THE NAVY & MARINE CORPS AVIATION SAFETY MAGAZINE

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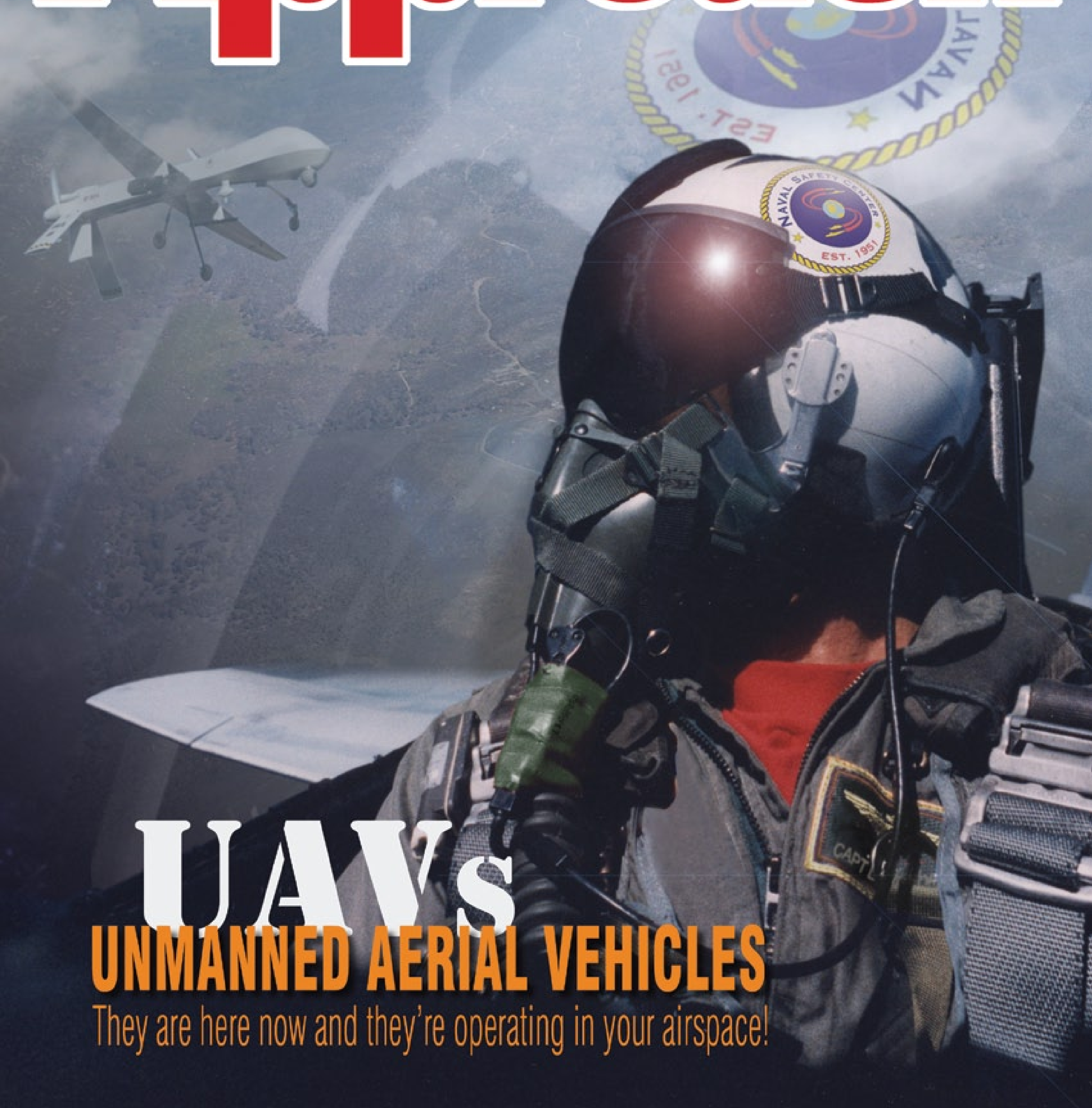
Approach



UAVs

UNMANNED AERIAL VEHICLES

They are here now and they're operating in your airspace!

The Navy & Marine Corps Aviation Safety Magazine

July-August 2009 Volume 54, No. 4

RADM Arthur Johnson	Commander, Naval Safety Center
Col. Mark Erb, USMC	Deputy Commander
John Mahoney	Head, Communications and Marketing
Naval Safety Center	(757) 444-3520 (DSN 564) Dial the following extensions any time during the greeting
Publications Fax	(757) 444-6791

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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CON

