

THE NAVY & MARINE CORPS AVIATION SAFETY MAGAZINE

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# Approach



MARINE CORPS AVIATION  
100th Anniversary



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# The Navy & Marine Corps Aviation Safety Magazine

May-June 2012 Volume 57, No.3

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Mishaps cost 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. 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; the time to learn to do a job right is before combat starts.

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# C O N

## Features

### Marine Corps Aviation Centennial

A young 1stLt. Alfred Cunningham reported to the Naval Aviation Camp on May 22, 1912, "... for duty in connection with aviation." Thus began the legacy of Marine Aviation. Approach celebrates this Centennial featuring an article by Maj. Geoff McKeel, the Aviation Safety Branch Head, CMC Safety Division HQMC. He provides an overview of Marine Aviation with a focus on safety. We also offer a sidebar highlighting the Marine's Safety Division.

#### 4. Marine Corps Aviation Centennial

By Maj. Geoff McKeel, USMC

For 100 years the Marine Corps' aviation program has flown with pride and with a proven safety record.

### Focus On Foreign Object Damage

We offer two articles that emphasize the importance of an all-hands effort to prevent FOD.

#### 10. Into the Eyes of a Dead man

By Lt. Mark Klein

If you ever doubted the seriousness of leaving an item in the aircraft, this article will remove that doubt.

#### 12. Should I Stay or Should I Go Now?

By Lt. Ian Chamberlin

Nobody needs to wait over an hour for a FOD sweep.

#### 16. Holy Cow

By Lt. Pete Noel

Sometimes you just have to go to Columbia to get a good cow story.

#### 20. Welcome to the Philippines

By LCdr. Hunter Bankart

An unsafe-gear indication may get you a trip to the beach.

#### 24. Pushing NATOPS? Bad CRM? Big Problem!

By Capt. Alfred Njie, USMC

You really can train another day.

#### 30. To Restart or Not to Restart

By Lt. Brett Jakovich and LCdr. Jason Hutcherson

Here we go again. This article states, "The plan was simple."

Front cover: AH-1Z from 11th MEU. Photo by Sgt. Elyssa Quesada, USMC.

Back cover: AB1 Andre Hardin guides an AV-8B Harrier onto the flight deck of USS *Peleliu* (LHA 5). Photo by MS3 Ian Campbell.

# CONTENTS

Photo by Ltjg. Don Clark, F2H from VMF-224, onboard USS Franklin D. Roosevelt (CV-42), 1952

## May-June Thanks

Thanks for helping with this issue ...

Lt. Mark Milliken, VT-10  
LCdr. Jeremy Railsback, VR-55  
Capt. Jerry Peacock, HMH-464  
LCdr. Thomas Clarity, VAQ-138  
John Minners, CNATRA

## Departments

### 14. Aeromedical: Tally Two ... Stars

By LCdr. Andrew Gastrell  
Treat your body well or you may get fooled.

### 17. Bravo Zulu

### 18. CRM: The First Wave

By Capt. Ryan Thompson, USMC  
All the training in the world can't always prepare you for the real thing.

### 28. ORM Corner: Hit by the Pensacola Heat

By Ens. Jason Hirzel  
Beware of Florida's summer heat, because you're not in California anymore.

#### Go To:

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## ORM Magazine

Help us with our new ORM Magazine issue. We're looking for articles where ORM or TCRM was used during any on- or off-duty situation. Did risk management play a key role in your success, or was the lack of risk management a problem? The point of contact for this magazine is Ted Wirginis at [Theodore.wirginis@navy.mil](mailto:wirginis@navy.mil) or at (757) 444-3520 ext. 7271. Send articles and inputs by July 20 to [SAFE-approach@navy.mil](mailto:SAFE-approach@navy.mil).



# The Initial Approach Fix

*Hello shipmates!* I'm Capt. Chris "SanDog" Saindon, the new Director, Aviation Safety Programs here at the Naval Safety Center. I recently completed a rewarding and challenging tour as Navigator aboard USS *Enterprise* (CVN-65), departing just as Big E headed over the horizon for her final operational deployment. I'm excited to be in a job where I can continue to be directly involved in Naval Aviation.



My time here so far has been short but very busy: seven Class A flight mishaps with a loss of eight aircraft and 15 irreplaceable aviators and aircrewmembers (so far for FY12, the Navy and Marine total is eight aircraft and 15 crewmembers). Also, two Class A UAV mishaps occurred within a 10-day period, the first reported Class A UAV mishaps to date. In short, not a great start to the second half of 2012.

As I step back and take a look at some of the emerging facts and circumstances surrounding these mishaps, I ask myself, "Why are we making the same mistakes that we have seen in the past?" We haven't invented some new method of destroying aircraft, have we? Didn't we learn that lesson years ago? We put that procedure in a NATOPS manual and incorporated that one into CRM training, didn't we?

Some of the investigations are ongoing, so the jury is still out. But most of the recent mishaps appear to be the result of human error rather than material failures: Crew Resource Management issues, loss of situation awareness (SA), or not following NATOPS procedures. All issues we have seen before, many with strikingly similar circumstances to past mishaps. We always read, "Brief this mishap to all aircrew," in the mishap-recommendations section of the SIR.

When does that obligation to learn from history end? In my opinion, never. We can never forget the lessons of the past. Many of them were learned at a great cost of both blood and destroyed aircraft.

For example, I was recently talking to some junior aviators from my community, Maritime Patrol and Reconnaissance. I asked them if they knew about some of the infamous P-3 mishaps that were driven into my head as a nugget P-3 bubba, mishaps such as Pago Pago, Crows Landing, the Aleutian ditch, the SOCAL midair. The young aviators all looked at me with blank stares. I was surprised and alarmed that they had missed that critical hangar-flying and the invaluable lessons-learned that came from analyzing those mishaps.

Every community has their history of events. We all have "classic" mishaps, rich with lessons and training points, that are perfect hangar-flying discussion starters.

To help us not forget the lessons of the past is a relatively new system called the Aviation Safety Awareness Program (ASAP), an on-line tool to help capture lessons learned and emergent issues in near real-time. My initial thought on this program was, "Oh great, another on-line form to fill out after a flight." But then I looked at some of the problems that were solved when key decision-makers acted to fix issues identified by analysis of ASAP data trends, and quickly changed my mind.

I equate ASAP to the old-fashioned "Anymouse" drop box on steroids. ASAP has great potential, but its effectiveness is directly related to the quality of the Fleet input received. So keep making those inputs, even if they seem like minor annoyances. They might add up to be a leading indicator to help fix a problem and prevent a mishap.

All you old salts out there, dig into your "Been there, done that" tool bag, and share your sea stories with the JOs. Talking flying is second only to actually getting out there and smelling the JP-5.

Keep 'em flying safely! — SanDog

## Command Excellence Through Safety

The Chief of Naval Operations and the Commander Naval Safety Center are proud to announce the winners of the CNO Aviation-Related Safety Awards for CY 2011.

### CNO Aviation Safety Award

These award winners are recognized for their professionalism, commitment to excellence, solid leadership and competent risk management which resulted in safe and effective operations.

#### COMNAVAIRLANT

VAW-124 VFA-81 VFA-34 HS-11  
HSC-26 HSL-48 VP-30 VX-1

#### CNATRA

VT- 2 VT- 7 VT-10 VT- 21  
VT- 27 VT- 35 HT-28

#### COMNAVAIRPAC

VFA-192 VFA-102 VAW-113 HS-4 HSL-49  
HSC-23 VP-47 VQ-1 (EW) VQ- 4 (TACAMO)  
VAQ-133 (PAC DEPLOYED) VAQ-141 (LANT DEPLOYED)  
VAQ-138 (EXPEDITIONARY) HSM-77

#### COMMARFORPAC

VMGR-152 VMGR-352 VMA-214 HMH-463 HMH-465  
HMH-466 HMLA-169 HMLA-267 HMM-262 HMM-265  
VMFA(AW)-225

#### COMMARFORCOM

VMA-223 VMM-266 VMFA-122 HMHT-302  
VMFA-115 VMAQ-1 VMAQ-4 HMH-366  
VMM-263

#### COMNAVAIRFORES

VP-62 VR-48 VR-53 VR-46  
VR-57 HSL-60 VFC-12 VFC-13

#### CG FOURTH MAW

VMGR-452 HMLA-773 HMH-772 VMR BELLE CHASSE  
VMR ANDREWS

#### COMNAVAIRSYSCOM

VX-20 FRC SOUTHEAST

#### MARINE CORPS INSTALLATIONS EAST

VMR-1

#### MARINE CORPS INSTALLATIONS PACIFIC

MCAS KANEHOE BAY

### Naval Aviation Readiness Through Safety Award and the Adm. James S. Russell Naval Aviation Flight Safety Award

Presented annually to the controlling custodian that has contributed the most toward readiness and economy of operations through safety. The command selected must have an outstanding safety record, an aggressive safety program, and an improving three-year safety trend.

Winner: COMNAVAIRSYSCOM

### Admiral Flatley Memorial Award

To recognize the CV/CVN and LHA/LHD ships with embarked CVW or MAGTF, which surpass all competitors in overall contributions to safety. These teams are selected based on operational readiness and excellence, and an exceptional safety program and record.

Winners: USS *George H. W. Bush* and CVW-8  
USS *Kearsarge* and 26TH MEU

Runners-up: USS *Abraham Lincoln* and CVW-2  
USS *Makin Island* and 11TH MEU

### Grampaw Pettibone Award

Presented annually to individuals and units that contributes the most toward aviation safety awareness through publications and media resources.

Unit award: VAQ-133

Individual award: Winner: Lt. Mark Milliken, VT-10

Media awards: Winner: VT-10

Runner-up: HT-18

Special recognition award: Mr. Peter Mersky, for his Centennial of Naval Aviation series in *Approach*



# Marine Corps Aviation

BY MAJ. GEOFF MCKEEL, USMC



**M**arine Corps Aviation began on May 22, 1912, when First Lieutenant Alfred A. Cunningham reported to the Naval Aviation Camp in Annapolis, Md., "... for duty in connection with aviation."

During the next four years, four other Marines joined him in learning to fly, forming the first nucleus of Marine aviators.

The growth of Marine Air in the years preceding World War I was modest. Despite it being the last of

developed and formalized. Following the practice begun during the Banana Wars, and after the Battle of Tarawa in 1943, the Marine Corps enhanced the quality of dedicated and effective CAS to Marines fighting on the ground. The support included establishing air-liaison parties to coordinate airborne fires in close proximity to Marines in combat with enemy ground forces. The Marine Corps, more so than the other services, had started to embrace the fundamentals of CAS. However, during the interceding years between World War II and the Korean War, the Marine

# tion Centennial

the services to be involved with aviation, the Marine Corps was the first service to send a fully trained and equipped squadron overseas when the First Marine Aeronautic Company deployed to the Azores soon after the United States became involved in World War I. Their mission was to hunt German submarines. Even after the war, Marine Aviation continued supporting operations overseas in Haiti, the Dominican Republic, Nicaragua (in campaigns known as the "Banana Wars") and China. Although in its infancy, Marine Aviation had established a forward operational posture, which has been its hallmark since those early days.

