Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

APRIL 2003 ✦ VOL 31 ✦ NO 4

NVG DESERT OPERATIONS

LESSONS LEARNED FROM DS/DS

PLUS: The Black Hole Of Night: SHIPBOARD OPERATIONS

Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

BG James E. Simmons – Commander and Director of Army Safety
COL John Frketic – Deputy Commander
John Hooks – Chief of Media and Marketing
LTC Richard Pryke – Publishing Supervisor
Paula Allman – Managing Editor
Danny Clemmons – Graphics
Sharrel Forehand – Distribution
e-mail - flightfax@safetycenter.army.mil
http://safety.army.mil

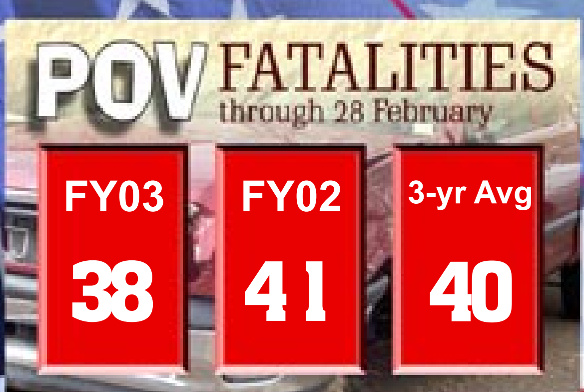
U.S. ARMY SAFETY CENTER

Page 3

Page 9

Page 11

CONTENTS



Flightfax is published by the U.S. Army Safety Center, Building 4905, Fifth Avenue, Fort Rucker, Alabama 36362-5363. Questions about the editorial issues addressed in Flightfax should be directed to the editor at DSN 558-9855, commercial telephone (334) 255-9855 or flightfax@safetycenter.army.mil. Distribution questions should be directed to Media and Marketing at DSN 558-2062, commercial telephone (334) 255-2062.

James E. Simmons
Brigadier General, US Army
Commanding

DASAF's CORNER

from the Director of Army Safety

PPE: It Can't Protect You If You Don't Wear It

Today's soldiers are the best-trained, best-equipped, and best–led in our Nation's history. I could not be more honored or more proud to wear this uniform of the United States Army. From having visited soldiers within every Army division during the last few months, I know that feeling of honor and pride is felt by all of our soldiers, whether they are currently at home station, deployed to Afghanistan, or forward deployed for the potential war with Iraq.

The expenditure of millions of dollars in developing and fielding personal protective equipment (PPE) for soldiers is evidence of the Army's commitment to keeping our soldiers as safe as possible. That PPE—Kevlar helmets, flak vests, Nomex gloves, balaclava hoods, seatbelts, hearing and eye protection, Nomex tank and flight suits, etc.—is provided to soldiers for a reason: to reduce the risk of severe injuries.

The Army standard is that, unless you have a waiver, you will wear all required PPE while performing tasks, duties, and operations that may expose you to personal injury hazards. If it's an Army standard to wear PPE, why do we still have soldiers who are injured or killed because they were not wearing it?

In just the last few months, there has been an increase in the number of instances where soldiers have been severely injured or killed while not wearing required PPE during the performance of their duties. We have had soldiers ejected from vehicles when they were not wearing seatbelts. We have had a company commander killed when a piece of shrapnel struck his bare head. Where was his Kevlar? Why was he, *as the leader*, not setting the example and wearing his PPE when there was no valid waiver permitting the unit to operate without it?

Failure to wear required PPE is clearly and simply a matter of indiscipline—knowing the standard and willfully choosing to violate it. Just because the Spalding vest may dig a bit into even the leanest of waistlines or push up into the chin when sitting inside the tank is not justification for not wearing it. Expended shell casings are hot when they're ejected. Yes, gloves may be a little cumbersome, but they are designed to help keep your hands protected.

The Army holds us as commanders accountable for the safety of our troops. The troops will emulate their leaders; therefore, we as leaders must demonstrate what "right looks like" all the time. So it's a command responsibility that leaders at every level not only set the example by wearing required PPE, but also diligently *enforce the standard* of wearing it.

As great warfighters, we have to be confident and aggressive. But at the same time, we cannot allow that confidence to convince us that we are invincible. There is not a single one of us with a big yellow "S" emblazoned on our chest. If the operation we are conducting has a standard for wearing PPE, we owe it to ourselves to wear it so that it can protect us from the hazards it has been designed to mitigate.

If you will not wear the PPE the Army has invested millions in for yourself, wear it for your family. Whether you are conducting routine training or on the battlefield, they want you back—unharmed. In that critical moment, the finest, most technologically advanced PPE that money can buy will not protect you if it is not on your body and being worn as it was designed to be worn.

Train hard, be safe!

BG James E. Simmons

NVG
DESERT OPERATIONS
LESSONS LEARNED—13 YEARS IN THE MAKING

Army Aviation units deploying to Southwest Asia for possible combat against Iraq have a significant advantage over units that saw action during Operations Desert Shield and Desert Storm. Over the last 13 years, units have rotated through Kuwait on numerous training exercises and that experience has been invaluable for those units that now find themselves poised for combat against Iraq.

Pilots who flew missions during Desert Shield/Storm and had trained in the deserts of Arizona and the National Training Center may have noted some similarities in the dry lake beds and scrub terrain; but the shifting sand dunes of the deserts of Southwest Asia presented totally new hazards to helicopter crews, particularly during night vision goggle (NVG) operations. The combination of visual illusions, featureless terrain, and extreme temperatures creates unforgiving situations for NVG crews not trained in this environment.

Today's pilots benefit from those lessons learned and have had 13 years to improve and hone those skills; however it is important that we take a moment to reiterate those lessons learned since Desert Storm.

