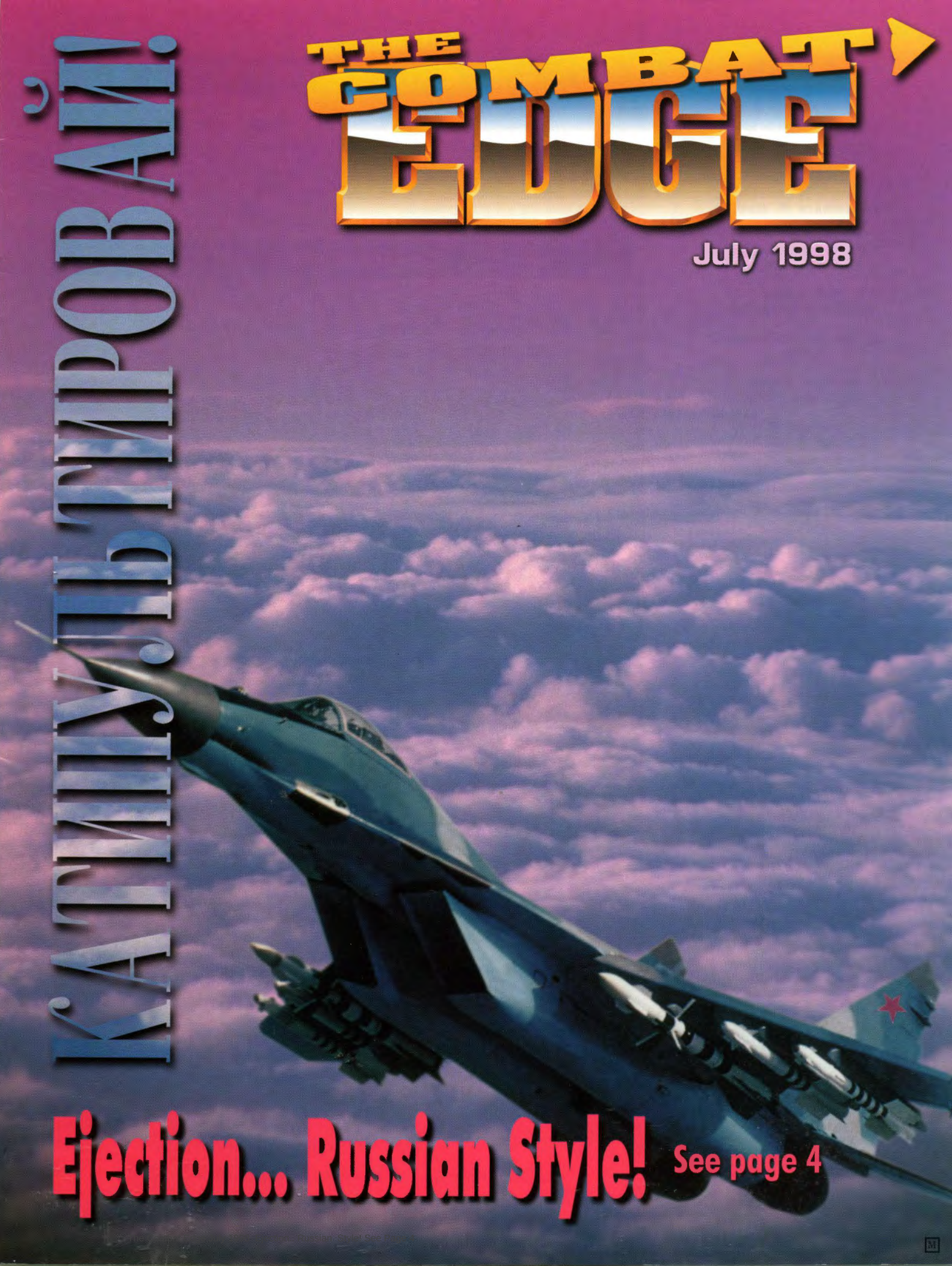
КАТАПУЛЬТИРОВАЙ!
THE COMBAT EDGE
July 1998
Ejection... Russian Style!
See page 4

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Editor, *The Combat Edge*
HQ ACC/SEP
175 Sweeney Blvd
Langley AFB VA 23665-2700

Telephone: (757) 726-8842
DSN 574-8842
FAX: (757) 726-8975
e-mail: adrian.robbe@langley.af.mil

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http://www.acc.af.mil/public/combat-edge/

ACCent on Safety

I recently asked Turk Marshall, my boss, if I could write the "ACCent on Safety" this month. I felt that before I retired I had some final words to say. My 30 years in an Air Force uniform (of one kind or another) have been filled with many assignments, opportunities, and wonderful memories. I have spent a good part of my career as a "safety professional" — including my final assignment.

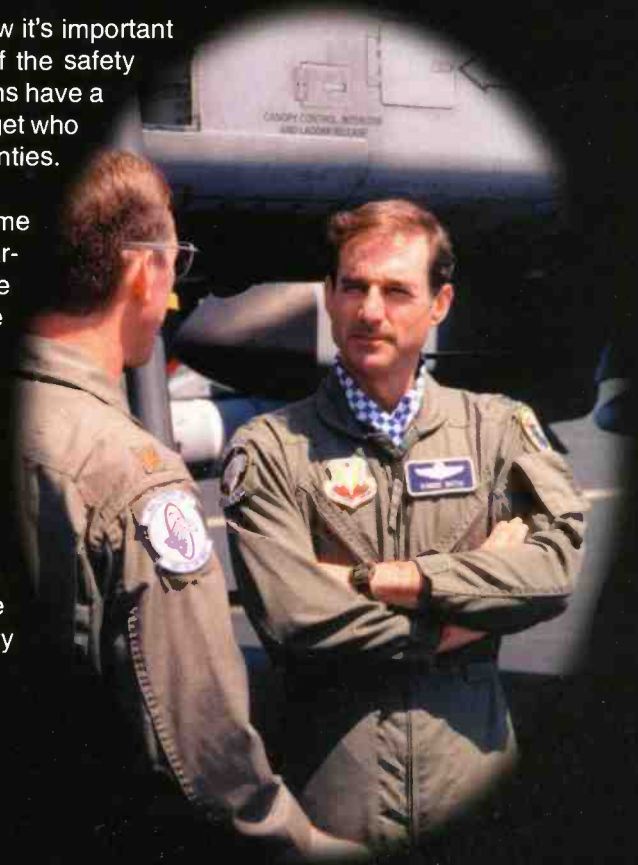
Here are my thoughts on safety:

Before you say "yes" to the job, your integrity must be unquestionable. The first time you have to investigate your own unit and find them causal in a mishap, your "so called friends" will challenge your investigation and loyalty; but you must stay the course. Lives and valuable resources will be saved because of what you're doing.

You must have a curiosity that goes beyond the normal. There are many sides to a story, and it's your responsibility to find and report the facts. A sprained ankle on the soccer field could be the result of more than just an over aggressive tackle. A lost panel on an aircraft may not be a failure to secure it properly. The obvious may be the easy answer, but not the correct one. Leave no stone unturned during your investigation.

There are no good times for mishaps, so don't lose heart when they happen. Get out there as quick as you can. If you hesitate, witnesses disappear and clues vanish. Be visible; just seeing the safety vehicle driving the flight line or the safety logo on your hat in the equipment yard may make someone think a bit more about what they are doing. Don't be shy — be gregarious, and talk with everyone. We all have opinions. It's amazing the problems people will tell you about that never get on a hazard report.

Be proactive; get buy-in from all levels. Sure, we all know it's important for the boss to have a keen awareness and full support of the safety program; it comes with the territory. All excellent organizations have a well-established top-to-bottom safety program. Just don't forget who "has" most of the mishaps ... that young first termer in his twenties. They are the ones whose brains you must get inside of.



Get all the training you can. With new technologies come new problems. Murphy truly lives; just think about those "Darwin Award" nominees you eagerly wait to read about. Write good reports with good recommendations. Write them so the average person can understand what happened. You don't want your message to get lost in the investigative web you've woven.

Lastly, the thank you's don't come very often; so don't expect them. Do the job the best you can; and at the end of the day, sit back for just a minute with the understanding that your contributions make a significant difference in our Air Force. We live and work in a safer place because of what you do. I trust you will continue to accept the safety challenge with pride and professionalism. Good luck to all of you "safety professionals." Be safe ... and keep them flying!

Col Vinnie Noto
Chief of Flight Safety

Peristroika Pr
an Opportunit
Save US Lives

Lt Gen George K. Muellner
Principal Deputy
Office of Assistant Secretary of the Air Force for Acquisition

Mr. James W. Brinkley, SES
Director
Human Effectiveness Directorate
Air Force Research Laboratory

MiG-29 Fighters Collide While Performing at International Air Tattoo 1993

ovides y to

Within the last 10 years, dramatic escapes from Russian fighter aircraft have captured the attention of military pilots and aviation enthusiasts around the world. The low-altitude ejection from a MiG-29 just prior to ground impact at the 1989 Paris Air Show and a pair of miraculous escapes from two exploding MiG-29s that had collided over Fairford, England, in 1993, vividly demonstrated the potential downside of flying high-performance, military aircraft. The pilots ejected successfully thanks to the K-36D ejection seat designed and built by the Zvezda Research, Development and Production Enterprise in Russia. These high-profile events and stories of successful Russian ejections at speeds up to 730 knots equivalent airspeed (KEAS) piqued our interest in this unique ejection seat.

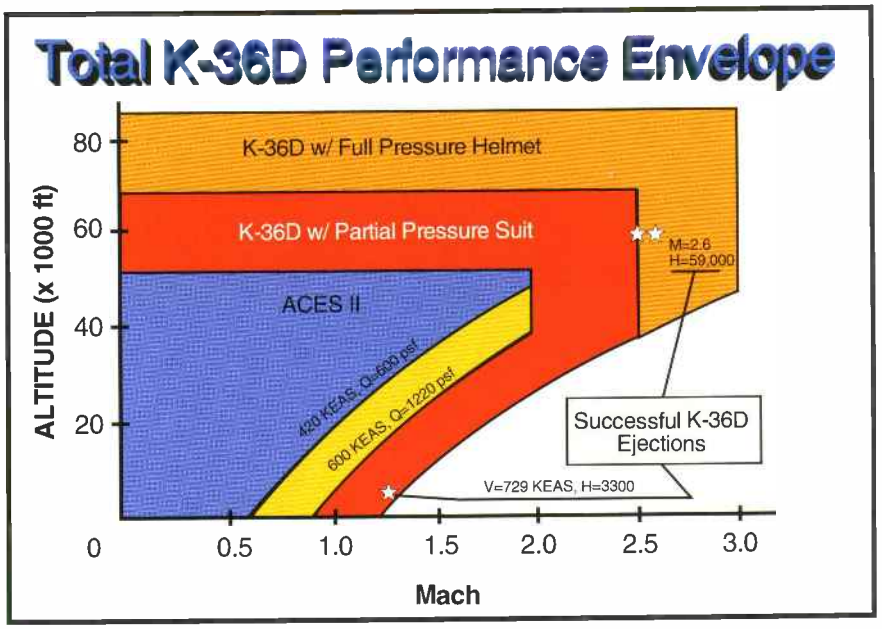
The K-36D ejection seat and its associated life support equipment are designed, tested, and produced under the direction of Professor Guy Severin. We have had the privilege of meeting with Professor Severin at length, both in the US and in Russia. Professor Severin, a member of the prestigious Russian Academy of Science, has devoted his life to developing and perfecting life-support and life-saving equipment for air and space systems. His achievements include the design of the cosmonaut seats, pressure suits, and the first extravehicular maneuvering unit for the Russian space program; aeronautical fire suppression equipment; and escape systems for fighters, bombers, VTOL aircraft, acrobatic aircraft, and the Russian Buran space shuttle.