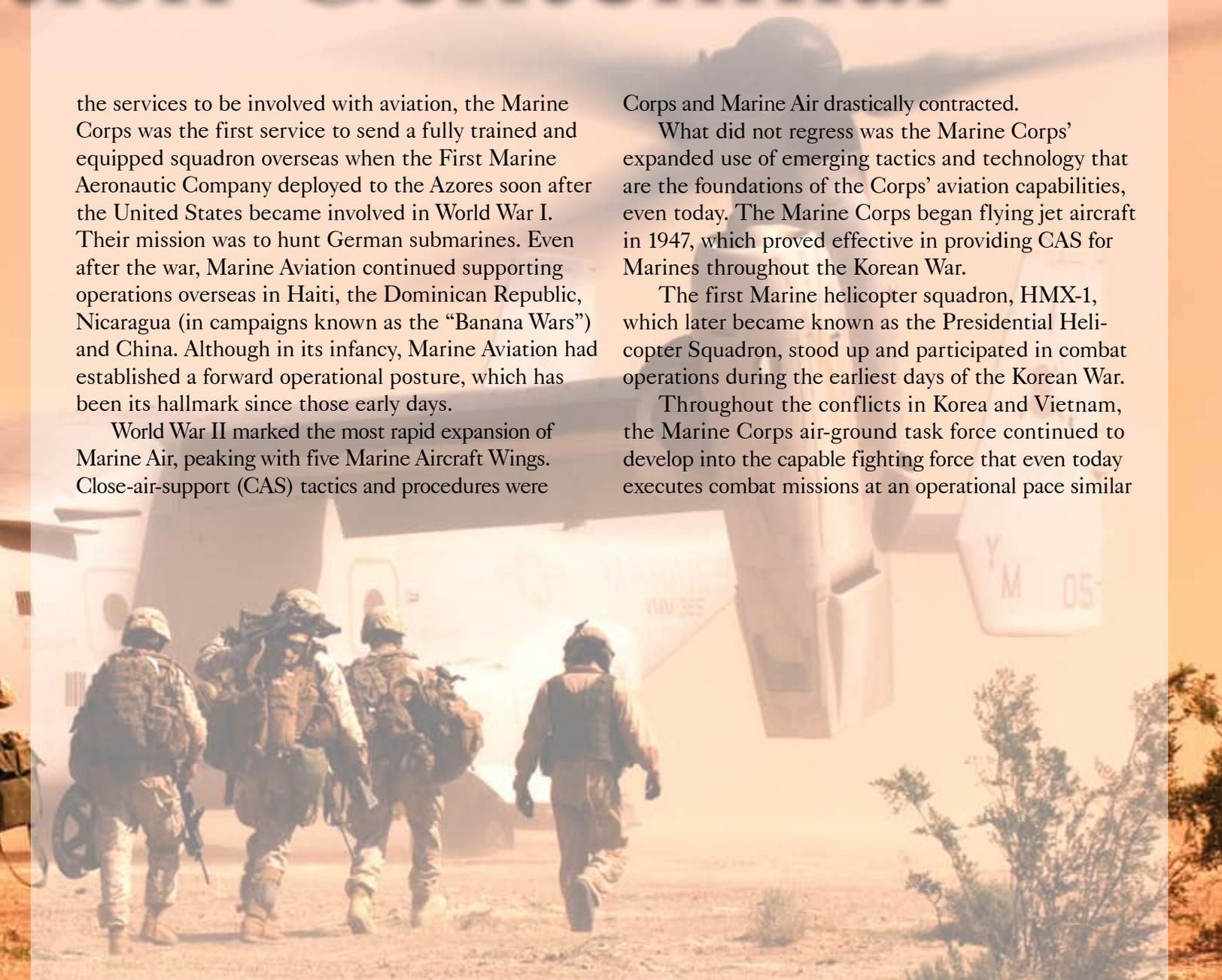
World War II marked the most rapid expansion of Marine Air, peaking with five Marine Aircraft Wings. Close-air-support (CAS) tactics and procedures were

Corps and Marine Air drastically contracted.

What did not regress was the Marine Corps' expanded use of emerging tactics and technology that are the foundations of the Corps' aviation capabilities, even today. The Marine Corps began flying jet aircraft in 1947, which proved effective in providing CAS for Marines throughout the Korean War.

The first Marine helicopter squadron, HMX-1, which later became known as the Presidential Helicopter Squadron, stood up and participated in combat operations during the earliest days of the Korean War.

Throughout the conflicts in Korea and Vietnam, the Marine Corps air-ground task force continued to develop into the capable fighting force that even today executes combat missions at an operational pace similar



Pilot and Aircraft WW1 in France



First Lieutenant  
the first Marine  
a Naval Aviator.

Maj Gregory Boyington, 1943



UH-1E on Mutters Ridge



SBD Pilots, Guadalcanal, 1943



Close Air Support



AD loaded with daisy cutter bombs in Korea



Alfred Cunningham



AH-1J Cobras

Photo courtesy of Defense Imaging.

to that of Vietnam. Through improving tactics and the introduction of airframes (such as the AV-8B and the MV-22, as well as future airframes like the F-35B) designed to meet the versatility of expeditionary operations, the Marine Corps continues to innovate to meet future challenges.

However, with the leaps forward in technology and tactics, and with continued operations around the globe over the last 10 years, came associated hazards and the need to mitigate those hazards. Much of the progress of Marine Aviation's safety programs has been in concert with Naval Aviation's safety initiatives.

Programs such as the development of the Naval Aviation Maintenance Program (NAMP) and the Naval Air Training and Operating Procedures Standardization (NATOPS) have forced the mishap rates downward. Programs such as the Aviation Safety Officer course and Crew Resource Management developed an academic foundation for safety. The Marine Corps and Navy have seen their mishap rates steadily improve as these safety programs took root and fomented stronger safety cultures among aviation organizations.

**DESPITE THIS IMPROVEMENT** in its safety record, Marine Air faced one of its most difficult periods, in terms of safe operations, within the past decade. During 2004, the Marine Corps had one of its worst years in terms of Class A flight mishaps of the past 30 years. A total of 18 Class A flight mishaps resulted in the loss of 11 Marine aviators and the destruction or serious damage to 20 airplanes. Coming on the heels of an increasing mishap trend from the earlier two years, 2004 proved to be a watershed year for Marine Aviation that energized proactive aviation leadership at all levels.

The Commandant of the Marine Corps' Policy Letter 1-05 aggressively responded to these trends by instituting numerous safety initiatives. These actions ranged from reinforcement of the basics of flying to ensuring aviation unit accountability to existing safety requirements. The policy letter also directed a dedicated education program, targeted at aviation leadership, which would serve to invigorate the safety culture among those tasked with shepherding it. This robust, programmatic approach continues in earnest to this day.

Initiatives included the Aviation Training System, a comprehensive training continuum that emphasizes standardization and flight leadership. Also, requirements establishing that future aviation safety officers

must be designated flight leaders. These steps underscore the premium the Marine Corps places in fusing its safety culture with its recognized aviation-leadership structure. The result of this vigorous response has been a steady downward trend in Class A mishaps. The lower Class A rates are even more notable in that they occurred during Operations Iraqi Freedom and Enduring Freedom, missions in the Horn of Africa, humanitarian assistance and disaster relief operations, and continuing support for deployed Marine Expeditionary Units around the globe.

The Marine Corps also has faced challenges associated with its distinctive warfighting assets and the forward-leaning nature of its combat-readiness posture. At times, these challenges have required the Corps to review its resources and capabilities to determine how best to maintain that constant posture of readiness. Most notably, the MV-22, after suffering two Class A mishaps in late 2000, stood down from flight operations for three years. During that time, the Marine Corps made a committed effort to the safety and operational capability of what is perhaps the most unique airplane in the Department of Defense inventory. Since that pause, Ospreys have proven themselves as exceptional combat multipliers for the last five years, all while having the best safety record among all Marine Corps rotary-wing aircraft.

Today, the Marine Corps continues its proactive approach to the safe employment of its aircraft to accomplish the mission whenever and wherever the nation requires Leathernecks to do so.

The Tactical Risk Management course is taught to weapons- and tactics-instructor students at Marine Aviation Weapons and Tactics Squadron 1. This course charges the newest cadres of tactical experts to be combat-aviation-skills instructors and operations risk managers. The program illustrates the value the Marine Corps places on balance between tactical proficiency and force preservation.

Undoubtedly, the future holds a constantly changing landscape in which Marines will have to answer the nation's call. An uncertain future includes flying while embarked, out of expeditionary or unfamiliar airfields and in austere locations. It is easy to see the potential for hazards from this operational complexity. Nonetheless, the Marine Corps has prided itself on establishing a foundation upon which it could build an expansive and effective safety culture.

In his policy statement on Safety and Force Preservation, the Commandant, General James F. Amos, explains, "Safety is central to the idea of readiness and must not be an afterthought of our actions in combat." The notion of safety in operations has always been a cornerstone of the Marine Corps' ability to be America's Expeditionary Force in Readiness.

As Marine Aviation moves to a more multifaceted and dynamic future, it will continue to be as aggressive toward readiness and force preservation as it is in its desire to be the finest fighting force, today, and on the battlefields of tomorrow. 

MAJ. MCKEEL IS THE AVIATION SAFETY BRANCH HEAD, CMC SAFETY DIVISION, HQMC.

## CMC Safety Division

CMC Safety Division is a Headquarters, Marine Corps staff agency that reports directly to the Assistant Commandant of the Marine Corps, and serves as the principle advisor to the Commandant of the Marine Corps on all Marine Corps safety matters.

Safety Division implements policy and directs the safety, risk management, and occupational health programs with the aim of maintaining a culture where risk management and force preservation principles are integral to mission execution, residing at all levels of the Corps, from the most junior Private up to the Commandant.

CMC Safety Division is composed of four branches: Aviation Safety, Ground Safety, Occupational Health, and the Administrative Section. The Aviation Safety Branch consists of a Branch Head, a Fixed Wing Aviation Safety Officer, a Rotary Wing Aviation Safety Officer and an Aeromedical Safety Officer. It is the principle aviation safety staff to the Deputy Commandant of Aviation for all matters relating to Marine Aviation safety, and works directly with the Aviation Safety Programs Directorate at the Naval Safety Center on all Naval Aviation matters. Together they address DoD aviation safety issues with the AFSC and ACRC. The branch works in concert with the Naval Safety Center, the Air Force Safety Center, and the Army's Combat Readiness Center for Department of Defense aviation safety issues.

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Aeromedical Safety Officer – 703.604.4168

Website: <http://www.marines.mil/unit/safety/Pages/welcome.aspx>

Facebook: HQMC Safety Division

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The mission of Safety Division is to enhance the Marine Corps' consistent posture of combat readiness by aligning doctrine and policy with risk management principles in order to foster a climate and culture of force preservation.



# Into The Eyes of a Dead Man

Does this sound familiar? “Our instructions and procedures are written in blood.” OK, I get it. But do you?

**BY LT. MARK KLEIN**

I thought I understood the term FOD, or foreign object damage. The concept sounds simple: Anything foreign can destroy an aircraft, killing everyone within. Not until I almost killed four members of my squadron did I grasp its true meaning. These were four people I’ve flown with countless times, four people I consider family.

I was assigned as mission commander for a Kuwait local-area orientation flight from Basrah, Iraq. Two crews were assigned. Our takeoff time was scheduled for 1600, with a 2000 return. We briefed as a section three hours before takeoff and walked to the birds 45 minutes before our scheduled takeoff time. Both crews did a standard two-look preflight and began their checklist procedures.

I heard Dash 2 call maintenance control requesting a FOD search. One of the pilots had dropped a piece of his writing utensil beneath his seat and couldn’t find it.