Illumination

Illumination is one of the most important factors in NVG mission planning. Pilots should use forecast moon position in NVG planning to ensure crews do not fly directly into a rising or setting moon. The angle of the moon has a positive, as well as a negative, effect on how things appear on the ground when viewed through NVGs. The moon at low angles (less than 30 degrees) may distort the shape of terrain features, making them hard to correlate with a map; while higher angles (70 to 90 degrees) and high illumination levels (80 percent) can cause washout of terrain detail with a corresponding decrease of visual cues. The optimum moon conditions for NVG operations in the desert may be 40 to 80 percent illumination and a 40 to 80 degree angle above the horizon.

Sand dunes

Of the three types of desert terrain, the one found to be most hazardous to helicopter NVG operations are the sand dunes. The crews found that in some modes of flight over sand dunes, the aircrew training manual (ATM) authorized airspeeds that were too fast.

■ **Nap of the earth (NOE)**. The authorized airspeed for NOE flight is 40 knots, but an aircraft flying in zero illumination at 25 feet in sand dunes should fly just ahead of effective transitional lift (ETL). In fact, NOE flight at 40 knots in the dunes is not recommended even at the highest illumination levels. The watchword is when low, go slow. Just keep in mind that at airspeeds below ETL, you may encounter rotor induced blowing sand.

This might bring up a question of whether NOE flight should be conducted at all in the dunes. The answer is yes. By flying low, aviators will be able to see visual cues (such as camel or vehicle tracks) that are not visible at higher altitudes.

Flying in a straight line NOE over dunes is extremely hazardous. Aircrews should follow low ground between the dunes—using scrub, contrast, and texture for cues—instead of trying to go over the tops of the dunes.

■ **Contour**. Flying contour in the dunes is not recommended. It is difficult to judge dune height and adequately assess obstacle clearance.

■ **Low level**. Ground references may be

MISSION PLANNING CHART for FLYING IN SAND DUNES. Numbers include no safety margins; altitude and airspeed must be adjusted for less than optimum conditions.

lost when flying low level (at 80 feet above highest obstacle {AHO}). For this reason, it is imperative that all obstacles in the area of operation or route of flight be identified. However, local maps of the region often lack detail and hazards may not be marked. That means aviators may have to conduct a day reconnaissance if at all possible.

Hazard maps should also identify terrain transition areas. Watching for changes in contrast, texture, and other visual cues can help to identify terrain transitions.

Another important point that must be kept in mind is that hazards in the desert are constantly changing. The sand dune that was located and marked one day may be in an entirely different place and a different height a few days later.

Because ground references may be lost when flying low level, the pilot on the flight controls may be required to refer to basic flight instruments (a situation similar to flying IFR). It is extremely important that during pre-briefing before every flight, all crewmembers are told what their specific duties and responsibilities are, where they're supposed to be scanning, and what they're supposed to be looking for. This is true regardless of the mode of flight. Again, crew coordination and scanning are critical for safe flight.

The TC 1-210, *Commander's Guide*, states that low-level aircrews may fly at whatever airspeed operational requirements dictate and aircraft limitations allow.

The chart above shows the demonstrated relationship between moon illumination and altitude as they pertain to optimum condition max airspeed. For example, an aircraft flying low level at 100 feet AHO in the dunes with 70 percent illumination can safely be flown at 110 knots. This is, of course, provided that detailed mission planning and route selection take place where the highest obstacle is known and visibility is unrestricted. It also allows for no safety margin. As in any operation, the risks of flying at higher airspeeds have to be weighed against the risks of not getting to the objective as fast, as well as vulnerability, fuel consumption, etc.

Approach to visibility altitude is recommended when descending from low level or greater altitudes. Aviators flying in the Kuwaiti desert have found the safest technique is to step down to an altitude where ground reference can be regained (approximately 80 feet, depending on terrain and illumination). Recommend an approach airspeed of 40 to 50 knots be maintained until the visibility altitude is reached. After reaching that altitude, continue the approach or transition to another mode of flight; e.g., contour or NOE. In other words, use a stepped-down approach.

Visual illusions

It is critical that pilots be familiar with visual illusions that may affect safe NVG flight. All of the visual illusions listed in chapter 1 of TC 1-204 can occur in the desert environment. The illusions shown in the sidebar to this article (page 8) are the ones most frequently encountered in desert conditions.

Although these illusions can, and do, occur over all types of desert terrain, they occur frequently at all altitudes in the dunes. It is vital that aviators are aware of such illusions and that they crosscheck each other during flight to be sure illusions are not being experienced. Crewmembers can also assist each other by calling out altitude, airspeed, and attitude.

Equipment

The kind of equipment available and the crewmembers' understanding of its capabilities and limitations can greatly affect the safety of desert operations.

■ **Navigation**. The most accurate navigation tool available is the global positioning system (GPS). However, aviation-related intelligence must be actively pursued; i.e., to document wires, towers, and terrain relief and pass it along to flight operations to post on centrally located hazards map.

■ **IR landing/search light**. This light is most effective at near-zero illumination levels; it can cause terrain washout at illumination levels of 30 percent and above. Use of the light tends to limit pilots' scan to within the area of beam spread. Pilots need to be aware of this tendency and consciously expand their scan to either side of the light beam. The light may cause brownout when used below ETL because of the reflection from dust in rotor wash. In dusty terrain, the light should be switched off before approach or takeoff to avoid brownout. A risk that must be kept in mind during combat operations is that this is a light- and heat-emitting active source that persists after the light is extinguished, providing a target for enemy sensors.

■ **Radar altimeter**. The radar altimeter is the most critical flight instrument during contour flight, approaches, and OGE maneuvers. Pilots have been known to misjudge altitude by plus or minus 70 feet when not using a radar altimeter, and it should be required for all flights below 150 feel AGL. Aircrews should remember that the radar altimeter only gives altitude directly beneath the aircraft; it provides no direct measure of terrain ahead.

■ **Night vision goggles**. With the harsh environment that the desert imposes, it is inherent that aviators take extra precaution to properly maintain their goggles. The lenses must be kept clean and the goggles stored in the zipped storage cases when not in use. Also after removing the goggles, the storage cases should be kept zipped to keep out the sand and dust.

