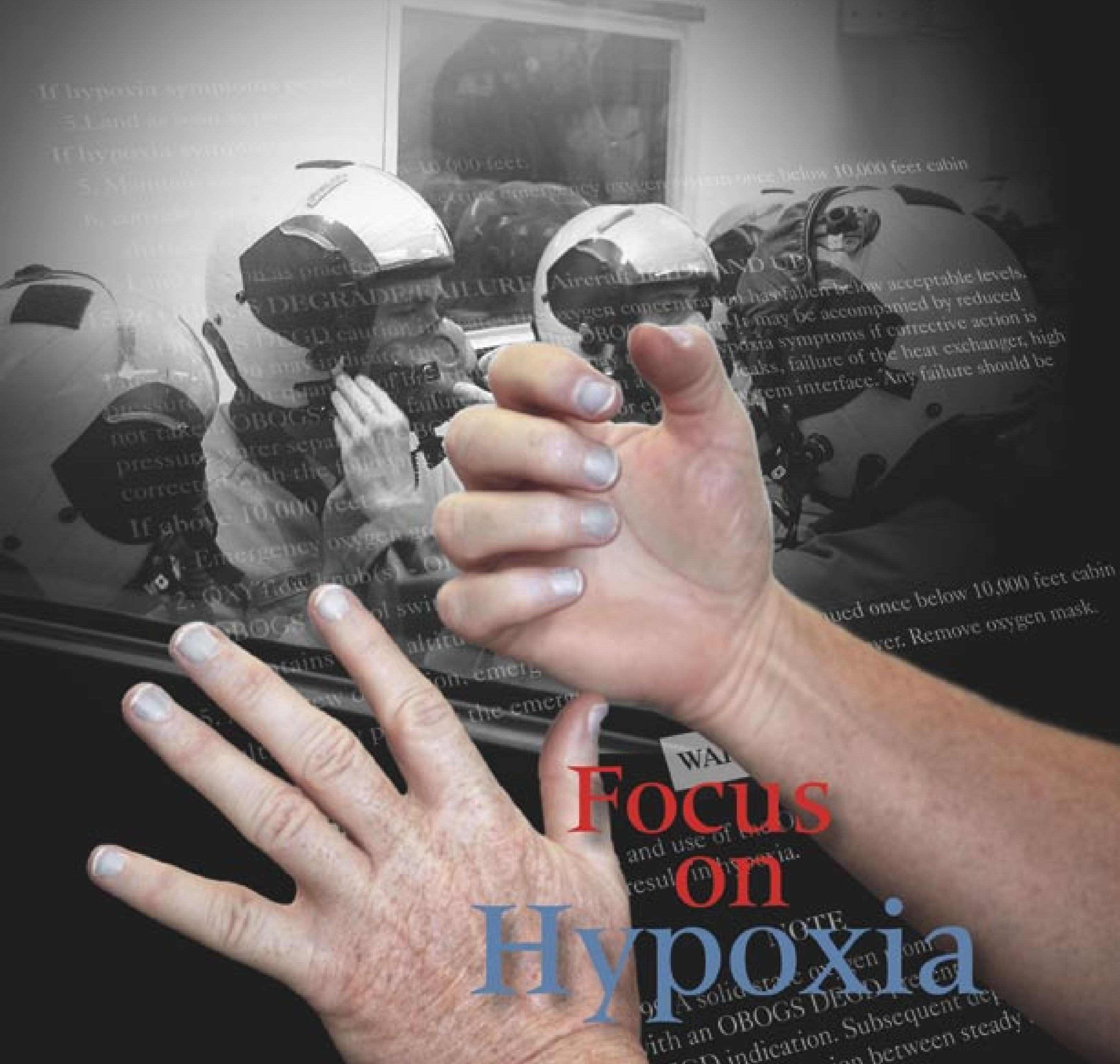
Reducing Mishaps - Saving Lives - Improving Readiness

THE NAVAL SAFETY CENTER'S AVIATION MAGAZINE

approach

www.safetycenter.navy.mil • May-June 2005



Focus on Hypoxia

The Naval Safety Center's Aviation Magazine

May-June 2005, Volume 50 No. 3

Mishaps waste our time and resources. They take our Sailors, Marines and civilian employees away from their units and workplaces and put them in hospitals, wheelchairs and coffins. Mishaps ruin equipment and weapons. They diminish our readiness. This magazine's goal is to help make sure that personnel can devote their time and energy to the mission, and that any losses are due to enemy action, not to our own errors, shortcuts or failure to manage risk. We believe there is only one way to do any task: the way that follows the rules and takes precautions against hazards. Combat is hazardous enough; the time to learn to do a job right is before combat starts.

Approach (ISSN 1094-0405) is published bimonthly by Commander, Naval Safety Center, and is an authorized publication for members of the Department of Defense. Contents are not necessarily the official views of, or endorsed by, the U.S. Government, the Department of Defense, or the U.S. Navy. Photos and artwork are representative and do not necessarily show the people or equipment discussed. We reserve the right to edit all manuscripts. Reference to commercial products does not imply Navy endorsement. Unless otherwise stated, material in this magazine may be reprinted without permission; please credit the magazine and author. *Approach* is available for sale by the Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. Telephone credit card orders can be made 8 a.m. to 4 p.m. Eastern time at (202) 512-1800.Periodicals postage paid at Norfolk, Va., and additional mailing offices.

Postmaster: Send address changes to *Approach*, Code 73A,
Naval Safety Center, 375 A Street
Norfolk, VA 23511-4399

Send articles and letters to the address above, or via e-mail to the editor, jack.stewart@navy.mil.

Features

Focus on Hypoxia

6 My Decision Matrix
By Lt. Brad Gilroy
Don't underestimate the value of pressure-chamber training.

8 Are You a Hypoxia Expert?
By Cdr. Kevin E. Brooks, MD, MPH
Here's a chance to test your hypoxia IQ.

10 Hypoxia in the Hornet
By Lt. Greg Ostrander
What we know, and what we're doing to reduce hypoxia incidents.

13 Oxygen Para-what?
By Lt. Greg Ostrander
Do you know about the oxygen paradox phenomenon?

14 Improved Hypoxia Training for Jet Refreshers
By Lt. Anthony Artino and HM1 Stephanie O'Brien
The Naval Survival Training Institute has a way to improve hypoxia training.

16 Investigating Hypoxia
By Dave Clark and Maj. Chuck Megown, USMC
Tracing the cause of a mishap to hypoxia is a challenge for our investigators.

18 Feeling Drunk on Thanksgiving
By Lt. Matt Hooker
A Hawkeye pilot recognizes all the tell-tale signs of hypoxia and reaches for the oxygen mask.

20 What Is He Doing?
By LCdr. Mike Fitzpatrick
A slow, unintentional descent allows Hornet pilot to regain consciousness.

Discover *Approach* online at:
WWW.safetycenter.navy.mil/media/approach

On the cover: This issue focuses on hypoxia. Aviators training in the pressure chamber.

30 CRM: **Ditching Into the Deep**
By LCdr. Bill Mellen
Today could be the day you fight for survival.

Photo Composite

22 **The Night Shift: Can We Completely Adapt and How?**
By LCdr. Mike Staier, USCG
Aviation is not a 9 to 5 job. Can you be on top of your game no matter what the clock says?

26 **Road Trip**
By LCdr. Donald E. Kennedy
Poor decisions almost killed a 19-year-old.

29 **Paying Homage to the FOD God**
By PR1 Thomas Leadingham
Find out where all that FOD comes from.

May-June Thanks

Thanks for helping with this issue…
- Lt.Don Hughes, HSL-44
- LCdr. Brad Bloye, VFC-12
- LCdr. Will Powers, VFA-37
- Lt. Marcus Cole, VAW-113
- Lt. Taylor George, NSC

Departments

2 Admiral's Corner
How Are We Doing?
Here's an update on the aviation-mishap rate.

3 Work Zone
The ORM and Fundamentals Campaign: Get a Triangulation Fix
By Cdr. Buc Owens, Cdr. Darryl Barrickman, and Lt. Scott Harvey

25 **Mishap-Free Milestones**

IBC ORM Corner—Best Practices
Information for continual improvement. Here are several best practices worth sharing.

BC Ready Room Gouge

Admiral's Corner

From Commander, Naval Safety Center

The Navy Safety Campaign Plan has been distributed to all commands. The campaign motto is "Work, Play, Live," emphasizing the 24/7 nature of risk. It focuses heavily on three key areas that produce approximately 75 percent of all Navy/Marine Corps fatalities, injuries, and costs: traffic (the leading cause of death for service personnel), recreational/off-duty (which cause the highest number of injuries) and aviation (costliest in terms of dollars, and too often the result of some form of human error).

This issue contains information to support the Navy Safety Campaign Plan. To help reduce human errors and to provide the tools each command can use in mishap prevention, the Work Zone section features information on the ORM and Fundamentals Campaign.

Recently, hypoxia incidents have reemphasized how dangerous and costly this medical condition can be. Our aeromedical staff wants everyone to get informed, so we have devoted much of this issue to hypoxia.

Hypoxia long has been and will continue to be a significant hazard in aviation. Year after year, we rewrite lesson plans, to again and again reemphasize age-old information on hypoxia hazards. Why must we relearn old lessons about using protective systems and rules that prevent hypoxia from occurring?

I have reviewed the last three mishaps where young aviators lost their lives as a result of hypoxia. Each loss is truly tragic because there is training and rules in place to have prevented the mishaps. Every one of us who wears the wings of gold must continue to follow the rules created to keep us safe, and to lead those under our charge.

As leaders, we must enforce the rules that govern the way we fly; when we don't, we gradually move away from safe practices. This migration is like termites in the wood of our safety culture; it invisibly but gradually eats into the core, destroying it from the inside out. We don't realize the damage that has been done until a major mishap occurs—one that was preventable.

I challenge all of us as Navy or Marine officers and aviation professionals to improve our safety culture. Set the example by relearning and following NATOPS. We are the greatest fighting force the world has ever seen. Permitting any erosion of our safety culture will degrade our effectiveness, result in the loss of skilled aircrew and assets, and impact our combat readiness.

Take on board the information in the Navy Safety Campaign Plan (available at: www.safetycenter.navy.mil/mishapreduction/campaignplan/) and use the resources provided in this issue.

RADM Dick Brooks

HOW ARE WE DOING?

Aviation (Rates = Mishaps Per 100,000 Flight Hours)

Class-A Flight Mishaps (FY05 thru 20 May)

Service	*Current Rate*	*FY04 thru 20 May 04*	*FY05 Goal**	*FY02-04 Avg*	*Fighter/Attack*	*Helo*
USN:	11/1.79	8/1.24	10/0.88	19.7/1.77	4/2.63	5/4.24
USMC:	4/1.68	10/4.79	7/1.94	14.7/3.96	3/3.14	1/.86

** Goals based on FY02 baseline.* *rate above goal.* *rate below goal.*

WORK ZONE

REDUCING MISHAPS BY 50%

The ORM and Fundamentals Campaign:

Get a Triangulation Fix

The ORM and Fundamentals Campaign for Navy and Marine Corps aviation focuses on:

- ORM training
- Community ORM review boards
- ORM assessment of each Type-Model-Series (TMS) community
- Community ORM and safetygrams
- **Culture workshops and safety surveys**
- Command safety climate assessments

By Cdr. Buc Owens, Cdr. Darryl Barrickman, and Lt. Scott Harvey

Fleet squadrons seem to misunderstand the difference between two programs offered by the Safety Center's aviation directorate. We receive phone calls weekly from newly trained ASOs asking to be scheduled for "one of those aviation-safety-cultural-survey-workshop thingamajigs." So, if you're an ASO and still are a bit confused about our programs, read on.

To start, the aviation directorate at the Safety Center offers two programs for your command: **aviation-safety surveys** and **culture workshops (CWs)**. When these two programs are used, along with the School of Aviation Safety's **command safety-climate assessment (CSCA)** survey process, commanding officers can gain a valuable "triangulation fix" on big-picture human-factor issues that may be present within their squadrons. This "Work Zone" will focus on the safety surveys and culture workshops and will provide contact information on the CSCA process.