The K-36D ejection seat provides directional stability and crew protection features that significantly reduce the risk of injury during ejection, especially at the higher speeds associated with fighter aircraft operations in wartime. Successful K-36D operational ejections have occurred at speeds of 729 KEAS and Mach 2.6 (Reference figure titled "Total K-36D Performance Envelope," page 6). The aerodynamic forces encountered at high speeds can cause severe neck, spine, and limb injuries. Our experience with Western ejection seats, which are aerodynamically unstable and have little or no limb restraint, indicates that the risk of major injury rises exponentially from about 350 KEAS to a high probability of fatal injury near the seat's structural limit, usually about 600 KEAS. The fact that the aerodynamic forces increase as the square of the velocity has made even incremental improvement of the performance envelope very difficult. Consequently, having an opportunity to test and evaluate an ejection seat with an envelope that Professor Severin claimed provides safe escape up to 755 KEAS, was one we couldn't pass up.

Engineers and scientists from the Air Force Research Laboratory's (AFRL) Human Effectiveness Directorate and the US Navy's Air and Surface Warfare Centers first evaluated the K-36D ejection seat in 1993 as part of a foreign equipment comparative testing program sponsored by the Office of the Secretary of Defense. Tests were con-

MiG-29 Fighter Explodes After Collision — Pilot Ejects Safely
Photo by R.F. Richards

ducted using Russian test facilities including a windblast facility, a vertical ejection tower, a rocket-propelled sled, and a MiG-25 aircraft. The K-36D seat was ejected from the rocket sled at speeds as high as 730 KEAS and from the MiG-25 at speeds up to Mach 2.5 and altitudes up to 56,000 ft. Additional tests were then conducted at the Holloman AFB NM sled track to demonstrate performance at low speed and adverse attitudes. This program, which included 17 successive, successful tests, demonstrated that the performance of the K-36D seat at these test conditions was superior to ejection seats used in US aircraft.[1]



The successful results of the comparative-testing program led to our decision to adapt this technology in the development of an ejection seat suitable for use in American aircraft.

A number of features are responsible for the superior performance of the Russian seat. During ejection, telescoping booms are deployed from the seat to stabilize the attitude of the seat from the time it leaves the aircraft until the seat and its occupant decelerate to the speed where the recovery parachute is deployed and the occupant is separated from the seat. The K-36D seat also deploys a windblast deflector during ejections at airspeeds in excess of 430 KEAS. The windblast deflector improves the airflow around the seat and contributes to windblast protection. Leg lifting devices and arm and leg restraints are provided to prevent limb flail injuries due to windblast forces. The limb restraints do not require the crew to hook up as they enter the aircraft and do not restrict limb movement during normal flight operations.


Ejection Seat Test From a MiG-25 Flying Laboratory, Altitude 1500 ft, Airspeed 500 knots, Gromov Flight-Research Institute, Russia — October 1997

The successful results of the comparative-testing program led to our decision to adapt this technology in the development of

an ejection seat suitable for use in American aircraft. AFRL has contracted with Boeing North American (BNA) and their subcontractor Zvezda to engage in an advanced development effort to demonstrate a seat design that will meet US performance requirements. These requirements include: reducing the seat weight by more than 50 lb, accommodating a larger range of occupant weights and sizes, improving the performance of the seat under adverse attitudes with high descent rates, integrating US life support equipment, reducing life-cycle costs, and improving seat producibility and maintainability. The seat that has been developed to demonstrate the feasibility of meeting these requirements uses many of the operationally proven components of the K-36D seat including the stabilization booms, windblast flow deflector, and arm and leg restraints. The seat structure has been redesigned to reduce weight, increase the vertical adjustment range, and provide fore-aft tilt of the seat back. The headrest/parachute container is smaller to improve the occupant's ability to "check six." The ejection catapult and rocket have been redesigned to control the seat acceleration for a wider range of occupant weights and sizes. Zvezda is meeting the challenge of providing improved performance for ejections from adverse attitudes with high descent rates by incorporating an electronic control system and a set of small, roll attitude control rockets. The control system uses data received from the aircraft to establish the best seat operating parameters for safe crew recovery.

Ejection Seat Test from the An-12 Flying Testbed

Inverted Ejection from the An-12 Flying Testbed, Altitude 300 feet, Airspeed 270 knots, Zhukovsky Airfield, Russia — 29 October 1997

Zvezda has been very proactive in their efforts to evaluate the effectiveness of the new seat design. They have developed a rocket-propelled sled with an aircraft forebody that can rapidly roll during the ejection. This facility is similar to the sled and forebody that will be used to test the seat at Holloman AFB later this year. Zvezda has also developed a flying testbed to evaluate the performance of the seat at adverse roll attitudes. The testbed consists of a cockpit mounted on the tail of an An-12 transport. The cockpit can be rotated to specific roll angles prior to the ejection. At the time that this article was written, Zvezda had completed 21 successful tests using these facilities as well as the MiG-25 test aircraft used in the earlier comparative-testing program.

Combining Russia's uniquely capable K-36D ejection seat and escape system design expertise with advanced US pyrotechnics, improved life support equipment, and electronic controls technologies offers the opportunity to provide US aircrews an affordable seat with unparalleled safe escape capability. ■

Lt Gen George K. Muellner

Lieutenant General George K. Muellner is the Principal Deputy, Office of the Assistant Secretary of the Air Force for Acquisition, Washington, D.C. He serves as the Air Force acquisition executive in carrying out the management responsibilities for the Air Force acquisition system to include direction, guidance, and supervision over all matters pertaining to the formulation, review, approval and execution of plans, policies, and programs relative to acquisition. Most of his career was spent as a fighter pilot, fighter weapons instructor, and test pilot with more than 5,300 hours in F-4, A-7, F-15, and F-16 aircraft. He completed 690 combat missions in Vietnam flying the F-4, and during Operation Desert Storm he commanded the Joint Stars deployment, logging another 50 combat sorties. As Director of Requirements at Air Combat Command, he orchestrated the operational requirements for all of the combat air forces and then became the mission area director for tactical, command, control, and communication (C3), and weapons programs for the Assistant Secretary of the Air Force, Acquisition. As the Program Executive Officer of the Joint Advanced Strike Technology Program, he created this joint service development activity.

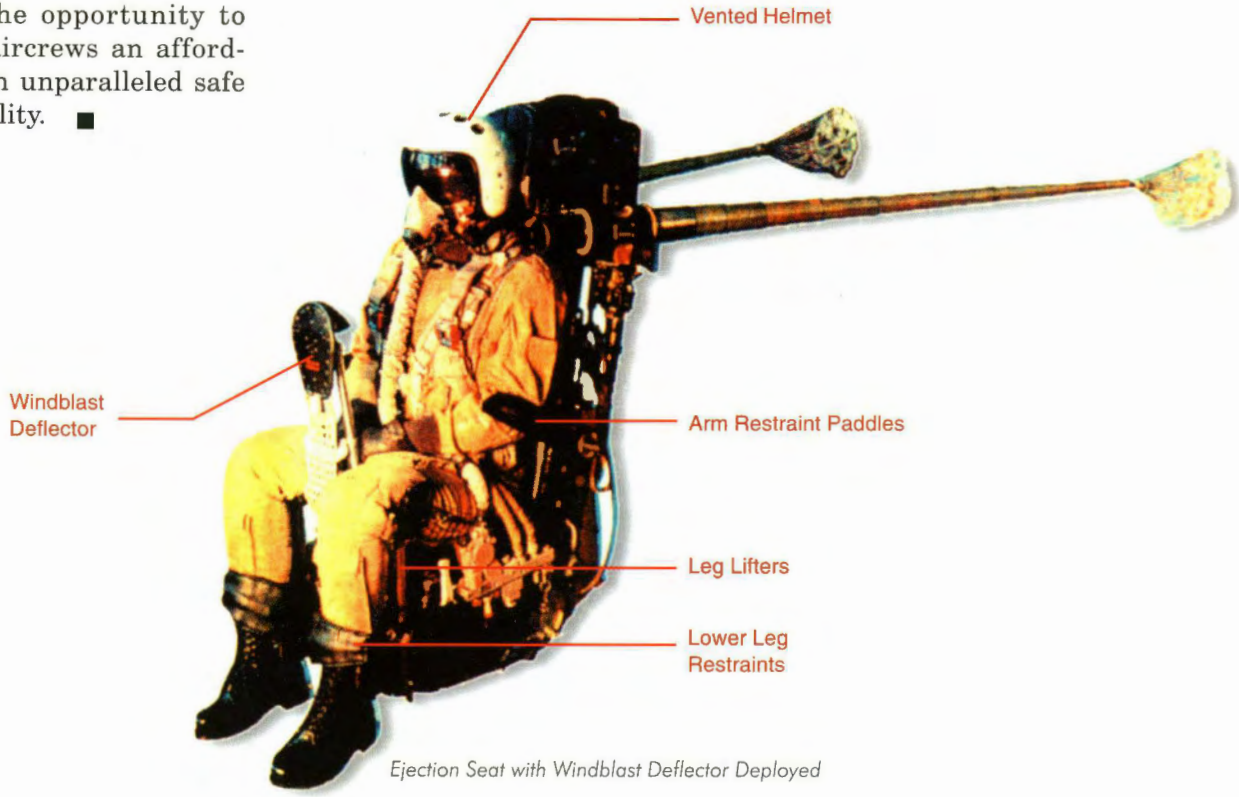
James W. Brinkley

James W. Brinkley is Director of the Human Effectiveness Directorate, Air Force Research Laboratory, Wright-Patterson Air Force Base OH. As director, he manages the major Air Force organizational element conducting research and exploratory development in the areas of human-centered design criteria, human performance enhancement, operator-system integration, and personnel protection. Mr. Brinkley entered federal service in 1958 and has held a variety of research and senior technical positions within the Air Force laboratory system. He has authored more than 70 scientific reports and journal articles and several book chapters in the areas of impact, vibration, and windblast effects, personnel protective equipment, and crew escape system design criteria. He was appointed to the Senior Executive Service in October 1988.

Reference:

1. Specker, L.J., and Plaga, J.A., The K-36D Ejection Seat Foreign Comparative Testing (FCT) Program, AL/CF-TR-1996-0099, Armstrong Laboratory, Wright-Patterson AFB OH, May 1996.

Photos courtesy of RD&PE Zvezda and IBP Aircraft Ltd.



Ejection Seat with Windblast Deflector Deployed

Your children are invited to participate in . . .

"Fire Prevention Poster Contest"

with Scorch
"the nasty little flame"

In observance of the upcoming National Fire Prevention Week (4-10 October 1998), *The Combat Edge* safety magazine is sponsoring a Fire Safety Poster Contest. Young boys and girls -- as well as teens -- may participate. The three age group divisions are as follows:

Division I (5-8 years)
Division II (9-12 years)
Division III (13-16 years)

Each division has two separate categories of poster awards; they are - (1) best art and (2) best theme. In addition, a single "best overall poster" among all entries received will be selected. All winners will receive a certificate, and their poster will be published in the October 1998 issue of *The Combat Edge*.

All poster entries must be hand-drawn in color on 8 1/2" x 11" paper. Entries must be received at the office of *The Combat Edge* staff no later than 20 August 1998. The following mailing address is to be used:

Note: Please ensure that the contestant's name, age, and complete mailing address are printed clearly on the back of the poster. Parents' daytime phone number would be appreciated. All entries become the property of the ACC Office of Safety and cannot be returned.

Safety Poster Contest
HQ ACC/SEP
175 Sweeney Blvd
Langley AFB VA 23655-2700

Please make a copy of this and take it home to your children. Parents are encouraged to help their children understand the benefits of fire prevention and come up with an appropriate fire prevention theme -- but don't forget to let the children do the work. The 20 August deadline will be here before you know it, so "make plans now" to get started!