Crew coordination and scanning

One of the most critical aspects of safe desert NVG terrain flight is effective crew coordination and scanning. The Southwest Asia Leaders' Safety Guide, published by the U.S. Army Safety Center, provides examples of how effective crew communication and proper sequence or timing of crew actions are addressed during mission planning; how crew responsibilities are assigned, discussed, and possibly rehearsed during the pre-mission brief; and amending responsibilities as necessary during the mission. Procedures for positive communication, directing and offering assistance, announcing decisions, and action sequence and timing are provided along with examples of each element in the procedures.

Crewmember scanning responsibilities for the pilot on the controls, the pilot not on the controls, and non-rated crewmembers are condensed into a table covering the three modes of flight: NOE, contour, and low level.

Crew selection

Keeping the same crews together becomes increasingly important in harsh environments like the deserts of Southwest Asia. Coordination is much easier for crews who have learned to work together than for those who must constantly integrate and train new crewmembers. While keeping the same crew together may present some difficulties for aviation units, it pays off with more effective crews and improved safety.

Risk management

Risk management is the process of identifying and controlling hazards to conserve combat power and resources. Leaders at every level have the responsibility to identify hazards, to take measures to reduce or eliminate hazards, and then to accept risk only to the point that the benefits outweigh the potential costs. The three basic principles that provide a framework for implementing the risk management process are:

- Integrating risk management into mission planning, preparation, and execution.
- Making risk decisions at the appropriate level in the chain of command. The commander is responsible for the mission and gives guidance on how much risk he is willing to accept and delegate.
- Accepting no unnecessary risk. Risk-taking requires a decision-making process that balances mission benefits with costs.

The Southwest Asia Leaders' Safety Guide provides steps to be used in the risk management process and an overall comparative risk analysis of the most critical NVG mission considerations in the Southwest Asian environment. Also included are METT-T considerations specific to night/NVG desert operations.

Conclusions

The dust of Desert Storm has long settled and since that time, we have reaped the benefits of experience gained in the desert environments of Southwest Asia. Aviators whose training is based on those lessons learned from previous crews flying under extremely treacherous conditions will be better-trained pilots...and better-trained pilots are safer pilots. ●

--CW5 Dennis J. McIntire, Chief, NVD Branch, Fort Rucker, AL, DSN 558-9515 (334-255-9515), mcintire@rucker.army.mil

Visual illusions

- **False horizon or lack of horizon**. Light-colored areas of sand surrounding a dark area; for example, sand dunes bordering a dry lake bed blending with the night sky can create a false horizon. Sand, dust, haze, or fog may also obscure the horizon.
- **Height perception illusion**. This sensation of being higher or lower than you actually are is due to poor contrast and lack of visual references. It may result in a tendency to inadvertently descend to acquire visual cues.
- **Ground light misinterpretation**. This illusion can occur when ground lights are confused with stars or other aircraft. An aviator who confuses ground lights with stars will unknowingly position the aircraft in unusual attitudes to keep what he perceives as stars above the aircraft. When ground lights are confused with other aircraft, aviators adjust attitude incorrectly based on relative position of misinterpreted ground light.
- **Fixation**. When an aviator fixes attention on high-interest targets/objects and stops scanning, the result may be an aircraft flown into the ground.
- **Crater illusion**. Viewing the periphery of the IR searchlight gives the illusion that flat terrain, such as that found in a dry lake bed, slopes upward. Viewing another aircraft landing using these lights can give the illusion that the observed aircraft is descending into a crater when it is actually in straight and level flight over flat terrain. (This illusion is not covered in TC 1-204.)
- **Lack of motion perception (motion parallax)**. At low level flight altitudes at relatively slow airspeeds, the lack of discernible terrain features may make the pilot think his aircraft is at near-zero groundspeed when it is actually moving forward.

Taking Back the Night

Imagine for a moment that you are the PC of the UH-60 Black Hawk in the following vignette—

The objective, a pocket of al-Qaida near the border of Pakistan, is less than 8 kilometers ahead. The mission is to insert troops near the objective via our flight of five Black Hawks. We're inbound on chalk three and should be landing in a few moments.

At near zero illumination, it couldn't be better for masking our flight; but it also couldn't be worse for getting the 'pucker-factor' way up. The landing zone (LZ) is supposed to be a craggy, dusty bit of low ground just below a ridgeline and out of sight of the objective. All of our aircrews are wearing Type 1 and Type 2 Aviator Night Vision Imaging Systems (ANVIS). Except for the artillery flashes in the distance lighting up my night vision goggles (NVGs), all I see are the ghostly silhouettes and exhaust plumes of the two aircraft ahead of mine. There's plenty of 'video noise' in my NVGs, much like you see on a television that's lost its signal. That makes it very difficult to pick out ground references, but we've all become used to that problem on dark nights like this.

It's time. We've begun our approach to the LZ. We're in a staggered-right formation with our flight stacked down so that our trail aircraft will touch down first. That will lessen the chance that the lead aircraft will brownout the LZ and make it impossible for others to land behind him.

Chalk four has just announced a go-around due to brownout! This could be ugly. He should be passing high and to my right, but I'm way too busy to watch out for him. I'm concentrating on my approach. My crewchief is calling the dust cloud. 'Dust cloud at the tail! MY door! YOUR DOOR!' I feel our tailwheel hit the ground just as we're totally engulfed in a vicious dust cloud.

My main wheels hit the ground hard. I stand on the brakes and we grind to a halt. At that instant, I see a flash of light from my right front that shuts down my goggles for a moment. It seems like chaos as our troops exit left and right and fall to the ground with their weapons extended in front of them. As the dust cloud begins to dissipate I see the underbelly of chalk two to my right. There's a flicker of fire from one of their engines. It looks like they've rolled over in a crevasse. I sure hope they're okay."

The episode you've just read is fiction, but adrenaline-pumping moments like these are familiar to anyone flying these types of missions. Requiring split-second decisions, formation dust landings under NVGs are some of the most hazardous missions our aircrews perform. It's critical that airspeeds and approach angles are closely monitored and that crew coordination is well exercised. Get slow too early and you'll quickly brownout and lose contact with most, if not all, of your references. Land with too much forward speed and you risk colliding with unseen obstacles or other aircraft.