Meanwhile, my crew pressed forward with our prestart checks. “Step 27, Lockpin status check.”

“Blade Fold Master switch – ON. Flight, no spread.”

I continued to press through the checklist and called for the required head check.

We realized after our systems checks that finding the FOD in Dash 2 was easier said than done. I held at the “No Rotor Brake Start Procedure” to conserve

fuel. My copilot and I continued to explore the aircraft’s software during the wait.

“Show me how you’d enter a manual contact at this location. Now make it a hostile airborne threat with a circle around it.” Why waste the training time?

We continued our session while the maintainers searched for the elusive FOD. An hour-and-a-half went by and still no joy. We were running out of time to complete the mission. Oh well, we’d just try again another day. It was a training mission, after all.

I discussed options with Dash 2’s aircraft commander. Since they had briefed for a utility-crewman check ride, there was no reason they couldn’t salvage the event if they stayed in the local training area, and as long as I gave them my bird. We got permission for this plan, and Dash 2’s crew headed to my bird. I sent my copilot inside while one of Dash 2’s pilots strapped in. My crewchief and I gave a face-to-face turnover with our counterparts. I was complete with the checklist up to step one of the “No Rotor Brake Start Procedure.” The other aircraft commander signed for the aircraft and the crew began the checklist where I’d left off. Within minutes the rotors were spinning at full speed, and they were out of the chocks.

Three-and-a-half hours later, my heart stopped.



The crew had landed and long since debriefed their flight. The maintenance control chief was standing in front of me holding a four-inch, folded pocket knife that a maintainer had found during the postflight inspection — in the rotor head.

I had looked the other crew in the eyes, told them it was a good bird and almost sent them to their deaths. I could have killed a maintainer if the pocket knife released itself from the rotor head and searched for a victim during rotor engagement or disengagement. I was speechless. I asked to see the knife to see if it was etched — it wasn't.

I gathered my crew and pulled them aside. My copilot, a pilot qualified in model (PQM), had unknowingly dropped his knife near a blade-fold hinge. It rested there unsecured throughout the spin-up, flight and shutdown. The knife waited as an evil final judge of destination, not only as a FOD hazard to the crew, but as a missile hazard to each of the maintainers tending the launch and recovery.

My copilot explained how he had heard a “metallic tink” as he climbed over the rotor blade to transition from the hydraulics bay to the engine portion of his preflight. He had discredited the noise. He thought it was “probably” the extra M-4 mag in his lower leg pocket. Probably?

I had failed. How could I have been so careless? How had I forgotten to stress the basics? How could I have not taught him to be accountable for the security and inventory of all personal gear, both before

climbing on the bird and after? How did I miss that he took an M-4 magazine loaded with 25 pieces of 5.56mm FOD with him to the hydraulics bay and engine compartments? I wasn't sure my crewchief was breathing at this point. In fragmented English he said, “After the lockpin status check ... I went up with the second crewman for the head check.”

I didn't sleep that night. I lay in bed wondering what I would have written to the wife or mother of the maintainer or crewmember that I had sealed the fate of when I turned over a FODed bird. How would I tell someone I had messed up so badly that their daughter, wife, son, husband, or father, someone I knew dearly, would never come home? Do I use their first name? Do I still call him AM2? Do I type it? No, it would have to be handwritten. I'd have to see them in person, look them in the eye. I would want them to know that I care. I would want to show them respect. How do I honor their memory? By being thankful for their lives? By writing an article to remind aircrew and maintainers alike that our instructions and procedures are written in blood.

It's a way of life, in the air, on the flightline, and in the hangar. It's an attitude and belief that the smallest lapse in attention to detail can have the largest impact on our family — on the family of our hardest working maintainer standing in the 128 F heat.

I now know what FOD is. I've teetered too close to its wrath, too close to the loss of a family member, too close to having their blood on my hands. 

LT. KLEIN FLIES WITH HSC-25.

## Should I Stay or Should I Go Now?

BY LT. IAN CHAMBERLIN

**A**fter years of sustained conflict in Iraq, U.S. forces were headed toward a complete withdrawal. As an expeditionary EA-18G squadron based out of Al Asad, Iraq, we were left dealing with many issues associated with the drawdown. After one particular flight in support of Operation New Dawn, the combination of redeployments and airfield drawdowns nearly reached up and bit us.

After five months of operations from Al Asad, we settled into a stable routine: brief, fly support missions, conduct training and head home to rinse and repeat. The one significant change we encountered on the backside of our deployment was the gradual decline in suitable divers as bases were preparing to close or be transferred to the Iraqi government. The NATOPS and squadron duty officers maintained a running tracker of closure dates and available facilities. Fuel ladders were adjusted as the nearby suitable divers dwindled.

Before briefing the day's flight, I consulted the board and saw that our best divert (an airfield that still had fuel, security and other services) was a 6,000-pound bingo. A less desirable divert was available at a 4,000-pound bingo. We would check the weather before our RTB and assess our options.

The mission was uneventful. After we were cleared to RTB by our JTAC, we took advantage of extra time and fuel for post-mission training. The weather was beautiful, and after coordinating airspace with Baghdad Control, we decided to work northeast of Al Asad. We planned to knock-it-off with enough fuel for two instrument approaches before we hit the 4,000 pounds of fuel required to bingo to the secondary divert.

While we weren't concerned about the weather, we did pad our gas in the event of any unforeseen issues at the field. The increased pace of flight operations to accommodate redeployers (shuttling in and out of the base) had already strained the capabilities of approach and tower. With a solid game plan, we executed our G-warm and post-mission training. We reached our RTB fuel within minutes, knocked it off, reset the bingo bug to 4,000 pounds and headed back to the ranch.

At check-in with Al Asad Approach, we were told the left runway was closed for a FOD sweep. A C-5 had departed the field, and the right runway was closed for preventive maintenance. The controller said they expected the left to open up in five to 10 minutes. With that in mind, we leveled off at 14,500 feet, and orbited about 20 miles east of the field. Initially, we didn't think much of waiting because the weather was beauti-

ful. We also had just returned from a great flight and had plenty of gas. However, as 10 minutes came and went without even a word from approach, we started to feel the hair rising on the back of our necks.

After asking approach control for an update on the left runway and getting the same response, "... open in five to 10 minutes," we expected to get the same reply on our next call. My pilot prompted me to ask about the right runway, and we were told it would remain closed for maintenance. In a short period, we had gone from dual-runway operations at take-off, to a single runway, and finally to no runways at all.

We were still 1,000 pounds above bingo fuel and had a healthy tailwind along our divert route of flight. We consulted the PCL and figured we had at least another 10 minutes of holding before we'd lose our divert option. I called base and asked them to check on what Al Asad Airfield Operations was saying about the closure. The relayed answer, ("Expect the left to open in five to 10 minutes") didn't do anything to make us feel better.

Every minute that ticked by brought us closer to a decision point, and with 200 pounds of fuel-remaining above our bingo, it was time to decide. Either we stayed near Al Asad, sacrificing our divert option, or we executed a bingo profile to our remaining divert, 140 miles away. We had just come from the east, and while the weather looked fine, we couldn't be sure that a dust storm had not popped up. We did not ask our base to check weather, which would have given us a better idea of our divert field.

With 100 pounds of fuel-remaining above our bingo, I said what we had been thinking, "Mutters, we have choices: We can stay here and orbit overhead the field until they clear us to land, we can stay here and orbit until we hit emergency fuel then land, or we can turn to our divert right now."

He was silent for a few seconds, so I added, "I think we should stay here. The field is VFR and it would be a bad idea to leave a good field for one that we have little to no information about."

He pondered for another second then said, "I'm going to head overhead the field, let them know."

We thought about how no one in the squadron had firsthand information on the current status of our divert field, and how NOTAMS highlighting reduced-airfield capabilities often badly lagged reality. Also, getting a quick squirt of gas from a tanker wasn't an option because of the lack of drogue-equipped aircraft in-country. Finally, if any heavies had recently taken off from our divert, we could potentially end up in the same situation. Worst case, we figured we could set up for a short-field arrestment at a

familiar field to minimize the FOD hazard.

We told base of our plan and got a sanity check with the safety officer, who recommended we remain overhead. We headed toward the field to gauge the progress of the FOD-sweeping effort.

From overhead the field, we could see the trucks sweeping the left runway for FOD, as another set of trucks blanketed the right. Our fuel continued to tick down, and what had started as a five-to-10 minute delay had devolved into a 35-minute delay.

Now 1,000 pounds below our bingo fuel and committed to landing at Al Asad, we continued to receive word that the left runway would reopen in "... another five minutes."

Another squadron aircraft waiting in the holdshort monitored our base frequency. They provided a play-by-play of the trucks sweeping the runway, trying to give us a better idea of when we could land. We were now only 200 pounds from emergency fuel.

We knew that when that low-fuel light came on, we would soon be coming in to land, regardless if the FOD sweep was complete. Switching to tower's frequency, I told them that we would be landing within five minutes. Tower immediately cleared us to land, and we touched down as the low-fuel caution light and master-caution tone came on.

While we could not have predicted the closure of one runway for a FOD sweep, there are a few things we could have done before walking to the jet that would have helped. We had checked the NOTAMS and found nothing about the right runway being closed for a maintenance inspection. However, after calling base ops, we learned that because the inspection was scheduled to recur weekly, the airfield listed this event in the IFR supplement rather than making a change to the NOTAMS. We also should have had our duty officer inquire about Kirkuk's weather and airfield status, so we could have made a more educated decision to divert or stay overhead. We should have pushed for that information earlier.

The FOD sweep lasted nearly an hour after a C-5 had taken off from the left runway. Our squadronmates, in the holdshort, had seen fist-sized rocks scattered along the approach end. We held for about 40 minutes of that hour, while approach continually insisted we would only be waiting for five to 10 minutes. We worked well as a crew, but in the future, we'll walk knowing that approach controllers and aircrew might interpret "five to 10 minutes" very differently. ■

LT. CHAMBERLIN FLIES WITH VAQ-138.

## Tally Two ... Stars

BY LCDR. ANDREW GASTRELL

I was a Cat “other” student going through a refresher syllabus at the fleet replacement squadron (FRS). As I prepared for carrier qualification (CQ) in the E-2C, I did a lot of waiting. During a field-carrier-landing practice (FCLP) det at NAS Jacksonville, the students getting their initial CQ are the priorities for the instructor pilots (IPs) and LSOs. So, you wait to hot switch into an aircraft, you wait to do internal switches in the airplane, and generally, you just wait.

I had almost 2,000 hours, four deployments, yada-yada. Yeh, I'd been there, done that. It's like riding a bike, right?

The IPs work extremely hard teaching the students how to land on the carrier. I know because I had been an FRS LSO and CQ IP in an earlier life. It means long days, hot weather, and very stressful flying, all of which contribute to fatigue over a two-week detachment.

On this clear and starry night, I was flying with a senior IP and another Cat other pilot. I was second to fly my eight passes. We then departed the pattern, executed a side-to-side crew switch, and reentered the pattern to get eight more passes for the IP. By that time, it was nearly midnight. It was also the second four-hour flight for the instructor that day. With one

pass to go, we were abeam the field on downwind. The only other plane in the pattern, a C-2A Greyhound, was RTB to NAS Jax.

We flew our pass, and paddles said, “641, switch lights and altimeter, cleared to depart, cleared to switch.” Our FCLP session and mission were complete, and it was time to go home.