Monthly Awards

AIRCREW SAFETY AWARD OF DISTINCTION

Capt Tom Nicholson, Capt Mark Williamson,
Capt Andy Dewald, Capt John Guetersloh,
MSgt Stephen Burrill, SrA Cory Edson
38 RS, 55 WG
Offutt AFB NE

Approaching level-off on a higher headquarters-directed operational reconnaissance sortie out of Kadena AB, Japan, on 25 Nov 97, the aircraft commander noticed his altimeter and Vertical Velocity Indicator (VVI) displayed erratic behavior. No Indicated Air Speed (IAS) problem was noted and the co-pilot pitot static instruments appeared to be functioning normally. Level-off was accomplished using co-pilot instruments and the auto-pilot was engaged, with the altitude hold function apparently working normally. Attempts to climb and descend failed to register properly on the altimeter or VVI instruments. Japanese Air Traffic Control (ATC) was notified that the transponder mode C was unreliable, and altitude squawking was suspended. The pilot team confirmed the pitot heat was activated and referred to the RC-135W-1 under pitot static malfunctions. Unable to determine altitude with certainty, the decision was made to abort the mission and declare an emergency with Japanese ATC. Weather was checked for Osan AB, Korea; Iwakuni AB, Japan; and Yakota AB, Japan. Forecasts at these three bases all reflected low ceilings (circa 2,000 feet Above Ground Level [AGL]) and Instrument Meteorological Conditions (IMC) up to Flight Level 230. Weather at Kadena AB proved the most promising, with a forecast of 020 Scattered, 040 and 200 Broken, with conditions expected to improve. In addition, the approach to Runway 05 at Kadena was over water—precluding obstacle clearance problems. The decision was made to continue to Kadena, update weather, dump gas, attempt to descend under Visual Flight Rules to 2,500 feet AGL where the radio altimeters would become effective, obtain vectors to a visual approach, and land. The navigator updated weather, and pilot reports were obtained. The weather was deteriorating. The ceiling had gone down to 020 Broken; there were rain showers in the vicinity. Clearance was obtained to dump gas in holding, while approach control tried unsuccessfully to vector a Japanese Air Defense F-4 to verify altitude.

From this point, Angle of Attack (AOA) was used as the primary means of airspeed indication. Winds were called 330 at 4 knots. In addition, the Precision Approach Radar (PAR) was NOTAMed out of service; however, a Marine controller was available and agreed to provide precision approach services. With checklists complete, a slow, spiraling descent was made in holding. The AOA indices proved to work well as the descent was continued. The navigators were able to verbally update the pilot team on the progress of the descent using Global Positioning System (GPS) data. As the aircraft descended, the GPS data began to correspond with the radar altimeter permitting some reasonably accurate altitude data, though rate of descent was still very difficult to determine. Nearing a cloud deck at 10,000 feet Mean Sea Level (MSL), a small gap was spotted through which the ocean could be seen. The crew descended visually through the opening. As approach vectors put the aircraft back into IMC conditions, another slow descent was begun to try and get below the overcast and attain altitude readings from the radio altimeters. At this point, the co-pilot static system unfroze. The altimeter wound down to 2,800 feet, matching the GPS. An uneventful PAR was accomplished to a full-stop landing, and the aircraft was taxied back to parking without further incident. Maintenance determined the cause of the dual pitot static failure was a large deposit of water in the pitot static system caused by heavy rain showers during a 5-hour weather delay. Because of superior teamwork and discipline exhibited by this resourceful crew in poor weather conditions, a high value Air Force asset with 34 crewmembers on board was recovered safely following a potentially disastrous system failure.

PILOT SAFETY AWARD OF DISTINCTION

Maj Ward Juedeman
7 FS, 49 FW
Holloman AFB NM

On 21 Nov 97, Maj Juedeman (Bandit 11) was returning to base from an F-117A day surface attack tactics training mission with approximately 15 minutes of fuel remaining. Maj Juedeman reported initial and set up for his base turn. After lowering the gear handle, Maj Juedeman noted that he only had a nose and right main gear down and locked indication with a red light in the handle. He quickly tested the lights, which checked good, and proceeded to break out of the overhead pattern leaving the gear down. Maj Juedeman declared an emergency, switched to the single frequency approach, and requested a safety chase. Since no other aircraft were airborne, the supervisor of flying immediately launched a T-38A that was taxiing for takeoff. After rejoining with the safety chase, Maj Juedeman was informed that the nose and right main gear were indeed down and locked with the left main gear up and the gear door closed. Referencing the checklist, Maj Juedeman attempted to raise the landing gear, but neither gear moved, leaving the aircraft in a configuration which recommends ejection. Maj Juedeman put the gear handle back down with no effect, and then attempted to lower the gear using the landing gear emergency extension system. After approximately 5 seconds the left main gear unlocked, deployed by gravity and air loads, and appeared to lock into place. Maj Juedeman then flew a flawless straight-in approach and landing. After stopping straight ahead on the runway the aircraft was pinned, shut down, and towed to parking. Maj Juedeman's outstanding airmanship, flying skills, and coolness under pressure resulted in the successful recovery of an irreplaceable Air Force combat asset.

FLIGHT LINE SAFETY AWARD OF DISTINCTION

SSgt Richard Rodriguez
33 MS, 33 FW
Eglin AFB FL

During a routine final egress inspection of an F-15D ejection seat, SSgt Rodriguez discovered the aft seat ejection control hose was misrouted. Uncorrected, this condition could result in an out-of-sequence ejection, potentially causing death or serious injury to the aircrew. Immediately upon discovery of this situation, Sgt Rodriguez initiated a thorough inspection of all 33 FW F-15D aircraft. Of the five aircraft on station, three were found to have misrouted control hoses. Sgt Rodriguez's swift detection of a life threatening hazard enabled the wing to pursue immediate corrective action before injury or loss of life occurred. Realizing this hazard was not confined to the 33 FW, Sgt Rodriguez decided to investigate. Upon further investigation he discovered that while the technical order includes a warning regarding the proper routing of the control hose, it does not provide a clear illustration of a properly routed hose. Consequently, many egress technicians were uncertain of the proper routing configuration. Sgt Rodriguez initiated an AFTO Form 22 for T.O. 1F-15B.2-95JG-11-3, subsequently approved by ACC, recommending inclusion of a clear illustration of a properly routed control hose. Based on Sgt Rodriguez's inputs, ACC is considering a command directed one-time inspection of all F-15D ejection seats. Sgt Rodriguez's vigilance, attention to detail, and initiative demonstrate a strong commitment to ACC's ORM philosophy. His actions have restored the egress integrity of F-15D aircraft throughout the fleet and prevented a potentially devastating injury or loss of life. The truly outstanding accomplishments of Sgt Rodriguez are indicative of his dedication and professionalism.

GROUND SAFETY AWARD OF DISTINCTION

SSgt Kelly G. Goldsberry
389 FS, 366 WG
Mountain Home AFB ID

During the past 6 months as the 389 FS Ground Safety NCOIC, SSgt Goldsberry has taken the 389th ground safety program and literally set the standard for the wing. During the squadron's annual wing safety inspection, the 389 FS earned a rarely awarded Outstanding rating for its ground safety program. This achievement was due solely to the incredible efforts of Sgt Goldsberry. Key among his accomplishments was his development of a Supervisor's Ground Safety Handbook. Sgt Goldsberry used his expertise as Squadron Environmental Manager and Resource, Recovery, and Recycle Program Manager as well as what he has learned in numerous training courses such as AF Hazardous Waste Management Training and the ACC Environmental Training Symposium to develop the handbook. He built a copy for every shop chief in the squadron. Included is essential information on hazardous material and hazardous waste as well as related training programs for supervisors to employ with their subordinates. A safety training program is also included as is a system for improving on- and off-duty mishap reporting. Though much of this information is available from other sources, this is the first time it has been assembled in this form. The book's organization encourages its use and allows supervisors to maintain a strong safety and hazmat program with minimum wasted effort. Throughout the wing, other squadrons were encouraged to benchmark their programs using Sgt Goldsberry's as the standard. Sgt Goldsberry also applies his exemplary interpersonal skills to improve safety awareness in the squadron. Not only does he brief every incoming T-Bolt on safety issues, he gets personally involved in squadron safety training. During a recent Safety Day, he brought in numerous experts on drinking and driving, cold weather, and cycle safety; all of whom gave effective and informative demonstrations to the squadron. Furthermore, he also briefed numerous topics in what was described as the best squadron Safety Day yet. Finally, Sgt Goldsberry's spot inspection program is a model for the wing. He accomplishes many more inspections than is required and has instituted a program to ensure the squadron commander is kept informed of the results so that the program remains relevant. Sgt Goldsberry's performance has far exceeded Air Force standards. He has taken safety to heart and as a result has made a direct impact on the combat effectiveness of the 389th Fighter Squadron.

CREW CHIEF AWARD OF DISTINCTION

SrA Stephen LaPorte
Det 1, 79 TEG, 49 FW
Holloman AFB NM

On 16 Jan 98, while performing a routine through-flight inspection on F-117A aircraft 837, SrA LaPorte discovered the nose gear torque link was loose. Detachment 1, 79th Test Evaluation Group uses this aircraft for F-117A Follow-on Operational Test and Evaluation. Amn LaPorte continued to troubleshoot the problem and found the strut bushings were worn, the lower strut was backing out, and the nose wheel steering dampener was excessively loose. He brought this discrepancy to the attention of his Senior Maintenance Officer (SMO), the Detachment Commander (Det CC), and the aircraft contractor. Despite the contractor clearing the gear for one more sortie, Amn LaPorte stood by his original finding that the aircraft was not safe to fly. In consultation with his shift supervisor, SMO, and the Det CC, the decision was made to cancel the next sortie even though it was an important classified test mission. Shortly thereafter the depot level technical expert independently overruled the initial one-time flight recommendation. The depot confirmed possible catastrophic results from flying the aircraft. Airman LaPorte immediately ordered a new strut and assisted as Aircraft Repair replaced the defective nose strut, quickly returning the aircraft to fully mission capable status. Further investigation of the steering unit revealed broken teeth on the nose wheel steering dampener potentiometer gear. This condition could have caused the nose wheel steering to fail to a "hard-over" position which on takeoff or landing roll may have resulted in loss of control of the aircraft. Amn LaPorte's sharp eye spotted and corrected this critical discrepancy. His skill and attention to detail averted the potential loss of an F-117A Stealth fighter and possibly saved a pilot's life.

UNIT SAFETY AWARD OF DISTINCTION

334th Fighter Squadron
4 FW
Seymour Johnson AFB NC

The 334th Fighter Squadron personnel are dedicated to meeting all mission requirements with "safety" as their watchword. From the commander to the newest airmen, the entire squadron echoes the sentiment, "if it is not safe, don't do it." It is clear that this atmosphere produces an environment in which safety is paramount. The 334 FS has consistently received honors that reflect their commitment to safely producing the best fighter pilots and weapons system officers in the world.

McDonnell Douglas has singled out the squadron for flying 60,000, 70,000 and 80,00 accident-free flying hours. The 334th achieved this award through the combined effort of the F-4E and the F-15E aircraft. These hours were obtained during some of the most demanding flying in the world including Red Flag, Combat Hammer, Combat Archer, Quick Force, Roving Sands, Operation Southern Watch, and more recently, training students in the F-15E. These milestones are a testament to the dedication of countless professionals within the 334th Fighter Squadron, the 4th Fighter Wing, and the United States Air Force.

The squadron's ground, weapons, and flight safety programs have set the standard for the 4th Fighter Wing. Over the past 3 years, the Annual 4th Fighter Wing Safety Evaluation has resulted in "Outstanding" ratings; and during the most recent annual safety inspection in Jan 98, two of the unit's programs received prestigious "benchmark" recognition. Vigilant tracking of discrepancies and monthly spot inspections resulted in the resolution of all noted problems and the "New Guy" briefings for aircrew, which incorporated hazards within maintenance as well as flying safety hazards. Flight Safety vigilantly reports all reportable incidents well ahead of schedule and works closely with maintenance to ensure malfunctions are corrected the first time.

