ladder connects the upper deck to the cargo compartment, and making several trips up and down the stairs with armfuls of stuff can be both time-consuming and tricky. So MT2, relatively new to the C-5 weapon system and, doing as he had been trained by some of his coworkers, used a more convenient method than traversing the ladder to get those used pillows, blankets and what-nots to the cargo compartment: He opened the upper deck escape hatch and simply dropped the materials directly onto the cargo compartment floor below.

The upper deck escape hatch is located in the floor of the upper deck, just aft of the courier area and just forward of the environmental compartment. This escape hatch provides crewmembers with an alternate means of egress from the upper deck in an emergency—simply remove the hatch and use the rope ladder to safely descend the 15 feet to the cargo compartment floor below.

MT1 completed his inspection of the environmental compartment, exited it to go forward and, after taking just a step or two, promptly fell through the open, unguarded upper deck escape hatch, hitting the cargo compartment 15 feet below. MT1 *did* land on top of some of the items MT2 had been dropping through the escape hatch, but still suffered trauma and broken bones. (Probably a good thing for MT2 that MT1 had to spend some time in the hospital and on quarters. MT1 had plenty of time to cool down…)

Remember what we said earlier about MT2 being new and using the upper deck escape hatch "…as he had been trained by some of his coworkers…"? As it turns out, using the "upper deck escape hatch method" as a means of removing overwater mission gear quickly from the aircraft was an accepted practice for some (but not the majority) of MT2's coworkers. Not only did workcenter supervision not authorize the troops to use this potentially deadly practice, *they didn't even know the troops were using it.*

If you're not already a regular practitioner of MBWA, then maybe this mishap will convince you of the value of integrating it into your leadership style. It could be the crucial element in promoting on-the-job safety and protecting the troops. ✈

USAF Class A Flight Mishaps

FY02 Flight Mishaps (Oct 01-Jan 02)	FY01 Flight Mishaps (Oct 00-Jan 01)
9 Class A Mishaps	6 Class A Mishaps
3 Fatalities	2 Fatalities
6 Aircraft Destroyed	7 Aircraft Destroyed

14 Oct ♣	An HH-60 crashed into a river while flying a low-level training mission.
17 Oct	An F-16CG was severely damaged following an aborted takeoff.
25 Oct	An F-16C departed the runway after landing.
05 Nov ✶	An F101 engine undergoing Test Cell maintenance sustained severe fire damage.
12 Dec ♣	A B-1B crashed into the ocean shortly after takeoff.
21 Dec ♣✶	A C-141B sustained a collapsed wing during ground refueling operations.
30 Dec ♣✶	An RQ-4A Global Hawk unmanned aerial vehicle crashed while returning to base.
08 Jan	A C-17 was damaged during landing (Mishap was originally a Class B and upgraded to a Class A).
10 Jan ♣	An F-16C crashed during a surface attack training mission.
10 Jan	An MH-53J crashed during a search and rescue mission.
17 Jan ♣♣	Two A-10As were involved in a mid-air collision. Only one pilot ejected safely.
25 Jan ♣✶	An RQ-1 Predator crashed on landing.
31 Jan ♣	A T-37 crashed during a training mission. The two crewmembers suffered fatal injuries.

- 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://safety.kirtland.af.mil/AFSC/RDBMS/Flight/stats/statspage.html
- **Current as of 31 Jan 02.**

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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.