We raised the gear and flaps, accelerated and climbed. Passing 400-foot AGL, the IP abruptly made an aggressive nose-down control input and pulled the power levers to flight idle. This action initiated a severe nose-down, high-VSI descent.

Stunned, I quickly uttered, “Whaddareyoudoing? Whaddareyoudoing? Whaddareyoudoing?”

The IP didn't respond to my challenges.



“I have controls,” I said, as I added full power and back-yoke pressure, arresting the descent at 150-foot AGL.

I climbed to 3,500-foot MSL for the RTB profile. The IP couldn’t communicate for a minute after the incident. Once we were straight and level, he explained that he had mistaken two stars for the wingtip lights of the departing COD. He had taken evasive action to avoid the imaginary mid-air collision. The IP was extremely shaken by the near controlled flight into terrain (CFIT), so I kept the controls and landed at NAS Jax.

This is a classic example of how fatigue can affect your situational awareness, vision and spatial perception. This was the second-to-last day of a 12-day detachment, the IP’s second flight, and the end of a hot, humid, 15-plus-hour workday. Add in just two small meals from the ready-room gedunk, too little water (it’s tough to use the relief tube while teaching your student to fly in the pattern), and almost all of

the holes in the Swiss cheese lined up.

This experienced IP exhibited many indications of fatigue. He couldn’t recognize the situation. He misperceived the visual indicators. He overreacted to the visual cues and tuned out audible cues, such as the departing radio call of the C-2 in front of us and multiple verbal challenges from the copilot.

Fortunately, after waiting around for so long, I was fresh and alert at the midnight hour. I’m glad it was me at the controls instead of a more junior, less assertive student pilot. A Class-A mishap was narrowly averted, one that would have cost the lives of three aircrew and destroyed a perfectly good airplane.

Every naval aviator is susceptible to the effects of fatigue and dehydration, regardless of rank, total pilot time, number of traps or any other measurement. Treat your body well, and know your limits just as well as you know those of the aircraft. 

LCDR. GASTRELL FLIES WITH VAW-125.

# Holy Cow

BY LT. PETE NOEL

*This story is so unusual, so out-of-the-blue, that when I told it to a couple of sim instructors at the C-130 schoolhouse in Ft. Worth, even those crusty salts were silenced. For the first time in history they didn't come back with, "That's nothing. One time I . . ." They had nothing.*

**T**his event occurred at a podunk strip of asphalt in central Colombia known as Aeropuerto Jorge Enrique Gonzalez Torres. We had a whopping 4,921 by 66 feet of runway, which is small even by C-130 standards. We were to deliver a few Navy SEALs and their training gear for their jungle adventure.

After an uneventful but brake-warming landing, we unloaded the cargo and waved goodbye to the SEALs. Then we waved at the locals who had gathered around the edge of the field to see this enormous aircraft. We taxied 50 feet back to the runway to depart.

A short-field takeoff in the C-130 requires more vigilance and planning than a standard departure from a large runway. We monitor engine output during acceleration and note our refusal speed, which was 101 knots for this takeoff. Factor in the runway width, which was exactly half of the 132-foot wingspan, and the result was more tunnel vision and focus inside rather than outside. As we accelerated past 80 knots, I focused on maintaining centerline. I felt good that the engines were performing as advertised.

Unfortunately, I wasn't scanning farther down the runway. Somewhere around 95 knots, I realized something was moving near the edge of the runway and moving toward us. I took a second to process what I saw. It looked like a full-grown, full-horned white cow,

and it was charging at full speed along the edge of the runway — right at our No. 3 engine.

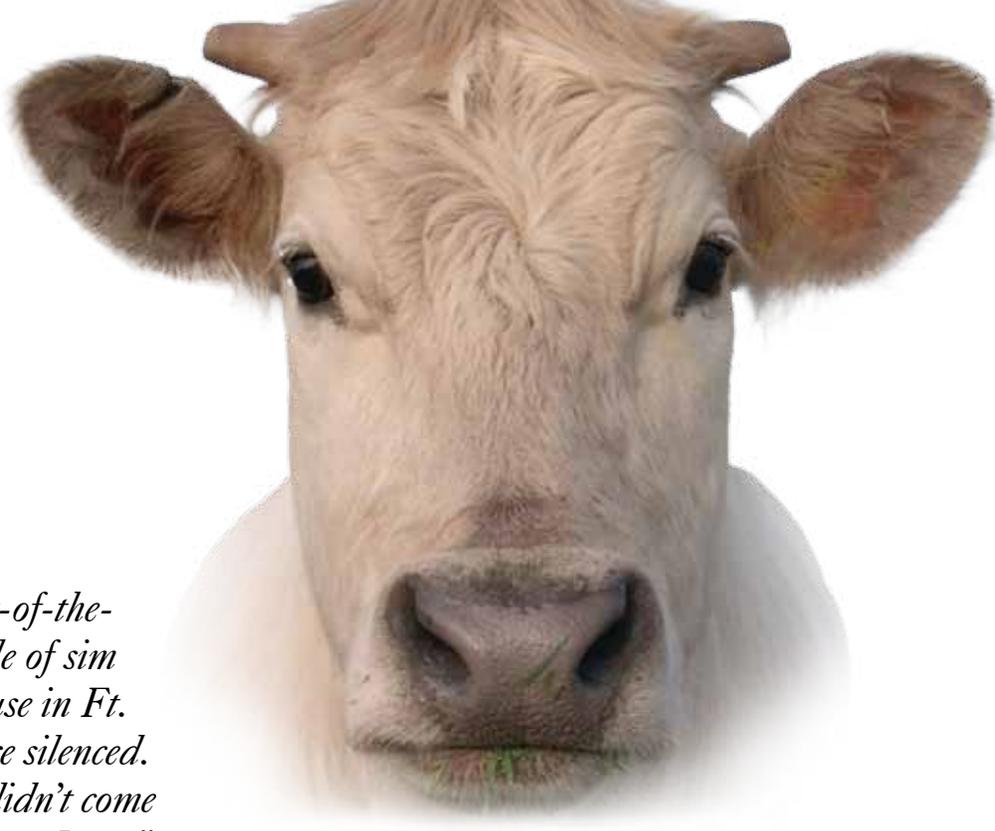
As if this wasn't enough to take in, a woman was chasing after the cow. At the same time, our highly experienced flight engineer must have looked up from the torque meters, because I heard his cool, unemotional Montana voice say, "Cow, pull up."

No exclamation point was needed. A quick scan of the airspeed indicator showed 110 knots, and I pulled hard. We lifted off quickly and left woman and animal in one piece. I'll never be quite sure whether we were still on the deck or airborne when that cow passed under the No. 3 prop, but it definitely got the full brunt of the prop wash. As for the woman, I'm sure she has the wildest story that's ever been told in central Colombia.

As if Kirk Gibson had just hit a home run in the '88 World Series, we all said, "I don't believe what I just saw."

Between the disbelief, laughter, and games of what-if ("What if that cow had turned onto the runway?"), it took awhile to come to grips with what had just occurred. Only four out of six crewmembers saw the cow. As we replayed the sequence of events, it was clear the flight engineer exercised outstanding crew resource management (CRM). He had super situational awareness (SA), quickly recognizing a critical situation, and he provided a clear, attention-getting response with his call of, "Cow, pull up." 

LT. NOEL FLIES WITH VR-55.



# VT-22



FLIGHT INSTRUCTOR LCdr. John Hamiter and student 1stLt. Marshall Clinkscales were on a T-45C day familiarization training flight with VT-22 at NAS Kingsville, Texas.

While inbound to the overhead break at 1,000 feet and 300 knots, 1stLt. Clinkscales briefly caught sight of a red-tailed hawk just before it hit the aircraft. The hawk shattered the forward canopy, entered the cockpit, struck 1stLt. Clinkscales in the helmet and dropped on his lap. The windblast through the canopy made it difficult for the crew to talk using the intercom system, so they initially communicated by shaking the control stick. Once verbal communication was reestablished, LCdr. Hamiter determined that 1stLt. Clinkscales' forward visibility was much better than his own because the bird remains obscured his vision.

While LCdr. Hamiter coordinated with Kingsville tower, 1stLt. Clinkscales landed their severely damaged aircraft.



# BRAVO Zulu



# VT-21

CAPTAIN NATALIE WALKER, USMC, a T-45C flight instructor with VT-21, was on an intermediate strike, cruise formation training flight. Her aircraft struck several birds while descending through 3,000 feet in parade formation on a precision radar approach to NAS Kingsville, Texas. The impact shattered the front canopy, allowing several birds to enter the front cockpit.

The crew in the lead aircraft saw her cockpit explode with blood, gore and canopy glass. They saw the student slumped forward and temporarily incapacitated. A large section of canopy and detonation cord had wedged against his head. His visor was broken and his mask was dislodged.

Captain Walker took control of the stricken jet. Despite the wind blast, she established communication with the student and reassured him that she was flying the aircraft. With the jet under control, she told the lead aircraft and air-traffic controllers she intended to make a precautionary approach. Her vision was limited to a saucer-sized gap in the lower starboard side of the canopy. Captain Walker flew an approach to an arrested landing.

# The First Wave

**BY CAPT. RYAN THOMPSON, USMC**

**O**ur squadron learning curve for operating in Afghanistan was steep during our first two weeks with Regional Command Southwest [RC(SW)]. Most of our flights were general-support missions as we moved people and cargo around the area of operation (AO). We also conducted several tactical troop inserts during high-light-level conditions.

On this flight, a section of CH-53Es were tasked for a two-wave extract from a tactical-landing zone (LZ) into a forward-operating base (FOB) during high-light-level conditions. I had a new copilot in the right seat, an experienced crew chief at the left window, a young crew chief at the right window and an experienced aerial gunner on the tail. During the first wave of the extract, the section landed in the tactical LZ and loaded the first set of passengers. The section then headed to the FOB about five minutes away.

The FOB had an LZ with two river-rock landing pads surrounded by moondust. An 8- to 10-foot-tall berm of moondust surrounded the FOB and LZ. During our unit's hand-over with the off-going unit, the zone was described as "sporty." Our squadron had made several high-light-level landings at this FOB, and all mission crews were aware that this zone required a lot of skill. Coming into the FOB, Dash 1 had kicked up a cloud of dust that lingered over the LZ because the winds were calm. As Dash 2, I had to wave off twice before I could land.

During the first approach, the right window browned out at 75 feet, while the left seat and window were OK. At 25 feet the left window browned out. We waved off. I

brought the aircraft around, set up in the downwind and turned for the second approach. On final, I saw nothing but a dust cloud and again waved off. On the third approach, I had reference of the LZ and other aircraft at the 90, so I made a nonstandard approach by flying perpendicular to the aircraft on the deck to maintain reference. This was the right call and we landed.

Once all the passengers were off and clear of the aircraft, the section lifted to extract the remaining passengers. The section landed in the tactical LZ and proceeded back to the FOB. On the second wave, Dash 1 landed in the zone and kicked up a huge amount of dust that remained stagnant over the zone. My copilot lost sight of Dash 1 in the dust, so controls were passed to me. I was 200 to 300 feet higher than we should have been. I tried to get down and not overshoot the zone by decreasing collective and increasing the nose attitude. At 200 feet AGL, I increased collective to arrest the rate of descent.