The efforts of the 334th and the 4th Fighter Wing have not gone unnoticed by the local community. The 334th's commitment to promoting safe driving in our community directly contributed to the Wing receiving the National Safety Belt Honor Roll from the Governor's Highway Safety Program in 1996 and 1998. Our active mishap prevention program has prevented several potentially hazardous situations within the work environment. From revising the flow of traffic within the parking lot to prevent accidents to putting up a guard rail around an open ditch to prevent personnel from falling in, members of the unit consistently look for potentially hazardous situations and develop safe solutions. This focus results in a safer way of life for all members of the wing.

USAF FY 97 NATIONAL SAFETY COUNCIL AWARDS

AWARD OF HONOR

The highest NSC award presented to the followng organizations with a perfect record of a reduction of 10% or more in the ground mishap rate; a composite rate better than the AF composite rate for the fiscal award year; and zero on-duty ground mishap fatalities:

2 BW, Barksdale AFB LA
5 BW, Minot AFB ND
28 BW, Ellsworth AFB SD
65 ABW, Lajes Field, Azores
366 WG, Mt Home AFB ID
509 BW, Whiteman AFB MO

AWARD OF MERIT

The second highest NSC award presented to the following organization with a perfect record or a reduction of at least 5% in the ground mishap rate; a compostie rate better than the AF composite rate for the fiscal year; and zero on-duty ground mishap fatalities:

ACC, Langley AFB VA

PRESIDENT'S CITATION AWARD

Awarded to the following organizations that had a perfect ground mishap record in the fiscal year:

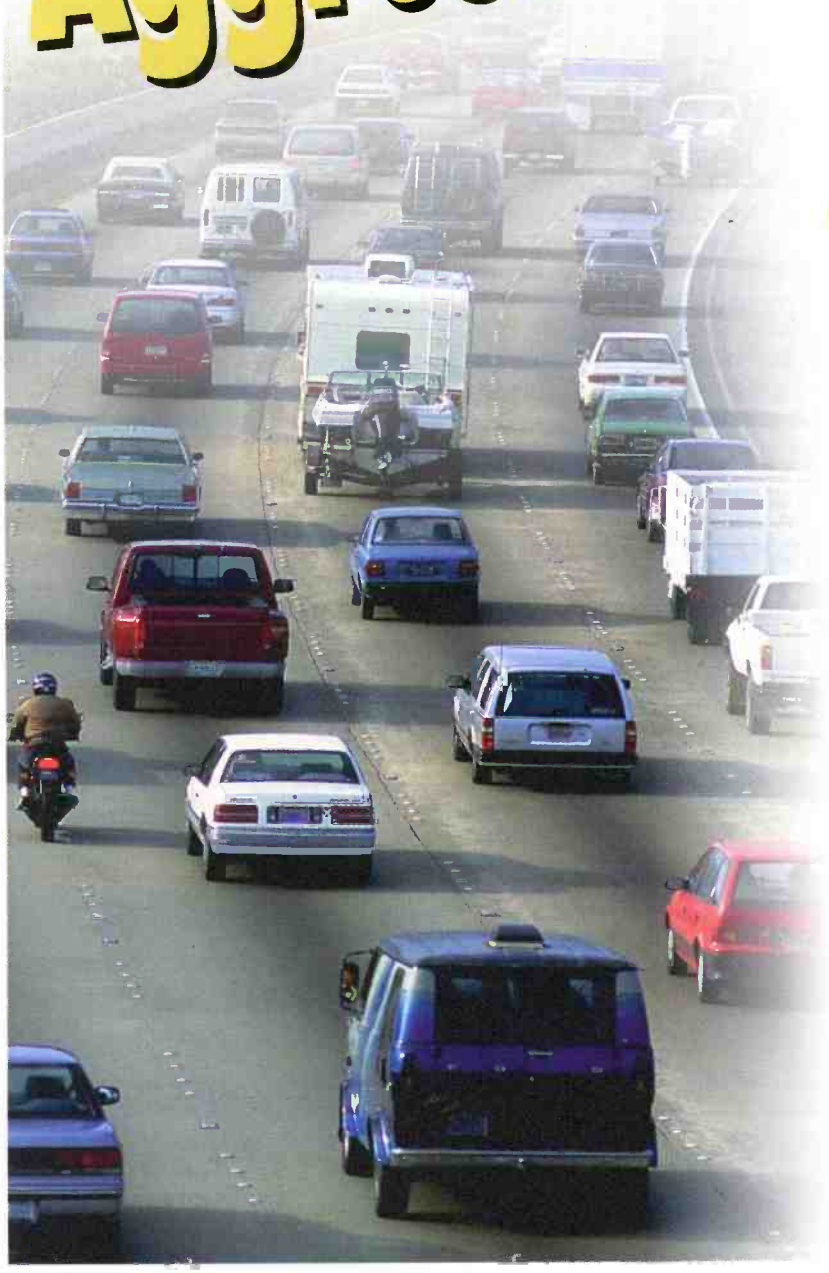
84 RADS, Hill AFB UT
3 ASOG, Ft Hood TX

Pardon our error printed in the June 1998 issue under the FY 97 USAF Safety Awards:

The Missile Safety Plaque was awarded to the 33 FW, Eglin AFB FL, for their outstanding achievement and contribution to missile safety, not the 366 WG as printed. Oops!

Courtesy of the National Highway Traffic Safety Administration
U.S. Department of Transportation
Washington, DC

We All Need to Take the Test
Aggressive Driving



Aggressive drivers are high risk motorists that climb into the anonymity of an automobile and take out their frustrations on anybody at any time. They run stop signs and red lights, speed, tailgate, weave in and out of traffic, pass on the right, make improper and unsafe lane changes, make hand and facial gestures, scream, honk, and flash their lights. They drive at speeds far in excess of the norm which causes them to follow too closely, change lanes frequently and abruptly without notice (i.e., no turn signals), pass on the shoulder or unpaved portions of the roadway, and leer at and/or threaten (verbally or through gestures) other motorists.

But what about your own driving? Take a minute to evaluate yourself to see if you may have developed some unsafe habits that could be adding to the aggressive driving atmosphere we live in today.

Are you an Aggressive Driver or a Smooth Operator?
Do you ...

Yes	No	
❑	❑	Overtake other vehicles only on the left?
❑	❑	Avoid blocking passing lanes?
❑	❑	Yield to faster traffic by moving to the right?
❑	❑	Keep to the right as much as possible on narrow streets and at intersections?
❑	❑	Maintain appropriate distance when following other vehicles, bicyclists, motorcyclists, etc?
❑	❑	Provide appropriate distance when cutting in after passing vehicles?
❑	❑	Use headlights in cloudy, raining, low light conditions?
❑	❑	Yield to pedestrians?
❑	❑	Come to a complete stop at stop signs, before a right turn on red, etc?
❑	❑	Stop for red traffic lights?
❑	❑	Approach intersections and pedestrians at slow speeds to show your intention and ability to stop?
❑	❑	Follow right-of-way rules at four-way stops?
❑	❑	Drive below posted speed limits when conditions warrant?
❑	❑	Drive at slower speeds in construction zones?
❑	❑	Maintain speeds appropriate for conditions?
❑	❑	Use vehicle turn signals for turns and lane changes?
❑	❑	Make eye contact and signal intentions where needed?
❑	❑	Acknowledge intentions of others?
❑	❑	Use your horn sparingly around pedestrians, at night, around hospitals, etc?
❑	❑	Avoid unnecessary use of high beam headlights?
❑	❑	Yield and move to the right for emergency vehicles?
❑	❑	Refrain from flashing headlights to signal a desire to pass?
❑	❑	Drive trucks at posted speeds, in the proper lanes, using non-aggressive lane changing?
❑	❑	Make slow, deliberate U-turns?
❑	❑	Maintain proper speeds around roadway crashes?
❑	❑	Avoid returning inappropriate gestures?
❑	❑	Avoid challenging other drivers?
❑	❑	Try to get out of the way of aggressive drivers?
❑	❑	Refrain from momentarily using High Occupancy Vehicle (HOV) lanes to pass vehicles?
❑	❑	Focus on driving and avoid distracting activities (e.g., smoking, use of a car telephone, reading, shaving)?
❑	❑	Avoid driving when drowsy?
❑	❑	Avoid blocking the right-hand turn lane?
❑	❑	Avoid taking more than one parking space?
❑	❑	Avoid parking in a disabled space (if you are not disabled)?
❑	❑	Avoid letting your door hit the car parked next to you?
❑	❑	Avoid using the car telephone while driving?
❑	❑	Avoid stopping in the road to talk with a pedestrian or other driver?
❑	❑	Avoid inflicting loud music on neighboring cars?

Score yourself:

Number of "No" Answers = _____

1-3	Excellent
4-7	Good
8-11	Fair
12 (or more)	Poor

Dead Men Do

Lt Col Marshall Bronston
ANG AFR Test Center
Tucson AZ

Night Vision Imaging System-modified primary flight instruments: "The round dials are designed to help save your life."

Editorial Comment:

"Dead Men Don't Talk" was taught to many pilots shortly after they mastered "TWO," "MAYDAY," and "BINGO." It is standard practice on certain training scenarios for pilots who have been simulated as "killed" to acknowledge the fact that they know they have been "killed." They say no more after that point — except for safety of flight calls. "Dead men don't talk" on the radio; they don't provide tactical calls to "alive" players; they don't use the radar to lock onto anyone; and they don't fly through an ongoing fight. In fact, if a simulated dead player does any of these things, it distorts the scenario and often the outcome. As a result, the "dead man's" job is to quietly and unobtrusively leave the mock battle. In the debrief, after the point where the player gets "killed," he should normally be fairly quiet. It's normally the flight lead/instructor pilot's job to draw lessons from "morts." Because real dead men don't get to speak up, it's incumbent on the rest of us to try extra hard to glean and grow from appropriate safety lessons learned. With this thought in mind, we welcome Lt Col Bronston's timely submission of an article addressing safety lessons learned concerning the use of Night Vision Goggles (NVGs). As Deputy Director of Test at the ANG AFR Test Center at Tucson AZ, he is well informed on the technical improvements and continuing development of night vision devices. I trust you will find, as we certainly did, his suggestions to be both thought provoking and practical.

As the Combat Air Forces (CAF) gain experience in NVG operations, those of us who regularly get to talk in the debrief have many lessons to pass on. Because NVGs are new to much of the CAF, the war story lessons learned are often as important as they are colorful. While this article is intended to pass on some of my lessons learned to NVG-qualified F-16 pilots, much of the material applies to other platforms as well.