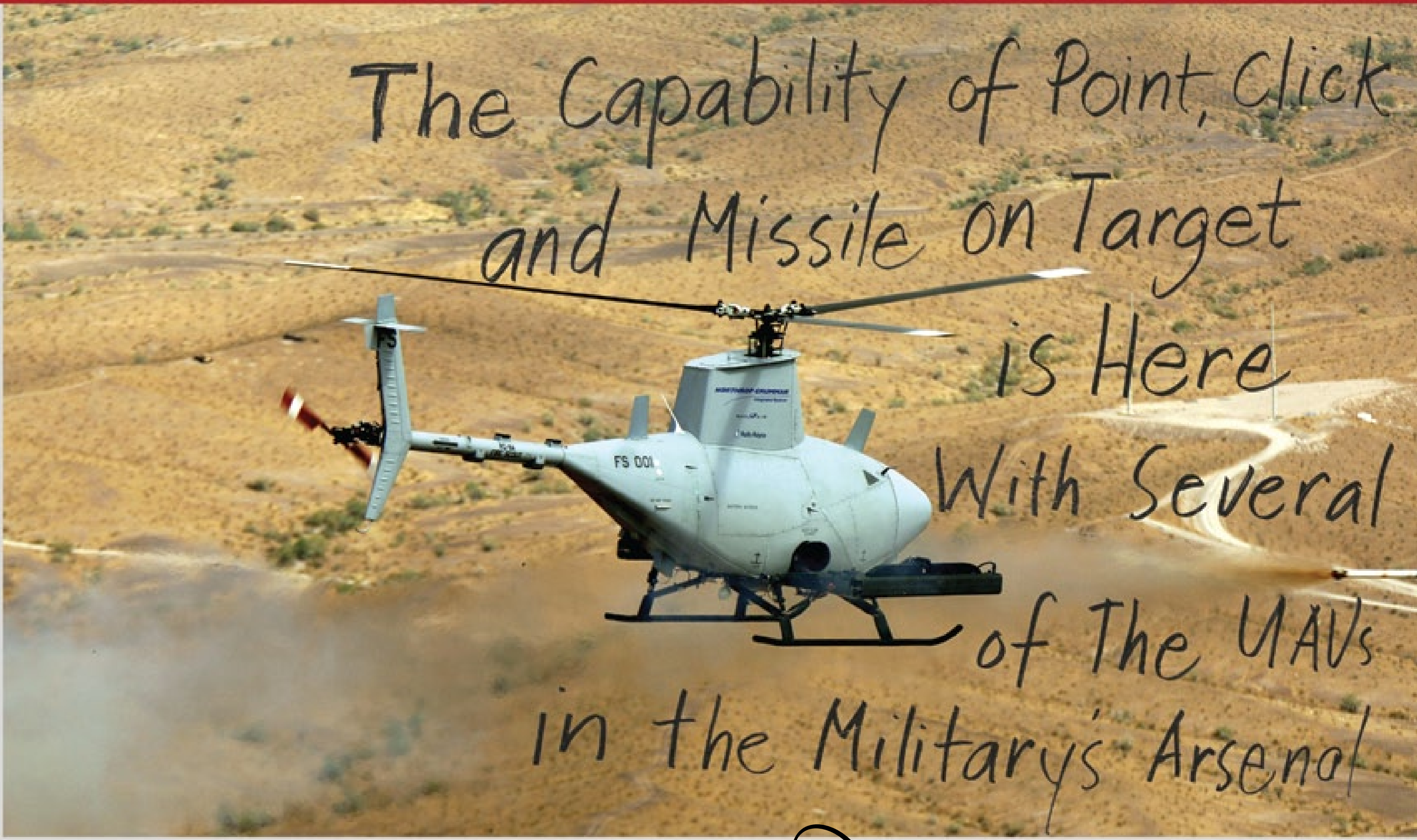
Features

Focus on Unmanned Aerial Vehicles

They're here now and they're operating in your airspace.

Front cover: Shared airspace photo-composite by Allan Amen.
Back cover: Illustration by Ricardo Nunes.

NTENTS



July-August Thanks

Thanks for helping with this issue…

Capt. Samuel Richard, USMC, VMM-263
LCdr. Charles Adams, HT-28
LCdr. Odin Klug, HS-5
Cdr. Randall Green, CNATRA
Lt. Nicholas Skirvin, VAW-124
Lt. Karen Hirko, VP-30
LCdr. Stan Fisher, HSL-49
Maj. William MacNaughton, USMC, VMAQ-3

Departments

The Initial Approach Fix

Unmanned Aerial Vehicles (UAVs)
They're here now and they're operating in your airspace.

As more and more UAVs, also known as unmanned aircraft systems (UASs), small and large, make an ever-increasing presence in naval aviation the need to jointly operate safely must be addressed. As ground troops hand-launch UAVs for tactical purposes, they fly at lower altitudes where helos historically fly. Larger UAVs fly in airspace normally considered the territory of carrier-based aircraft. What's the policy that governs aircraft separation and who's coordinating operations? A midair between a UAV and a manned aircraft still results in unacceptable losses. How do you report a UAV mishap?

This issue of Approach focuses on UAVs and provides some answers. The more critical point we want to make is that so much more needs to be done to fully integrate UAVs into our aviation community and warfighting capability.

Aviation Safety Awareness Program—A VP-47 Safety Gram

In a recent Orion safety gram the skipper of VP-47 shared feedback on the aviation-safety-awareness program, known as ASAP. This program builds on the "anymouse" concept where everyone is encouraged to provide comments, good or bad, with the intent on improving the way we do business. By making the inputs anonymous allows for honestly and removes any retribution.

This safety gram cites specifics where improvements have been made because of ASAP. From operating in poor weather, to training, to crew-resource management (CRM), constructive feedback has made a difference in their squadron. One of the conclusions states, "Tools such as ASAP will prove critical in the future of our community as we posture for a seamless and safe Orion-Poseidon transition."

To view the entire VP-47 safety gram and learn more about ASAP go to: http://www.safetycenter.navy.mil/media/approach/default.htm

Reader Feedback

We received feedback on two articles published in the March-April 2009 issue of *Approach*. The first letter to the editor, from Capt. Andrew Graham, USMC, offers a counterpoint to the article, "Night-Vision Devices: Your Least Reliable Instruments," by LCdr. Thad Johnson, p. 7. The article discusses why using NVDs may not always be the right decision, and Capt. Graham makes a case for their use. The second letter, from Clark Morris, commented on the article, "Warlord 715 Versus the Volcano," by Lt Vincent Dova, on p. 18. While the crew had comm problems while flying near a Pacific island, Mr. Clark raises the question of HF radios and their capabilities. Could HF radio usage helped this crew?

We appreciate the feedback and want to make each letter available in its entirety.

To read both letters and to review the published articles, go to the *Approach* webpage and look for "Reader Feedback."
http://www.safetycenter.navy.mil/media/approach/default.htm

Bravo Zulu to following commands for submitting Aviation 3750 hazard reports (hazreps) using WESS, 2nd quarter FY09.

Five or more hazrep submissions:

VAW-116 VAW-117 VAW-125 HSL-43 VFA-143 VFA-147 VP-4 VP-30
VP-45 VPU-2 VT-2 VT-7 VT-9 VT-21 VT-86
TRAWING 2 Naval Station Rota, Spain Patrol and Recon Wing 10 NAS Patuxent River, MD

Four hazrep submissions

VAW-123 VRC-40 HS-5 HSM-71 HSC-2 VFA-125 VP-8 VP-16 VT-35

The Next Age in Aviation

Photo courtesy of Northrop Grumman.

By LtCol. John Wilson, USMC

"As of October 2006, coalition unmanned-aircraft systems (UASs), exclusive of hand-launched systems, have flown almost 400,000 flight hours in support of Operations Enduring Freedom and Iraqi Freedom… " –Opening statement of the Executive Summary of the Office of the Secretary of Defense Unmanned Systems Roadmap (2007-2032).