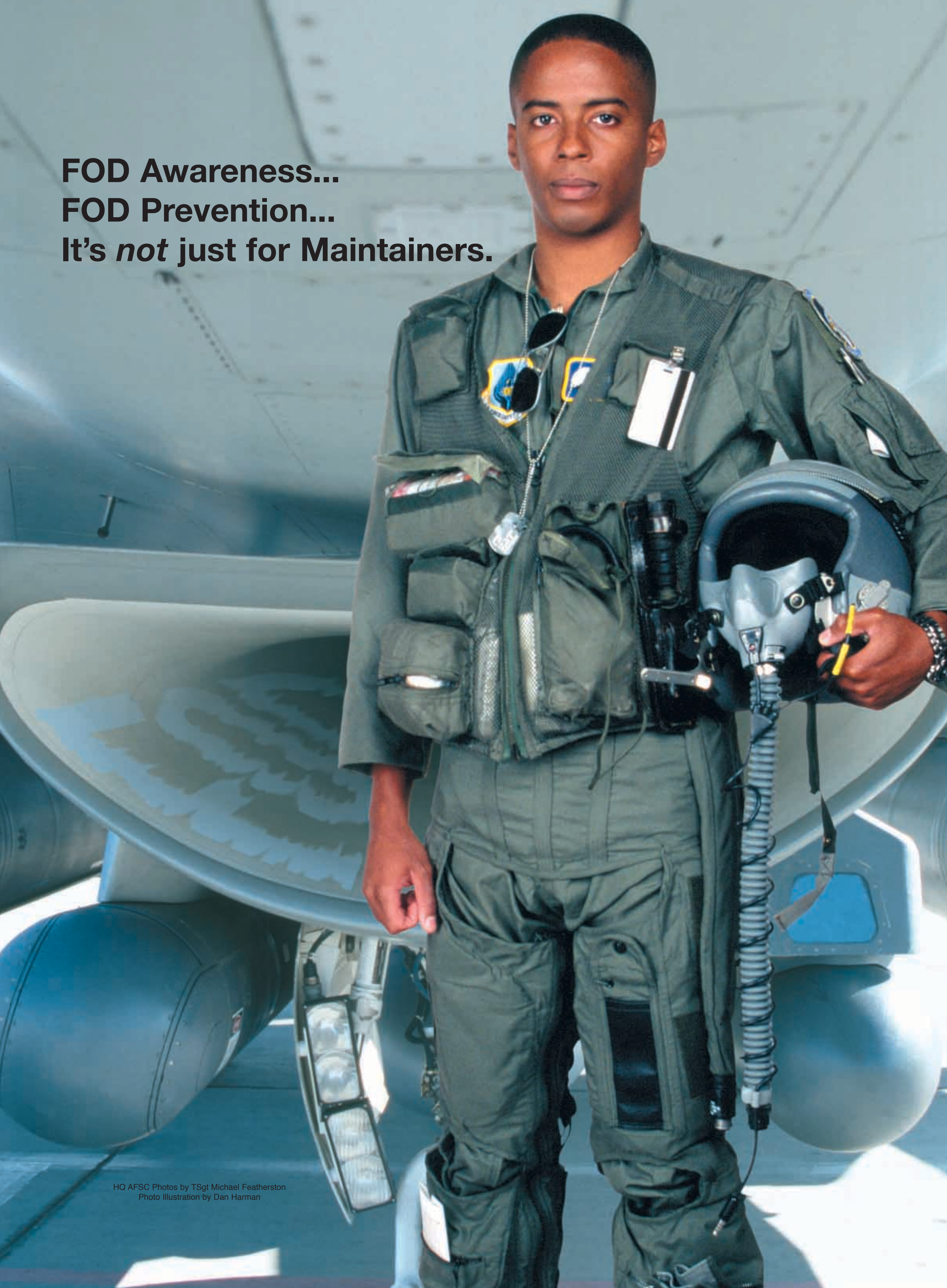
Technical Sergeant Karl K. Hoeppner
355th Component Repair Squadron
Davis-Monthan AFB, AZ

Technical Sergeant Karl Hoeppner, a 355th Component Repair Squadron fuels system craftsman, expertly put his annual fire extinguisher training into action and averted a potentially life-threatening aircraft incident. While transiting the flight line in a vehicle, he noticed a Navy CH-3 helicopter preparing to taxi onto the active runway. Sergeant Hoeppner saw smoke coming out of the helicopter near the right main landing gear area, and sprang into action when he saw the smoke turn into large flames.

Rapidly assessing the situation, Sergeant Hoeppner drove his truck 400 yards through several restricted areas to reach a flight line halon fire extinguisher bottle parked at the nose of a transient C-141. He parked a safe distance away from the still-turning helicopter rotor blades and dragged the 150-pound halon bottle approximately 75 yards to the aircraft while simultaneously alerting the flight engineer of the danger. The flight engineer then alerted the rest of the four-man crew to run their emergency checklist and shut down the aircraft.

Sergeant Hoeppner took control of the scene and directed the flight engineer to charge the fire bottle while he manned the nozzle. He approached the aircraft with the wind at his back and directed the halon spray at the right wheel well, smothering the fire that had started due to an overheated wheel brake. He remained on scene until the fire department arrived to take over, and was then transported to the base hospital and treated for smoke and halon inhalation.

Sergeant Hoeppner's quick and decisive actions prevented the loss of a valuable aircraft and potential loss of the four-man crew. Due to his rapid response, the damage repair cost for the helicopter was limited to less than $1,000.



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