Lesson 1: Only the Sun Turns Night into Day

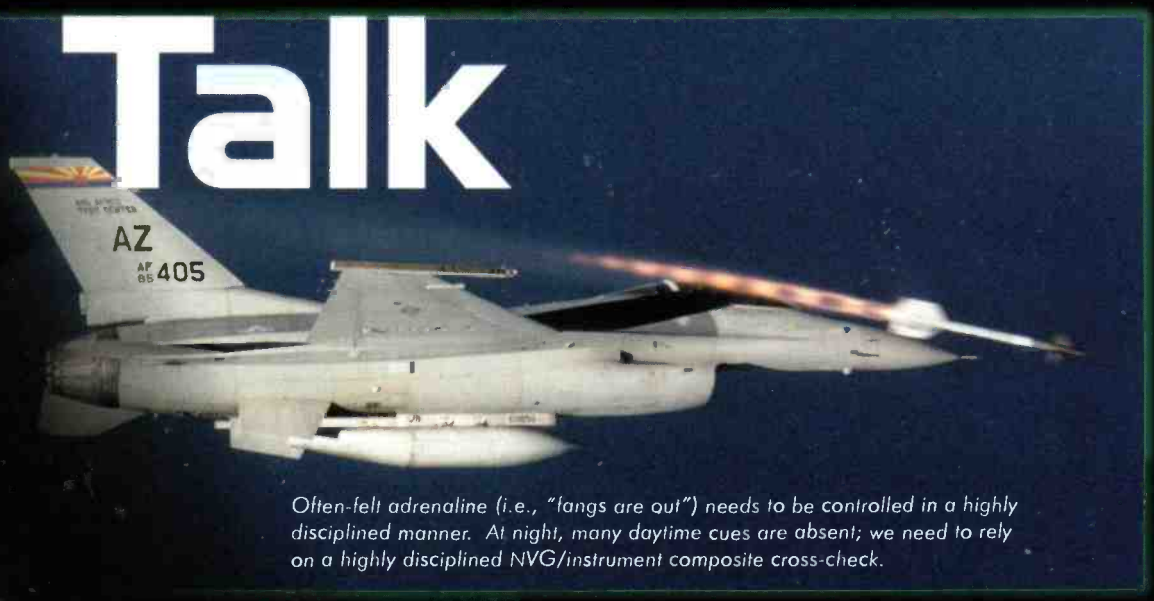
Significant limitations of NVGs include:
- Limited Field of View (FOV)
- Flat, monochrome, auto-gaining display
- Less acuity than day vision

In addition, every night is different. Terrain, contrast, texture, moon phase/angle, clouds/haze, and a hundred other factors have dramatic effects on what you get to see. However, despite these limitations, there is quite an improvement in night vision capability.

Lesson 2: You Need to See Your Attitude Indicator

It's very tempting to dim down your cockpit lighting to the point where you can't effectively read your Attitude Direction Indicator (ADI) "in a pinch." As the comfort factor on a given night increases, we naturally spend more time using the NVG-provided horizon as a reference. This is a good thing as long as we keep the ADI -- "the life vest" --

n't Talk



Often-felt adrenaline (i.e., "fangs are out") needs to be controlled in a highly disciplined manner. At night, many daytime cues are absent; we need to rely on a highly disciplined NVG/instrument composite cross-check.

nearby and ready. When you get into a "RECOVER" situation, you need to be able to read the ADI instantly. The bottom line is ... turn the brightness up so you can read it.

Lesson 3: NVG/Instrument Composite Cross-check is Different

The composite cross-check of a NVG/Instrument is different from a "normal" weather cross-check (little-to-no looking outside) or "normal" Visual Flight Rules (VFR) scanning. Unchecked, the ability to "see" and employ "near daytime" tactics can lure you into inappropriate use of daytime techniques. With goggles, we increase our night maneuvering to a more dynamic level. At the same time, the tactical situation often draws attention to eye-magnets outside the cockpit (e.g., target, adversaries, flares, etc.). It's easy to be coaxed into taking attitude references out of the cross-check. As your maneuvering becomes more dynamic, you need to blend reliable attitude references into your NVG/Instrument Composite Cross-check more frequently.

Lesson 4: It's a Good Idea to Cross-check the Round Dials

A few places where I've found benefit from taking a peek at the ADI include:

- Recoveries from diving deliveries
- Notch threat reactions
- Combat descents
- Part of any "dynamic" maneuver

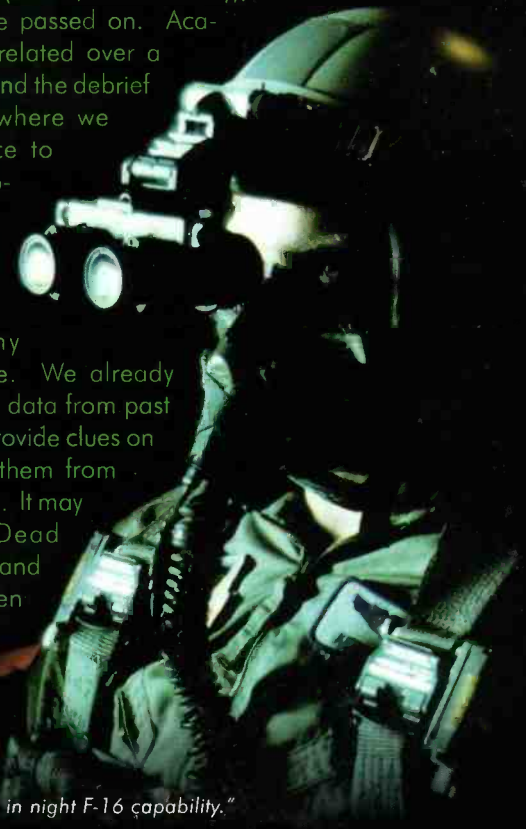
One way I compensate for the limited NVG field of view is by reducing the severity of pitch changes and attitudes. When I do get into a spot where I need to use the vertical more aggressively, I put up a mental flag that tells me I need to increase the rate and time I spend cross-checking the round dials — especially the ADI. The lack of peripheral cues and "ground rush" cause me to spend more time referencing the altimeter.

These lessons are more obvious in a 1-G air-conditioned chair than in the cockpit on a "glorious" goggle night. Remember, the FOV is the same on a good night as it is on a crummy one.

Summary of Lessons Learned:

- NVGs have distinct limitations
- Have your lights bright enough to see the gauges in a pinch
- Composite cross-check is different
- Include looks at the round dials

These lessons learned are knowns. While they don't need to be re-learned (that is, the hard way), they ought to be passed on. Academics, stories related over a cold beverage, and the debrief are all places where we have the chance to pass our war stories on to others. In order to keep talking in the debrief, we need to learn from any source available. We already have a wealth of data from past mishaps which provide clues on how to prevent them from happening again. It may just be that "Dead Men" **DO** talk, and we need to listen better. ■



Pilot Wearing NVGs: "NVGs, properly employed, offer a revolutionary improvement in night F-16 capability."

Flight Safety Stats

ACC & ACC-Gained Losses for FY 98

"Not a single sortie we fly is worth compromising the integrity of an aircraft or the life of an airman."

1 Oct 97 - 5 Jun 98
Class A Flight Mishaps

8 AF	
9 AF	
12 AF	
AWFC	None
CANG	
CAFR	
Aircrew Fatalities	

Class A - Fatality; Permanent Total Disability; Property Damage ≥ $1,000,000


Fleagle
THE ONLY THING I PLAN TO DO THIS FOURTH OF JULY IS WATCH TH' FIREWORKS FROM A SAFE DISTANCE.
EVERY YEAR I TRY TO DO SUMPIN SPECIAL, I GET IN TROUBLE.
MAN! LOOK AT THEM ROCKETS BLOW!!
WHERE'D EVERYBODY GO?
IS...IS THAT A SKY ROCKET COMING THIS WAY??
© STAN HARRISON 1998
GOOD LORD!
FLEAGLE...?
MUTTER..., MUTTER... MUTTER...
HARRISON

Professional Pain... The Worst Kind!

Sgt Jeffrey C. Aiken, 5th Air Support Operations Squadron, Fort Lewis AIN WA

The mistake I made occurred while unloading one of our High Mobility Multi-Purpose Wheeled Vehicle (HMMWV) trailers during our first day out on the Fort Lewis training range in support of exercise "Cascade Thrust II." It had rained heavily over the weekend, and the area was soaked. The prospect of finding a dry spot to put up a defensive fighting position, a tent, and sleeping bag had disappeared long ago. The rain had turned to drizzle as we began the process of setting up camouflage to conceal the vehicles.

The door on the HMMWV trailer shell was hanging down and blocking our access to the back of the trailer. We tried to swing the door up and lock it into position; but since the front of the trailer was lower than the back side, closing the door was extremely difficult to accomplish. I said to the rest of the team, "We need to lower the tailgate so I can get in there and prop up the door." However, one of my more experienced teammates "wanted the tailgate up." I knew at that time it would be safer to put the tailgate down before climbing in, but I decided to make the best of it and ignored the hazards involved. After all, I figured there was some reason why my fellow coworker wanted it in the up position. Since he had been on more of these exercises than I had ever been in the past, I went ahead and trusted his judgment.

After climbing inside, I stood up, braced my left leg against the tailgate, and placed my right hand onto the side wall. Using my left hand, I attempted to swing the braces outward into their locking position; but it was still out of reach. During this process, most of my upper body was hanging out of the trailer. As I examined how to get the door open, I repositioned myself. Not thinking about the wet floor of the trailer, I slipped, lost my balance, and fell forward and outward. However, there was no place for my left leg to go except into the tailgate.

The back of my left foot was now pinned against the cargo. My forward movement forced my left femur out of joint with the tibia. As I heard and felt the pop, my right hand pulled away from the side

wall. This was a desperate attempt to stop the pain as I reached down, but this action spun me around to the right and outward ... only to feel and hear another pop and a tear. That was my anterior cartilage and medial ligament. Then, my full weight was forced onto my knee joint and pinned foot. I continued forward until I stopped just outside the tailgate. Hanging there and trying desperately to dislodge my foot, it finally came out after several seconds which seemed like an eternity. Nonetheless, I'm thankful I didn't land squarely on my back, because that's where I was headed. There was enough spring action left to twist me around where I landed on both my left side and helmet.

I've never known so much agony as I laid there. The only words I uttered to my stunned team members were, "Someone, please get a medic! Now!" I think my team chief was already on her way, because it wasn't very long before a combat medic arrived. With pain rushing throughout my entire body, my thoughts returned to what actually had happened and what the future would entail. As my teammates tried to help me, I began to think about how I'd let them down. It was already difficult to do our job with four people; I thought about how much harder it was going to be for them to accomplish the setup and endure the mission — minus one (me).

The ambulance ride over uneven ground made the pain worse. In the trip to the field hospital, I still found reason to be thankful. I thought about how fortunate I was to be in the Brigade Support Area and not at Battalion or Company level which was much farther away from medical assistance. I didn't know it then, but I later learned the Army sends their best doctors out to the field hospital. The temporary treatment I received was absolutely outstanding. As I laid down in the recovery tent, my thoughts drifted back to my teammates again and the mishap. I took no comfort in the fact that I was in a warm tent listening to the rain begin to pour down. I was here because I didn't follow through with what I knew was right to do.

Because of my foolishness, the doctors tell me I'm faced with at least 6 months of rehabilitation in order to walk again without a full leg brace. If that isn't successful, then I have to undergo major surgery with 1 year of painful recovery and physical therapy (all of which may or may not work). I have to face the fact that this injury may be with me for the rest of my natural life.

The real irony of it all is this: "I'm the Unit Safety NCO (a safety professional) ... and I knew better!" That realization is also a painful reminder of my professional responsibility to my organization. For my wrong actions, I accept the slings and arrows of accountability which include repeated briefings up the chain, writing of safety reports, and knowledge that staff meeting presentations will no longer show our unit's safety record as untarnished. Once more, I'm the top nominee for a trophy I've managed thus far to avoid — the unit "Blockhead Award."

Another painful consequence comes with the knowledge that while only 1 duty day was lost, I won't be able to attend our rotation to the Joint Readiness Training Center this year. In addition, I won't be able to be with the rest of my unit to participate in the many exercises yet to be carried out on the Fort Lewis Training Ranges — or anywhere else for that matter. Moreover, I can't participate in unit physical training three times a week; so I have to do something else to stay in shape. The fallout from this is that I've also compromised our unit's manning strength and ability to meet the mission.

Small units like ours with special missions usually are a tighter knit group. The cohesion among members within mine is really close — almost like family. There has never been a feeling of closer identity with any of the other organizations I've ever served with. The hardest of all consequences to bear is that I can't be a full member of my team. The last thing I ever wanted was to be left behind, but that's what happened.