Safety surveys, as addressed in Chapter 2 of the OPNAV Instruction 3750 (series), should be requested every two years. Commands located in the Norfolk area receive a survey every two years, while squadrons outside the Norfolk area currently average a survey every three years. Recently, culture workshops also have been mandated on an every-other-year basis for all operational naval-aviation squadrons.

Here's how the two programs work.

Aviation-Safety Surveys

The aviation-survey team's travel schedule is published annually (July) via message for the next FY. The message announces dates and locations for the team and tells how to get a survey scheduled. Priority is given to those squadrons with the oldest survey date on file.

FAQs about surveys:

• **What is the purpose of the safety survey?** It helps the command to identify hazards and thus mitigate the likelihood of future mishaps.

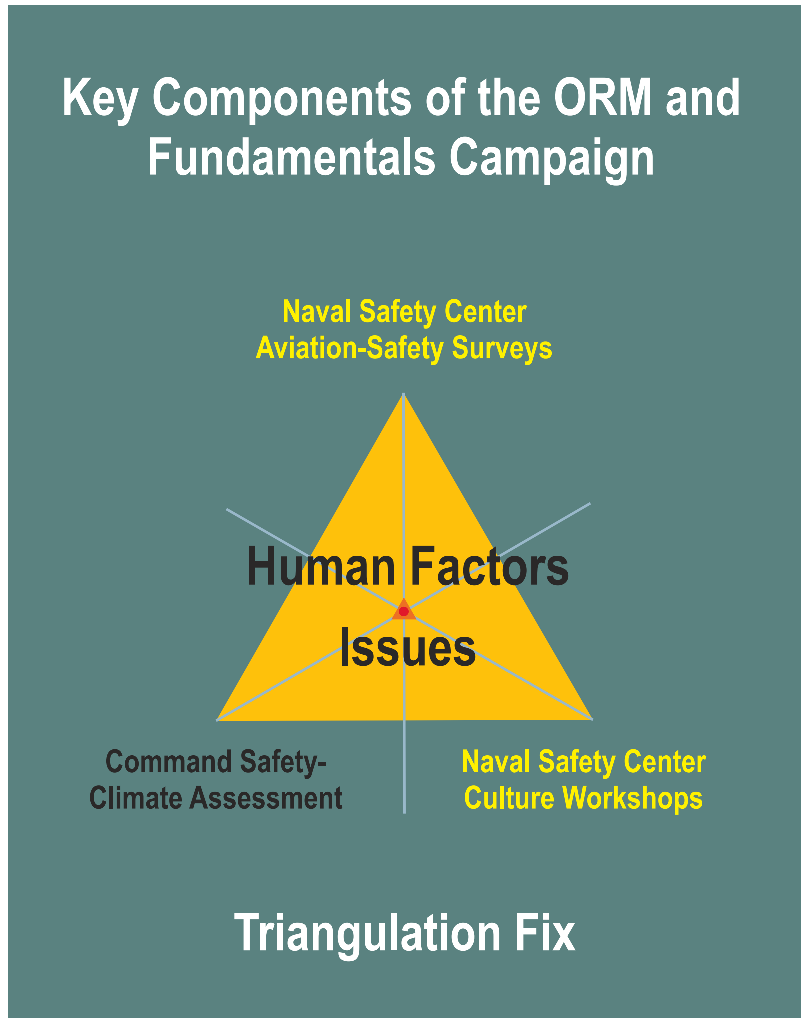
• **Are we required to have one when the Safety Center is in town?** The easy answer is no. The Safety Center survey process is conducted on invitation of a command CO. Occasionally, the squadron can't accommodate a survey team because of other operational commitments. We understand deployment schedules, but remember that another visit to your home base may not occur for the next year or two.

• **Is a survey an inspection, and, if so, who gets the results?** The Safety Center is not, repeat *not*, an inspection authority, though the programs surveyed are similar in content to an inspection. The results are debriefed to the CO; they remain confidential and only can be used at the CO's discretion. However, the Naval Safety Center shares trend information and common areas of concern with all squadrons and leadership.

• **How long does a survey take?** It takes a full day, beginning with a CO in-brief at 0800. Most surveyors complete their information collection by 1300, prepare their report, and then debrief the CO by 1600.

• **What is the impact on the daily flight schedule?** Most squadrons fly a regular flight schedule, with few modifications. Proper planning around the key individuals involved keeps the impact minimal. If someone needs to assist with a launch, recovery or other squadron task, the surveyor will stand fast until that evolution is completed.

• **Who is involved?** The ASO, safety officer, or DoSS is our primary point of contact throughout the process. The key squadron individuals are: CO, all maintenance-shop supervisors, MMCO, QAO, MMCPO, AMO, Ops O, NATOPS/safety/ASO.



• **Whom do I contact?** Your Safety Center POC is Lt. Gretchen Swanson; (757)444-3520, ext. 7276 (DSN 564), or e-mail gretchen.swanson@navy.mil. She can schedule your command for a survey and tell you the date of your command's last survey.

Culture Workshops

Recently, ComNavAirFor has mandated that all aviation commands schedule a culture workshop every other year. This program offers a unique chance for a squadron to look within itself and determine its culture, which can be defined as how or why a unit operates the way it does. In other words, it is the underlying modus operandi of the unit, established over a long period of time. The workshop aids the CO in identifying hazards, but, most importantly, it reveals how the squadron does business from the perspective of its members.

FAQs about culture workshops:

• **Are CWs a Safety Center-facilitated inspection?** The culture-workshop facilitators are not in the business of inspecting anyone or anything. There are no associated checklists to query squadron members on a variety of "yes/no" questions found in 3710, 4790 or specific NATOPS manuals. While some of the facilitators, typically O-5 and O-6 aviators, are attached to the Safety Center, most are not.

• **Does the CW assess my command's climate?** Climate is only the "tip of the iceberg." Culture more closely is equated to the vast portion of the iceberg below the surface. The senior facilitator, assisted by two people from outside the squadron (typically a JO and CPO from a sister squadron), conduct a two-day workshop. The workshop consists of individual one-on-one conversations with random squadron members of all paygrades and workcenters, followed by group seminars broken down by paygrade and experience levels. The CW team "paints a picture" of how the squadron views itself and presents that picture to the unit's CO without attaching any personnel assessment or suggested fixes.

• **Do CWs evaluate safety programs?** Culture workshops have more to do with improving a squadron's operational effectiveness or excellence than they do with determining a command's safety posture. The facilitators gather information on how effectively a squadron communicates (vertically and horizontally); how the unit feels about trust (a reliance in character, strength, ability, and truthfulness) in its people, programs and assets; and finally, what the level and motivation is behind a unit's integrity (the unit's adherence to a code or standard). The CW process seeks to answer the question, "How does the unit operate?"

• **Who gets the results of the CW, and are they punitive?** All information (critiques, notes, debrief forms) gathered within a squadron is turned over to the commanding officer. The end product is left in the hands of command leadership. However, the Naval Safety Center shares trend information and common areas of concern with all squadrons and leadership.

• **How do I schedule a culture workshop?** Unlike the safety survey, no formal message announces a yearly schedule. Each squadron can request a CW online at www.safetycenter.navy.mil/culture/request.htm. Try to schedule a workshop three to six months in advance. Once your request is submitted, a facilitator will contact your squadron to set up the specifics of the visit. Contact our Safety Center scheduler, Lt. Scott Harvey, at (757)444-3520, Ext. 7208 (DSN 564), or e-mail scott.harvey@navy.mil. An alternative is to contact the CW program manager, Cdr. Buc Owens, at Ext. 7210 or e-mail donald.owens@navy.mil.

Where can I go to learn more about this process? The Safety Center's website is an outstanding source of information: www.safetycenter.navy.mil/culture/default.htm.

Command Safety-Climate Assessment

The third part of the triangle, the CSCA survey process, is a web-based tool for commanding officers to survey aircrew and maintainers on their perceptions regarding safety issues within their unit. *Approach* magazine featured the CSCA process in the March-April 2004 issue; view the article at www.safetycenter.navy.mil/media/approach/issues/marapr04/CSCA-update.htm. The CSCA website may be viewed at www.safetyclimatesurvey.org.

Cdr. Owens, Cdr. Barrickman, and Lt. Harvey are analysts with the Naval Safety Center.

My Decision MATRIX


Photo by Matthew J. Thomas

By Lt. Brad Gilroy

I was scheduled for my first night flight since returning from deployment two months earlier. I was proud to have completed my nugget cruise but still was humbled by the new-guy label I had had for the last year.

With limited flying the past month, we wanted to refresh our perishable intercept skills. The flight was scheduled for a three-plane, night-intercept hop. Our department-head lead would take a fellow JO for some 2 v 1 intercepts against me before swapping roles and dragging me through a few sets. The presentations were basic and designed to get us up to speed.

As I walked to my jet, I grabbed a set of NVGs—they seemed like an old friend I hadn't seen in a while. Ground operations were normal. Like everyone who has gone through the FRS in the last few years, the issue of hypoxia problems in OBOGS-equipped Hornets was well ingrained in my head. I also had joined the growing list of pilots who have witnessed an OBOGS DEGD while flying in the Med a few months earlier. As a result, the OBOGS plunger test already was built into my habit pattern, and tonight was no different. The test passed, and I was on my way.

The three-plane launch and trip to the area went just as briefed. On the climb-out, environmental-control-system (ECS) flow seemed unusually strong, until I realized the defog handle was in the full-aft position. I made a quick adjustment into the mid-range setting, and everything was back to normal. We entered our operating area and headed to our planned CAPs. On the first run, I climbed to the high-altitude block and came at them with a healthy amount of knots.

My troubles started in the climb. As I passed through 25,000 feet, ECS flow became just as powerful as before; only this time, it fluctuated at an incredible level. I checked the defog handle to see if I again somehow had knocked it back into the aft position, but it hadn't moved. The cabin-pressure-altimeter needle was moving rapidly, and my ears began to ache because they couldn't keep up with the pressure changes.

As I continued to climb, I tried to troubleshoot the ECS problem and head for my CAP point. As far I was concerned, a minor ECS problem could be dealt with, and I still could continue the mission.

Suddenly, everything started to fall apart. Oxygen flow to my mask was cut off for a second, and then it returned just as quickly. I felt like someone suddenly had squeezed and then released the hose between my regulator and mask. This sensation didn't last long enough to impede my breathing, but the sudden sensation of the mask suctioning tighter against my face was enough to trigger alarms. As I reached to see if my hose was caught on something, I began to feel tingling in my hands. I then realized this might be a good time for some of those hypoxia immediate-action items recently incorporated into NATOPS. The combination of ECS and oxygen-flow problems, along with some strange feelings in my body, didn't sit well with my decision matrix.

The cabin-pressure-altimeter needle was moving rapidly, and my ears began to ache because they couldn't keep up with the pressure changes.

After fumbling with the emergency-oxygen green ring (conveniently placed under my left leg), I secured OBOGS flow and immediately started a dive below 10,000 feet on the cabin altimeter. I let my flight lead know what had happened, and he backed up my emergency procedures. Once I got below 10,000 feet, I removed my mask and reset the emergency oxygen as soon as I was comfortably established on the RTB. Within a few minutes, the hypoxia symptoms had subsided, and I landed uneventfully.

In the few days that followed the flight, the jet, my mask, and regulator all disappeared for numerous tests. Our maintenance technicians discovered a loose connection in the ECS duct. On deck, the OBOGS supply air was supplied forward of the leak, allowing the system to pass the BIT checks. However, once airborne, the OBOGS supply shifted aft of the leak and caused the problems I had experienced.

Two indications that would have been helpful are an AV AIR DEGD and/or an OBOGS DEGD. The former is a direct reflection of good ECS flow through the cockpit. Although cockpit pressurization was fluctuating rapidly, there was enough flow to prevent the caution display.

Similarly, an OBOGS DEGD also indicates a degraded system. Unfortunately, the caution is only a measure of air quality, not air quantity. The quality of the oxygen was good enough, but the surging slowly was depleting the plenum until the flow wasn't enough to support me.

I'm not sure how quickly I would have recognized the symptoms without training. While the pressure-chamber ride in aviation physiology might seem benign, my ability to recognize hypoxia saved my life. The FA-18 has numerous warning systems to alert the aircrew of malfunctions. Survival training is designed to help us when those cautions might not be displayed.