Interestingly enough, about 50 percent of our aircrews perform this tremendously difficult task with the oldest ANVIS in our inventory, the Types 1 and 2. (Type categories of ANVIS are fully defined in the latest ASAM, GEN-02-ASAM-02, available at **www-rucker.army.mil/ATB/NVD/NVDB.html**.)

Type 1 ANVIS are equipped with 15mm eyepieces and a single Interpupillary Distance Pivot and Adjustment Shelf (IPD PAS), or have incorporated either improved 25mm eyepieces or dual IPD PAS. Type 2 ANVIS incorporate both improvements in the 25mm eyepieces and a dual IPD PAS to give the wearer the ability to fully adjust the NVGs for the optimum field of view.

All Type 1 and 2 ANVIS use the earliest intensifier tubes, providing just 20/40 vision during high-light conditions while providing only 20/120 vision during low-light conditions. While this equipment is still "good" and heads above the earlier ground NVGs flown in the late 1970s and early 80s, it's far from the best equipment produced.

Type 3 ANVIS, used by about 20 percent of our aircrews, are essentially Type 2 ANVIS with improved intensifier tubes. They give the wearer 20/33 and 20/105 vision during high- and low-light conditions, respectively. Type 1 through 3 ANVIS fall under the classification of AN/AVS-6(V)1 and have a typical "halo," a bright haze around light sources, of about 1.5 mm or larger.

Type 4 ANVIS fall under the nomenclature of AN/AVS-6(V)1A or are an earlier AN/AVS-6(V)1 that has been upgraded with the "(V)1A" intensifier tubes. The 160th Special Operations Aviation Regiment (SOAR) and other select aviation units have been using the Type 4 ANVIS for years.

Type 4 ANVIS are nearly twice as good as Type 1 and 2 ANVIS with high- and low-light visual acuities of 20/28 and 20/70, respectively. First delivered in the mid 90s, more emphasis was put on halo reduction in the Type 4s, which resulted in halos of no greater than 1.25 mm in the central viewing area. In addition, these NVGs use more of an amber colored phosphor screen instead of the dark green phosphor screens that so many of us are used to.

The Type 5, the newest member of the ANVIS family, uses the nomenclature of AN/AVS-6(V)3. The Type 5 has already been fielded to the 160th SOAR and some other high-priority units with additional fieldings ongoing. I won't go into detail, but suffice it to say that the technological improvements in Type 5 ANVIS are markedly above that of Type 4 ANVIS. Units fielded with Type 5 ANVIS have improved Military Operations in Urban Terrain (MOUT) capabilities. This is primarily due to the Type 5's ability to maintain crisp, clear images during overly high ambient light that would otherwise shut down other NVGs or provide only washed-out images.

As the Type 5 ANVIS are being fielded, more of our aviators are benefitting from a cascade plan that sends Type 4 ANVIS to the next-highest-priority units. As that plan progresses, more and more aviators will see tremendous gains in their ability to function at night. They'll enjoy higher resolutions, less halo and less video noise during low-light conditions. The cascade plan will continue until all the newer ANVIS are fielded and the older Type 1 and 2 ANVIS are purged from the inventory.

Not resting on our laurels, we are committed to equipping our aviators with the best that industry has to offer so that our aviators can better perform their difficult missions. As I write this, the Type 6 ANVIS is just around the corner with unheard of specifications.

Another bright spot in the area of Night Vision Device (NVD) advancements is with the improvements to the AN/AVS-7, Heads-Up-Display (HUD) and the fielding of the Advanced AN/AVS-7 Heads-Up-Display (AHUD). AHUD incorporates an upgraded computer processor that gives aviators "real-time" information as to their flight profiles. The fielding of AHUD was completed during the third quarter of FY 2001, and is installed in all CH-47 aircraft and approximately half of the UH-60 fleet. The remainder of the UH-60 fleet received a software upgrade to its basic HUD that dramatically improved its speed (there is a plan in place to equip all UH-60s with an AHUD or better system in the near future).

Commanders need to take advantage of the advances in HUD. Incorporating more of HUD in their unit ATP and having their crews use HUD during missions will enhance performance and reduce risk.

Consider again our fictional but realistic troop-insertion mission. Perhaps our crews could have benefited from the use of Type 4 or better ANVIS and/or HUD. Though not the only considerations for a dust approach, better references for gauging aircraft speeds, angles of approach, and rates of descent could certainly aid in successfully landing an aircraft before brownout conditions become too hazardous. Perhaps the crew of chalk two might have been able to adjust their flight profile to avoid that disastrous crevasse if they had a clearer view of their landing point.

Although we are always attempting to mitigate risks associated with "taking care of business," our missions are routinely fraught with danger. NVG flights are intrinsically riskier than other modes of flight, but it's good to know that we are delivering better NVD equipment to our aircrews to more safely take the fight wherever it calls us.

That's what I call taking back the night! •

—MG John M. Curran is the commander of the U.S. Army Aviation Center and Chief of the Aviation Branch. Reprinted with the permission of Army Aviation Magazine" June 2002. This article has since been updated by the NVD Branch at Fort Rucker, AL.

The Black Hole of Night: SHIPBOARD OPERATIONS

Most aviators realize the risk inherent with flying helicopters, especially at night. All commanders must fully understand the awesome responsibility of complete risk mitigation in regards to helicopter operations. Joint operations present new challenges to all members involved. The Army continues to answer these challenges in the current high-optempo, widely diverse mission environments.

One of the missions that the Army finds itself thrust into more often these days is operating helicopters aboard Navy ships. In reality, the Army has been conducting shipboard operations for decades and several Army units around the world are currently executing this joint mission. All things being ideal, well planned, and prepared, just flying to a ship is a relatively simple task. Of course elements such as the size of the ship, the size of your aircraft, the sea state, weather, wind, night flight over water, and countless other variables combined to complicate the process and make the challenge a quite formidable one.