My copilot called out altitudes from the radar altimeter and airspeeds off the airspeed indicator. Our GPS had not worked for the entire flight, which limited our ability to accurately gauge groundspeed. The desert landing profile used in the CH-53E gives certain altitude, airspeed and distance checkpoints that have been proven to minimize brownout and power required in the landing profile. The airspeed indicator is inaccurate below 40 knots, so the GPS system is used for airspeeds below 40 knots.

Passing through 25 feet, I heard one of the crew chief's calls for "Power, power, power."

I pulled in power to arrest the decent. With the sudden collective increase, the rate of decent was

arrested. However, it also increased the amount of dust due to increased downwash, combined with a nose-high attitude. This caused an unrecognized aft drift by the pilots and a brownout situation.

Looking back, I think I saw the ground, or at least believed I did, but it all looked the same with nothing to give me any reference. This situation should have been my cue to wave off, but I didn't because I thought I had reference and could land the aircraft.

Shortly after the power calls, an aft-drift call was made and then we felt a shudder from the impact. No brownout, reference, nor wave-off calls had been made by any of the crew members. We had a breakdown in crew resource management (CRM) because of the speed at which everything happened. After the shudder, I lowered the collective to get the aircraft on the deck. Once the collective was full down and the aircraft had landed, I assessed the crew and passengers.

After the aircraft was shut down, the aircrew learned the tail rotor had struck the berm and broken off the aircraft.

We have landing profiles and wave-off criteria for a

reason. A brownout situation is not the time to have a breakdown in CRM or aviation duties, whether at the controls or not. You seem to have plenty of time when things are going right, but when things go wrong, they seem to happen in a blink of an eye. When parameters are exceeded, all aircrew need to speak up and take corrective action. Whatever those actions may be, forcing the landing should not be one of them.

We do not regularly train to fly approaches into confined LZs at forward-operating bases with perimeter obstacles/barriers such as HESCO barriers, berms, guard towers, antennas and wires. We should have these types of LZs available for all assault platforms to train, especially in large force exercises such as Enhanced Mojave Viper (EMV), which is required for all Marine units deploying to Operation Enduring Freedom.

Regardless of where Marines operate in the world, a similar FOB construct will require the same skill set and procedures. No exercise can prepare you for all real-world operation, but you'll have the basics to apply to any situation. 

CAPT. THOMPSON FLIES WITH HMH-464.



# Welcome to the

BY LCDR. HUNTER BANKART

**M**y last day flight before a port call in Manila, Philippines, was a good-deal red air for a SWFTI level III event. The red-air lead covered the admin and tactical specifics of the mission, and we left the brief without any questions. As we sat down for our individual brief, we made sure to cover additional cautions and checklists.

I was flying with the skipper, who had more than 2,000 hours in the EA-6B. I was the pilot in command and only needed 98 hours to break 2,000 in model. We drilled down on emergencies at the carrier and spent extra time discussing the CRM of fires in-flight. We also discussed abnormal configuration approaches to the boat in hot, humid weather. We figured we had covered it all.

After launching, we used the surface-search radar to pick our way through convective thunderstorm cells. To add insult to injury, the ship was operating in a typhoon that was passing to the north of the working areas. The red-air lead found a block of clear air and set the war. The blue fighters echoed the weather, and we were off to the races.

The first signs of things to come began in the Prowler cockpit. The weather wasn't getting any better, and the inertial (the "I" in "Embedded GPS/INS") in the Prowler started to drift and eventually failed, leaving us only with GPS. Next, the TACAN began to spin erratically and the DME to the carrier went blank. ECMO 1 ran a BIT (built-in test) to check the status of the box. The BIT returned a "NOGO" indication, meaning that it also had failed. Knowing that it would take additional time to locate the exact position of the carrier for the return-to-base (RTB), we started our flight back using only GPS and radar.

Upon check-in with marshal, we were told that the weather at the ship had degraded from Case I and to expect a Case II arrival via the CV-1 approach. ECMO 1 reported negative TACAN and requested a GPS holding point to wait for our arrival time. We held in a clear pocket of air while we waited for our push time. CATCC did a great job of providing immediate vectors to effect the negative TACAN, CV-1 approach. At 10 miles and 1,000 feet, ECMO 1 called the ship "In sight," and I accelerated to break speed at 800 feet.

We were the first aircraft down. The deck was open, so I made a break over the tower to reduce the open deck time. While approaching the 180, I extended the gear and flaps, starting my landing checklist. Everything was shifting and moving normally, but the nosewheel still indicated barberpoled on the integrated position indicator (IPI). As the aircraft decelerated through 160 knots, I started to level my turn and hawk the airspeed. The aircraft passed through 150 knots and then 140, but the nosewheel was still barberpoled. As we entered the groove, ECMO 1 called tower and paddles, told them of our configuration issue, and said we were taking it around for troubleshooting. The Air Boss instructed me to climb to 2,000 feet and stay in a modified pattern.

ECMO 1 broke out the pocket checklist (PCL). It was the fourth time I had experienced this malfunction. I had been an FRS instructor, so I knew this was not going to be an easy day. ECMO 1 began the "Landing Gear Handle Down Indicates Unsafe" checklist. We coordinated with the ship on what their game plan would be in the off chance we didn't get a three-down-and-locked indication.

ECMO 1 methodically called out each step for me: make sure circuit breakers were in, check for secondary indications of possible down and locked, obtain a visual check, and yaw aircraft and apply G loading. The only

# Philippines



thing going through my mind as we stepped through the checklist and waited for a tanker to join was, “I have seen this before and none of this crap ever works!” I was just biding my time for the tanker. We are most likely going to blow this gear down, and we were below dirty bingo.

As I processed that a barricade could be in my near future, the tanker began to join. We asked him for a visual check of the port side of the extended nose landing gear to see if two small pieces of red tape on opposite sides of the over-center pivot were touching and creating a straight red line. This would indicate the gear should be down and locked.

“500, your red tapes that you described appear to be touching and forming a straight line. It looks down and locked to me,” came the reply.

I thought, “Well, that’s great, minus that I don’t have a good IPI indication, and we don’t have a single secondary that confirms that gear might be down and locked.”

The tanker peeled off and maintained 3,000 feet as we continued to troubleshoot at 2,000 feet. ECMO 1 continued to run through the checklist, and we sped up so we could recycle the gear. We still had some time to troubleshoot. Our gas was at 5.8, clean bingo was at 4.8, and we still had the ability to raise the gear. The checklist called for “Landing Gear... Recycle (below 200 KIAS).” I executed the procedure and prayed that maybe the fourth time with this emergency would be the charm — no such luck. We still had a barberpoled nose landing gear, with no secondary down-and-locked indications.

The entire crew knew that the next step was an “irreversible action” we brief at the carrier all the time. If you blow down the gear using the emergency method, you no longer have the option to raise it using normal methods. We were above clean bingo numbers to Clark AFB (in the Philippines) with the ability to get clean and deal with the situation later, or wait for more senior leadership to direct blowing down the gear and handling the emergency at the ship.

Then the call came in, “500, blow down the gear.”

ECMO 1 had enough experience to call back to tower and ask, “Boss, 500. Understand that you have directed us to blow down the gear?”

He knew we were below dirty bingo and committed to trapping or barricading at the ship. Tower quickly responded, “Correct 500, this is the Boss and we want you to blow down the gear.”

ECMO 1 responded with, “500 copies.” We blew down the gear at 4.8 on gas. No luck.

**WE SELECTED FLAPS 30**, which is a slower flap setting, to mitigate the possibility of a stall. We also slowed to 122 knots at 18 units (on speed is 17 units) angle-of-attack (AOA) and reattempted to blow down the gear. We still had the same issue. As soon as we notified tower, they directed tanker No. 1 (205) to give us his offload of 2.5, and told us to execute the dirty drag bingo to Clark AFB. We did some quick math and figured that 2.5 plus our current state would be under the official dirty bingo, but it would work to get us on deck. I saw the tanker and followed his lead. We still had no INS and our TACAN wasn’t working. The tanker flew the bingo profile, and I settled into “pre-contact” with our fuel switches set to take gas.

The tanker could not extend his drogue and the rat was not spinning. He was a sour tanker, and we had only enough gas to make it halfway to Clark. ECMO 1 told me to turn back around to the ship and said, “We are most likely going to set up for the barricade.”

Gas was now at 3.7 and counting down rapidly in the dirty configuration. As I turned back toward the ship, I saw 205 still following the dirty-bingo profile solo. Apparently he didn’t hear the call that we

detached to return overhead. Then, much to my surprise, through 135 degrees of turn and separated by two to three miles, I saw the drogue extend and 205 piped up, “I am now a sweet tanker.”

I thought, “Sweet Mary, they say timing is everything, and my timing sucks. No chance, Paddles.”

At the same time, tower instructed another tanker (113) to join on us and give us their frag to allow more time to set up for the recovery. Tower asked 113 how much frag they had, and they reported 2.5. I laughed when I thought about the additional 15 minutes of decision time 113 was going to provide me. Once overhead, 113 made a quick tactical join to our starboard side. I double-checked that my switches were correct to take gas.

As we began to tank, I heard the sweetest query of my naval career, “113, tower. If you were to recover on this recovery how much gas could you give 500?”

There was a quick pause. “Sir, we could give 5.8 no problem.”

Tower came back and instructed 113 to give all they could and to start the bingo profile to Clark with 500. As the aircraft began to fill to 8.1 with a 7.9 bingo, I felt a huge sense of relief that I would not be the first Prowler barricade. We took our load, quickly moved to starboard side, gave 113 a thumbs up, and headed to Clark. Wow, I had just dodged that bullet.

As we climbed to our bingo altitude of 25,000 feet, squawking emergency, we realized the previous gremlins of no INS and no TACAN were about to come full circle and kick us right in the teeth. I leveled off at 25,000 feet, and we asked Red Crown for pigeons to Clark AFB to double-check our GPS heading. They replied three times with pigeons back to the ship. On the fourth request for steering or heading to Clark, Red Crown finally passed us 048 degrees for 198 miles. Finally something made sense and was going right. The COD that had just launched off the carrier (on an RTB to Manila and then Clark) heard our emergency declaration and relayed the information to Manila Center, adding that we’d need crash-crew assistance upon arrival. Man, it was great to hear shipmates helping us out.

During an emergency you have moments of nervousness and uncertainty, and then there are those

moments of eerie calm. I should have known that the eerie calm while completely IMC was only a moment in time. As I strived to maintain my cruise speed of 215 knots, or .52 Mach, I should have only guessed the next downhill on our EP rollercoaster was coming: A line of convective activity between me and the field, with no gas to deviate, no other field to land at, and no way to return to the ship. To add even more insult to injury, it was now dark, and the jet was slightly stalling and falling a couple hundred feet every few minutes. ECMO 1 was working the radar giving updated steering, and I was leaning left or right depending on where the last lighting strike appeared to come from.

I was nervous but sure we would make it. Then I heard ECMO 1 ask, “Why are we not transferring gas? Why is there only 3.4 in the main bag?”

**W**e still had 124 miles to go, and the main bag was not going to cut it. My heart instantly sank as I knew what had just happened. In the fray of getting gas off the tanker, I had taken the override switch, which transfers gas when your landing gear is down or not up and locked, and moved it to “NORM,” so we could take gas off the tanker. As we jumped off the tanker, climbed to cruise altitude in IMC conditions, and started to deviate around the thunderstorms, I had forgotten to reselect “Override” to start the fuel transfer to the main fuel tank. I immediately selected “Override” and looked at ECMO 1 as if I had just let dad down and wrecked his new car. We both took a long pause as we studied the gauge to see if transfer would start. Seconds later, the main bag rapidly started to fill. I quickly said a prayer of thanks and gave a nod to the angels under our wings that night.