I religiously will continue to run the OBOGS BIT checks every flight. We cannot always trust our jet's warning systems to alert us to every aircraft malfunction.

Lt. Gilroy flies with VFA-37.

Are You a Hypoxia Expert?

By Cdr. Kevin E. Brooks, MD, MPH

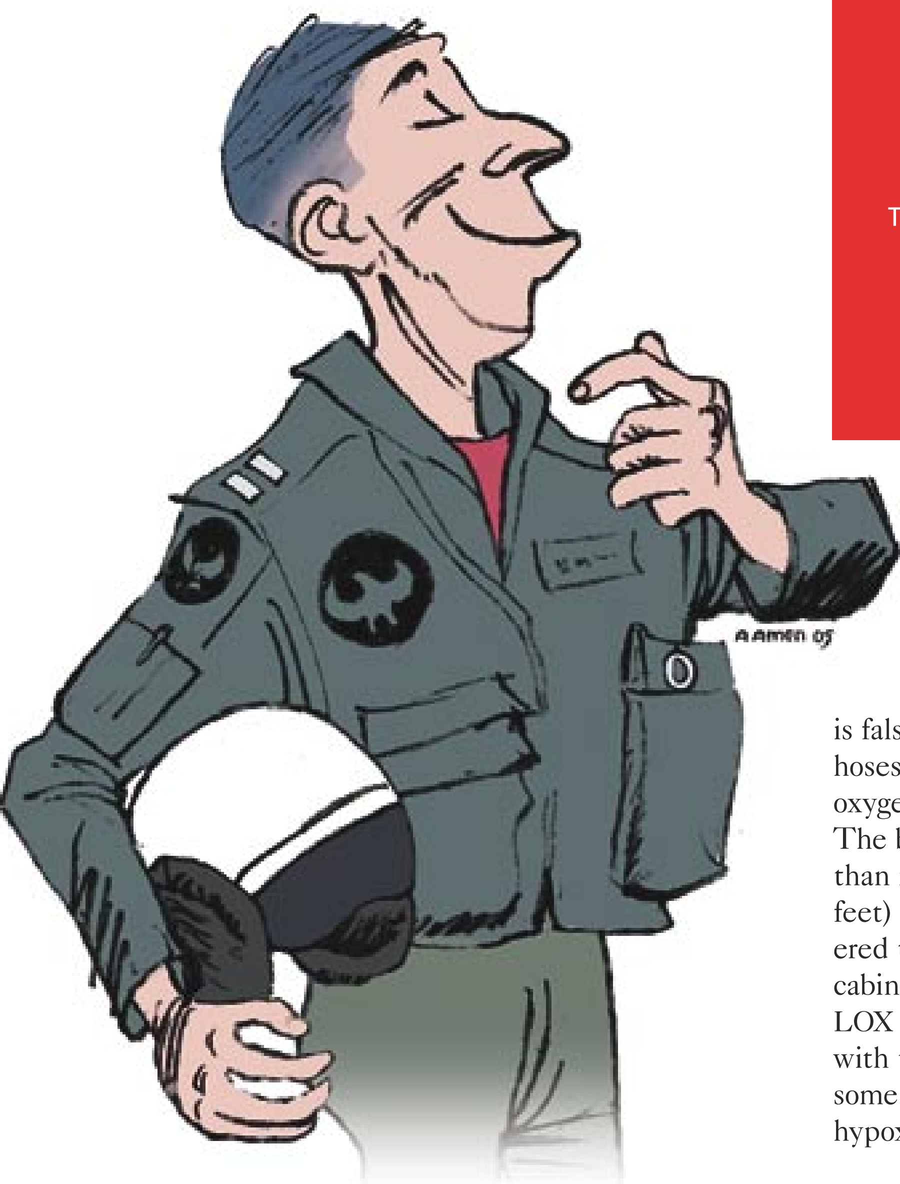
Do you consider yourself an expert on hypoxia? After all, you've been through your physiology training, and maybe even have tons of flight experience. You already know hypoxia means inadequate oxygen. But, hold on for a second. Maybe there's more to hypoxia than you think, and maybe even a few new wrinkles, too.

Let's check your hypoxia IQ—see how you do on this short quiz (don't worry, the quiz isn't graded). The first four are "True or False"

1. I can't get hypoxic with my mask on.
2. Hypoxia is caused by not breathing enough oxygen.
3. Hypoxia is not a problem below 10,000 feet.
4. I always wear my mask in accordance with NATOPS.
5. Define oxygen paradox.

The answers are

1. False
2. True, but…
3. False
4. True (it better be)
5. We'll get to oxygen paradox later.



How'd you do? I'm betting you didn't score 100 percent, even though the quiz addresses topics that are critical to every tactical-aviator's survival. Let's look at these questions a bit more closely.

Question 1 is straightforward. The statement is false because poorly fitted masks, holes in oxygen hoses, poor seals, and even forgetting to plug into the oxygen system can all lead to hypoxia with the mask on. The bottom line is that an aviator will get less oxygen than intended any time high-altitude (above 10,000 feet) cabin air mixes with the breathing mixture delivered to the mask. This situation rapidly worsens as your cabin altitude increases. A degraded or contaminated LOX or OBOGS system also could lead to hypoxia, even with the mask on, regardless of altitude. Read on for some physiologic conditions that can lead to mask-on hypoxia.

Question 2 is a trick question because the statement is only partly true. There actually are several causes or types of hypoxia. Here are four you should know:

Hypoxic hypoxia is the type we usually think of in aviation. This type occurs when there is *not enough oxygen in the air we're breathing*, as we see at altitudes above 10,000 feet. Aircraft have onboard oxygen and pressurization systems to prevent hypoxic hypoxia.

Hypemic hypoxia occurs in two major types. The first type is when there is *not enough blood* to carry adequate oxygen supplies to the body tissues. This situation can be caused by not having enough blood: anemia. Although anemia is more common among some female aviators, it also can be a problem for male aviators. Concern regarding anemia is the reason aviators cannot freely donate blood. The second type of hypemic hypoxia occurs when *something decreases the blood's ability to carry oxygen*. You probably are familiar with carbon monoxide, the most common cause of this form of anemia. Carbon monoxide prevents oxygen from entering the blood, causing less oxygen to be delivered to the body. Because carbon monoxide is a common combustion product, it is not unusual to have at least some exposure to it from sources such as engine exhaust or charcoal grills. However, tobacco smokers are chronically exposed to surprisingly high levels of carbon monoxide, and they cannot tolerate altitude as well as nonsmokers. The carbon monoxide absorbed from one pack of cigarettes can raise your effective physiologic altitude by 5,000 feet, or more. To put these facts into perspective, consider two aviators, one a smoker, the other a nonsmoker, both flying at a cabin altitude of 9,000 feet without supplemental oxygen. Because of the physiological effects of carbon monoxide, the smoker effectively will be at 14,000 feet or higher and is much more likely to experience hypoxic symptoms.

Stagnant hypoxia occurs when *blood flow is inadequate*, or there is blood pooling. For example, pulling high positive Gs can cause blood to pool in the legs and lower body. This condition leads to decreased blood flow to the brain, which becomes hypoxic, and the aviator may G-LOC. This phenomenon can occur at any altitude. The G-suit, M-1, L-1, hook maneuver, and anti-G straining maneuver (AGSM) are all aimed at preventing blood pooling and stagnant hypoxia.

Histotoxic hypoxia is a type of poisoning that *interferes with the body's ability to use oxygen*; cyanide poisoning is one well-known example. However, histotoxic hypoxia is not a common problem in aviation.

Question 3 is tricky, because we all know that the atmosphere below 10,000 feet has enough oxygen to support life. So if this is true, how can an aviator get hypoxic below 10,000 feet? Questions 1 and 2 provided several examples of situations where hypoxia can and does occur.

Question 4 should be a "gimme" because NATOPS is quite clear on this requirement. NATOPS requires all tactical aviators to use supplemental oxygen continuously from takeoff to landing. Aviators in other pressurized aircraft will use supplemental oxygen whenever the cabin altitude is above 10,000 feet. See OPNAVINST 3710.7T, paragraph 8.2.4, for details.

Question 5 addresses a phenomenon that may be unfamiliar to you. Oxygen paradox refers to the situation where a hypoxic aviator's symptoms get worse after he/she begins breathing supplemental oxygen. A real-life example will illustrate this phenomenon. An aviator flying at 25,000 feet without a mask on experiences mild hypoxic symptoms because of an unrecognized cabin-pressurization failure. When the aviator finally recognizes the hypoxic symptoms and dons the oxygen mask, he suddenly feels worse, becomes dizzy and is disoriented. The symptoms clear up after 15 seconds or so. What happened here? Why didn't the oxygen correct things right away?

One way to think about this is that while hypoxia shuts down the brain, supplemental oxygen will wake or reboot it again. The problem is the brain doesn't shut down or reboot all at once. Rather, it typically does so in a fairly predictable and organized pattern. Problems can occur when the brain reboots in a disorganized sequence. Fortunately, these problems generally are quick to correct, but the aviator may be unable to fly the aircraft until things sort themselves out. Unfortunately, a natural response is to think, "Hey, I got worse with the oxygen; it must be bad," and to remove the mask. But, that action is precisely the wrong thing to do, because it guarantees you will become more hypoxic. A far better solution would be to avoid hypoxia and oxygen paradox in the first place by wearing the mask as outlined in NATOPS. For a more physiologic perspective on oxygen paradox, check out Lt. Ostrander's article on page 13.

Whether you aced my quiz or not, I hope you have learned something that will make you a bit more hypoxia savvy, and a smarter, safer aviator, as well.

Cdr. Brooks is assigned to the Naval Safety Center.

HYPOXIA IN THE HORNET
What We Know, And What We're Doing

By Lt. Greg Ostrander

An FA-18B pilot flying at high altitude experienced hypoxia after 30 minutes in flight. The aviator (flying in the rear cockpit) experienced disorientation, tingling, discolored skin, and extreme fatigue. He told the other pilot they needed to descend, and they headed down. After a few minutes at 8,000 feet, the pilot's symptoms subsided, and they uneventfully returned to base. All effects of the hypoxic experience were gone in 10 to 15 minutes on deck. Here's the kicker: The pilot had on his mask the whole time, and the cabin altitude was between 14,000 and 18,000 feet.

What was the cause? If you said "contaminated LOX," you'd be wrong. The cause was a leaking oxygen valve in the rear cockpit. The faulty valve had drawn cabin air into the pilot's hose and significantly reduced the delivery pressure. Also, the pilot's personal mask was changed out before the flight because of a comm problem; the mask he used didn't fit him as well.

This incident illustrates recent FA-18 problems with hypoxia. Each incident may have many possible causal factors, but no single causal factor seems to be prevalent (this holds true for LOX or OBOGS jets). However, analysis indicates some common threads are emerging.

NavAir, the Naval Air Warfare Center, the Naval Survival Training Institute, and the Naval Safety Center are working to identify the reasons behind hypoxia events and to provide fixes.

What We Know

In the past, most hypoxia incidents in fleet aircraft were caused by material failures or cabin pressurization problems. In TacAir, occasionally there would be LOX contamination, OBOGS degrades, or aircrew inappropriately flying with their masks off. In the Hornet, recent problems have been more varied and more frequent—14 incidents reported in the last 12 months alone. Three fatal Class-A flight mishaps attributable to hypoxia have occurred since 2001.

Summary of the Problems

• Problems with maintenance and material failures have included burst hoses, kinked hoses, mask/hose separations, cabin pressurization/ECS failures, loose fittings, and systemic leaks. Corrective actions have been taken to prevent most of these problems from recurring.

• Aircrew (with OBOGS) continue to expe-

rience mask-on hypoxia and are recognizing their symptoms and taking corrective action. However, some aircrew are not following the emergency procedure for hypoxia, they are omitting steps or do them out of order.

• Three incidents have occurred at low altitudes (less that 10,000 feet), where hypoxia should not be a problem. The OBOGS system may have been contaminated, or, aircrew waiting to take off may have inhaled large amounts of exhaust gases. Also, fatigue, dehydration, or anemia may have been factors.

• Oxygen paradox occurs when reoxygenation after hypoxia causes a temporary worsening of symptoms, causing aircrew to consider taking off their masks—which can be catastrophic. Oxygen paradox is discussed in more detail in adjoining articles.