Deck Landing Qualifications (DLQs) aboard ships require that a series of aviation training issues be addressed (see DLQ MOU dated Jan'02, Army FM 1-564 and Shipboard Operations and Joint Pub 3-04.1—*Joint Tactics, Techniques, and Procedures for Shipboard Helicopter Operations*). For the most part, these issues are addressed in Naval standards, since the Navy and Marines operate to, around, and from ships daily. Navy and Marine Corps pilots are taught from "Day One" in flight school to treat all nighttime departures from the deck of a ship as an instrument take-off and that nighttime ship traffic patterns are to be treated as "instrument patterns."

The Army should not hesitate to benefit from the Navy/Marine Corps experience with shipboard helicopter operations, since a great deal of knowledge has been documented and recorded over the years. Navy standards for shipboard helicopter operations exist for good reason, and it only makes sense for the Army to utilize that invaluable information. The Navy has considerable insight into shipboard operations from which the Army can benefit.

The modern Army fights at night, flies at night, and as such, trains at night. Aided and unaided flight at night is normal ops for the Army. However, the nighttime maritime environment poses special challenges for helicopter crews. Army commanders must evaluate risk and risk mitigation in detail for night flight aboard ship. This risk assessment becomes extremely critical during periods of low illumination and/or periods of reduced visibility. Aboard ship, there may also be a requirement for a visible horizon in three or more quadrants, in addition to weather, wind over the deck flight envelopes, and ceiling and visibility requirements.

Most Army aviators believe that in their heart of hearts, they know the darkness of night better than anyone else does. If they have flown off the deck of a ship at night, they certainly have experienced unusual sensations, as evidenced by the following recent quotes from some seasoned Army aviators:

- "It was like flying through the white letter eight into the inside of the black eight ball." (CW-5 IP/SIP)
- "It was like flying inside of a snake." (CW-4 IP)
- "When we left the ship, I couldn't tell where the sky ended and the water started. I thought I knew darkness, but never, never anything like this." (Captain (O-3))

The seas often produce a "wet haze" just above sea level and as often as not sea fog forms in conjunction with this haze, compounding the already extremely limited visibility prevalent in the night overwater environment. Even with visibility, limited or otherwise, a visible horizon is oftentimes nonexistent in the night overwater environment.

When ships are close to shore and visible lights from the shore fill up part of a quadrant, there may be some visibility and orientation enhancement. However, ships do not normally operate close to the shore and most of the time ships operate "over the horizon" and well away from visible shorelines.

Another potential danger involving overwater flight and artificial lighting involves the "Black Hole Effect." This effect occurs when the aircraft flies from an environment rich in visual cues immediately into a cue-poor environment. The sudden loss of primary visual cues may have devastating effects on maintaining situational awareness and aircraft control. Two situations that are very conducive to this effect include:

- The first opportunity for experiencing this effect is immediately after crossing the coastline going out to sea or going "feet wet" from a highly textured, artificially lit, overland environment. The effect is exacerbated by a flight path that goes from overland with ample visual cues to overwater with low visibility, low illumination, and little or no visual cues.
- The second case occurs immediately upon departure from a lighted flight deck and into an overwater environment with reduced visibility and loss of visual cues.

Aviators must familiarize themselves with all the visual and sensory illusions associated with night flight, and particularly night flight over water. Overland, artificial light

often enhances the total available illumination, a phenomenon that rarely occurs when flying overwater.

During night overwater flight, artificial light is usually associated with the coastline, but a lighted coastline can actually cause negative effects on night situational awareness because it offers a “false horizon” that may actually disorient the aircrew. Even within visual meteorological conditions (VMC), the natural horizon is seldom discernable at night overwater, due to the “sea haze.” This may lead to the “ping pong ball effect” in which everything looks the same and “up” cannot be distinguished from “down” by outside visual reference alone, and the aircraft attitude cannot be safely maintained without the use of aircraft instruments.

Adding to this effect are greatly reduced surface texture and a lack of normal terrestrial visual frames of reference. During reduced visibility flying overland, pilots use a variety of night vision techniques to fly “outside the aircraft.” They use visual cues closer in their field of view to judge relative distance and closure rates in horizontal and vertical planes. However, when visibility is reduced at sea, the surface of the water does not present these visual cues. When flying VFR with reduced visibility, the pilot must descend toward the surface to bring out usable cues and maintain situational awareness. While flying overwater, in calm seas, more than one pilot has flown into the water searching for visual texture cues to judge rate of descent. The more placid the water, the less texture available and the less visual cues that may be gained from the surface.

Another illusion associated with calm water is caused by the reflection of the sky off the surface of the water. Aircrews have mistaken the reflection of the sky for the actual sky on numerous occasions, sometimes with deadly consequences. Visual cues from natural and manmade surface objects provide known frames of reference overland. These cues allow pilots to estimate distance and perceive depth in their field of view.

When flying with reduced range of view, due to visibility, or low cloud cover, these frames of reference help pilots maintain attitude and altitude. Similar frames of reference are seldom available at sea to assist pilots in maintaining situational awareness. Army FM 3.04.301 (the old 1-301) titled “Aeromedical Training for Flight Personnel” provides excellent examples of night flight techniques, but unfortunately the main emphasis of the text is on overland topics.

The use of flight simulators is highly recommended, not only to improve identification and perception of visual cues, but also to reinforce instrument flight training proficiency. Aviators that fly aircraft not “fully” equipped for instrumented meteorological flight; e.g., AH-64 and OH-58 series aircraft, must be prepared and be extremely proficient at transitioning to instrument flight during night shipboard takeoffs.

Most traffic patterns for ships are flown at 300 feet above the water. Some Army units prefer to “fly on the waves” at 50 feet above the water in order to maintain visual reference to the water and/or for tactical reasons. The Navy is very uncomfortable with this practice for many reasons. Real-world tactical situations may require overwater flights at very low altitudes; however in the training environment, this allows very little reaction times for aircraft emergencies.