Manila Center passed us off to Clark Approach, and we started the descent profile. I knew we were homeward bound as we completed our ship to shore and descent checklist. All I needed to do was pray the nose didn't fall through on touchdown (24 hazreps in the community said we would be fine and three mishaps said it was not looking good). Passing through 8,000 feet, we started to go in and out of the weather. I saw

from the corner of my eye a master-caution light lit up; we had just lost our left generator. I pulled the ram-air turbine (RAT) for precautionary back-up power and hoped we wouldn't lose it or the other generator.

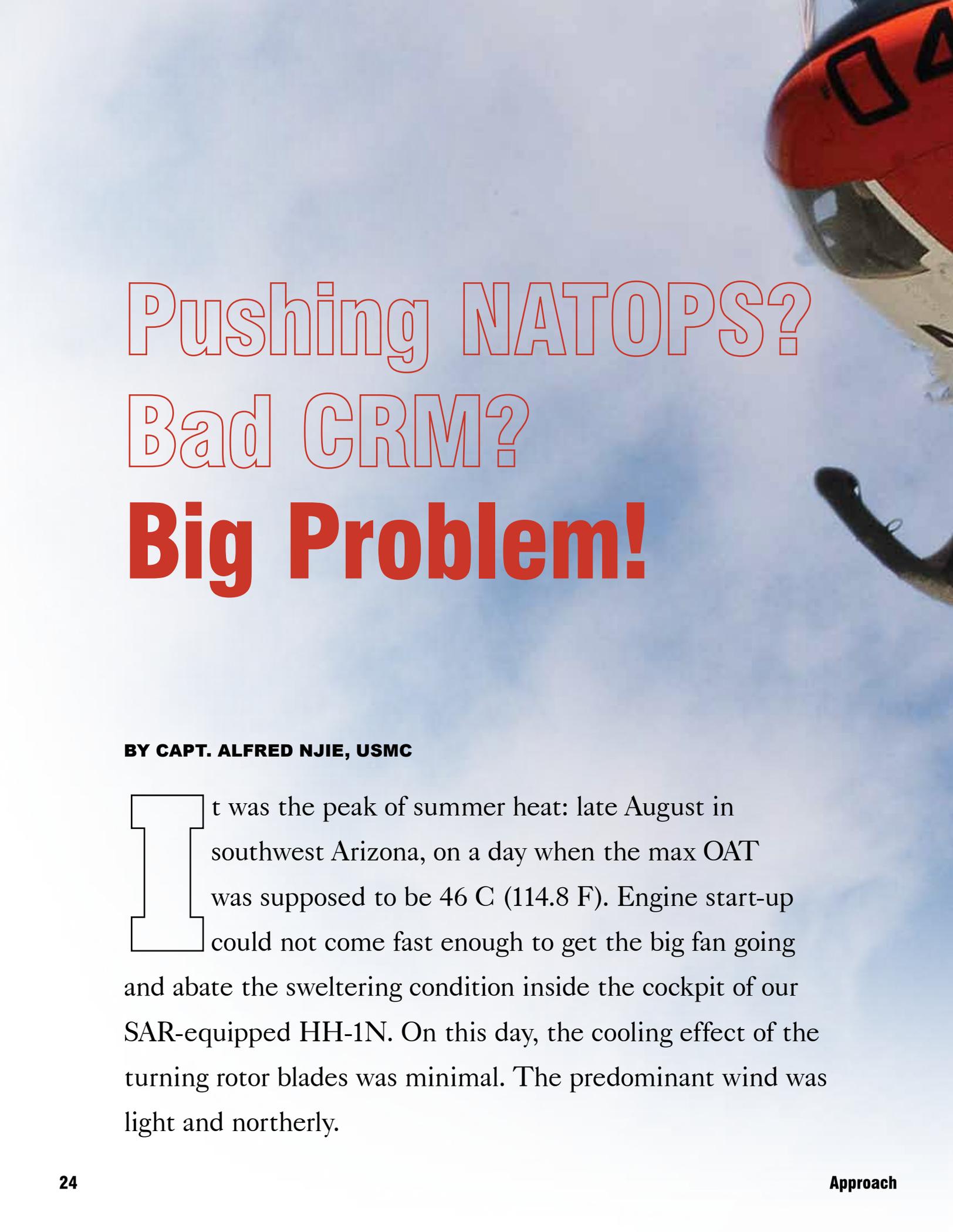
Passing through 5,300 feet, I spotted a thin line of lights through the sheets of rain hitting the canopy. I was convinced that couldn't be the airfield because we were too high, and the civilian ILS was indicating we were still southwest and below glide slope. Passing through 4,100 feet, I saw another long string of lights that were brighter than the first. I was sure that was Clark, but with today's circus show I was not really sure of anything anymore. ECMO 1 made a great call and contacted tower to bring the approach lighting to full. Seconds later, the string of lights bloomed like a Christmas tree. About 500 feet later, we broke out of the weather, perfectly set up to fly the ILS to runway 020 at Clark AFB.

At five miles from the threshold, I extended the speed brakes to slow our descent. Seconds later, the AOA indexers lit up like a pencil flare. I knew exactly what that meant. I looked down and checked the IPI and ol' 500 had just given us a three down-and-locked indication. I rolled the rheostat down on the AOA indexers and ran through the landing checklist two more times for good measure. We quickly talked about holding the nose off as long as possible on touchdown to mitigate a hard landing or an inadvertent gear collapse.

With 2,200 pounds on final, we touched down at Clark AFB and rolled out just fine. We taxied clear of the runway to find that our COD brothers before us had activated every piece of emergency equipment for our hair-raising arrival. What a great welcoming committee: 10 guys in oven-mitt suits and loads of fire trucks. The follow-me truck showed up and escorted us to a dark hangar in no man's land.

Our maintenance rescue det found that the landing gear down-and-locked actuator had failed, causing a linkage failure in the gear. Fortunately, the gear came three down and locked on short final because per the Vegas odds listed above, this malfunction was the one that led to the three instances of collapsed nose-landing gears on touchdown. 

LCDR. BANKART FLIES WITH VAQ-133.



# Pushing NATOPS? Bad CRM? **Big Problem!**

**BY CAPT. ALFRED NJIE, USMC**

**I**t was the peak of summer heat: late August in southwest Arizona, on a day when the max OAT was supposed to be 46 C (114.8 F). Engine start-up could not come fast enough to get the big fan going and abate the sweltering condition inside the cockpit of our SAR-equipped HH-1N. On this day, the cooling effect of the turning rotor blades was minimal. The predominant wind was light and northerly.



The plan for the search-and-rescue (SAR) crew that afternoon was a training flight for a SAR crew chief under instruction. The pilot in command conducted the brief. The suitable zones for the training mission, considering the current winds, were discussed. The pilot in command and the crew-chief instructor agreed on the primary and alternate working zones.

Power checks were completed at the primary zone. We also did a profile simulating the technical-rescue evolution we would later practice. The surrounding terrain at that location is usually perfect to funnel northerly winds, with almost no chance of crosswind interferences. During the profile, however, something didn't feel right because there appeared to be a considerable crosswind. The pilot in command struggled to maintain a stable hover, and the crew unanimously recommended to try the alternate zone.

We arrived at the alternate zone and immediately tried a profile. Working at the alternate zone required about a 200-foot hover over a river, with no appreciable aid from the surrounding terrain. The bowl effect of the primary zone provides favorable winds on most days (reducing the power required to hover out of ground effect). Also, you're closer to the terrain, which provides hovering-in-ground-effect characteristics.

Halfway through the profile, the pilot in command asked for the temperature reading on the combining gearbox (C-Box), almost as if he expected something to be wrong with it. In the HH-1N, this gearbox receives input from the free power turbine of each of its engines and combines the output. It then routes the power toward the main rotor and tail rotor.

I stretched to the center of the instrument panel so

I could read the value without parallax, which is usually associated with reading gauges from the left seat. I read the C-Box temperature at 120 C. The crew-chief instructor quickly came inside and confirmed that number. The maximum C-Box oil temperature is 115 C. Though not a memory item, I knew the emergency procedure (EP) for this over-temperature condition is to land as soon as possible.

**THE PILOT IN COMMAND** then terminated the profile to land at the rig zone, which was the closest option. Rig zones are used for crew chiefs and in-flight rescue medical technicians (IFMT) to make the cabin ready and “rig up” for the actual technical rescue or simulation. It’s also the most likely place a technical rescue will terminate on a short-haul rescue (an emergency-rescue technique meant to quickly get a patient out of a dangerous situation and place them in a safe location). Short haul involves rappelling from a hovering helicopter to a victim below.

After landing I pulled out the pocket checklist, read the EP, and confirmed that we had needed to land as soon as possible. The crew-chief instructor inspected the oil coolers and oil-cooler blowers, which are located aft of the engines and the C-Box. The C-Box oil temperature gradually cooled to within normal limits. Strangely, the pilot in command’s response to the EP was, “We’ve done that.” He seemed to imply that because the C-Box had cooled back to within limits, we had complied with the emergency and could resume normal operation of the aircraft. The crew-chief instructor then entered the cabin. The discussion quickly progressed to what maintenance action would be required once we returned to base. The consensus was to complete the training with the first of two short-haul rescues.

On the first one, I closely monitored the engine-instrument panel with specific attention to the C-Box oil-temperature gauge. Once a hover-out-of-ground-effect was established, the C-Box oil temperature gradually

increased. Though it initially was in the normal operating range and the rise in temperature was slow, it eventually went right back up and again stabilized at 120 C.

By now the IFMT was on a ledge, hooked up to the helicopter with his rappel rope. I stated the over-temperature condition and noted the time. Because we had a person at the end of a rope outside the helicopter, we were committed to complete the rescue unless the helicopter could no longer maintain flight. It took about 12 minutes to land following the second over-temperature condition of the C-Box. The consensus at this point was to terminate training and RTB.

The C-Box cooled back down within normal limits, while the air crew cleaned the cabin and packed the ropes.

When we returned to base, the pilot in command thought it best to shoot an approach to the airfield. He thought the higher altitudes and increased airflow would cool down the C-Box considerably, which it did. This part of the flight was uneventful, and a maintenance-action form for the C-Box over-temperature was submitted the following day.

What on earth just happened?

Our crew chose to expose the HH-1N helicopter on what might have been the hottest day that summer to a very high workload environment. Every Huey aircrew with deployments to the Middle East knows the brutal effect that high, hot and heavy conditions have on helicopters. Flying deployment missions at max gross weight in hot weather was not uncommon. We also knew that the C-Box oil temperature, to a certain extent, was a limiting factor in those conditions.

### **The NATOPS factor**

NATOPS addresses this situation (14.28.4 Combining Gearbox Oil Temperature Exceeds Red Line): Step 1. Land as soon as possible.

That’s all the EP says. It should have been enough. Once on deck after a C-box limitation was exceeded,

# **There is no reason to endanger lives in a training environment.**

any aircrew should count themselves fortunate. A complete C-Box failure would essentially warrant an auto-rotation as the main drive shaft to engine connection would be severed. There is probably a good reason why NATOPS does not add material found in maintenance manuals, because it is beyond the scope of normal operating parameters when an aircraft has an emergency requiring it to land as soon as possible.