Since this executive summary was published, the unmanned-aircraft-system (UAS) arsenal has grown exponentially. New UAS fleets have been introduced, research and development continues on new and better craft, and the number and variety of systems sharing your airspace has skyrocketed. In 2000, we had about 50 UAVs per DoD component. The more than $17-billion investment planned from now to 2013 will result in upwards of 6,000 UASs per DoD component.

The upside of this explosive growth in the UAS arena is enhanced situational awareness for commanders and reduced risk for our ground troops. Unmanned-aircraft systems provide new and versatile ways to close with and destroy our enemies. The downside for us as aviators is that we now share ever-more-crowded and complex airspace, with growing legions of aircraft unable to execute their portion of the see-and-avoid principle.

Here's an overview of the types of UASs and their performance characteristics, with a focus on the systems the Navy and Marine Corps either currently have or are acquiring.

The Marine Corps categorizes its UAS arsenal in tiers.

Tier I

Man-packable, hand-launched, autonomous systems. They are designed to provide the small-unit commander with a reconnaissance and surveillance capability to see over the next hill on the battlefield, or around the next building in a city. The Marine Corps recently transitioned from the Dragon Eye UAS to the Joint Raven B UAS. The Raven is hand-launched, weighs less than five pounds, has a range of five to seven miles, with an endurance of up to 80 minutes. Of greatest significance to manned rotary-wing crews, it flies at altitudes between 150 and 500 feet AGL. Deployment of Raven B at the battalion level began in September 2007.

Tier II

Designed to support divisions, regiments, battalions, and MEUs. This role is supported by Scan Eagle, a 40-pound (18-kg), unmanned aerial vehicle (UAV) designed for continuous missions of 15-plus hours. It cruises at 50 knots, at up to 15,000 feet. The system was designed for autonomous field operation. It can be launched and retrieved in any terrain and while underway.

Tier III

Primarily designed to support an MEF or joint-task-force-level command. The long-time workhorse Pioneer UAS recently was replaced with the Shadow, which has similar capabilities with some upgrades. The Shadow provides the MEFs with a day-night ISR and target-acquisition capability. It carries an electro-optical-infrared payload and a laser pointer. This UAV can fly for up to six hours with a range greater than 90 kilometers. It typically operates between 8,000 and 11,000 feet in the daytime, and 6,000 to 8,000 feet at night.

The Shadow is slated to serve as an interim system until a vertical UAS (VUAS) is developed. The VUAS will provide a land- or sea-based capability. It will provide the future MAGTF with organic, responsive and real-time information. VUAS can both find targets and shoot weapons.

RQ-16 T-Hawk

Named after the Tarantula Hawk that swoops down on poisonous spiders in the desert, this micro air vehicle (MAV) uses a fan-duct engine to hover from between inches above the ground to hundreds of feet. Each T-Hawk is small enough to carry in a backpack and is equipped with video cameras that relay information to foot soldiers, using a portable handheld terminal. The circular vehicle, weighing 17 pounds and measuring 14 inches in diameter, can fly down to inspect hazardous areas for threats without exposing warfighters to enemy fire. T-Hawk has the ability to take off and land vertically from complex desert and urban terrains, without using runways or helipads. The T-Hawk can fly in excess of 40 minutes, travels at more than 40 knots, and can operate at altitudes up to 10,000 feet.

The T-Hawk's ability to hover has been a major benefit to units in theater in the detection of improvised-explosive devices (IEDs). Convoy commanders in Iraq have been using the RQ-16 to fly ahead and scan the roads for roadside bombs, and the craft has been credited with saving a number of lives in Afghanistan. Each system will consist of two air vehicles and one ground station.

Additional UAVs:

MQ-8B Fire Scout

Fire Scout, the Navy's VTOL (vertical take-off and landing) tactical unmanned aerial vehicle (VTUAV), is programmed to deploy aboard the littoral-combat ship and become operational in FY09. The Fire Scout provides day-and-night, real-time ISR and targeting, as well as communication-relay and battlefield-management capabilities to support core littoral-combat ship mission areas of ASW, MIW and ASUW for the naval forces. The Navy is acquiring the Fire Scout to fulfill the service's requirement for a tactical UAV, capable of operating from air-capable ships. The Fire Scout is 23 feet long, has a 28-foot rotor arc, a max gross weight of 3,150 pounds, and a 600-pound payload capacity. With vehicle endurance greater than six hours, Fire Scout can provide continuous operational coverage 110 miles from the launch site, at altitudes up to 20,000 feet. Initial shipboard capabilities assessments are ongoing aboard USS *McInerney* (FFG-8).

X-47

The X-47 is designed to be a carrier-based, long-range surveillance and attack aircraft. It will have a 62-ft wingspan and will weigh around 45,000 pounds at takeoff.

The first X-47B Pegasus unmanned-combat-air-system-demonstration (UCAS-D) program is scheduled to start in late 2009. It will begin a series of detailed flight-envelope and land-based carrier integration and qualification events beginning in 2010, with the first at-sea carrier landings planned for late 2011.

The unmanned aerial age of naval aviation has arrived, and it's here to stay. As with the introduction of any new technology, the NATOPS for these birds are being written. Study up, stay alert, and see to it that they don't use a few pints of blood to pen a page or two.

LtCol. Wilson is with Naval Warfare Development Command and flies with HMM-774.

Photo by PH1 Michael Larson.

Pvt. Jeremy W. Reid, of 4th Battalion, 42nd Field Artillery Regiment, 1st Brigade Combat Team, 4th Infantry Division, assembles an RQ-11 Raven Unmanned Aerial Vehicle in the early morning hours for a flight to search for insurgents placing improvised explosive devices. The Raven weighs nearly 1.9kg and carries two cameras in its nose assembly for monitoring enemy activity.

U.S. Navy photo by Photographer's Mate 1st Class Michael Larson.

Planning For **The Future**

By Cdr. Chris Sledge

The Chief of Naval Operations has directed Commander, Naval Air Forces (CNAF) to assume duties as TYCOM for all Navy unmanned aircraft systems (UAS). Although specific responsibilities still are being clarified, CNAF likely will have two primary tasks to fulfill in this role:

– Provide aviation policy and guidance for all Navy UAS

– Operate large, complex UAS

To accomplish these tasks, CNAF is modifying the major naval-aviation-policy instructions, such as OPNAVINST 3710.7T and CNAFINST 4790.2A, to integrate UAS policy guidance. In addition, CNAF is working with the Naval Safety Center to make sure UAS-policy documents are aligned with the requirements for mishap reporting outlined in OPNAVINST 3750.6R.