• The intense workload and high-altitude flying in TacAir make mask-off flying a bigger risk. Hornet pilots have taken off their masks to drink water or to wipe their face without checking the cabin altitude, and several hypoxic incidents have resulted. Outright violations (flying with the mask off intentionally—"We don't need no stinking oxygen") were the root cause of aircrew hypoxia in three recent incidents.

What's Being Done

The following actions are being taken to reduce hypoxia incidents:

• Maintenance solutions focus on reducing occurrences as a result of material or systems problems. AFB 500 addressed system-leak problems by ordering one-time inspections and adding leak-check requirement to 84-day special inspections. PMA-265 procured leak-test adapter kits to accomplish the inspections. Pilot-services-panel "B-nut" torque was established (incorporated in IETM May 2004 release). Excessive hose bending/kinking was addressed by IRAC 22/23. Cabin-pressure-warning system (CPWS) was developed and is planned for incorporation in Lot 29 aircraft and retrofit in Lot 21-28.

• Hypoxia training provides more realistic training and includes mask-on hypoxia scenarios. The new reduced-oxygen-breathing device (ROBD) lets you experience hypoxia while performing flight duties in a simulator. Actual aircraft EPs can be performed in the simulator, and feedback is provided to the aviators on their performance.

• OBOGS-system problems are being corrected. OBOGS contamination problems have been identified, and plans are ongoing to educate aircrew on these regimes and the associated risks.

• Oxygen-paradox training has been added to physiology training. Ensuring aircrew understand this phenomena more completely is critical in managing hypoxia incidents. In several cases, aircrew reported feeling worse and

A Few Numbers

The Naval Safety Center tracks hypoxic-event rates the same way we track flight-mishap rates: number of events per 100,000 flight hours. But, because hypoxia is a self-reported event, the numbers are only an estimate. Hypoxia-event rates, however, are a good indicator of the problem. Since hypoxia events are rare, we can get a good overview of the problem by using a rate ratio (RR). This ratio indicates how rates compare over time, and spikes may draw attention to a particular hypoxic issue.

The hypoxia-event rate for all TacAir is 0.23 per 100,000 flight hours (compare to a Class A flight-mishap rate of about 2.0). The Hornet hypoxia-event rate is 0.55, which is approximately 2.3 times the overall TacAir hypoxia-event rate.

A comparison of all TacAir aircraft, using LOX versus OBOGS, shows the hypoxic-event rate for OBOGS aircraft is 4.3 times the all-LOX rate.

Looking at these rates for the Hornet in Class-A flight mishaps (with hypoxia as the primary causal factor) from 1980 to 2000, the rate was 0.03, while the rate from 2001-2004 was 0.29. This puts the RR at 9.7—a huge difference.

These data indicate some important new hypoxia issues have surfaced in the last few years, and they increasingly are being identified as causal factors in mishaps.

wanting to remove their mask because they weren't convinced the oxygen was helping. These effects also were reported in ROBD trials, where 21 of 30 aircrew stated they wanted to remove their mask. The ROBD allows aircrew to experience oxygen paradox and "tough it out" through the effect.

How To Reduce Your Risk

The following actions are recommended to reduce the risk of hypoxia:

• Know the oxygen system in your jet, whether OBOGS or LOX. Several incidents were caused by aircrew's lack of system knowledge. Oxygen Systems Team "road shows" are available to fleet squadrons. Many aircrew and maintainers are surprised with what they didn't know. These presentations may be scheduled through the NavAir Oxygen Systems Team (Bill Struble, POC, info below). Better knowledge equals less risk.

• Request training from your aeromedical-safety officer (AMSO) or flight surgeon. Annual training at the squadron is an effective tool to keep current on hypoxia issues. The ROBD is an important part of this training.

• Don't set yourself up to get hypoxic or to be more susceptible to oxygen paradox—wear your mask. While there are good reasons to remove your mask momentarily, leaving it off is a flagrant violation of NATOPS. If you get hypoxic, execute your EPs and land. Do not continue your mission, despite feeling better.

With closer scrutiny of a few previously unidentified risks and more realistic hypoxia training, the number of incidents will decrease. In the meantime, use the resources available to you to reduce your risk: Get training, and stay fit, well-nourished, and well-hydrated. If you need any help or guidance, call us.

Lt Ostrander is an aeromedical analyst at the Naval Safety Center.

Hypoxia/Oxygen Systems/Aeromedical POCs:

• Naval Safety Center:(757) 444-3520 (DSN 564), extensions below:
Cdr. Kevin Brooks, flight surgeon, ext. 7268
Lt. Greg Ostrander, aeromedical analyst, ext. 7229
AMEC Ed Cintron, aviation life-support analyst, ext. 7269

• NavAir Oxygen Systems Team:
Mr. Bill Struble, team leader, (301) 342-9237

Oxygen Para-what?

The Oxygen Paradox Phenomenon

By Lt. Greg Ostrander

Most people never have heard of oxygen paradox. The condition is rare and, until just a few years ago, was poorly understood.

Oxygen paradox is a physiological phenomenon that occurs upon reoxygenation after periods of either prolonged or severe hypoxia.

This phenomenon has two causes:

1. When you are severely hypoxic, it takes a few seconds for the effect of reoxygenation to occur. You continue to get hypoxic because the 100-percent oxygen has to go through the hose and mask, then into your lungs, where it diffuses through various membranes and such. This process may take a few seconds.

2. The effect of reoxygenation may not be positive at first. As the oxygen hits your pulmonary vascular bed, some vasodilation may occur, which slightly drops your blood pressure. The lowered pressure may make blood delivery to the brain more difficult because the blood vessels may be constricted. The reason why this occurs goes back to the prolonged or severe hypoxia part of this discussion. As you get hypoxic, you start to hyperventilate, which reduces carbon dioxide. A reduction of carbon dioxide tells the central nervous system to constrict the blood vessels, which will stop the hyperventilation. Your body drives ventilation and blood-vessel constriction off the amount of carbon dioxide in your blood, not oxygen. The lack of oxygen stimulus is much weaker and doesn't occur until far down the process. You get lowered blood pressure and blood flow and continue to get hypoxic, all while breathing 100-percent oxygen. So, you put on your mask, and, bam, you start to feel worse, not better.

Aviators must understand this issue because the natural tendency in an oxygen-paradox-phenomenon case is to do exactly the wrong thing: Remove the mask. In the past, we also thought teaching this concept was counterproductive—that it would confuse people. This belief since has changed, and keeping the mask on is taught in quadrennial training.

Controlled runs on the reduced oxygen-breathing device (ROBD) indicate this phenomenon occurs more often than we thought (21 of 30 trainees reported a strong desire to remove their mask). However, this feeling only lasts for a few seconds and then passes. The key point is the feeling will pass. If you understand what is going on and trust your emergency oxygen, you will be OK.

Why Are My Fingertips Blue? Improved Hypoxia Training for Jet Refreshers

By Lt. Anthony Artino and HM1 Stephanie O'Brien

A Hornet was on a high-altitude ferry flight when it descended from 42,000 feet and crashed. The pilot never ejected. Investigators determined the most plausible explanation was pilot hypoxia.

The incident appeared to be caused by a bleed-air leak in the common bleed-air ducting, which resulted in a total bleed-air shutdown, subsequent loss of OBOGS, and loss of cabin pressurization. Those conditions, coupled with a delay in selecting emergency oxygen and a delay in descending, incapacitated the pilot .

Current Hypoxia Training

What are we in naval aviation doing to prepare aviators for the threat of hypoxia? For more than 50 years, aerospace physiologists and aerospace physiology technicians have been providing hypoxia training to Navy and Marine Corps aircrew in the form of low-pressure chamber training. This training, which hasn't changed significantly in all these years, consists of students listening to physiology lectures and then "riding" a large steel box to a simulated altitude of 25,000 feet. At altitude, students remove their oxygen masks while they play patty-cake and do puzzles, worksheets, or other activities to help them experience and recognize the signs and symptoms of hypoxia.

Although effective, hypoxia training in an altitude chamber does have its drawbacks and limitations. First, refresher students do not perform activities in the context of their working environment: the aircraft. Second, jet students experiencing hypoxia in an altitude chamber do so with their masks off, a fact that may render the training a bit unrealistic in the face of the many recent OBOGS incidents (most of which occurred with oxygen masks in place).

Improved Hypoxia Training

The use of a reduced-oxygen-breathing device (ROBD), combined with actual flight duties, may provide more effective training for jet-refresher students. The ROBD is a portable device that simulates the rarified atmosphere at high altitudes by diluting the inspired oxygen with nitrogen under sea-level conditions.

The advantages of ROBD include:

a. The ability to accurately and reliably induce hypoxia with no risk of decompression sickness, inner ear or sinus trauma.

b. The ability to operate the device almost anywhere, including inside a fleet simulator (this type of training is called simulator-physiology training, or "SimPhys").

c. The ability to induce hypoxia while students wear an oxygen mask and perform actual in-flight duties.

d. The ability to tie together three important aspects present in almost all of the recent in-flight hypoxia incidents:

- The need to recognize aircraft warnings for an oxygen-systems failure
- The need to recognize the signs and symptoms of hypoxia
- The need to execute the proper aircraft-specific emergency procedures to counter the threat

The use of an ROBD is just one part of a larger shift in the traditional physiology and water-survival training paradigm. This new school of thought says aircrew should experience physiological problems in the context of their working environment, not simply listen to lectures about physiological threats. Also, aviators should practice applying effective countermeasures to deal with these physiological threats while immersed in a realistic training environment.

The Road Ahead

The Naval Survival Training Institute (NSTI) provides physiology and water-survival training, and recently has purchased a number of ROBDs. These new training devices have been tested inside a medium fidelity simulator and in FA-18 and EA-6B simulators.

The next time you receive quadrennial physiology and water-survival-training qualification, you may have the opportunity to experience hypoxia while flying in a simulator, instead of playing patty-cake in an altitude chamber.

HM1 O'Brien and Lt. Artino are with the Naval Survival Training Institute.

ROBD training is scheduled for integration at three ASTCs this summer. A new curriculum (NP-9, hypoxia only) will be available for squadrons as adjunctive training by summer 2005.—Lt. Greg Ostrander, aeromedical analyst, Naval Safety Center.

Investigating Hypoxia

By Dave Clark and Maj. Chuck Megown, USMC

Photo by PH2 Bruce Trombecky

In the last 10 years, naval aviation recorded more than three dozen episodes of hypoxia, 12 of which involved the FA-18. Three of the Hornet episodes resulted in Class-A mishaps. In one instance, the first report of the mishap's scenario seemed peculiar: The aircraft crashed during a transit flight, leaving a crater, and the pilot did not eject. Before all the evidence was gathered and analyzed, the investigator's gut feeling had him thinking hypoxia was a factor. But gut feelings are not admissible, so what definitive evidence was available to indicate hypoxia as the cause? Here are some thoughts from the lead investigator:

Aircraft history and maintenance. Did the aircraft have recent problems with the LOX or OBOGS system, or the canopy seal? Have there been instances of the O_2 hose being stepped on or pinched? A review of the MAFs will provide many answers; also, scrutinize pilot aviation life-support system (ALSS) history.

Pilot history. A review of the pilot's 72-hour history is critical. Pilots likely to succumb quickly to hypoxia are often fatigued and smokers.

ATC tapes. Radar tapes provided by the FAA, the Air Force's 84th Radar Evaluation Squadron (RADES), or ships, will give clues to aircraft maneuvers. Incapacitation and loss of control at high altitude generally result in the pilot flying a meandering course and altitude, followed by an uncorrected dive to impact.

Pilot voice. ATC voice recording, aircraft voice recorders, or wingman statements will provide evidence of the pilot's condition. Missed calls, slurred speech, slow vocal tempo, microphone-keying activity, and unresponsiveness to commands indicate hypoxia. The NTSB provides the Naval Safety Center with expert voice analysis.

Non-volatile data recorders. An intact recorder can provide detailed information on control inputs (or the lack of), power manipulation, and warnings and cautions. Alone or matched with radar tapes, data recorders give dramatic insight to what was or was not occurring in the cockpit.