To meet the challenge posed by shipboard helicopter operations, Army aviators must start their planning well in advance of embarkation. Commanders must evaluate the risks associated with shipboard helicopter operations, especially at night, and consider the following:

■ Not all ships are night vision device (NVD) compatible. (See Shipboard Aviation Facilities Resume as published January each year, Naval Air Warfare Center, Aircraft Division, Lakehurst, N.J., 08733-500. Hot Line Action Desk: DSN 634-2592 Commercial (732) 323-2592)

■ Not all ship's company personnel are NVD trained.

■ Individual ships may not have adequate quantities of NVDs on hand and it may be necessary for the embarked unit to provide NVD gear to ships from which they are operating.

■ Not all ship's company personnel are familiar with Army aircraft.

■ Not all ship's company personnel are familiar with Army night helo operations.

■ The landing zone (the deck) is moving across the surface of the sea with variations in vertical and horizontal planes.

■ The landing zone (the deck) rolls and pitches with the movement of the sea.

■ Depth perception and visual cues are less defined.

■ Not all ships have weather forecasting/ monitoring capabilities.

■ Electromagnetic vulnerability may limit a ship's capability to provide air traffic control information to aircraft.

■ Space aboard ship's decks is often extremely limited. Rotor blade clearance from obstacles and other aircraft may be as little as 15 feet, and on some air capable ships clearance can be even less than 15 feet.

Night flight, aided or unaided, from the deck of a ship (and hence overwater) is an unforgiving and perilous mission with little or no room for error. Proper planning and coordination will aid in minimizing risk, maximizing safety, and ensuring successful mission accomplishment. Factors to consider include the following:

■ During Shipboard Operations Ground School and DLQ School, the inherent challenges associated with flying to and from ships at night should be stressed.

■ Use simulators to practice transitioning from visual meteorological conditions to instrument flight conditions.

■ Review visual illusions for night aided and unaided flight.

■ Maintain positive control of the aircraft at all times, in flight as well as on the deck.

■ Practice precision night vision device takeoffs and landings.

■ Re-enforce constant crew coordination.

■ Establish a rapport with ship's company personnel early on in the planning and, if instructions are not clear, ask questions. NEVER ASSUME ANYTHING!

■ Learn as much as you possibly can about the ship's capabilities and the capabilities of the crew.

The Army must realize that at all times the Captain (CO) of the ship must protect the ship from all hazards. Ships must maneuver to gain favorable winds during launch and recovery, while at the same time maintain a combat posture to protect the ship. Returning to the ship at night, following missions ashore or over the horizon presents a completely separate challenge. When a ship is utilized as a Forward Support Base for joint contingent operations, tactical requirements will dictate the time to strike. The illumination and visual quadrants requirements may or may not be met when the tactical situation dictates launching the assault. Flying from the deck of a ship at night, under all conditions, may be the challenge of a lifetime. Being prepared for the worst case scenario will go a long way toward contributing to mission success. ●

—Michael J. Vandeveer, CW4 Ret., JSHIP–Procedures & Training Area Manager, DSN 342-4936, ext. 211 (301-342-4974 ext. 211), VandeveerMJ@navair.navy.mil.

CW4 Vandeveer retired from the Army in 1988. He has had two tours of combat in Viet Nam, holds a Masters Degree from Murray State, Murray, KY, in Occupational Safety and Health, and works for the Office Sec of Def, Joint Test & Evaluation at Patuxent River Naval Test Center, Maryland.

HOT STUFF for Aviators

With summer fast approaching and many of our forces already deployed to warmer climates, it's a good time to talk about heat: how it can adversely affect our performance, and indeed cause us bodily harm. And while we obviously need to be diligent in protecting our troops abroad, it is imperative that we not be lackadaisical about the threat to those "left behind." There is a significant potential for heat injury throughout the United States, especially in the late spring and summer.

Understand the threat

In a culture accustomed to climatically controlled quarters and workplaces, many of us have become cavalier about the adverse affects of heat. We remember "sucking it up" at two-a-day football practices in high school and enduring conditioning drills in basic training and pre-commissioning programs, but that was "back in the day" when we were. . .well, you know what we were!

Many of us now train only enough to pass our semi-annual APFT, while those not subject to an APFT may only be "training" enough to pass the next flight physical. We leave our air-conditioned homes and drive in air-conditioned cars to air-conditioned offices. Some of us even fly in air-conditioned platforms (although we realize the air-conditioning is there for the on-board automation equipment, not for our comfort!). The point is that heat exposure and injury is often insidious in onset, and unless we actively seek to mitigate its effects, it can adversely affect the mission. Even professional athletes are not immune; recent avoidable deaths due to heat injury in major league baseball and the National Football League (NFL) drive this point home.

Acclimatization

Implied in the previous paragraph is an individual responsibility to maintain a degree of fitness commensurate with our job requirements. This necessitates an appropriate level of heat acclimatization when working in a hot environment. You do not get acclimated by exiting an air-conditioned cocoon and entering another as soon as practicable. You get heat-acclimated by being exposed to heat and working in it.

Heat acclimation can be achieved through individual or collective physical training, but it must be a deliberate decision on the part of leaders. Time must be provided to become adequately exposed. Physical training (PT) at noon—in the hottest part of the day—is an excellent method, but it is essential that one uses the "crawl, walk, run" method. You WILL have heat casualties if you take a group of non-acclimatized soldiers and have them do a 12-mile forced march at Fort Rucker, AL, at noon in the summer.

Remember the cynical wisdom of Noel Coward: “Mad dogs and Englishmen go out in the midday sun!” Cultural pride and intuition aside, there will be times when working in the heat of the day is unavoidable, so we must be prepared and acclimated to do so. Start slowly and build up your heat exposure over a week or so. Make your deliberate exposure in the heat of the day, but plan your harder physical labor in the cooler parts of the day, even after you are acclimated.