The words, “land as soon as possible,” should imply an imminence of catastrophic failure should a pilot choose extended flight. NATOPS does not further specify what should be done after landing or if the C-Box temperature returns to normal limits. We should have known not to resume subsequent flight operations without maintenance on the aircraft. But, we did anyway.

In addition to NATOPS, our squadron SOPs have a chapter stating, “Any aircraft malfunction that requires a deviation from planned itinerary or possible cancellation of a mission shall be reported to squadron operations as soon as possible. If a flight is aborted for any maintenance or safety issue, the CO must approve subsequent flight. Anytime an aircraft aborts or diverts for a maintenance problem, the aviation safety officer (ASO) shall be notified. The ASO will make a recommendation to the CO regarding any requirements for a hazard report.”

This SOP should have been the final safety net. It removed the burden of responsibility from the pilot in command. And it allowed the CO, armed with information from the maintenance department, to decide about subsequent actions. Once the aircraft had landed the first time after the initial C-Box overtemp, the decision and authority to continue flying or not no longer belonged to the pilot in command. There was no logical reason to put the aircraft in the same regime as before, for a longer period of time with an IFMT dangling underneath.

## **CRM Breakdown**

The CRM process for this crew broke down. The pilot in command is a highly experienced aviator, a night-system instructor and a former fleet-replacement-squadron instructor. I had the pleasure to fly with him as a student. However, he sometimes isolated other crew members, making it hard for them to participate.

As the copilot, I had a nagging feeling that we should have called base to inform the CO or his acting representative. I said nothing, partly because of the cockpit climate and partly because there was no cell-phone reception at our location. I had forgotten that the SAR kit we always took with us had a satellite phone we could have used. I still should have spoken up.

The pilot and crew-chief instructor had a discussion about what the maintenance manual directed for the overtemp. It was assumed that only an inspection would be required. I was not familiar with the maintenance manual and allowed myself to be boxed out of contributing toward the decision-making process. All the while, I held my NATOPS pocket checklist, which is all we needed to have made the right decision.

If there is anything to learn from this I'd say the Huey has its moments where it is forgiving. This was one of those moments that our crew got away from unscathed. My advice: Do not try this at home (with any aircraft).

Crew resource management is much larger than any individual personality. Every crew member needs to speak up for what they believe should be done.

Training flights have always been trumped by emergencies. There is no reason to endanger lives in a training environment. You can always train another day. Prevent the mishap and survive the emergency. 

CAPT. NJIE FLIES WITH HEADQUARTERS AND HEADQUARTERS SQUADRON AT MCAS YUMA.

## Hit by the **PENSACOLA HEAT**

**BY ENS. JASON HIRZEL**

**F**or a wide-eyed ensign stationed in Pensacola, summer offered great flying conditions. I enjoyed sunny days of zooming through a big, blue sky while cloud-surfing and enjoying a beautiful coastal view. What more could a student NFO ask for? However, coming from California, where the summers are moderate and pleasant, I failed to realize the intensity of the summer heat in Florida. If Pensacola isn't overcast with an impending thunderstorm, then it's hot and humid. You just want to sit inside with a cold beverage and max air conditioning. Add to the heat our full flight gear, a hot parking ramp, and a T-6A canopy that when closed emulates the greenhouse effect, and your chances for a heat-related incident are real.

I had recently returned from a weekend cross-country flight to Santa Fe, N.M., and was scheduled for two flights on Monday. I went home to begin flight planning. I pounded caffeine drinks and snacked to stay focused. I didn't drink water or eat a healthy meal — I wanted to get to bed at a reasonable hour.

The next day the sun was beating down, the temperature was more than 100 degrees and the humidity near 100 percent. The tarmac was hot, with sauna-like conditions in the cockpit; the Pensacola summer was en fuego.

With full flight gear, including G-suit and harness, I was ready to walk to the plane with my instructor pilot. The heat was more intense than expected. Sweat beads started to form, and I had a river streaming off my nose even before I got to the aircraft. I shrugged off having my gear sweat-soaked and continued with the checklists. I was confident that I'd cool down after engine start when the air conditioning came on.

We were delayed with clearance delivery for a few minutes. I noticed how much I had sweated but continued to press forward. As the aircraft left the chocks, we heard a loud clunking noise and suspected a nosewheel-steering problem. This would be yet another delay and would require maintenance troubleshooting.

While we waited for maintenance, the heat continued to beat down on me. I felt dizzy and very dehydrated. We were instructed to shut down the engine and get another aircraft; this one was not fully mission capable. My IP instructed me to start on the preflight checklist on the newly assigned aircraft, and he would go inside to complete the necessary paperwork.

I ran to the new plane to get everything set up, not wanting to disappoint my IP. Running to the plane in the heat was a mistake. Once I got there, I was breathing heavily, sweating profusely and felt even dizzier. Heat had never been a problem for me in the past, and I didn't want to stop because I felt hot.

My instructor arrived at the plane, and we started the before-exterior checklist. As I read the checklist items, I felt weak in the legs. My head was spinning, and I could barely breathe. But, I didn't want to wimp out. I thought, "It's just a little heat, I can get through this." Then I started to slur my speech; my knees buckled. The heat delivered its final blow as my instructor grabbed me, took me off the wing, and had a maintenance golf cart drive me into the air-conditioned building.

Our medical folks diagnosed me with a case of heat asthenia, a lesser case of heat exhaustion. I was told to drink twice the usual amount of water and supplement with sports drinks.

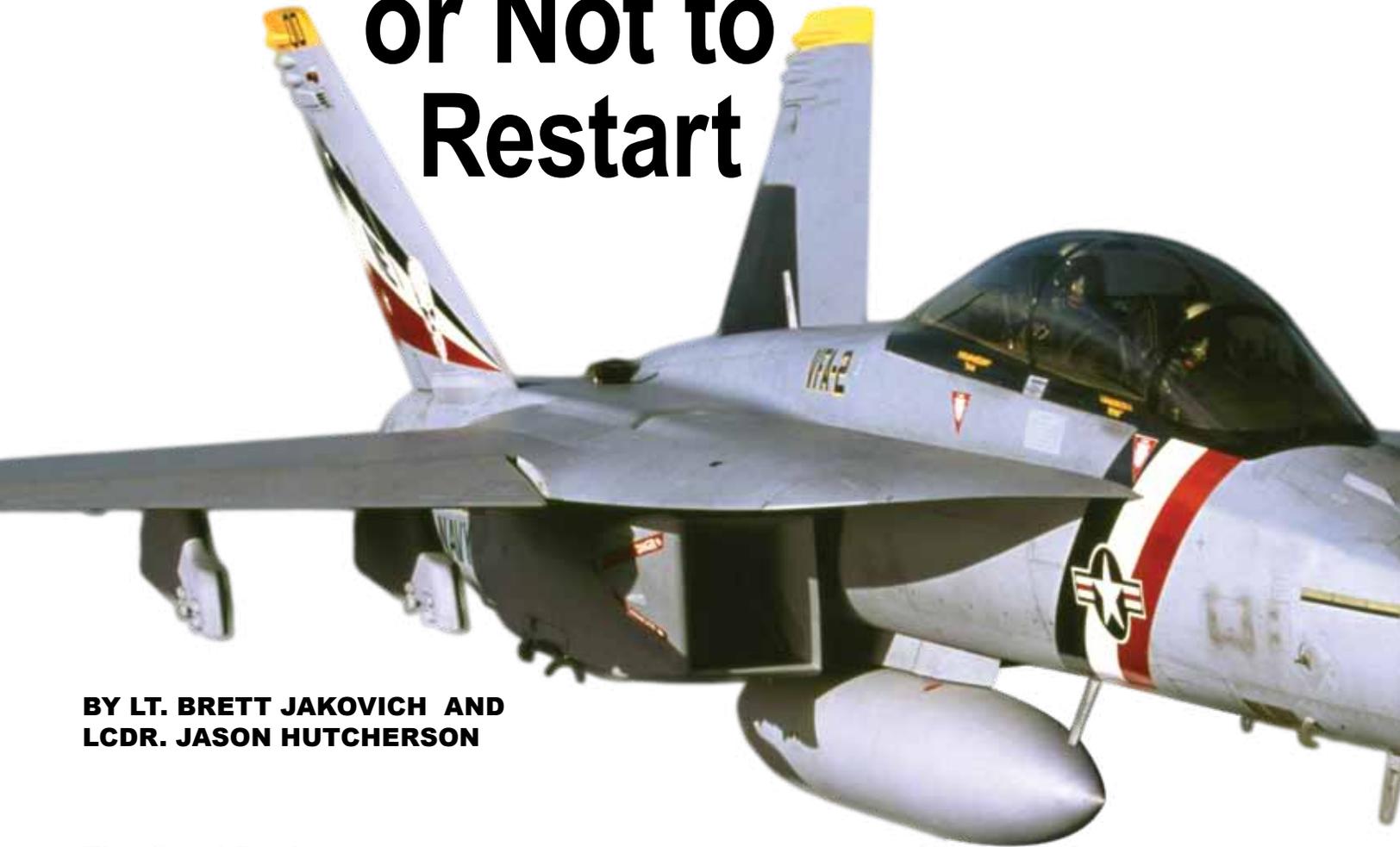
Heat illness is a serious condition and can kill if not recognized in a timely manner. Had we actually taken off, I would have been a liability to the aircrew. I would not have been a functioning crewmember, which would have put me and my instructor in danger.

I realize my situation is not nearly as severe as conditions can be on aircraft carriers or the Middle East desert, but the lesson remains the same: Stay hydrated, eat healthy, get a good night's sleep and always be aware of the heat. 

ENS. HIRZEL FLIES WITH VT-10.



# To Restart or Not to Restart



**BY LT. BRETT JAKOVICH AND  
LCDR. JASON HUTCHERSON**

## The Good Deal

**T**he squadron had recently returned to Lemoore from an air-wing Fallon detachment, and we were ready to enjoy the Labor Day weekend. Before that, though, the squadron planned a few Thursday flights for our new guys to get practice plugs from our 5-wet tanker.

The plan was simple. A flight of two nuggets and a senior pilot would launch, proceed to R-2508, meet over Saline Valley and conduct practice plugs. They would then complete individual training missions (sim strafe, sim bomb) depending on individual training and readiness (T&R) requirements.

Our senior O-4 pilot briefed the details of the

launch, join-up, tanking and other safety/ORM considerations. Weather and NOTAMS were briefed by the junior aircrew to the entire group, which is standard procedure in the squadron. While reviewing the NOTAMS, a briefer forgot that it was Sep. 1 and not Sep. 2. This error would affect our decision-making process later in the flight. The only item of note was that China Lake was closed for the long weekend. The rest of the flight members thought nothing of the closure, as it was a long weekend and not unexpected. With China Lake closed, we agreed that any emergencies would require us to return to Navy Lemoore versus the standard “Don’t take a serious emergency back over the mountains” contingency.

We discussed a Z-diagram for roll-ins and 1 v 0 items. We also decided to have the R2508 Sidewinder low-level info and route available in case it got to that. We covered the training rules and briefly reviewed the Sidewinder route, noting high-traffic (Inyokern, Trona Gap) and noise-abatement areas.

The man-up was standard, but then things began to fall apart for the other aircraft. The tanker and the other junior wingman had aircraft issues. We launched as a single and conducted our own 1 v 0 while we

waited on the tanker. En route to R-2508, we heard from flight lead that both aircraft were hard down and that we should proceed on our training mission.