Wreckage evidence. You can expect aircraft fragmentation and many very small pieces at the crash site. A thorough sifting of dirt and collection of parts is required. In most cases, pieces will be unrecognizable, but even the smallest of identified pieces can provide evidence. For example, the position of the ejection handle or bleed-air-shutoff valves can provide useful clues.

The value of reporting physiological events cannot be overstated. Increasing awareness and improving training to counter the effects of events such as hypoxia are key to overcoming them. Share your experiences, report these events, and improve your awareness of physiologic events. For more information on aviation-mishap investigations, visit our website at: www.safetycenter.navy.mil/aviation/investigations/.

Mr. Clark and Maj. Megown are investigators with the Naval Safety Center.

Medical Investigation of Suspected Hypoxic Events

We do a very thorough job of investigating mishaps that involve fatalities. But, when it comes to physiologic events such as hypoxia, we sometimes drop the ball, particularly when the events don't result in a mishap or a fatality. Here are several medical considerations when investigating hypoxic events:

Encourage all aircrew to promptly report any suspected physiologic events. Events involving suspected problems such as oxygen-system contamination are time-critical, because the clinical evidence may be extremely short-lived. Make sure the involved aircraft and gear are "downed." It's easy to release the aircraft and gear if you determine further investigation isn't needed, but you may lose critical evidence if aircraft are re-used before you get to them. Besides, anyone who uses the aircraft or gear may be at risk. Have EIs performed on all suspect equipment.

Perform at least a focused history and physical examination on affected aircrew. Pay particular attention to the neurological and cognitive exams, but don't omit the cardiovascular and pulmonary systems, vital signs, and drug/supplement use history. Obtain a 12-lead electrocardiogram (ECG) and pulse oximetry. A chest X-ray is indicated if you suspect atelectasis or other lung disorders. Collect urine and venous blood samples from affected aircrew. Order a complete blood count (CBC) at the absolute minimum, but consider toxicological studies as well. Arterial blood gas (ABG) and carbon-monoxide level (smokers) tests may be indicated in some cases.

Contact the Naval Safety Center aeromedical division at 757 444-3520 ext. 7268 (DSN 564) for additional assistance.

Feeling Drunk on Thanksgiving

By Lt. Matt Hooker

Our strike group was halfway through work-ups, and, if everything went smoothly, we would get to enjoy Christmas at home before our long deployment. This meant spending Thanksgiving bobbing up and down off the Florida coast, but no one was complaining. It was my first exposure to cyclic ops, and, being a young, dumb, nugget, E-2 pilot, I was excited to find my name on the Thanksgiving-night flight schedule.

We gathered the crew early and briefed 15 minutes before the scheduled time, so we could take a few minutes before the flight to devour our turkey dinner. We reviewed the emergency procedures and then discussed ORM issues. We talked about the added distractions associated with flying on a holiday. Everyone joked about the dangers of tryptophan as we headed to the wardroom for our holiday feast.

Our timing worked out well, and, after squeezing into our flight gear, we got to the plane on schedule. Mom shot us into the darkness, and soon we were on station just east of Jacksonville. In the Hawkeye, everyone is part of the mission, and it wasn't long before the copilot had pubs and mission materials strewn across the cockpit.

We drilled holes in the sky for more than an hour before it happened: a sharp swerve and the groan of a dying engine. The master-caution light illuminated with a starboard generator light before I could get on the controls and disconnect the autopilot. The starboard engine was winding down. In disbelief, I stumbled through the six memory items engrained in the head of every Hawkeye pilot.

With the engine-failure checklist complete, we took a minute to assess the situation before moving on to the less critical post-shutdown checklist. We selected the entire crew on the ICS panel and gave a sitrep to the backend. We seemed to have a perfectly good airplane (minus one engine). Once everyone had a warm and fuzzy, the mission commander expedited handing over control of our airborne assets. The copilot began stowing unnecessary materials in the cockpit. As I sat patiently in the left seat, I headed toward Jacksonville, and maintained a shallow descent to keep the plane flying.

But, something didn't feel right. The Hawkeye is surprisingly stable when operating with one engine; however, focusing on single-engine ops seemed to require all my concentration. I initially had written off this feeling as nerves; I felt like my IQ was decreasing by the second. My skin felt cool and clammy. It wasn't until I felt the tingle in the tips of my fingers that I realized what was happening: hypoxia!

The E-2C is designed with numerous safety features to keep aircrew out of trouble. When an engine fails in flight, bleed air from the opposite engine is auto secured to maximize performance of the remaining operating engine. Without bleed air, the air-conditioning system shuts off. The air conditioning is not only a nice creature comfort; it also keeps the cabin pressurized, allowing aircrew to fly without oxygen masks. Oxygen masks are connected on preflight but only are used in an emergency. After securing an engine, aircrew can restore pressurization by selecting override on the air-conditioning panel. This step is addressed in the post-engine-shutdown checklist, the same checklist we had postponed.

As I realized what was happening, I started to reach for my mask but first decided to get the crew involved. I reached over, grabbed the copilot's shoulder, and mumbled, "Get your mask on."

I snatched my mask and held it to my face. As I continued to fly with my free hand, each crew member donned his mask and checked in over ICS.

I nudged the copilot and pointed to the yoke. He took the controls while I connected my bayonet fittings and hooked up the mike in the oxygen mask. Once I was back on ICS, I explained to a very concerned and confused crew that we had allowed the airplane to depressurize, and I had been hypoxic. In just a few seconds, the cabin altitude had risen to approximately 20,000 feet. I selected override, and, as cabin pressurization was restored, we were able to remove and stow our masks. At about this time, the ship told us they were making a ready deck. They wanted us back.

As is common during an emergency in the Hawkeye, the plane commander (PC) and I swapped seats, so the more experienced pilot could bring the plane aboard. In the right seat, I was sweating like a toilet in Casablanca, but I focused on being the best copilot ever. The PC flew a slightly high pass to an underline OK. It was over.

The hyperbaric-chamber training I had received in Pensacola was priceless. Hypoxia sets in fast, and a quick diagnosis is essential to a long, happy life.

There is no substitute for solid NATOPS knowledge; it's not enough to memorize your EPs and occasionally draw a system diagram. Every aviator needs to **review the purpose and effects of every step of every emergency procedure.**

Lt. Hooker flies with VAW-121.

What's Your Real Altitude?

The effects of self-imposed stressors on physiologic altitude

Did you know you could impose physiologic effects that can make your body think it's at a higher altitude than you actually are? Self-imposed stressors, such as smoking, dehydration, and fatigue, can cause your physiologic altitude to be much higher than you think.

Some stressors, like fatigue, are not as well-defined, but smoking and dehydration have well-known effects. Smoking a pack of cigarettes per day can raise your physiologic altitude by 3,000 to 5,000 feet. Drinking one ounce of alcohol can raise physiologic altitude by 2,000 feet. While the 12-hour drinking rule will keep you legal if you drink moderately the night before, if you drink excessively, you probably still will have alcohol in your system when you start to preflight.

So, if you smoke a pack of cigarettes a day and drink hard the night before, you could be at a **real altitude** of more than 7,000 feet. If you are taking off from NAS Fallon, Nev., with a field elevation of 3,934 feet, you're already over 10,000 feet while on the deck!

What Is He Doing?

By LCdr. Mike Fitzpatrick

The air wing was in the Gulf of Alaska getting ready for Operation Northern Edge, scheduled to start in a few days. We had a nighttime, double-cycle, airborne-early-warning (AEW) and 2 v 2 air-intercept-control (AIC) hop.

Our E-2 had a full crew of five: a combat-experienced carrier-aircraft plane commander (CAPC) and copilot; a mission commander, combat-information-center officer (CICO); an air-control officer (ACO); and a nugget radar officer (RO).

As we climbed, the RO brought up the weapons systems, and the CICO checked in with the air-defense commander. Everything worked as advertised; the weapons systems were operating 4.0, the sky was clear, and moon illumination was 27 percent. The E-2 did what it was designed to do: provide AEW and command-and-control (C2). The only downside was we had to wear anti-exposure “poopie” suits because the water temp hovered around a balmy 46 degrees Fahrenheit.

To prepare for the second half of the flight, our crew verified system setup and got ready for the first AIC run. We monitored the fighters as they checked in with strike and Redcrown. The fighters then checked in with us. We vectored them to their stations and gave them a standard AIC brief. Both AIC runs went without a hitch: The red fighters monitored the control frequency for reverse ground-control intercept (GCI), and the blue fighters practiced section tactics. Our nugget RO controller did a good job providing solid, Top-Gun-standard air control. After the second run, the fighters updated their fuel states, were given a steer to mom, and switched-up with strike. Shortly thereafter, things became non-routine.

After checking in with marshal, our crew noticed something wasn't quite right. One of the fighters we had been controlling, 204, was headed away from the marshal stack. The crew thought, "What the heck is he doing?"

Aircraft 204 quickly was joined by his wingman. Both marshal and the wingman were unable to reach 204's pilot on the radio. We dialed up the squadron's tactical frequency, and tried to contact 204—there was no response.

About this time, 204 began a slow descent, with his wingman following him down. The wingman reported no obvious movement inside 204's cockpit, nor did the pilot respond to radio calls. The situation was becoming dire, and the radio calls became more frantic as 204 continued to descend. Marshal, the wingman, and our crew continued to call the pilot on multiple frequencies, multiple times—with no joy.

Finally, as 204 passed through 8,000 feet, the pilot responded to radio calls. To everyone's relief, he leveled out at 6,500 feet and recovered.

During debrief, we learned that 204's onboard-oxygen-generating (OBOG) system had failed. The pilot was hypoxic. Only during his slow, unintentional descent did he regain consciousness as the ambient oxygen increased at the lower altitude.

If his OBOG system had failed while he was in the middle of a high-speed, AIC run, there may not have been sufficient time for him to recover the aircraft.

The next time I find myself thinking or I hear someone say, "What is he doing?" I'll consider the possibility the pilot may be hypoxic. Early recognition by a pilot or controller can help prevent disaster.

LCdr. Fitzpatrick was flying with VAW-113 when he submitted this article.

THE NIGHT SHIFT:

CAN WE COMPLETELY ADAPT AND HOW?

Circadian Rhythms & Coast Guard Flight Operations

By LCdr. Mike Staier, USCG

Scenario One:

In August 1993, a DC-8 crashed in broad daylight in Guantanamo Bay, Cuba. The crew had been awake for 19 to 23.5 hours; the effects of fatigue and the completion of this nine-hour leg proved too much. The pilot fixated on the white strobe that marks the fence line, dividing Communist Cuba and the American-leased air base. A high angle-of-bank and deteriorating airspeed gave no indication the pilot had made any corrective actions before crashing one-quarter mile from the intended landing zone.

What's remarkable about this mishap? It's one of the first times the National Transportation Safety Board (NTSB) cited fatigue, inadequacy of flight, and duty-time regulations as causes.

Typical Coast Guard mission scenarios call for low, night and overwater flights, which require hovering over pitching and swaying masts of fishing or sailing vessels. Coast Guard aviators are called upon at all hours of the day or night, in the most miserable weather conditions, to save lives and property or to protect the homeland. A good night's sleep is a rarity.

Scenario Two:

Another standard scenario is reverse-cycle-operation (RCO) deployments. These deployments are designed to maintain an air presence during nighttime hours, primarily in support of counter-narcotic operations, fisheries law enforcement, or homeland security.

So, you're a JO, assigned to the schedules office at a group or air station, tasked with creating a special operation with a focus on nighttime surveillance. What do you need to know? How do you get the most from the aircrews while keeping them safe?

Can your crews adapt completely to the "night shift"? What can you do in advance, and during the deployment, to ease the transition?

Background

The most common performance challenges of night-shift work come from the human biological clock or cycles. Three main cycles, or rhythms, have been identified: ultradian (20 hours or less), circadian (20 to 28 hours), and infradian (28 hours or more). Circadian comes from the Latin (*circa*, about; *dies*, day) and is based on the human internal-body clock that runs on a schedule of about 24 hours. To understand this 24-hour cycle, let's look at what influences it.

Sleep Influences

• **Biological factors** include the rise and fall of human-body temperatures throughout the day and the daily cyclical production of different hormones. Human-body temperatures can vary by nearly five percent in a single 24-hour period. A low temperature peak at approximately 4 a.m. and a high temperature peak near 5 p.m. coincide with a crewman's typical alertness extremes.