We face several significant challenges and opportunities. One challenge is developing policy that incorporates the various groups of UAS and provides a standard for operating each group without restricting the current capabilities of the systems. Maintenance and operational policy likely will be implemented, using a graduated scale of requirements, with larger UAS (Group 5) held to standards similar to manned aircraft, while smaller, hand-launched UAS (Group 1) will comply with a small subset of these standards. Other groups of UAS will fall somewhere between these two bookends.

Another challenge is determining the level of knowledge and training required of UAS operators. A joint standard for training UAS operators has been developed to make sure manned and unmanned aircraft from all services safely can operate together. It is envisioned that all UAS operators will be required to have a basic understanding of airspace and other aviation concepts, with more knowledge expected of the operators of larger UAS. Because most Navy UAS are "fly by mouse," rather than flown like manned aircraft, UAS training probably will place less emphasis on the physical skills of flying and more on conceptual skills needed to manage three-dimensional problems.

A benefit of UAS training is that simulations can be used heavily. Because UAS operators are not subject to the physical cues and inputs aircrew normally experience, operating a UAS virtually is indistinguishable from conducting a simulation. This capability will allow for very realistic training of UAS operators, while also saving fuel and wear and tear on the actual machinery.

These issues just begin to scratch the surface of the UAS-policy matters that are being addressed. Besides clarifying the role of the UAS TYCOM, a host of other areas also require attention and definition, from developing the UAS organizational structure to determining crew-day limitations and minimum flight-time requirements for UAS operators. We are fortunate to have a vast amount of knowledge and experience to draw upon from the Navy, Marine Corps, and other services.

This is a dynamic time for naval aviation and an exciting opportunity to expand our warfighting capabilities. As CNAF develops UAS policy, the rich legacy of naval aviation provides a solid foundation on which to build a UAS force committed to safety and operational effectiveness.

Cdr. Sledge is with Commander, Naval Air Forces. Mr. Chris Fitzgerald contributed to this article.

UAV/UAS Mishap Investigating and Reporting

With one exception, the Naval Aviation Safety Program (OpNavInst 3750.6R) requires Department of the Navy (DON) UAV mishap investigation and reporting, and hazard reporting, in the same manner that manned aircraft are treated. Like manned aircraft, UAV mishaps are reported as Class A, B or C, flight, flight-related or aviation-ground mishaps. This criteria applies to all operators of DON UAVs, regardless of community or warfare specialty.

OpNavInst 3750.6R states that one of the criteria for a Class A mishap is "a naval aircraft is destroyed or missing." However, the military Services have agreed that this statement refers to manned aircraft and not UAVs. Therefore, a destroyed UAV only results in a Class-A mishap when the total event cost or injuries meet or exceed the Class-A threshold. A destroyed or missing manned aircraft always results in a Class-A mishap. The severity classification of a UAV mishap is tied to the total cost of the event, including DoD and non-DoD property loss and/or injuries or fatalities that occur during the event. UAV events that fall below the Class-C cost or injury threshold are not reported as mishaps but may require a hazard report. *[Information provided by Kimball Thompson, executive assistant, aviation safety programs, Naval Safety Center.]*

Facing AIRSPACE ACCESS Head-On

By Capt. Bob Dishman, USN

Airspace access is one of the most significant challenges for the Navy's broad-area-maritime surveillance, unmanned-aircraft systems (BAMS, UAS), because they must operate in national and international airspace.

Without an onboard pilot, who can "see and avoid" other aircraft, important questions emerge: How will BAMS UAS respond in a dynamic airspace environment to ensure separation from other aircraft? What is the best means of complying with stringent air-traffic procedures, equipage rules, and airspace regulations? What visual aids and computer software does the ground station need so the air-vehicle operator (AVO) has optimal situational awareness?

HERE'S HOW THE SITUATION COULD PLAY OUT: RISKY BUSINESS AT 45,000 FEET

A commercial-fishing boat, trolling for cod in icy North Atlantic waters, is floundering amid rough seas because of engine failure. Their distress signal is picked up by Coast Guard 1st District in Boston, Mass., but assistance is needed in locating the vessel and verifying its status.

The timing couldn't be worse. Bad weather has civil-air traffic backed up along the East Coast, just as the usual wave of transatlantic flights departs for the evening, compounding problems in the already congested corridors.

On this evening, BAMS 326 is operating "due regard" along the Atlantic Coast, on a homeland-defense mission. The mission commander receives a request from U.S. Northern Command to support a Coast Guard search-and-rescue mission. From FL530, the onboard, air-to-surface radar on BAMS 326 detects a target at the specified location. To positively identify the vessel, the mission commander must descend BAMS 326 below a forecasted cloud layer at 14,000 feet. The AVO powers back BAMS 326 to begin its descent into the crowded skies. As the aircraft passes through FL450, audio and visual alarms go off at the same time from the onboard traffic-avoidance system. An unknown-air contact (a Boeing 777 going west at FL430), is detected at 10 miles. Within 60 seconds, it will come within a nautical mile of BAMS 326. A mid-air collision is possible.

The computer gives the BAMS 326 AVO a recommended maneuver to keep the two aircraft at a safe distance; it continuously calculates the closest point of approach and recommended course of action. The AVO responds by leveling the descent of BAMS 326, according to the computer's calculated maneuver. BAMS 326 steers clear of the 777. The pilot resumes the previous descent and continues supporting the Coast Guard search-and-rescue mission.

MAJOR SAFETY INITIATIVE FOR UNMANNED-AIRCRAFT SYSTEMS

The fictional account above is based on numerous airspace-integration scenarios being evaluated by the Navy's Persistent Maritime Unmanned Aircraft Systems (NavAir PMA262) as part of a major safety initiative to improve operations of large unmanned aircraft in global airspace. PMA262, along with the Air Force and industry partner Northrop-Grumman Corporation, are developing a first-generation, collision-avoidance system for the Navy's long-endurance BAMS UAS, a maritime version of Northrop Grumman's Global Hawk RQ-4, a platform used by the Air Force. The partnership, which includes involvement by the office of the secretary of defense (OSD) is focused on establishing safe operations for large UAS in the global airspace.