Jackpot. We had the keys to the car, a full tank of double-bubble gas, and the whole of R-2508, which was almost entirely devoid of traffic. We entered the airspace and conducted our G-warm. We quickly flew several 1 v 0

maneuvers to get warmed-up, and followed that by a simulated JDAM delivery. With those T&R items covered, it was time to get to the always fun low-levels.

We had conducted portions of the Sidewinder scenario but had never managed to do the entire route, so another attempt was in order. We descended into Owens Valley, completed our low-level checklist (visor, mask, radalt), and told Joshua we'd be low level from Owens on the Sidewinder. Switching to the low-level frequency, we were greeted by crickets upon our advisory check-in — perfect day.

## Gone Bad

We began in Owens Valley at 500-foot AGL and headed clockwise. We proceeded toward Bishop, then

turned east over the mountains and into Saline Valley. So far, so good. We had clear skies, no other aircraft, plenty of gas, a jet that was performing well and time to kill. We moved across Saline Valley and started up the gradual slope. This slope eventually turned into a ridgeline; on the other side was Panamint Valley. The fun began on the slope. We got a master-caution light with a HYD 1A caution.

The pilot eased off the throttles and climbed away from the deck as the WSO reached for his pocket checklist (PCL). As quickly as the WSO could get his PCL out and turn the pages, the HYD 1A caution disappeared and was replaced by the HYD 1B caution. With that quick switch, we witnessed a very rapid degradation of the reservoir-level-sensing (RLS) system. We probably would lose all of HYD 1 within moments. Then the HYD 1B caution vanished. Just as I breathed a sigh of relief, the HYD 1A and HYD 1B cautions reappeared. The HYD 1 needle initially stabilized at zero. This entire process, from the HYD 1A caution to the complete loss of HYD 1, took about five seconds. We had never seen the RLS go through its motions in the jet, and we never expected it to occur so rapidly.

Safely away from the deck and in the climb, the pilot pulled the left throttle to idle and began a turn to the west. At this point the L AMAD PR (airframe-mounted-accessory drive) and FCS cautions appeared, the HYD 1 needle fluctuated a lot, and the left leading-edge flap (LEF) and right aileron (AIL) were X'd out. Clearly, something was seriously wrong with the HYD/AMAD assembly.

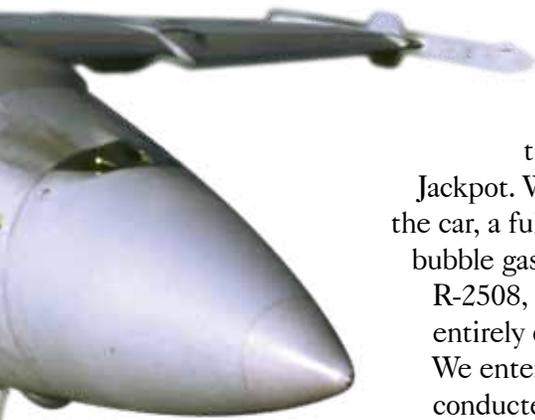
As the WSO settled on the HYD 1A/1B failure in the PCL, he contacted Joshua Approach and said we were an emergency aircraft, single engine (anticipating the shutdown), RTB to Navy Lemoore and requested FL180. With a good rate-of-climb established, we started through the EP:

1. Throttle LEFT engine – IDLE
2. Airspeed – Maintain below 350 KCAS
3. Land as soon as practical

We arrived at that moment we knew was coming: If HYD 1 needle NOT stabilized at zero -

4. Throttle LEFT engine – OFF

The pilot said, "The left engine is at idle, we



have good airspeed and altitude, left throttle is coming off.” As we approached FL180 the left engine spooled down and the L BOOST LO and L GEN cautions appeared.

We felt more at ease as we headed home, level at 18,000 feet, and passing over Owens Valley. It was time to tackle the system malfunctions and create our game plan. We had a HYD 1 leak, a HYD 1 pump mechanical failure, a left AMAD oil-pressure failure, and switching valve failures to our left LEF and right AIL. Our quick game plan was to run through the PCL items, keep the engine shutdown, and make a short-field arrested landing back at Lemoore.

With the single engine, we wouldn’t normally have headed over the mountains, but we thought China Lake was closed. While discussing the issues at hand, we distantly heard over Joshua’s frequency, “Koso 71, Joshua, China Lake current information Charlie.”

What? Did he just give ATIS information for a closed airfield?

After briefly considering the situation, we decided to stay single engine, over the mountains, and pointed toward home base with rigged arresting gear. This was better than single engine, making a 135-degree turn over the mountains, toward an airfield whose gear may or may not be rigged. We needed to stick to the plan but definitely make this a debrief item. We later learned that the junior member of the flight had mistakenly mixed up the dates and read the airfield closure NOTAM for the following day.

With the airfield question settled, we continued to work through the HYD 1A/1B cautions.

If HYD 1 HOT caution never displayed –

5. Consider restarting for landing (if required)

We never did have the HYD 1 HOT caution, but with all the hydraulic pump and AMAD issues, a long field with good gear and a VFR day, we decided not to restart the engine.

However, the associated caution states:

CAUTION – Prolonged use of a failed hydraulic pump without the pump shaft shearing as indicated by the needle not stabilized at zero will generate considerable heat and may result in an AMAD bay fire. Consider restarting the engine prior to landing. (I’ll get back to this)

If right AIL, left RUD and/or left LEF X’s –

6. FCS RESET button – PUSH (multiple times if required)

The pilot periodically pressed the FCS RESET button, with no success; the LEF and AIL X’s would not clear. We’d have to execute a controllability check if the surfaces didn’t return.

We decided to check the AMAD PR EP before getting into controllability checks. Because the engine was secured, we skipped ahead to step 3:

Restart for landing (if required). The associated AMAD warning reads:

WARNING: A L/R AMAD PR caution could be an indication of an AMAD oil leak which may result in an engine/AMAD bay fire.

We’ve now had two EPs suggesting we restart the engine for landing, but use of that engine may result in an AMAD and/or engine-bay fire. We didn’t have an L GEN failure or HYD 1 HOT, so both of the opposition cautions to restarting the engine with the AMAD PR and HYD 1A/1B cautions shouldn’t have been a factor. Yet, after quickly discussing the nature of the failures, we decided that restarting the engine for landing would be more hazardous than not.

We cleared the mountains and began our descent. We were gratified to see that the FCS RESETs finally had worked and that all our control surfaces were functional. Bypassing the controllability checks, we set up for the straight-in to runway 32 left at NAS Lemoore and made an arrested landing. After all the excitement, we took a tow back to the line; no sense in pressing our luck.

The chip detector for the AMAD had a thumbnail’s worth of fine metal shards bunched around the magnet, and the HYD 1 reservoir was empty. The bay reeked of the distinct smell of burning metal, which is a common smell when the hydraulic pump mechanically malfunctions and begins to destroy itself.

The surface issue was clear: The hydraulic pump had failed. The contents of the HYD 1 reservoir, along with the metal pieces from the hydraulic pump, had been forced around a seal, through the hydraulic-pump shaft, through a second seal and into the AMAD. The 3,000-psi hydraulic fluid then forced the AMAD oil out of the AMAD. The loss of the hydraulic pressure and associated AMAD overpressure relief valve emptied the AMAD of most of its oil. This left a thin mixture of hydraulic fluid and AMAD oil in the AMAD. Of note, hydraulic fluid is not designed to lubricate and cool the AMAD; it does the exact opposite.

## The Aftermath

What exactly malfunctioned, why, and how? The squadron submitted hazardous-material-report/engineering-investigation (HMR/EI) requests to Commander, Naval Air Systems Command (ComNavAirSysCom) for the hydraulic pump and the AMAD. ComNavAirSysCom responded that the hydraulic pump in question was part of a batch of pumps which had an additional wave washer installed on the shaft seal to “prevent shaft-seal separation during pump degradation.” This wave washer was later found to cause “premature wear of the shaft seal due to loading of the seal by the wave washer” on two pumps in the batch. The batch of hydraulic pumps with the wave washer installed would have the washer removed during regular overhaul. No recall had been put in place for this overhaul; it was a regular maintenance replacement.

The AMAD HMR response pointed the finger at the failure of the hydraulic-pump-shaft seal to do its job (with the help of the wave washer). The seal between the hydraulic-pump shaft and the AMAD is designed to keep AMAD oil from leaking into the engine-bay cavity or back along the hydraulic-pump shaft. It is not designed to keep hydraulic fluid under pressure from leaking into the AMAD. The AMAD PR caution was the result of a hydraulic-pump seal failure, hydraulic fluid displacing the AMAD oil, and then the pressure switch tripping with the change in fluid viscosity and pressure.

A mechanical chain of events that was not supposed to happen did. All the pumps were supposed to have the wave washer removed at a regular overhaul. The seal was supposed to prevent a failed hydraulic pump from leaking. If the seal failed, then the fluid should not force itself along the hydraulic pump shaft into the AMAD. This domino effect was leading to a potentially catastrophic AMAD failure and/or fire.

### “By the Book” and Restart for Landing?

The PCL guidance about restarting for landing raises a few important points on systems knowledge and decision-making. Discussions with senior airframers and the Boeing Tech representatives yielded a surprisingly scary scenario. Hydraulic fluid in a turning AMAD could lead to either an AMAD fire and/or catastrophic AMAD seizure. An associated GEN caution may or may not appear in time to convince the aircrew that the

AMAD must be shut down before catastrophic failure.

The PCL would lead one to believe that, if necessary, restarting the engine immediately before landing is appropriate. But only as long as there was no GEN or HYD HOT caution associated with the AMAD PR or HYD 1A/1B cautions. Yet, what appears to not have been considered is the presence of hydraulic fluid in the AMAD. If we had restarted that engine, the AMAD could have rapidly seized and seriously damaged the aircraft.

Isn't there any reason to restart? The weapon-systems officer (WSO) subsequently put three crews from three squadrons through this situation during NATOPS checks. They had a clear VFR day, on a low level, with China Lake available, and the exact sequence of malfunctions. He did not discuss the scenario with the crews before the simulator. Of the three crews, two chose to secure the engine, not restart it, and take the arrested landing at China Lake. The third crew chose to restart the engine about 10 miles from the field.

The PCL may be clear in most cases, but as unexpected malfunctions appear in our aging aircraft, we need to thoroughly understand what a series of malfunctions tells us. Each crew may respond differently to the same scenario and still be “following the book.”

For instance, the crew that elected to restart the engine noted that at no time did they receive a HYD HOT or GEN caution, so, per the PCL, restarting the engine was completely appropriate. The results of the HMR and discussions with HYD/AMAD system experts may give one pause, however, when we consider the specific series of failures which occurred.

Understanding the system may lead us to further restrict or expand our available game plan and better apply emergency procedures from the book. Consider if this same malfunction occurred at night, in bad weather, and behind the boat, then restarting the engine at three miles may be worth serious consideration. Yet, restarting this engine in VFR weather, at the field, with arresting gear available, may be inviting more trouble than it's worth.

Knowing the system, the potential of certain malfunctions or combinations of malfunctions, and weighing the risks are the beginnings of good game-plan development and should be emphasized in every ready-room brief. When would you restart that engine? 

LT. JAKOVICH AND LCDR. HUTCHERSON FLY WITH VFA-2.

“Safety is central to the idea of readiness and must not be an afterthought of our actions in combat.”

— Gen. James F. Amos, Commandant, United States Marine Corps