• **The social cycle** is dictated by societal norms, such as when the smell of breakfast wafts into your dream, or when the garbage collector tumbles the trash cans down the street. It's difficult to overcome these sleep influences, even with reduced light and noise for daytime sleeping. The clock on the wall, habitual sleep, meal times, and work and leisure activities are prime examples of social time cues. People seldom or never adjust completely to the night shift or to a new rhythm. The only way to adapt fully to RCO schedules is to reset your biological clock so your energy peaks during nighttime. Since this adjustment requires bright light in the workplace, flight crews only partly can adapt.

Challenges

Operational commanders face many challenges during the planning phases of an RCO deployment. Typically, the air station that owns the airframe and crew does not maintain tactical control of the asset. The aircrew may work for other Coast Guard entities, such as a cutter or group. Before a deployment, schedulers should discuss mission objectives, scheduling, crew accommodations, and environmental considerations to make sure crew endurance is managed properly.

Close consideration of sortie length, mission times, and crew motivation is crucial.

• Keep **sortie length** to a minimum. Schedulers should keep in mind that a two-hour sortie can mean being awake six hours during the middle of the night. Two hours of flight time does not equate to two hours of work.

• Evaluate **mission time** scheduling with sortie length. When practical, tactical commanders should schedule RCO patrols, one per night, so that a nap, preferably during darkness, may be taken before flight. Patrols during the early morning hours should be avoided from 4 a.m. to 6 a.m., when sleepiness peaks.

• **Crew motivation** and commitment to the reversed cycle are important when adjusting your circadian rhythm to night work. Total commitment is rare and hardly can be expected, considering the social difficulties involved. Typically, a crew of four to seven people is cohesive and enjoys dining and taking part in other activities together. However, a task that normally would take one person 20 minutes to do, such as eating, can take considerably longer when more people are added to the mix. Socializing is best saved for lively discussions during the sleepiness peak.

Three main factors influence the likelihood of unintended sleep during a duty shift:

1) circadian rhythm,
2) quality of the last sleep,
3) time since the last sleep cycle.

Sleeping at the right times, in best coordination with the circadian rhythm, is referred to as having good **sleep hygiene**. Postflight sleep should be coordinated with the circadian rhythm. Studies show daytime sleep periods are typically 41 percent (three hours) shorter and less restorative than nighttime sleep. A shift from the normal sleep, work, leisure schedule to one of work, leisure, sleep is required to allow sleep during the normal afternoon trough in body temperature and peak

in error tendency. The latter scenario is preferred if the crew cannot complete the sortie and return to their sleep rooms before sunrise. Studies show a moderate error peak around 3 p.m., with a much more severe error peak around 3 a.m.

Crews should break up long awake periods with naps. Plan preflight naps according to the planned nap length and the time since the last rest period. This system precludes the debilitating effects of **sleep inertia**, which is the body's slow transition to a wakeful state after sleeping. Sleep inertia is most severe after a deep sleep, during a long nap (90 minutes or longer), and after a long period of wakefulness. A person can feel decreased accuracy and attention for up to three hours—an obvious safety concern.

The **environment** plays a critical role in two phases of an RCO deployment: the in-flight environment and the rest-time environment. Everything from weather to crew dynamics to work load influence the in-flight environment. The white noise of quiet radios and the dull hum of the aircraft's power plants, along with the gentle rocking motion, create an atmosphere reminiscent of the womb. The crew needs to break the silence and monotony with lively, yet nondistracting conversation. This technique can be a real challenge if the crew mix includes introverts who are unfamiliar with each other. Keep the aircraft cool. Carefully regulate the rest-time environment. Keep sleep quarters quiet, cool, dark, and comfortable. Maintain a temperature between 60 and 75 degrees Fahrenheit.

The recommended **dietary** intake includes healthy choices of moderate to low-fat foods, with moderate portions. Odd eating times and poor quality food lay the groundwork for gastrointestinal disorders. A low-fat diet is important during the first three days after rotating to the night shift to help avoid gastrointestinal disorders while the body is trying to adjust to the new schedule. Crews should avoid the urge to "eat on the run" and take the time to sit and eat prepared foods. Avoid smoking and drinking alcoholic or caffeinated beverages. Smoking impairs circulation of oxygenated blood throughout the body by restricting and hardening the arteries. Alcohol is a depressant that decreases REM sleep. Caffeine is a stimulant that can delay restful sleep if ingested near planned nap times or toward the shift's end. Sleep scientists recommend avoiding caffeine within four to six hours of a scheduled sleep period. For caffeine to be used as an alertness boost three or four hours after consumption, drink it at low levels and only when needed.

Another challenge for our crews is that they can be awakened anytime day or night for urgent missions. Every sortie is a potential multi-mission flight that can include search and rescue, homeland security, law enforcement, or pollution response. If possible, crews dedicated solely to the RCO should be on a set schedule, which eliminates many of the problems mentioned.

Bright lights in the nighttime work environment significantly increase performance. But, it's impossible to use bright lights when dark adaptation and night vision are critical to Coast Guard missions.

Changing wake-up times, even as little as two hours, disrupts the energy-restorative process and degrades alertness and performance.

Remedies

Bright lights in the nighttime work environment significantly increase performance. But, it's impossible to use bright lights when dark adaptation and night vision are critical to Coast Guard missions. However, pilots and crew should try to gain exposure to bright lights before each sortie. This exposure, even for a relatively short time, will help to reset the body clock, and prepare the body for wakefulness during the "back side of the clock." Planning the crew's exposure to sunlight is a powerful tool.

Conclusion

If you are tasked to schedule an RCO deployment, pay particular attention to sortie times and length. If possible, schedule an RCO crew dedicated solely to the special op mission.

Can a crew adapt completely to the "night shift"? I don't have a good answer. Full adaptation is hindered by lack of bright lights in the nighttime workplace during an operational patrol. However, recent studies have shown progress in phase shifts when temporary bright-light exposure is scheduled during the night shift.

What can be done in advance and during the deployment to ease the transition to the "night shift"? Strict maintenance of sleep, diet and environment is the cornerstone. The entire crew-endurance team, including schedulers and crew members, must adhere to the guidance I've presented. Obviously, operational commanders will be constrained by a variety of factors that may render some of this guidance unachievable. The goal is to provide safe, well-rested crews for night missions on a recurring basis and enhance the opportunity for success.

LCdr. Staier flies the HU-25 Falcon Jet, and is stationed at Coast Guard Air Station Cape Cod, Mass.

Mishap-Free Milestones

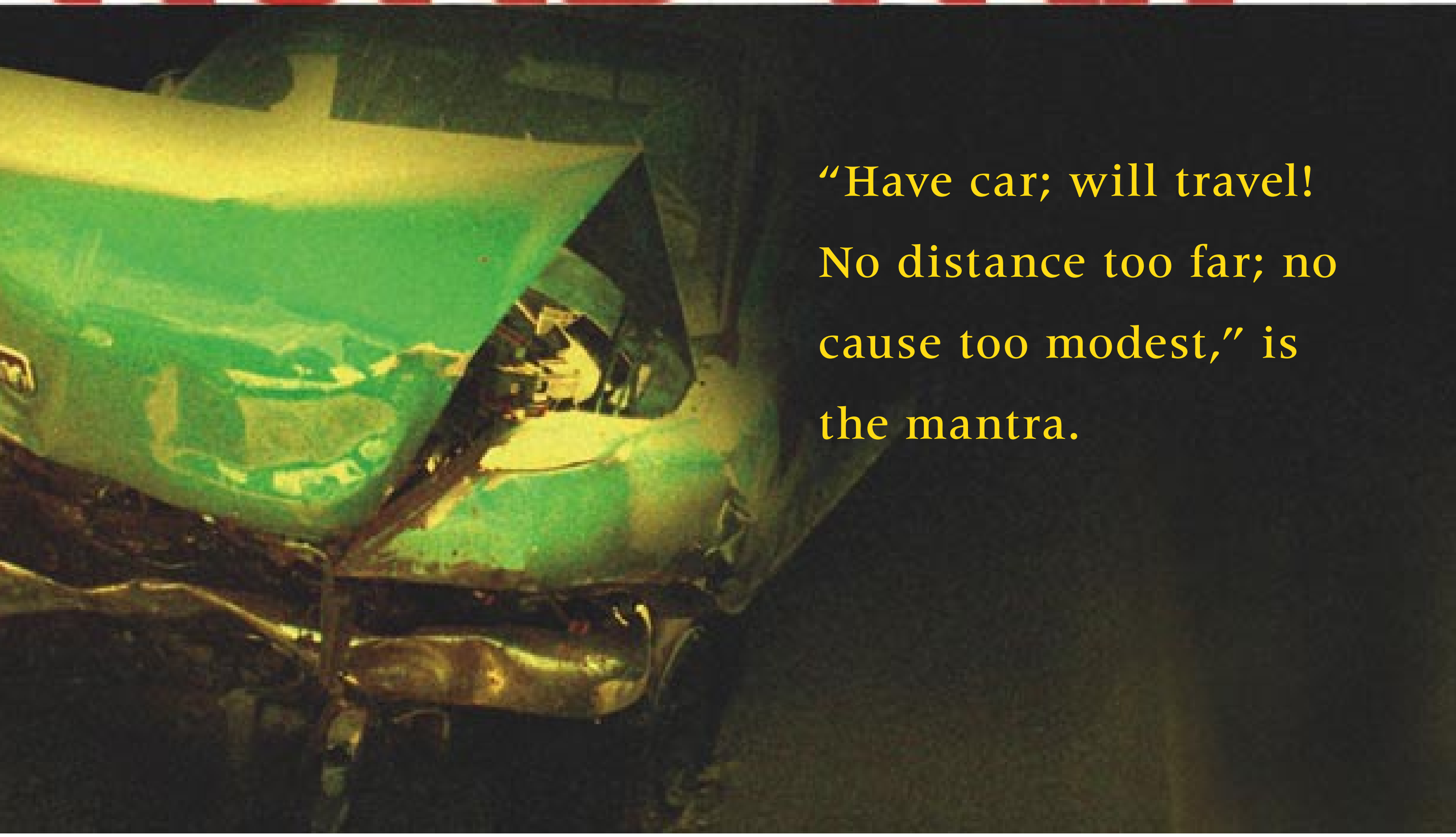
VFA-83	11 years	44,500 hours
HS-8	24 years	
HS-14	9 years	31,000 hours
VRC-40	21 years	95,099 hours
VAW-124	12 years	23,000 hours
VR-53	11 years	43,425 hours
VP-40	38 years	243,000 hours
VAQ-138	23 years	38,584 hours
VF-11	11 years	37,881.5 hours
HS-6	16 years	53,500 hours
HC-5	7 years	52,052 hours
VAQ-129	2 years	15,137 hours
VFA-81	11 years	45,500 hours

HT-18 27 years 1,000,000 hours

Congratulations to Helicopter Training Squadron Eighteen on this historic milestone. Based aboard NAS Whiting Field, Milton, Fla., HT-18 trains approximately 300 new helicopter pilots annually in the Bell TH-57 Jet Ranger.

HT-18 celebrates the squadron's surpassing 1,000,000 Class-A mishap-free flight hours at a cake cutting ceremony. From left, 1stLt. Justin Howe and Maj. Keith Kincannon, the crewmembers who flew the TH-57 aircraft that reached the milestone; HT-18 Commanding Officer LtCol. Ron Colyer; Suzanne Carris, aircraft issuer, TH-57 Program and David Carrington, maintenance manager, TH-57 Program. Photo by Kevin Gaddie

ROAD TRIP



"Have car; will travel! No distance too far; no cause too modest," is the mantra.

By LCdr. Donald E. Kennedy

Ask any teenager or young adult, and they'll tell you a road trip is synonymous with fun and adventure. "Have car; will travel! No distance too far; no cause too modest," is the mantra. The road trip, a perceived right of adult passage, has been the glorified subject of several recent movies oriented toward young adults.

My misadventure fits the Safety Center profile to a "T." My road trip was a "simple" midnight run home. And, yes, I applied about as much forethought and common sense to my travel as Jake and Elwood did in their famous drive to Chicago in *The Blues Brothers*. Fortunately, my story has a happy ending. For many young Sailors and Marines, however, statistics prove otherwise.