Commanders must be present to ensure that soldiers are adequately hydrated and that training is geared toward the less-fit, not the most-fit, members of the unit. Most units will be able to acclimatize within 3-8 days and the physiological benefits are dramatic. As they become accustomed to the heat, soldiers will sweat more, which will cool them off more rapidly, but this will also increase their need for fluids. The body conserves sodium more efficiently when acclimated, so salt losses in sweat will decrease. The soldiers are able to do more because their body core temperature decreases, lessening the likelihood that they may become a heat casualty. After the acclimation process (3-8 days), resume PT at normal hours in the morning or late afternoon.

A decreased total body water of only 2 percent has been shown to adversely affect mental function, and these adverse effects get worse with increased dehydration. We have all seen or heard of heat casualties falling out of runs and forced marches, but did we ever think we were losing IQ points as we dried ourselves out? Add to the dehydration the separate and measurable adverse effects of heat, and it is synergy working against you! Let's not degrade that Pentium 4 that resides in your electric hat! It's hard enough to do what we do with all of our neurons firing.

Drink enough water

Adequate hydration cannot be overemphasized. We all know we are supposed to drink more water when we are in a hot environment, but the vast majority of us do not drink enough water even during our “normal” day. Those of us who drink a lot of fluids often drink coffee, tea, or sodas. Caffeine is a diuretic, which means you lose more water than you consume.

Consider the “seasoned” aviator who finds himself going to the latrine every 60-90 minutes. You’ve seen these guys in meetings. After 60 minutes, they are “dancing” in their chairs and get up suddenly and leave in a hurry. It’s not because they have to solve some important world crisis, it’s because they have to go!

Benign prostatic hypertrophy is not so benign when you are getting up once or twice at night, or going to the latrine every 60-90 minutes. You know who you are! You have a prostate the size of a bagel and you seem to always have to go. So what do you do? You cut down on fluids before a flight, right? Unlike the United Nations, you have developed an exit strategy. What I mean is that you are thinking ahead: “If I hydrate like Doc says, when am I going to offload? I can’t just “water the tail boom” like I used to when I was a WO1/2LT.”

Leaders need to think about this. If the flight line is a quarter-mile from the hangar, your people will not drink enough water. Let’s backward plan here for a bit. Show time is 0600. Preflight planning, weather brief, mission brief, hit the head, preflight aircraft, hit the head again, crank, break, get maintenance, crank, hit check, hold, maybe get some hot gas, and finally take-off at 1100 for a flight that was supposed to be back at 1030. Now you return in the heat of the day, at 1300, and the last thing you drank was coffee at 0700. Think you are hydrated? You know the answer. But what’s the big deal?

Decreased performance

It's all about performance. Pilots, like surgeons and goalkeepers, have to execute just about flawlessly, or somebody loses. Most of us can't afford a significant performance decrement. I realize the average aviator thinks he is 50 percent better than he needs to be, but the reality is we work in an environment that is terribly unforgiving of any carelessness or neglect. A decreased total body water of only 2 percent has been shown to adversely affect mental function, and these adverse effects get worse with increased dehydration. We have all seen or heard of heat casualties falling out of runs and forced marches, but did we ever think we were losing IQ points as we dried ourselves out? Add to the dehydration the separate and measurable adverse effects of heat, and it is synergy working against you! Let's not degrade that Pentium 4 that resides in your electric hat! It's hard enough to do what we do with all of our neurons firing.

Summary

It is important to plan ahead when your soldiers are facing a situation where heat exposure can pose a problem. In summer months, this is just about anywhere. Develop an acclimatization program prior to deployment and educate your soldiers on the risks of heat exposure. Take actions to reduce those risks by modifying training and work/rest cycles in hot weather, supervising your soldiers' training, and making sure they drink enough water. Ensure there are convenient latrine facilities available, especially when the flight line is distant from fixed facilities. Modify the training if you have a heat injury, and consider the effects of MOPP and other protective gear. Remember that caffeine is a diuretic so sodas, coffee, and tea are working against you. Take care of your body; where else are you going to live? ●

—LTC Joseph F. McKeon, USASC Command Surgeon, DSN 558-2763 (334-255-2763), joseph.mckeon@safetycenter.army.mil

Some Helpful Resources for You!

COL REGINA CURTIS
Office of the Surgeon General

The article by Dr. McKeon on heat injury prevention in this issue of *Flightfax* is part of the U.S. Army Medical Command's Heat Injury Prevention Program (HIPP). Each year soldiers die from heat injuries and those deaths are often preventable. However, they are only "preventable" if you know how to prevent them, put that knowledge into practice, and keep a watchful eye on your fellow soldiers.

Here are some places where you can get helpful information:

- U.S. Army Center for Health Promotion and Preventative Medicine (CHPPM). Go on their Web site on heat injury prevention at: **http://chppm-www.apgea.army.mil/heat**.
- The instructional video, *Heat Injury Risk Management,* was developed at Fort Benning, Ga., one of the Army's warmest and most humid training places. To get a copy, go to **http://safety.army.mil**, click on MEDIA, then on DOD AUDIOVISUAL LIBRARY. Type the video's title in the search bar and order either the video or DVD.
- Want to talk to someone for help? Feel free to contact me at (703) 681-3017, or by e-mail at: Regina.Curtis@otsg.amedd.army.mil.

WAR *Stories*

Risk management lessons learned

A Dark and Stormy Night

We had been in theatre for almost a month. It seemed like summer came early to Bosnia, with high temperatures and hardly any snow by the end of March. But, today was different. We had already logged more than six hours of flying before leaving Split, Croatia and returning in the rain to Banja Luka (BL) with the Commander of Multi-National Division—Southwest (MND SW). It was dusk and the weather was deteriorating, but dodging low cloud and showers, we made it to BL near the end of our crew day.

Bosnia poses a number of difficulties for us as aviators, ranging from minimal safe landing areas to minimal weather reporting or forecasting. The Balkans region is very mountainous and the weather can change drastically from one valley to the next; it's as if each valley has its own separate weather system.