Because of my foolishness, the doctors tell me I'm faced with at least 6 months of rehabilitation in order to walk again without a full leg brace.

From this experience, I've learned the best learned lessons in life are often the hardest ones to endure. I've also learned it is always best to take prompt, appropriate action against any and all identified sources of danger as you carry out your unit's mission. The consequences of ignoring hazards can be very painful or even fatal. Be sure to determine which course of action will get the job done best with an acceptable level of risk; and don't hesitate to question someone else's "preferences." They may be based simply on opinion rather than factual knowledge or experience. Remember, of all the tremendous suffering that you may encounter as a result of an operational mishap, the "professional pain" can be the worst kind! ■

ASK ORVILLE!

The unanimous choice for "letter of the month" comes to us through the Public Affairs channels from Dyess AFB TX. Our inquisitive and curt correspondent writes:

Col Ronald L. Garhart
HQ ACC/SEO
Langley AFB VA

Dear Orville:

Let me get right to the point. With the lower experience levels we're seeing in a number of career fields, how will the use of Operational Risk Management enhance safety?

Major I. M. Callow

Salutations and congratulations, Major Callow:

By recognizing inexperience as a potential source of risk, you (and I might add a myriad of others over the past year) are already taking advantage of Operational Risk Management (ORM). I can't begin to tell you how many letters I receive each month in which folks say that they are having great difficulty identifying areas and issues on which to use the ORM process. Most of them reached the conclusion that Operational Risk Management is just not applicable to their function in life — it can't help 'em, never could, never will! But you dear Major, have overcome this typical obstacle by realizing that lower than normal experience levels are a very real source of risk that should cause us all concern.

Before we get into a bona fide reply to your astute question, I need to be quick to point out that there are two sides to the inexperience coin that should be considered. Heads — personal injury to the fledgling worker; and tails — nonperformance of the task or mission to be accomplished.

First, the one you alluded to in your observation, "How will ORM enhance safety?" Certainly it makes sense that a "tenderfoot" may be exposed to a greater number of hazards than one who is familiar with the job and associated "gotchas." And furthermore, regardless of the number of hazards a person is exposed to, an apprentice is far more likely to fall prey to those hazards than a veteran.

Second, regarding an inexperienced person negatively impacting the success of a task or procedure, Orville can give you a personal testimonial to the validity of that theory. About 15 years ago, I was attempting to put my son Mark's first bicycle together using the "easy-to-follow"

instructions that came with it. Well, deep into about step 17 of this 42-step process, it became intuitively obvious to me that these instructions were created for a person with far more savvy in the art of "bicycle-puttin-together" than I possessed at the time. But low and behold, by the time I became a seasoned father working on bike number three, the instructions were a breeze to follow. Experience with the task really did make a substantial difference.

Our approach to solving either of the above problems is going to be the same. Workers are provided structure in which to conduct their tasks. Checklists and Technical Orders (T.O.s) provide necessary guidance to safely and competently accomplish those tasks. But in general, those checklists and T.O.s were created for use by a person with a minimum level of training and experience. So what happens when we put a person on the job that doesn't meet that assumed level of experience? Quite possibly, increased risk of personal injury or task failure. Solution?

O...R...M...

Yes! ORM, Major Callow!

1. Identify the Hazards: Starting with step 1 in the 6 step process, choose wisely among the tools and techniques in AFP 91-215 "ORM Guidelines and Tools" (released this month, Jul 98). The tools will help you identify hazards specific to the neophyte that would not normally be considered a problem for a person with the required level of experience. In addition, use the same tools to identify unique hazards to task accomplishment caused by the "greenhorn's" lack of prowess and developed skills.

2. Assess the Risks: Next, use the risk assessment matrix or one of the other wonderful risk assessment tools found in (you guessed it) AFP 91-215 to evaluate the risks associated with each of the hazards you identified in step 1. Then rank order the risks from most to least impact when performed by these "rookies."

3. Analyze Risk Control Measures: Take a look once again at AFP 91-215 (is there anything involving ORM that is not contained in 91-215?) to select tools that will help you identify appropriate control measures for each of the hazards and associated risks.

4. Make Control Decisions: Now that you gathered the necessary information and increased your situational awareness, it is time to use your judgment. You are ready to decide which hazards and risks have cost effective and practical control measures that you are able to put into practice. They will all boil down into two general categories: (1) Risks that you are able to avoid, mitigate, transfer, etc., through sound control measures, and (2) Risks that you are willing to accept because it is not practical or cost effective to apply control measures. But even in the latter case, you will at least now have a heightened sense of awareness of the accepted risk.

5. Risk Control Implementation: Make certain that everyone involved or affected by the new control measures are aware of them and up-to-speed on their use. If you want to know how best to accomplish this step, refer to the appropriate section of (can't fool you) AFP 91-215.

6. Supervise and Review: Now it is time to sit back, have a soda, and observe the effect of your selected control measures. Are they doing the job you intended and meeting your expectations? Or did the new controls introduce unanticipated or unwanted side-effects? It is possible that a repeat of one or more of the 6 steps may be required as a result of your supervision and review.

Here are the foot stompers, Major Callow. The secrets to successfully accomplishing steps 1-6 are:

- Choose the right mix of people to conduct the process. In this case, I would likely start with a functional expert and a person new to the task at hand.
- Use the tools and techniques found in AFP 91-215 to focus your efforts and guide you through each of the 6 steps.

And remember, Major Callow, just like putting those bicycles together; the first time you try the ORM 6-step process, your inexperience is likely to show. But not to worry — by the second or third ORM application, you will be a seasoned veteran.

Keep those cards and letters flying in,

Orville R. Mudd
ORM Dogfight Veteran
ACC Office of Safety

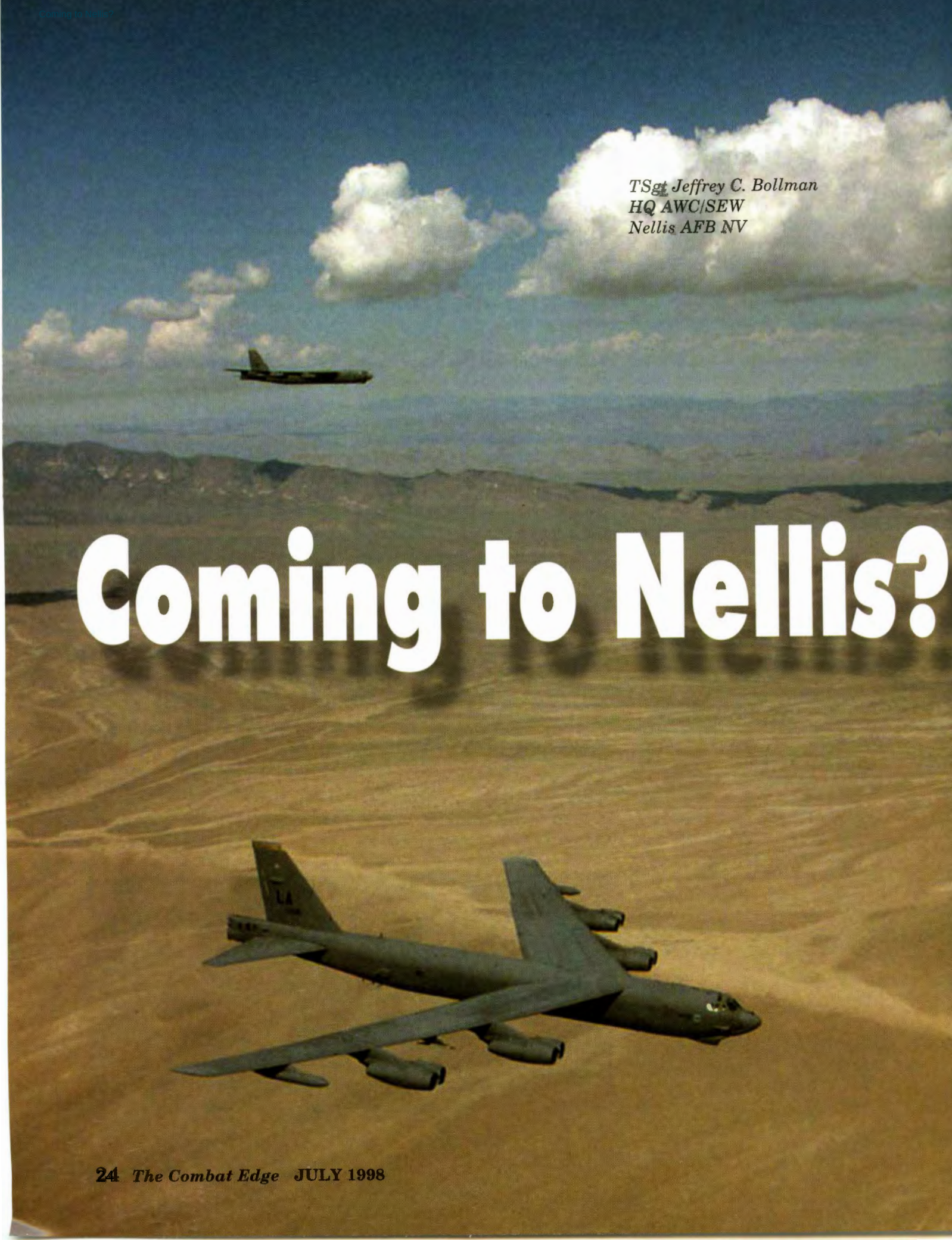
If you have any questions or comments regarding ORM, send them to:

"Ask Orville!"
HQ ACC/SEO
175 Sweeney Blvd
Langley AFB VA 23665-2700

DSN 574-8800, Fax DSN 574-8975

TSgt Jeffrey C. Bollman
HQ AWC/SEW
Nellis AFB NV

Coming to Nellis?



B.Y.O.S. (Maybe)

Many units from around the world visit Nellis AFB NV in support of Green Flag and Red Flag exercises. Each exercise provides realistic training for both aircrew and maintainers. With each exercise, unique — and sometimes challenging — circumstances arise.

For example, in a recent Green Flag exercise, three B-52 aircraft were deployed to Nellis. While providing operational support to these aircraft, the assigned maintenance personnel were confronted with the following two unique situations.

Situation #1

The first situation arose when the aircrews wanted to train with the ALA-17 flare sets. While this is old hat back at their base, Nellis operational support personnel discovered that they didn't have the authorized support equipment to accommodate the ALA-17 flare. The technical order specifies that a "particular type of test stand" be made available to support ALA-17 flare maintenance. Because Nellis AFB only supports fighter aircraft, the required test stand was not available. The provisions in the technical order further specify an alternative if no test station is available. Upon evaluation of this morsel of data, we began following written procedures detailing the construction requirements of a test stand.

On the surface, the instructions seemed clear and logical. However, under other paragraphs in the technical order, it stated that the stand must ensure personnel are protected from hot exhaust gases and very bright light. Then, Weapons Safety asked the following perplexing question! How does an M548 can (20 mm container) that is attached to a thin piece of plywood provide adequate protection from gas, heat, and light? Well, it really doesn't do very good at all. Therefore, the core unit contacted the item engineer at Hill AFB UT with a new test stand design concept to support the ALA-17 flare. Their idea involved using a BSU-49 fin container with a piece of 3/4" plywood attached to the top and secured by tie-down straps with a plate aluminum sheet covering the plywood secured by screws. The ALA-17 rack assembly is held into position with a rod securing it in the M548 can. The M548 can is then secured to the plywood/plate aluminum shield by screws. The shield provides adequate protection — as long as personnel stand behind it. The ALA-17 engineer agreed with the proposed design concept; and thus, an alternative test stand was built. Following this experience, an AFTO-22 (Technical Order Improvement Report and Reply Form) was submitted for the test stand which included clarification of safety information.