When I was a midshipman at the Naval Academy, I participated in airborne training at Fort Benning, Ga. My father had served in the 101st Airborne, so attending jump school seemed like the perfect opportunity to march a few miles in my father's footsteps. And, Fort Benning was only a six-to-seven-hour drive from my home in Clinton, Miss. By taking a POV, I had transportation for weekend excursions and the opportunity to drive home for the upcoming 4th of July weekend. I didn't know the drive home would prove to be far more dangerous than jumping out an airplane at 1,200 feet.

My three weeks at Fort Benning were memorable and action-packed. The opportunity to jump out a perfectly good airplane seemed exciting, invigorating and dangerous. As the 4th of July weekend approached, however, I anxiously looked forward to "fleeing the coop" and spending some time with my family and current girlfriend, whom I had seen little of since leaving for Annapolis more than a year before.

Because we lost a training day to the long holiday weekend, we were required to complete Monday's training on Friday. We started our daily grind an hour earlier at 0400; reveille was at 0330. We ran, marched and jumped until 2000 that evening. Before dismissing the troops for the weekend, however, the airborne training cadre assembled and subjected us to the mandatory, preholiday safety brief.

After a tortuous ordeal that seemed to last an eternity, liberty call finally was announced. I hustled to the barracks, impatiently waited in line to shower, quickly changed, and packed my bag for the weekend. As I slid behind the wheel of my father's SUV about 2230 that evening, the seat felt relaxing to my tired and aching body. I was energized by the prospect of going home, and I never thought twice about my 19-hour day (so far) or the message my body was telling me.

I stopped at a local convenience store for gas and grabbed a 20-ounce Mountain Dew and a pack of sunflower seeds. Suitably equipped and alert, I was ready for the midnight run.

The first few hours of my trip were uneventful. Once I hit Highway 80, it was a straight shot to Interstate 20 and home. With little nighttime traffic, I set the cruise control at 10 mph over the speed limit, cranked up my favorite tunes, and started counting down the miles to the state line.

Over time, my eyes grew heavy, and I struggled to keep them open. Remember, this road trip was a long time before I had heard of the operational-risk-management concept, but, even at 19 years old, I was smart enough to implement my own "risk controls." So, what did this wise, young teenager do? I rolled down the windows, threw in my favorite road-trip cassette, and began to howl at the moon with my not-so-impressive renditions of 80's rock classics.

I was good for 20 more songs until the sound of my tires on the gravel shoulder brought me out of my trance. I quickly swerved back onto the road just before I almost hit a bridge. OK, I realized now I was spending less time on driving and more time trying to stay awake. I took the next exit, found a truck stop, and went inside.

I wish my story ended here, but it didn't. The simple concept of getting a hotel room for the night was foreign to a teenager who saw 50 bucks as half a month's spending money. Furthermore, I pleasantly was surprised to discover I was only 100 miles from home. Although I couldn't remember driving through half the state of Alabama, my destination was within reach. I just needed a little break—I convinced myself. I went inside the truck stop's 24-hour restaurant, sat down, and ordered breakfast with a pot of coffee. A half-hour later, I declared myself rejuvenated and hit the road.

About sunrise, I crossed the state line—almost 28 hours after my day had begun. The familiar road and countryside was a welcome sight. Feeling well-caffeinated, fresh, and ready for the backstretch, I no longer needed my rudimentary but resourceful "risk controls." I rolled up my windows, turned off the air conditioning, and turned down the radio. It now was all downhill—well, almost.

The next thing I remember was feeling the impact of a front-end collision. When I awoke, my vehicle still was moving, but I had no forward visibility because of the mangled hood directly in front of the windshield. I finally realized I could see through a gap below the hood, and I used my limited visibility to pull over to the side of the road. I climbed out unharmed but saw my vehicle likely was totaled. A few hundred yards up the road, an 18-wheeler also had pulled over to the shoulder. I then realized what had happened: I had fallen asleep and rear-ended the tractor-trailer. Ironically, the only damage to the truck was a bent "Drive Safely" sign suspended from its bumper.

My road trip had ended less than 60 miles from my home. The good news was that I walked away with only minor cuts and a few bruises to my ego. In another half-mile, the road took a sharp bend. If not for the tractor-trailer, I likely would have plowed into a stand of trees at 75 to 80 mph with the cruise control engaged. I certainly wouldn't have been here to write this story.

In retrospect, my misplaced motivation to get home and maximize time with my family drove me to make some poor decisions. First and foremost, rather than get a good night's sleep and leave when I was rested, I tried to drive through the night while physically exhausted. I had been awake for 28 hours when my body finally cried "no mas." Second, I selected my desired arrival time and then adjusted my speed en route to get there. My attitude was, "What's another 10 to 15 mph above the speed limit?" Third, I ignored numerous warning signs that my body rapidly was approaching its limits. Despite the urban-teen myths, rolling down windows, listening to loud music, singing in the car, taking in lots of caffeine, and even stopping occasionally are not "risk controls," and they will not make sure you safely reach you destination. Last, when driving by automobile, the price of a hotel room is often a wise investment that pays in spades.

From a leadership perspective, the training command made some poor risk decisions, as well. The training cadre conducted a mandatory preholiday safety brief, but it had an unintended and negative effect. By delaying leave and liberty call until late in the evening, they actually encouraged poor decision-making and increased the risk to those who were traveling over the weekend. If they had anticipated risk and desired to encourage positive behavior, Friday's schedule could have been pared back, allowing leave and liberty call to begin at a reasonable daytime hour. If this was not possible under the course-schedule constraints, they could have made the more difficult but prudent decision and delayed leave/liberty until the next morning.

I look back at some of my earlier decisions with absolute bewilderment: What was I thinking? When driving, I now ensure that I am well-rested, or I delay my travel. My wife and I split the driving; we take frequent breaks, and we seldom drive more than 8 to 10 hours a day. Anything more, and we stop for the night. I know that a hotel room is a cheap investment for my family's safety.

At work, when my officers or enlisted bring me a leave chit, I ask questions about their travel plans and sign it only after writing deliberate comments like "Buckle Up" or "Don't Drink and Drive" in the comments section. I borrowed an idea from the Safety Center Traffic toolbox (www.safetycenter.navy.mil/ashore/motorvehicle/toolbox), and created a "Contract to Arrive Alive" that I use for all the holidays and long leave periods. The contract re-enforces desired behavior and forces personnel to do some planning before I sign their leave chits. Do these things work? I don't know, but, honestly, I don't care. The important thing is taking advantage of an opportunity to put out the message and have some face time with my troops. We have to do something to educate our young Sailors and Marines, who, like me at age 19, perceive themselves to be "10 feet tall and bulletproof."

Sailors and Marines serve in high-risk organizations and environments, and we perform our duties remarkably well. However, we need to carry the same discipline, risk management, and common sense into our off-duty activities—especially when operating private-motor vehicles. For those of us who serve on board ships, in the field, and in aviation squadrons, it's hard to believe that the most dangerous mission may just be the drive home.

LCdr. Kennedy flies with HSL-44.

Paying Homage to the FOD God

By PR1 Thomas Leadingham

"Get your hands out of your pockets
Eyes on the deck ...
No talking...
Let's go!"

Every morning around sunrise, Navy and Marine Corps aviation personnel walk the flight lines in a ritual almost as old as naval aviation: the FOD walkdown. This morning stroll seeks to collect worthy tributes; we then display the day's offerings to the mighty FOD god. Every pilot and maintainer knows that if the FOD god is not given his offerings, an aircraft may not go flying, or worse, one could fall from the skies in a most ungraceful way.

We walk (slide in some cases) the good walk—in bright sunshine, snow, rain or monsoon, to find things that could be harmful to our aircraft. The hot sunny days of summer can be nice until the flight-line temperature breaks 110 degrees Fahrenheit. The cold days of winter are absolute zero fun, until a nice, light snow covers the flight line, resulting in an all-out snowball fight before we get back to the hangar. Hey, snow is FOD, right?

Foreign lands hold their own charms. The Philippines can be sunny one minute and engulfed in a monsoon the next, with sideways rain so hard the monkeys would tumble down the flight line. Japan always has ash on the runways. In Korea, we find golf balls next to the revetments (everywhere but on the course). Bases in Turkey have empty shell casings everywhere.

In the few years I have been paying homage to the FOD god, I have found some wondrous objects: a wrist watch, ink pens, nuts, bolts, screws, washers, gold necklace, rattlesnake (live), soda can, dog tags, $5 bill, cigarettes, rank insignia, an igloo cooler, a pizza box (empty), and (drum roll please) the "golden bolt," which won me a day off.

All this FOD raises some questions. Ever wonder where all these offerings to the FOD god come from? Ever wonder what we don't find? The next time you go to work on the flight line, stop and think about what you might leave as an offering to the FOD god–car keys, safety wire, screws, pens, candy wrappers, sunflower seeds, or worse yet, part of you.

PR1 Leadingham is with VFC-12.

Crew Resource Management

Situational Awareness
Assertiveness
Decision Making
Communication
Leadership
Adaptability/Flexibility
Mission Analysis

Ditching Into the Deep

By LCdr. Bill Mellen

"Ok guys, this is it, we gotta do this," was the last thing I said before we lost all power to the aircraft.

Those words could have been my last ones had I not had the proper training. I was straight out of Aviation Safety School and just three weeks into my department-head job as the squadron safety officer; I couldn't help but shake my head at the irony of it all.

It was a typically brisk but clear, winter day in Norfolk. The water temperatures were reported to be in the high 30s to low 40s. I begrudgingly donned my dry suit—not thrilled by the prospect of having the suit's rubber seal chafe my neck, like a cheap, rented tuxedo, for the duration of a three-hour, airborne mine-countermeasure (AMCM) sortie. With a seasoned lieutenant for an aircraft commander (HAC) and a complement of six salty aircrewmen, I felt the deck was stacked for an easy back-in-the-saddle flight for the old O-4. Good thing I didn't make a wager.

We were scheduled to hunt "mine like" objects in a training minefield 30 miles off the coast. When we reached the training field, I settled our MH-53E into a 75-foot hover as the crew prepared the AMCM gear. We completed our premission checklist in the cockpit and awaited the "ready to commence" call from the crew. Instead, we heard, "Sir, do you hear that noise?"

A high-pitched whining sound could be heard over the ICS. I quickly scanned the gauges—indications were normal.

I replied, "Everything looks normal up here. Where is the sound coming from?"