The thought had occurred to us to stay overnight in BL, but a quick estimate of the time required to reach our base in Velika Kladusa (VK) had us getting home inside our eight hours flying limit. A weather call to VK confirmed the conditions there were still good.

We strapped on our night vision goggles (NVGs) after refueling and decided to go for it. Despite en route showers and the occasional thunderstorm cloud that we were able to avoid, we almost reached our destination uneventfully. We were just seven miles out from VK when we noticed something odd. The usual scattering of lights on the hills all around were no longer on our left side and they were disappearing ahead of us as well! The cloud deck was lowering until it was engulfing the hills to our left and up ahead.

The rain was heavy now and we made a quick circuit to assess our options. We realized that the route we followed to get here was closing off behind us and a return trip to BL would be a risky venture. We followed the only open valley in sight, heading north and perpendicular to our intended track. I was starting to breathe heavily now and I could read the headlines back home already, "PRESSING PILOT PILES IN." I felt stupid, knowing I had been safe and sound in BL just forty minutes ago.

Our crew day was nearing its end and we weren't at our best any more. Now we faced the most hazardous situation we had seen that day, that week, and thus far, that tour! In America, we could have simply landed in a field to wait out the weather. But, that was only a last and desperate option in mine-strewn Bosnia.

I must have been through the third iteration of my "Please, God, help me out of this mess" prayer when I saw the opening. I noticed a gap between the hills on our left and I could see the light of the valley beyond clearly. A way past the cloud! We took it, hoping like crazy that our map was accurate and that there weren't any wires strung across the gap as we flew through it.

The rain continued unabated, but beyond the gap, the ceiling was higher and we could breathe easier. We could already see VK ahead of us, glowing like a lighthouse in the fog, less than five miles away.

My arms and legs were rubbery, and the FE's NVGs were literally washed out by the downpour as we made our descent. It took three passes before we landed safely in the helicopter-landing site and we could start breathing normally again.

It doesn't take long for complacency to set in, and sometimes, our "can do" attitude gets in the way of good judgment. It took all the experience and skill we had as a crew to get us safely on the ground. A little more experience and we would have known to call it a day in BL. We all strive to be professionals and we all want to get the job done. We take pride in our ability to do so, especially in trying circumstances or with minimized resources. But, pride, on occasion, gets in the way of sound judgment. •

—Courtesy of Flight Comment, no. 2, 2002

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

A Model

■ **Class C:** Post-flight inspection of aircraft revealed tail rotor damage from a suspected tree strike. Aircraft had been on a support mission at the time of the accident. No personnel were injured in the accident.

D Model

■ **Class B:** While in phase maintenance, aircraft's mast-mounted sight dropped approximately 12 feet during hoist operations. No personnel were injured in the accident.

■ **Class C:** After refueling during aerial gunnery training, aircraft picked up to a hover on one engine and overtorqued to more than 130 percent, damaging the transmission. The aircraft was trucked back to post. No personnel were injured in the accident.

MH-60

L Model

■ **Class A:** After completing a night gunnery engagement, the aircraft continued to descend and impacted the ground, fatally injuring all four crewmembers and destroying the aircraft. Investigation is ongoing.

HH-60

L Model

■ **Class D:** While conducting local area orientation and environmental training (dust landings and takeoffs), the glass lens of the aircraft's FLIR broke.

UH-60

L Model

■ **Class A:** Aircraft crashed during training, fatally injuring all four crewmembers and destroying the aircraft. The investigation is ongoing.

■ **Class C:** Routine maintenance inspection of aircraft conducted the day following a training mission flight revealed damage to one main rotor blade tip cap and evidence of a bird strike (remains).

■ **Class C:** Damage to one main rotor blade tip cap and evidence of bird strike.

OH-58

DI Model

■ **Class C:** Aircrew on a training mission experienced inadvertent instrument meteorological conditions (IIMC) and requested precision approach radar return to the airfield. During the return, the aircraft experienced engine (135 percent/3 seconds) and transmission (127 percent/3 seconds) over-torque conditions. No personnel were injured in the accident.

■ **Class C:** Aircraft experienced engine (135% / 3 sec) and transmission (127% / 3 sec) over-torque conditions.

UH-1

V Model

■ **Class E:** While on a VFR/NVG training flight, at cruise altitude, the engine RPM light and RPM audio came on. The pilot lowered the collective to enter an auto rotational descent and turned toward the airfield to a safe landing area. During the descent, the engine and rotor RPM came back to normal operating limits and an approach was accomplished without further incident. Maintenance investigation could not duplicate the incident.

C-12

D2 Model

■ **Class B:** While on final approach in gusty winds and moderate turbulence, the aircrew realized the landing gear was not down and initiated a go-around. The aircraft propellers contacted the ground during the maneuver, but the aircrew was able to complete the go-around, lower the landing gear, and land the aircraft without additional damage. Post-flight inspection revealed that the propellers were bent from the impact with the ground. No personnel were injured in the accident.

C-26

B Model

■ **Class C:** Aircraft was performing a service mission when, after approximately 2 hours of flight, the left engine failed. The aircrew performed emergency actions and landed the aircraft at a civilian airport. No personnel were injured in the accident.

UAV

Shadow Model

■ **Class B:** During landing procedures, the tactical automated landing system of a UAV defaulted to GO-AROUND. The engine resumed full rpm and began climb-out when the engine failed. The UAV descended to impact approximately 50 feet off the runway and was destroyed.

Note: For more information on selected accident briefs, call DSN 558-9552 (334-255-9552). Information published in this section is based on preliminary mishap reports submitted by units and is subject to change.

Heat Injuries are Preventable

All commanders and supervisors are responsible for heat injury prevention.

1. **Monitor your soldiers.**
2. **Make acclimatization of soldiers a deliberate process.**
3. **Supervise fluid consumption when conditions dictate.**
4. **Schedule heavy work and strenuous physical exertion for early morning or late evening.**
5. **Maintain a high level of physical fitness.**

U.S. ARMY SAFETY CENTER