Situation #2

Just when things seemed to be moving forward, a second unique situation reared its ugly head. In addition to this special test stand, the technical order stated we also had to provide a clear zone of 300 feet. Weapons Safety tried to find a site that was approved for explosive operations, had available test stand grounding points, and would not interfere with other operations. The Munitions Area was the logical choice. However, a 300-foot clear zone would encompass the only primary road of egress in case of a mishap from other operations. With a need to consider other alternatives, we left the Munitions Area and went to the flight line. This proved to be a key decision. The clear zone could be maintained at the flight line, grounding points were available, and no additional hazards to operations or personnel were created.

The Moral to the Story

If you're coming to Nellis for a Green Flag or Red Flag exercise and you have a weapon system that is unique to your base, please call ahead to see if Nellis can support it. By maintaining an open line of communication, we can order the necessary equipment — or you can make arrangements to Bring Your Own Support (B.Y.O.S.) with you. ■

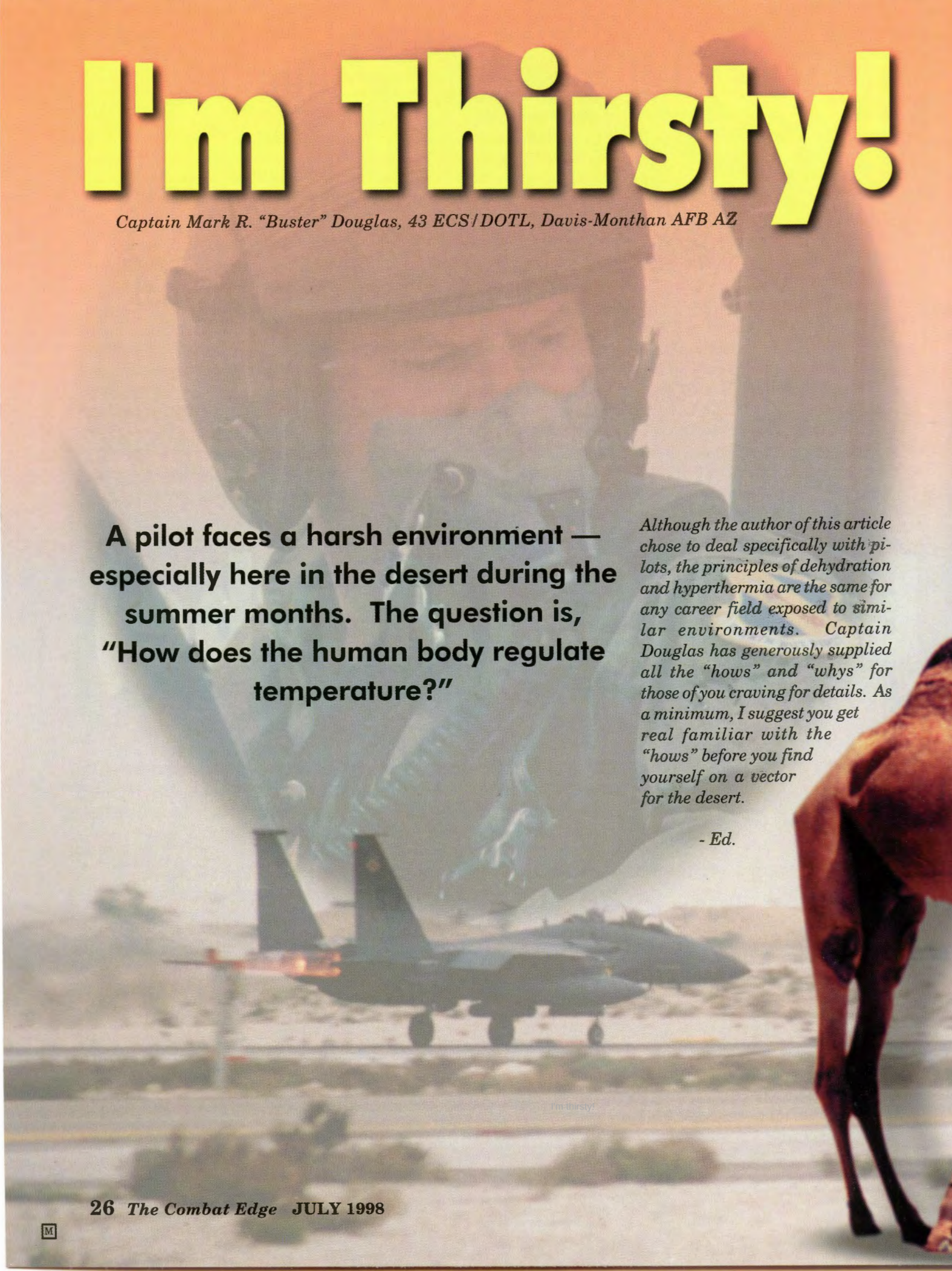
I'm Thirsty!

Captain Mark R. "Buster" Douglas, 43 ECS/DOTL, Davis-Monthan AFB AZ

A pilot faces a harsh environment — especially here in the desert during the summer months. The question is, "How does the human body regulate temperature?"

Although the author of this article chose to deal specifically with pilots, the principles of dehydration and hyperthermia are the same for any career field exposed to similar environments. Captain Douglas has generously supplied all the "hows" and "whys" for those of you craving for details. As a minimum, I suggest you get real familiar with the "hows" before you find yourself on a vector for the desert.

- Ed.



I want to address the physiological aspects of operating in the heat environment. Since many ACC bases are in relatively hot environments (I'm in Tucson), and with the large commitment in the Middle East, every ACC pilot at one time or another will be subject to heat stress. Dehydration in particular can degrade performance in just a matter of a few hours. After reading this article, you will have a better understanding of how a person becomes dehydrated, what effects the heat environment and dehydration have on a pilot's ability to perform and some practical means to avoid dehydration.

Dehydration is simply water depletion (Wilson, 1991). The human body experiences water loss three ways: transpiration, urination, and perspiration (Dr. F. E. Lorch IV, personal communication, 18 April 1997). Transpiration is the moisture lost when exhaling. Little can be done to control water loss through this method other than by relaxing to keep the rate and depth of breathing low. Urination is another function over which people have little control, nor would they want to. Although water is lost in this manner, people also expel waste from their bodies by urinating. The color of the urine gives an indication of what the body's hydration level is. If well hydrated, urine will be diluted making the urine clear. If not, the body will conserve water causing the urine to become yellow, or in extreme cases, brown (Lorch, 1997). Perspiration is much easier to control. The amount of exercise done and the temperature in which it is accomplished will dictate how much sweating occurs. Outside the cockpit, pilots can control how and where work is accomplished and adjust their habits to ensure they are ready to fly. Once in the cockpit, the environment and workload are much more difficult to control.

Although equipped with air conditioners, many aircraft will stay extremely hot until after airborne, leaving extensive exposure to the hot environment during ground operations. Even after becoming airborne, perspiration can be difficult to control. In addition to the flight suit, helmet, and gloves trapping the metabolic heat produced by the flight crew, there are four other heat sources inside the cockpit (DeHart, 1996). Radiation heat comes directly from the sun. A pilot touching both sides of his helmet during flight will notice that the side facing the sun will be hotter than the side away from the sun. Convective heat enters the cockpit if the ambient temperatures are high. This type of heat is only a factor in the lower altitudes. Aerodynamic friction on the other hand will heat up the aircraft skin especially at the higher mach numbers experienced in the high altitude structure. The electrical equipment aboard the aircraft also produces excess heat which is vented into the cockpit. Considering the aircraft temperature may be in excess of 50 degrees Centigrade (or 122 degrees Fahrenheit) when the crew boards the aircraft, these additional heat sources will prolong the air conditioner's cooling period.

A pilot faces a harsh environment — especially here in the

desert during the summer months. The question is, "How does the human body regulate temperature?" The answer is two-fold in a heat environment. The first method is a process called vasodilatation (O'Brien, 1995). Vasodilatation is the opposite of the pooling of the blood in the body's vital areas (called vasoconstriction) which occurs when the body is cold. The blood flow to the extremities and then to the skin actually increases dramatically. By getting a larger volume of blood to the surface, a heat exchange will occur (O'Brien, 1995). The blood, usually heated to about 37 degrees Centigrade (i.e., 98.6 degrees Fahrenheit), is then cooled by the ambient air. Obviously, this process only works when the air is cooler than the blood. The larger the temperature differential, the better the system works. When vasodilatation doesn't cool the body sufficiently, the body begins to sweat (O'Brien, 1995). Sweating cools the body by having water on the body evaporate into the atmosphere. Each liter of evaporated water carries away 590 kilo-calories (kcal) of heat (DeHart, 1996). Sweating only works when the water evaporates. When water is wiped off the body, the water is wasted causing further dehydration. The effectiveness of the sweating mechanism varies dependent on the external environment. Why this variation occurs is beyond the scope of this paper; but suffice it to say that a hot, dry environment with a low pressure altitude is most conducive to evaporative cooling (sweating). Additionally, for sweating to be most effective, the skin must be uncovered to facilitate evaporation.

Having looked at the "causes" of dehydration, I will now discuss the "effect" dehydration has on the body. In any aircraft, mild dehydration and hyperthermia (the rise in the body's core temperature) causes degraded performance, increased fatigue, and an increased susceptibility to physical stressors (DeHart, 1996). In high performance aircraft, this can translate to a decreased G-tolerance, greater fatigue, and a decreased resistance to motion sickness or hypoxia.

G-tolerance, or the ability of a pilot to keep an adequate supply of oxygen to the brain, can be degraded by even mild dehydration or hyperthermia.

G-tolerance, or the ability of a pilot to keep an adequate supply of oxygen to the brain, can be degraded by even mild dehydration or hyperthermia. At the onset of a high-G pull, blood is forced by centrifugal force to the lower extremities. If nothing is done to counteract this, the pilot will experience a G-induced loss of consciousness (GLOC) in about 5 seconds once the reserve oxygen supply in the brain is depleted (AFPAM 11-404, 1994). The body's defense mechanism is to increase heart rate and blood pressure, but this takes 10 to 15 seconds to occur and will not increase G-tolerance significantly (AFPAM 11-404, 1994). Although modern aircraft have devices like the G-suit and the reclining seat to help a pilot cope in the high G environment, his main weapon to fight GLOC is the anti-G straining maneuver (AGSM). The AGSM is a method used to raise blood pressure enough to ensure the eyes and brain receive the proper supply of oxygen (AFPAM 11-404, 1994). Advanced dehydration reduces G-tolerance by actually reducing blood volume (Lorch, 1997). Lower blood volume means the pilot will have to strain harder to effect the same G-tolerance thereby increasing fatigue or, once the full strain is reached, the pilot will GLOC causing dangerous — and many times deadly — consequences. The reason this can be such a dangerous problem is the effects of dehydration can occur before the pilot is even thirsty (DeHart, 1996). A person will become 2-3% dehydrated before the onset of thirst. These are the same percentages researchers have determined cause significant loss of G-tolerance (DeHart, 1996). Hyperthermia also effects G-tolerance. If the cockpit environment is hot enough to cause vasodilatation, there will be more blood in the extremities than there would be in a cooler environment. Because this blood has farther to travel to

reach the brain, G-tolerance is reduced by 0.5 to 1.0 G's (DeHart, 1996).

The other effects of dehydration are more difficult to quantify but still need to be addressed. Studies of highly motivated, mildly dehydrated subjects have indicated the following results: shorter simple reaction times; higher error rates; narrowed attention with neglect of secondary tasks; diminished capacity for learning; and slower response to unusual events (O'Brien, 1995). The physiological problems include increased susceptibility to hypoxia and a greater chance of experiencing motion sickness (DeHart, 1996). The common thread to each of these symptoms is the inability of the subject to realize he is vulnerable to degraded performance. A pilot can experience a number of these symptoms and not know his performance has deteriorated at all. If a pilot does notice increased deviations from normal performance, the problem will probably just be written off as having a bad day.