Technical teams are engaged in initial efforts of developing the collision-avoidance capability that meets the needs of both programs, timed to coincide with delivery of BAMS UAS initial-operating capability to the fleet.

TRANSFORMING CONCEPT-OF-FLIGHT OPERATIONS

The Navy and Air Force team is seeking new ways of thinking about flight operations. Because unmanned aircraft move the pilot from the cockpit to a ground-based, mission-control suite, we are exploring the best uses of existing technology to make sure aircraft-systems designs are used optimally and implemented safely.

In the realm of unmanned-aircraft operations, this task requires that situational awareness be quickly, accurately displayed to the AVO and mission crew, so they can plan and act. The question always before us is how to enhance the AVO's situational awareness to respond to a wide range of scenarios, allowing them to make accurate and timely decisions.

To contrast BAMS UAS and a commercial jet, a 737 operating in national airspace has no air-to-air radar. An air-traffic controller keeps it separated from other aircraft with normal flight-planning procedures and by monitoring the transponder output. The pilot has a Mk 1 Mod 0 eyeball out of the cockpit window to "see traffic," but in IMC, the benefit of the pilot's outside scan is limited. The traffic-collision-avoidance system (TCAS), as it was originally designed and FAA-certified, required the pilot to respond within a set time to avoid a potential collision.

For safe operations, the BAMS UAS is being designed with a layers-of-defense architecture comprised of multiple "cooperative" sensors. BAMS UAS will come equipped with all normal air-traffic-control equipment associated with IFR-rated manned aircraft. BAMS UAS also is slated for an air-to-air radar system to detect cooperative and uncooperative traffic in VFR and IFR conditions. This layer doesn't exist for most commercial airliners. Added to this capability are the automatic dependent surveillance broadcast (ADS-B) and a TCAS system. These systems are designed to work together to provide situational awareness to the AVO for cooperative and uncooperative aircraft. In controlled airspace, the AVO still will have a ground controller to deconflict airspace.

The net result is BAMS UAS will have capabilities and functionality that mirror a typical airliner, with the additional enhancement of an air-to-air radar.

STRIVING FOR A FAIL-SAFE SYSTEM

The work in developing an effective traffic-collision-avoidance system solves an intricate and complex set of problems for unmanned-aircraft operations. The ultimate solution likely will transform military and civil aviation. Today's efforts for BAMS mean operational and technical solutions for tomorrow's unmanned-aircraft systems.

With the commitment by OSD, Navy, Air Force, Northrop Grumman, and other participants from federal agencies and academia, we are aggressively pursuing a fail-safe avoidance system. We're diligent in our resolution to deliver a responsive and remarkable BAMS UAS to the fleet: an unprecedented system for an unprecedented maritime intelligence, surveillance and reconnaissance capability.

Capt. Dishman is the program manager, Persistent Maritime Unmanned Aircraft Systems (PMA262) at NAS Patuxent River.

U.S. Air Force photo by Airman 1st Class Christopher Griffin.

Looking Forward

By Capt. Andrew Tidball, USMC

The VMU-2 Night Owls have "The Future of Marine Aviation" on the outside of our building at MCAS Cherry Point, N.C. I believe UAVs are the future. We can provide real-time video and imagery of the battlespace and deliver ordnance at a fraction of the cost of manned aviation. The only thing lacking from an unmanned perspective is troop and cargo transport.

I am a pilot who loves to get out of the office and fly helicopters—I love the feeling of being in the clouds. I understand, however, the resistance from the manned-aviation community about UAV integration into the airspace, whether CONUS or otherwise; airspace control hasn't been proven to be reliable enough. Or has it? The VMU community has not had a Class A or B mishap since transitioning to the RQ-7B Shadow. The equipment is more reliable and more capable than ever. The experience gained from previous iterations of UAVs has been incorporated into current and future models and types.

The RQ-2B Pioneer has been replaced by the RQ-7B Shadow in the Marine inventory. The Raven, ScanEagle, Global Hawk (RQ-4), Shadow (RQ-7B), and many others are being used in multiple theaters and have been invaluable for their real-time imagery and ability to be retasked at the unit level.

This community is coming of age and producing air vehicles that will take over manned-aircraft missions. The longer on-station times, incorporated communication and surveillance, as well as the lower cost of production, are making UAVs a stronger option to accomplish all the missions required of today's combat situations.

Large video cameras (electro-optical (EO)), thermal imagers (infrared (IR)), near-infrared (near-IR) cameras, and synthetic-aperture radar (SAR) represent a large portion of what a UAV can carry. Most only have EO and IR cameras, similar to a forward-looking-infrared (FLIR) camera or a Sony HandyCam. The ability to "see" how warm an object is, where the temperature difference is, or the real color of the "blue" bongo truck can save lives. Ground units will know where improvised-explosive devices (IEDs) are, which vehicle was just driven, who was running away from the good guys, or who is acting out of the normal routine.

With the technology maturing, reliability increasing, and longer endurances available, the writing is on the wall for when manned combat aviation will cease. It might not be 10 years, it might not end in 15 years, but it will end. The capability of point, click, and missile on target is here with several of the UAVs in the military's arsenal. Improved imaging capabilities contained in smaller and lighter payloads make the availability of UAVs cost effective and the right choice versus manned aviation.

Capt. Tidball is with VMU-2.

That Dirty RAT

By Maj. Charles Roell, USMC,
Maj. Adam Musoff, USMC, and
1stLt. Nathan Berth, USMC

We expected an easy Friday with a functional check flight (FCF) "A" profile on one of our EA-6Bs that hadn't been flown in more than 30 days. The front cockpit crew was experienced: the maintenance officer as ECMO 1 and the assistant maintenance officer as the pilot. They had flown FCFs together numerous times. The third crew member had been in the squadron only two months. He was pulling backseat duty to watch circuit breakers.

The admin portion of the brief covered weather, NOTAMS, communication, navigation, and emergency procedures. The weather in W-122 and over MCAS Cherry Point was forecast to be a mostly clear November day, with a scattered layer between 5,300 and 7,000 feet. It would be easy to remain VMC and pick our way through if necessary. We then briefed the FCF "A" profile directly from the card, and discussed procedures and "what ifs?" The Prowler FCF "A" requires a solid hour to complete, as it covers all of the aircraft's systems and requires the jet to fly at 10,000-, 40,000-, 30,000-, and 5,000-foot altitudes.