One crewman suspected the No. 3 engine. "No biggie," I thought. After all, this is the mighty 53E, with three engines and power to spare; just transition to forward flight, and, if the engine fails, land as soon as practical. It was time to show the lieutenant how

CRM Contacts:

CRM Instructional Model Manager
NASC Pensacola, Fla.
(850) 452-2088 (DSN 922)
https://wwwnt.cnet.navy.mil/crm/

LCdr. Deborah White, Naval Safety Center
(757) 444-3520, Ext.7231 (DSN 564)
deborah.j.white@navy.mil

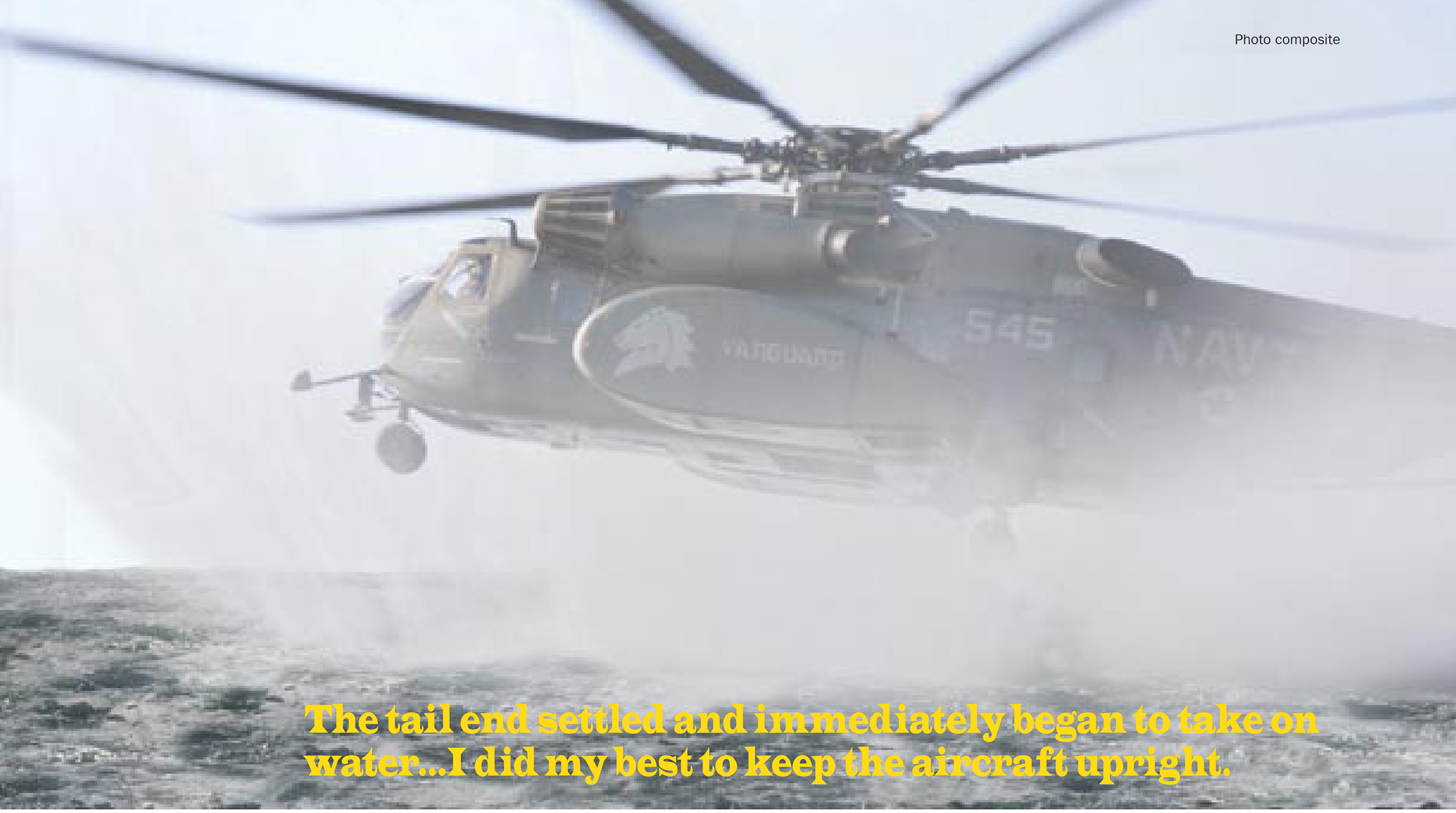


Photo composite

an "old school bubba" greases on a dual-engine landing.

I was awakened from my pretentious stupor by another crewman's remark, "Ah, actually, sir, I think the noise is coming from the main gearbox."

Yikes! The machine just upped the ante, and this was a winner-takes-all game.

We immediately headed for the beach. As I mentally reviewed the NATOPS procedures for an impending main-gearbox failure, I flew a "low and slow" profile of 100 feet AGL and 80 knots.

Within three minutes, the noises from the back grew deeper and louder; airframe vibrations now accompanied them. I could feel the aircraft laboring to stay in the air. I asked the HAC to check the pressure and temperature gages and to alert me of any abnormal indications. The gages checked within limits, but the aircraft was talking and telling a story whose plot was easy to follow. With numerous mishap accounts fresh in my mind from safety school, I knew the all-too-often abrupt ending.

"This is not good," I remarked to the crew.

Reading between the lines, the HAC directed the aircrewmen to prepare the cabin for a possible water landing. Still 28 miles from land, I wondered how much farther I could coax the aircraft to fly. I got my answer moments later when the MGB-chip-detected light illuminated, followed, in short order, by a hydraulic-pressure caution light.

Completely persuaded that the gearbox was catastrophically failing, I rapidly flared to set up for an immediate, no-hover landing.

"Ditch, ditch, ditch; we're making a water landing guys," I announced over ICS. I asked the HAC to raise the landing gear and to get out a Mayday call on guard frequency.

"I can't believe I'm about to do this," I thought, as I set the aircraft on the ocean.

The tail end settled and immediately began to take on water. The HAC reached up to secure the engines, while I did my best to keep the aircraft upright with the cyclic. Suddenly, power cut off, and all we heard was the whistle of the blades as they coasted down.

Seeing the water level creep up the chin bubble, I realized I needed to prepare for the inevitable egress. I reached down and pulled the window's emergency-release handle, gave the window an elbow, and watched it fall into the water.

"What else?" my mind raced to recall. "Air, that's right, I got air."

I reached across my survival vest and grabbed the helicopter-aircrew-breathing-device (HABD) regulator, put it my mouth, and took a short breath to make sure there would be no surprises (I had been in too much of a hurry on preflight and hadn't bothered to check the bottle pressure). As the rotor blades slapped against the swells and came to a halt, the aircraft began a slow roll. I looked over to the HAC and saw he already was underwater. I held on to my window frame for reference, placed my other hand on the harness release, and braced myself for the big-ticket ride.

I was comforted by how surprisingly close the airframe-roll mirrored that of the 9D5 helo dunker. However, my comfort level soon was exceeded by the inrush of water from my window. It felt like a fire hose had been sprayed in my face. Every part of me desperately wanted to get out of that seat, but the phrase, "Wait until all violent motion stops," rang in my mind, and I stayed strapped in until the rush subsided.

Suddenly, it got dark but calm. Breathing on my HABD bottle, I turned the harness release and fell out of the seat—still holding on to my window frame with the proverbial death grip. As I fought through debris that washed forward from the cabin and filled the cockpit, I pulled myself through the window and made a few strokes.

Next thing I saw was the blue Virginia sky as my head popped out of the water. I soon felt the cold bite of the frigid water; I now was glad to be wearing that cheap, rented tuxedo.

Regrettably, I had opted to leave my dry-suit underliner hanging in the paraloft, because I didn't want to get too warm in flight. I pulled the beaded handles to inflate my survival vest and was granted the luxury of an auto-inflate. Others of the crew were forced to manually inflate their vests when the beaded handles failed them.

I looked around and spotted an orange raft floating 20 yards away—the crew chief had been able to deploy and inflate the raft during egress. I backstroked my way to the raft, where the rest of the crew met me. We all worked to get each other on board. I counted eight smiling—no, make that, giddy—faces and let out a sigh of relief that everyone safely had gotten out. We were cold and wet, but there wasn't a scratch on anyone.

A Coast Guard C-130 crew heard our Mayday and, within minutes, was circling overhead. We established communications with the plane on the PRC-149 survival radio from one of the crewman's vest. Help was on the way. Morale was high in the raft. I almost felt guilty about quenching the festivities by putting on my safety-officer's hat and reminding the crew we still were in the ocean and needed to stay focused on our procedures for rescue. As advertised, the cavalry soon arrived in the form of two Navy H-60 helicopters that quickly hoisted us to safety.

Back at the hospital, a crewman asked me if that was the back-in-the-saddle flight I was looking for. "Not so much," I replied. Yet, if experience is the best teacher, I earned a Ph.D. on that flight. Foremost, I learned that the aircraft doesn't lie when it's talking to you, so you better be all ears. Abnormal noises may be the first and possibly the only indication of malfunction before failure. What's more, it has been said that the NATOPS was written in blood. Unless you want to write a postscript with yours, know its contents cold; there's no time to cross-reference when things get ugly.

Don't allow the donning of your survival gear to become a mere formality: Dress for survival, not for comfort. Preflight and thoroughly familiarize yourself with all personal- and aircraft-survival items; today might be the day you call on them to save your life.

Finally, believe in the emergency-egress training you've been taught. Does it really work? I bet my life on it—literally.

LCdr. Mellen flies with HM-14.

AN/PRC-149

The AN/PRC-149 personal locator beacon and voice transceiver (PLBVT) provides GPS location and communication to SAR units. It is carried in the crewman's survival vest and is activated by the crewman.

The integral voice transceiver features multiple-channel selectable VHF/UHF capability. The search and rescue satellite-aided-tracking (SARSAT) capability provides near instantaneous notification of distress signals to rescue agencies.

With its embedded GPS receiver, the AN/PRC-149 provides automatic position reporting. A detachable radio-control unit enables rescue swimmers to communicate hands-free with the hovering helicopter, and allows full use of their hands for the rescue operation.

The radios are being issued through normal logistics chains as a programmed replacement for the PRC-90 and PRC-125 survival radios. There are more than 10,000 AN/PRC-149 radios currently in the fleet, spread across all aviation communities.

ORM Corner

Information for Continual Improvement

What are we doing right? Much of what you read about safety usually focuses on mishaps, near-mishaps, and what our Sailors and Marines are doing wrong. As professionals, we need to continually improve the way we do business. As the articles in Approach *are meant to share experiences so others learn (the "There I was" concept you're familiar with), we also need to share practices that can prevent mishaps.*

From a Hornet community safety gram:

The following is taken from the commodore's comments: "The large increase in reported hypoxia events over the last six months is cause for great concern. Thanks in part to aggressive hazrep reporting, we have taken steps to improve the maintenance procedures and reliability of the OBOGS system. If equipped, the OBOGS system must be bit checked before every flight. If you must take off your mask to take a drink, make sure sure a check of the cabin altitude is part of the process. Suspected wingman hypoxia shall be incorporated into CRM training. Finally, if things just don't feel right, pull the green ring and descend to a safe altitude to sort things out."

From a USS *Shoup* (DDG-86) mishap-reduction-effort message:

Daily inspection of flight-deck nets and hardware, specifically retaining pins, are conducted to prevent the inadvertent lowering of nets, which can result in possible damage or loss in rough seas. A "rule of 20" (sum of rudder angle in degrees and speed in knots is less than 20) while flight-deck nets are down is used to prevent excessive rolls, which are hazardous to flight-deck equipment and personnel. Also, communication between flight-deck personnel and the bridge team is conducted before lowering nets. 1MC announcements inform the crew of ongoing evolutions and schedule changes.

From a safety survey at Naval Station Norfolk:

The VAW-121 Bluetails have a valuable tool available at the click of a mouse. The squadron ASO has assembled a library of VAW-community hazreps, arranged in an Excel spreadsheet with hyperlinks to the individual messages. The messages can be accessed by squadron members on the local intranet.

From HS-75 in a HS community ORM/safety gram:

"We have been seeing a decline in the quality of our daily-turnarounds (D-TAs). Pilots have noted obvious discrepancies on preflight. To fix this problem, we took two steps. First, we started having a second look (called a smoke-over) after we took the aircraft to the line. A plane captain different than the one who conducted the D-TA almost always does this second look. Second, we initiated a plane-captain-evaluation form. Both efforts have combined to improve the quality of our inspections."

From a VP-16 Orion safety gram:

"We must find ways to recognize and combat complacency. If curing complacency were easy, the Naval Safety Center already would have issued the solution. In an effort to prime the pump, here are a few discussion points:

"Think what-if. While we don't want to go around foretelling doom and gloom and suggesting the sky is falling, a certain amount of critical thought should accompany any evolution. Anticipating problems and shortfalls and rehearsing alternative courses of action is not paranoia; it is preparedness.

"Use ORM wisely. Operational risk management is a tool that may or may not help combat complacency; it depends on how the tool is used. If an evolution is approached with a comfortable, complacent attitude, it is unlikely risk factors will be identified and managed. However, if ORM is used as a method to step back and evaluate a task with a fresh set of eyes, then the ORM process should accomplish its intended purpose.

"Leadership and professionalism can provide a certain amount of insight or instinct to ferret out subtle complacency. While this ability may be more art than science, it certainly falls into the category of leadership. What we now call 'intrusive leadership' is simply recaging leadership to where it always should have been. As professionals, it is our job to anticipate problems, to ask the probing questions, to listen intently to what is said versus what we expect to hear, and to have the courage to act accordingly. Combating complacency sometimes requires directing action that seems like overkill or excessive preparation. Personal discipline and moral courage are required to hedge against a low-probability outcome. But that is the hallmark of leadership; the fact is that the tenets of responsibility and accountability demand such discipline from those privileged to exercise authority."

Ready Room Gouge