So how do we combat dehydration and hyperthermia? The obvious answer would be to drink more and stay cool, but a pilot doesn't always know when he's susceptible to these effects. The first step would be to monitor preflight activity. If a pilot heads to the gym for a workout prior to flying, he is already in danger even before approaching the plane. If preflight activity involves physical work or extensive time in a hot environment, this must be taken into account when planning to fly.

Once ready to fly, the pilot must do his best to control his environment. Although limited in the steps available, tools such as shade, portable air conditioners, and even takeoff times in the cool part of the day will help alleviate the hot environment. The clothes worn also make a difference. A military pilot must wear a flight suit, but chemical warfare gear training should be avoided in the summer months. Taking steps to ensure the coolest possible environment in summer months will reduce heat stress on the body.

Fighting dehydration is a difficult problem in the hot environment. Doing moderate levels of work in a hot environment can cause water losses up to one liter per hour. Heavy workloads in the same conditions can double the loss (DeHart, 1996). Drinking a liter of water just prior to stepping to fly will combat dehydration. This must be accomplished just prior to stepping to fly because the body will dispose of the water if the antidiuretic effect of heat and exercise does not act to hold onto the water (DeHart, 1996). Once in the aircraft, the pilot must continue to drink water over the course of the entire preflight and flight. Thirst is not an adequate indicator of when the body needs water. The pilot must ensure an adequate supply of water is aboard to replace lost water volume, not just enough water to keep him from being thirsty.

In mild environments, the human body does an excellent job of regulating core body temperature and proper hydration. When a pilot is forced to work effectively in hot temperatures wearing warm protective clothing, this system is not as effective. Although the body will still manage to maintain a normal core temperature, it does so at the expense of proper hydration. Knowing this, a pilot must take steps to combat the cumulative effects of prolonged exposure to a heat stress environment. He does this by monitoring his preflight activity, minimizing the effects of the heat by all available means, and by drinking lots of water. Only then will a pilot be able to perform up to his full potential in the summer months in the desert. ■

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Editor, The Combat Edge
HQ ACC/SEP
175 Sweeney Blvd
Langley AFB VA 23665-2700

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Tragedy at Elmendorf

Sir, I would like to request (if possible) 10 copies of the April 1998 edition of the ACC "Combat Edge" magazine. As a primary player in what we think of as a pretty effective BASH [Bird Aircraft Strike Hazard] program here at Eglin AFB, I plan to distribute these to all Bird Hazard Working Group (BHWG) members. I would also like to thank you and [the] ACC [safety staff] for taking this BASH program seriously. [The] articles/information/guidance ... in this edition of the "Combat Edge" will aid unit-level folks like me and the BHWG at Eglin in keeping BASH a "daily" briefing item during mission planning/scheduling.

[Relative to the article "Tragedy at Elmendorf" in the April issue,] I was the HQ PACAF functional "Airfield Manager" during this accident ... I just wished this article would have taken the opportunity to stress and challenge the "Wing" level commitment required to ensure an effective BASH program. To learn from this terrible tragedy, I believe future programs/education efforts should focus on what we "should" be doing instead of re-living what we "could" have done.

Very respectfully,
SMSgt Tim Gunnison
Eglin AFB FL

Thank you for your kind words concerning the April 1998 issue of The Combat Edge. *We have received a lot of positive feedback relative to this particular special focus issue on bird aircraft strike hazards. The copies you requested have been mailed to you — distributing this issue to the members of your Bird Hazard Working Group is a great idea. We're glad we could help.*

Now, I'd like to address your comment on Wing-level leadership commitment to the BASH program. Although the Elemendorf article is not written with a focus on the benefits gained by proactive participation of Wing-level leadership for reducing bird aircraft strike hazards, it does address post-accident BASH related actions/fixes (i.e., things we "should" be doing). Furthermore, it provides a brief overview of the disciplinary actions taken toward Wing-level leadership as a result of the mishap. I believe the article conveys an eye-opening message to our readers on the importance of working together to reduce the risks associated with bird aircraft strike hazards. To prevent mishaps like this, individuals at "every level" must understand BASH related risk management concepts and apply them to their particular part of the mission. Proactive leadership at "every level" is key to the successful risk management of bird strike hazards. If the possibility of bearing the responsibility for needless loss of life and being relieved from a command position is not incentive enough for Wing leadership to fully support their local BASH program, I don't know what is. While bringing an otherwise successful career to an abrupt halt is not the goal of any mishap investigation board, the article does prove that we have a system in place which holds people accountable for their actions. Our ultimate goal is to figure out how to reduce the hazards that birds pose to our flight operations in order to prevent a reoccurrence of a similar tragedy; and that requires a strong BASH program. Not to be flippant about the need to stay in tune with the threats that birds pose to our operations — and I say this reverently — maybe we should schedule a showing of Hitchcock's film every 6 months to help us keep our bird awareness up and to get the idea across that our feathered friends are "everyone's" problem. That includes individual technicians, supervisors, aircrews, staff, and command-level leadership alike.

-Ed

Bird Awareness Flies into Action

As the Deputy Flight Commander for over 80 personnel in air traffic control (ATC) and airfield management, I found the [April 1998 edition of The Combat Edge on Bird Aircraft Strike Hazards (BASH)] very informative and on par with the challenges we are facing with our BASH program. The article on the

Elmendorf accident was an eye-opener for me. It made me stop and reevaluate our BASH program to see if we are doing everything we can to keep our airspace safe. [The April 1998 issue is now] placed in the read-file and ... is required reading for everyone in my flight. Afterwards, I plan to solicit their inputs and opinions on ways to improve our BASH program.

Sincerely,
1Lt R. Stephen Sprowls
McGuire AFB NJ

Thanks for the compliment. When we get letters like yours telling us that the safety messages contained in The Combat Edge are having a positive impact upon Air Force units in the field, it's payday for us. After all, our purpose in life is to educate — to stimulate thought and action in order to learn from the pages of a magazine rather than from painful personal experience or the pages of a mishap report. It may sound trite, but actions like those you are taking in response to safety lessons learned on BASH might be just what is needed to save someone from injury — it might even save a life. Keep up the good work!

-Ed

Pilots and Finger Rings

The cover picture [of the November 1997 issue of The Combat Edge] shows the pilot wearing a finger ring while ascending/descending the ladder. Our unit has discussed this issue with pilots at length. Their argument was there was no place on the boarding ladder to snag the ring to cause injury. After a further look, the Fighter Squadron Commander put out a letter prohibiting pilots from wearing finger rings on the flight line. The habit of wearing the ring should not be the rule while working in and around aircraft. If there were to be an error in making this assessment, it should be to error on the side of safety. Pilots ascend and descend, perform preflight checks, and various other tasks while on the flight line — not to mention they could be summoned to assist in a variety of emergency situations. The bottom line is: wearing a finger ring on the flight line is not a good practice given the multitude of operations and associated risks encountered. In addition, several pilots have told me that in pilot training they are instructed to remove the finger ring. A pilot missing a finger is a loss we can't afford.

Thanks for your consideration on this issue,

Dan Maham
Whiteman AFB MO

You're absolutely right! Wearing finger rings on the flight line "is" hazardous. AFOSH Std 91-100 "Aircraft Flight Line — Ground Operations and Activities" dated 1 April 1998 states "finger rings shall not be worn any time where there is a potential for the ring catching on a part of the equipment" (e.g., while ascending or descending ladders, scaffolds, platforms, etc.). When we selected the cover picture of Lockheed's F-22 Test Pilot for the November 1997 issue of The Combat Edge, none of us caught the safety discrepancy that you brought to our attention. Thanks for your input — we appreciate eagle-eyed readers like yourself because it keeps us on our toes. Continue to Aim High! ... and we'll do our best to encourage our folks to keep their rings at home ... instead of wearing them on the flight line. Maybe Lockheed will do the same!

-Ed

SAC Trained Killers

I enjoyed your article on fatigue in air operations in the March 1998 edition of The Combat Edge. The photo of the fatigued, over-worked Navigator (from appearances, a "toad" nav) on page 6 was a nice touch. But what I spotted upon closer examination, the "SAC" patch on his flight suit, brought back memories and warmed the cockles of this "SAC trained killer's" heart.

Now as a proud "ACC Warrior," I have one very special memory of that September day in 1991 as my crew R-74 (Stuart Latta, Mike Barnett, Ricki Romano, Bones McCoy, Gregg Schultz, and myself [Anton Komatz]) — "The Atomic Punks" — stood on the Alert Pad at K.I. Sawyer AFB MI as the last B-52 aircrew on alert. As we watched the tug pull the last BUFF from the pad that day, SAC was essentially "mission complete" as 35 plus years of 24-hour nuclear alert came to an end. I can remember feeling a little uncertain about the "new world order" that we were entering, and a whole lot of pride for what "we" (ourselves and those who came before us) [had accomplished over the years] as we stepped quietly from the pad.

Captain Anton Komatz
Hanscom AFB MA

P.S. - It's nice to see a fine ACC publication remembering its roots. (By the way, upon closer, closer observation, the shadow of the patch looks doctored — like it was cut and pasted into place. All good natured kidding aside, you have a very good magazine — keep up the good work.)

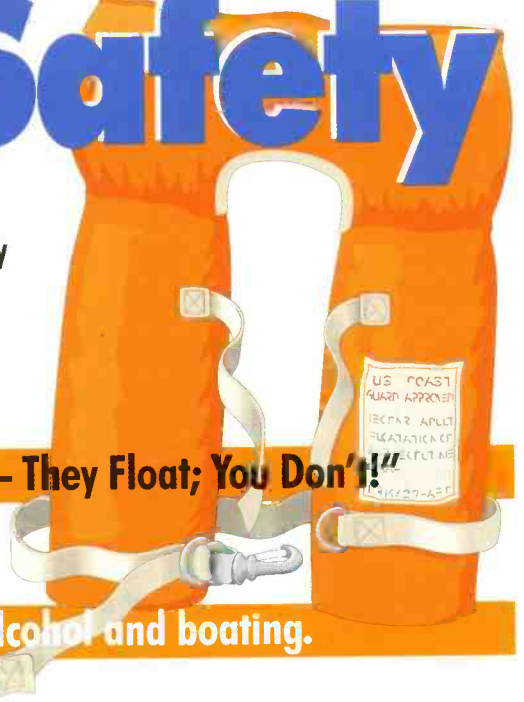
Your letter nearly brought tears to our eyes as we read about the unique experience you and your crew had as the last B-52 aircrew to stand nuclear alert ... you certainly have a way with words. Now, regarding the SAC patch in the photo you spotted on the navigator's arm in the March 1998 edition, let me say that the photo was not "doctored up." It is actually an archived picture we had in our files from the old SAC days. Any photo that we modify is appropriately marked as explained in our disclaimer on page 2.

-Ed

P.S. - By the way, it is good to know that there are still some "SAC trained killers" in today's Air Force. The years of exposure to SAC alert operations and strenuous readiness exercises certainly prepared them for the worldwide contingencies that challenge the Air Force today. ■

Courtesy of the National Safe Boating Council, Lexington KY

The DO's and Don'ts of Boating Safety



Following these simple do's and don'ts of boating safety will help you chart a safe course towards the fun and excitement of recreational boating:

DO wear a life jacket. "Life Jackets — They Float; You Don't!"

Don't mix alcohol and boating.

DO observe the nautical rules-of-the-road.

Don't stand in a small boat.

DO check the weather forecast before getting underway.

Don't overload your boat.

DO keep a good lookout.

These suggestions are constant reminders of one very important thing in regards to boating safety. Use common sense!

The waterways offer an open invitation to all types of boating. Therefore, since accidents oftentimes result from a chain of circumstances or behavior which can be easily avoided, it is important for boaters to be aware of the outcome of their actions. Remember to follow the above boating safety do's and don'ts, and take the time to attend a boating safety course. It could save your life.