We walked downstairs to maintenance for the quality assurance, maintenance control, and work-center briefs on what had been done to the jet in the previous month. The list was extensive because the aircraft just had completed a 364-day inspection, the incorporation of a technical directive, and a modification for the LITENING Pod targeting system. Everything in the book looked good, so we put on our gear and strapped into the jet. No problems in the line; everything worked as advertised. We had a great day to go flying.

We took off and headed east to the whiskey area, completing the first portion of the card en route. Established in the area, we completed our 10,000-foot checks and made the long climb to FL400 for our jam accelerations and cabin-pressure checks. The crew in the front seat efficiently worked through the checklist, and we expected to beat the lunch crowd to the deli shop. We descended to FL300 and ran through the checks. The jet looked good, and the back-seater was enjoying the views of the coast, as he listened for other traffic that could be checking into our

area. So far, it had been an easy day for us.

As we flew toward the coast and descended for the 5,000-foot checks, ECMO 1 read the steps from the card. We shut off electrical equipment in the cockpit one piece at a time, checking the emergency-power-distribution system. This action is accomplished by deploying the ram-air turbine (RAT) and securing the generators to verify the RAT can handle the electrical load without the generators online.

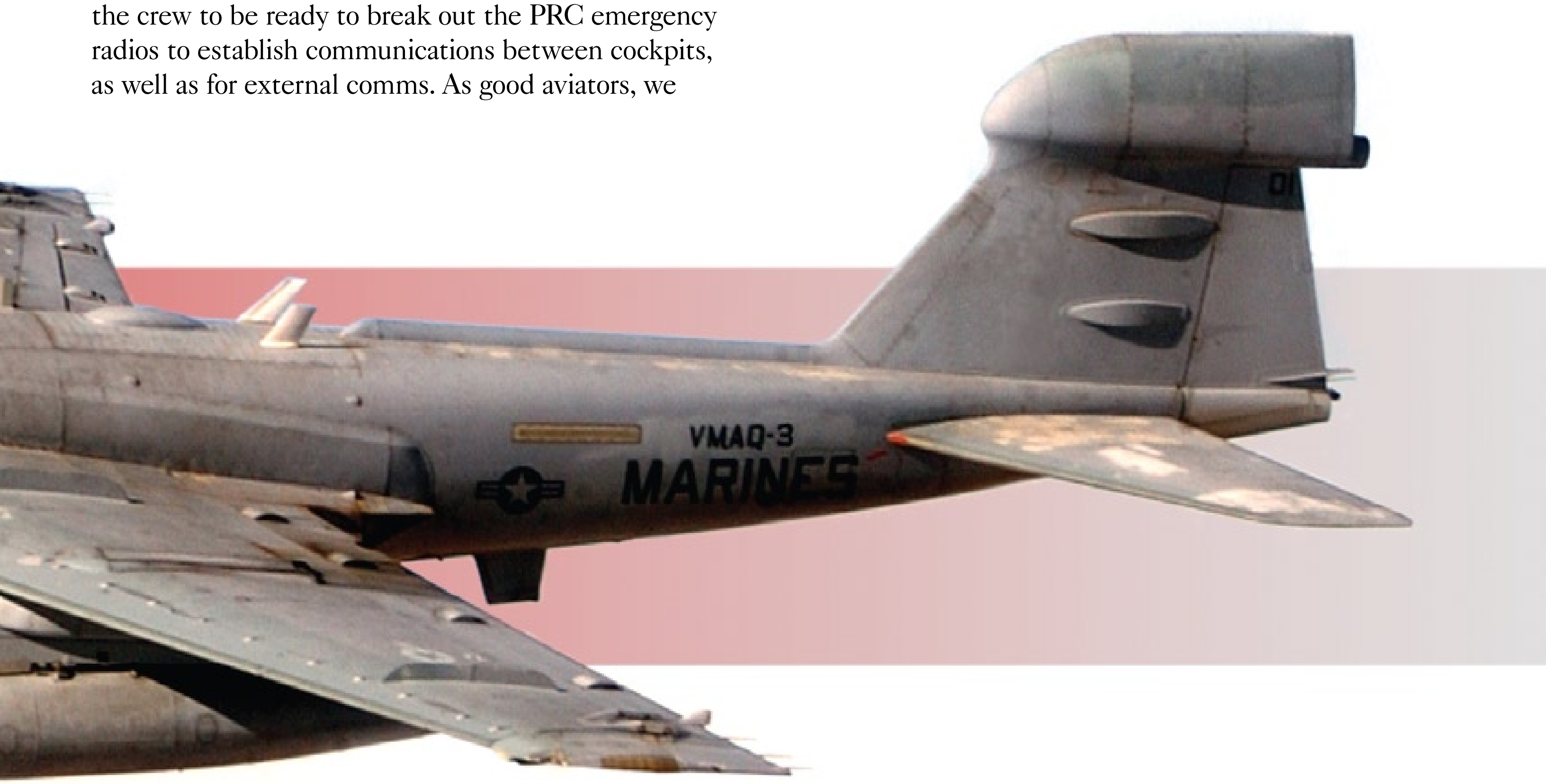
THE PILOT DEPLOYED THE RAT and secured the generators one at a time. As expected, the RAT picked up the electrical load, and we verified this step with the FCF checklist. The generators then were placed back online, or so we thought (both the left and right generator lights went out, which indicated both generators were online). The pilot then secured the RAT, and we lost all electrical power. He immediately redeployed the RAT, and once ICS was reestablished, we ran through what just had happened and the possible causes of the total electrical failure.

Obviously, something was preventing the generators from picking up the load once the RAT was stowed—a scenario none of us ever had heard of, let alone practiced in the simulator. The good news was the RAT was functioning, but we still had a lot of unknowns to work through because this was a FCF, and the jet hadn't flown in awhile.

Our crew discussed the situation. ECMO1 reminded the crew to be ready to break out the PRC emergency radios to establish communications between cockpits, as well as for external comms. As good aviators, we didn't want to bring back a down jet, so we decided to troubleshoot the situation. The next step in the FCF checklist was to exercise the emergency flaps and slats. This system runs on generator power and should not work solely on RAT power (the generator lights remained out, signaling the generators were working). The pilot reduced airspeed and engaged the emergency flaps and slats. All flight controls and indications worked without a fault, and the pilot then cleaned up.

It appeared we were not on RAT power alone, and the generators were working to some degree. We tried to restore normal power one more time: generator switches reset—on, generator light—out, RAT—stowed. As expected, we had another total electrical failure until the RAT was redeployed.

We climbed to establish communications with base and maintenance control for troubleshooting advice. Maintenance asked what instruments we currently had available, and they looked in the books for the cause of the generators not picking up the electrical load. They asked if we were comfortable securing the RAT for a third time to help with their troubleshooting back at base. This time, we would leave the generator switches off, secure the RAT, and then turn on the generator switches to see if we could override the presumed stuck relay. The crew agreed it would not be a problem, and ECMO1 again reminded everyone to be ready to use their PRCs.



Once more, we lost all electrical power, and the RAT had to be redeployed. All three RAT stows had the same result: the dreaded NATOPS-simulator-check-ride, complete electrical failure. The EA-6B electrical system is complicated. Without the RAT, only one avionics battery back-up system provides six to 15 minutes of emergency-backup power to the primary embedded GPS—INS (EGI), as well as the electronic-flight-instrument system (EFIS: two digital screens, one for attitude reference and one as a compass card). It was time to return to home plate on RAT power alone. We figured we had all the basics needed to get back on deck.

We began a climb to 10,000 feet and advised the controller we were returning to base. En route to Cherry Point, the crew realized we had more systems working than what should have been available with just RAT power: We just received ATIS on the No. 3 radio, which should have been inoperative and, earlier, the emergency flaps—slats worked when they shouldn't have. As a result, we requested to hold between entry—exit points "A" and "B" of the W-122 to do some more troubleshooting.

What was going on? Did we have generator power, and if so, what was working off of it? Did we have a double generator failure or a partial electrical failure? Did we really need to take a trap and declare an emergency (a requirement for landing on RAT power, because we did not have our speed brakes, nosewheel steering, antiskid, or flaperon popups)? With half a turn in holding complete, while headed back to the east, the answer became readily apparent. The cockpit went silent, red "off" flags appeared in gauges, and the digital fuel totalizer went blank. The pilot immediately cycled the RAT to no avail.

"WTF," resounded in our masks. We now had a complete electrical failure.

The pilot and ECMO 1 immediately took off their masks so they could shout at each other, but in the back seat, ECMO 3 had limited awareness of what was going on. Right away, we pulled out our PRCs and tried to raise tower or approach on guard—no go. The radios became our way of communicating between the front and back seats. Approach had us on the radar and was clearing the area of all other aircraft, but they did not have IFF contact or communications with us.

We knew a trap was inevitable, but the complete electrical failure brings with it another set of issues. At least with the backup battery, we had the EFIS and our navigation system—not! Within seconds of the total electrical failure, the EFIS also went blank. Only after debriefing the flight did we realize that the previous troubleshooting with the RAT stowed must have exceeded six minutes and had drained the battery by the time we really needed it.

"Houston, we've got a problem."

The engineers at Grumman Ironworks designed the aircraft to land with a complete electrical failure, but it had to be done quickly (and with the majority of the seat cushion sucked up between your cheeks). Time was not on our side. The backup-battery system for attitude reference and navigation had expired, and the fuel totalizer was blank (fortunately, the pilot and ECMO1 had completed a fuel check in discussing the possible field-arrested landing just before the complete electrical failure: 6,000 pounds). Even though we made calls in the blind, we could not raise anyone on our PRCs. It was time to execute NORDO procedures for Cherry Point.

BASED ON WINDS, AIRFIELD CONSTRUCTION, and the standard nonrigged gear on the approach end of the Cherry Point duty runway, we flew over the Neuse River toward the initial for runway 23R. We then offset to the left of the runway, flying toward the tower at 1,000 feet, looking for the gear and an Aldis lamp signal, rocking our wings, and continuing to make calls in the blind. Within a few thousand feet of the tower, intermittent communications were established: the tower was having the gear rigged for 32L, so one problem was solved.

With a complete electrical failure, the Prowler will have to land in a no flap—no slat configuration, because the hydraulic motor-shaft brake will release without power. The airspeed needed to fly for this configuration easily can exceed the maximum tire speed (175 knots) to remain above stall speed. Also, the hydraulic-system isolation valve closes and prevents the normal actuation of the landing gear. Thus, the crew has to initiate the emergency-landing gear: blow-down bottles (nitrogen) to get the gear down and locked. The airspeed maximum limit for this procedure is 150 knots.

We were sitting on the horn of a Grumman Ironworks dilemma. Somehow, we had to get the gear down at a speed below 150 knots without stalling the jet, and then fly an approach at airspeeds near or exceeding the 175 knots nose-tire-speed limitation. Fortunately, someone else already had figured this out (which is how NATOPS is updated).

The pilot found a hole in the cloud layer and then flew a dynamic zoom from 1,000 feet to about 7,500 feet MSL to get the aircraft below 150 knots to blow the gear. At the same time, he maintained less than 1G flight to prevent the aircraft from stalling. This move had to be performed quickly, because none of the crew had an idea how much fuel was left.

With one pull of the handle, we heard the thud of the gear. We floated down to 1,000 feet MSL, hoping we had three down and locked. We flew the length of 32L, making calls in the blind. We asked tower to confirm our landing gear and hook were down, and looked for that Aldis-lamp signal to clear us for the field arrestment.

Just then, off the starboard side, we saw one of our sister-squadron Prowlers overtake us with their arresting hook down. A VMAQ-4 jet, callsign "Hook 41," had entered the whiskey area just before we had exited and had heard all the approach and tower calls on guard from us after the complete electrical failure. (However, they never had heard the calls we were making from our PRCs.) As we flew past tower, communications were established with Hook 41, and they joined on us in the downwind. The section climbed another 500 feet to make sure VMAQ-4's jet was safe from any obstacles and the deck. Hook 41 confirmed we had three down and locked, hook down, everything else looked fine, and we were cleared for the arrested landing. The pilot turned left for the approach end of 32L.

WE ESTIMATED OUR FUEL STATE at 3,000 pounds, going by what the pilot and ECMO 1 remembered from the last fuel check, combined with what we thought our flight time had been. On final, ECMO 1 yelled to ECMO 3 in the back to put on his mask and to stay in a good body position. We were not planning on taking the aircraft around unless absolutely necessary. The pilot flew the short-field arrested landing without any problems, and we came to a full stop in the wire.

With the jet back in the hangar, maintenance found both RAT blades completely had separated from the hub. Fortunately, they were both in the RAT well and only had gouged the RAT door itself (so no TFOA); that explained why the RAT stopped providing power. An engineering investigation (EI) later revealed that corrosion on one of the blade's screws most likely had caused the fatigue failure of a single blade. The failed blade then either hit the other blade or caused enough stress for the other blade to separate on its own.

Maintenance also discovered that the K-6 AC/DC seal-out relay had failed and prevented the generators from picking up the electrical load after the RAT was stowed. This relay is only checked during the FCF "A" profile. The location of this relay along the electrical-power system still allowed some of the equipment to function normally, even with its failure. This is why we had certain items working that we weren't expecting; the generators still powered equipment upstream of the failed relay. Anything on the downstream side of the relay did not work.

Treat every FCF like it's a NATOPS check ride. Brief the "what ifs," and open up the PCL to a few emergencies.

The PRC radio will work in a bind, but the gold canopies of the EA-6B limited its effective distance. The squadron was in the dark, because they could not listen to guard from the base radio. However, the PRCs work great from cockpit to cockpit.

Use the earpiece of the PRC to overcome cockpit noise and your helmet-ear protection. The Aldis lamp at MCAS Cherry Point's (and I'd guess most) towers completely is useless during daylight hours.

SOPs and NORDO procedures work. Our crew accomplished items efficiently and safely because of them.

Standardization and working relationships across a community come to the rescue every time. VMAQ-4's crew came to our assistance without hesitation and performed the universal Prowler-community procedures.

EP simulators should push your aircrew; don't give them a free ride. The entire crew had at least experienced, in the simulator, a failure requiring them to actuate the emergency-landing-gear system in a no flap-no slat configuration.

After landing, we were stuck in the arresting gear and couldn't raise the hook without electrical power. We needed a tow back from maintenance.

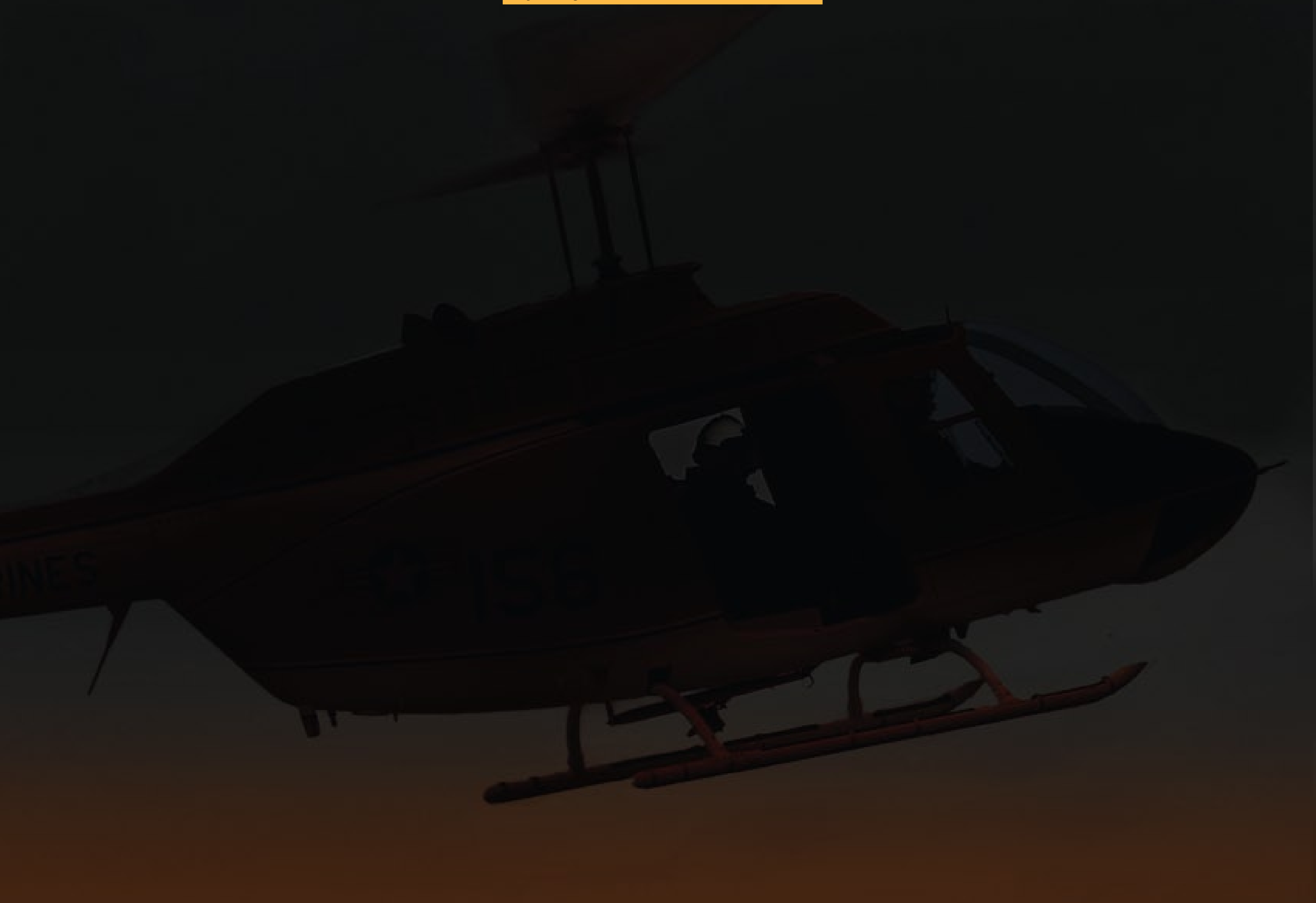
Tell sea stories during AOMs and happy hours. As a First Lieutenant, about 10 years earlier, ECMO 1 had sat in the same squadron ready room and had heard the exploits of a crew that left MCAS Beaufort returning from an "out and in." That crew experienced a complete electrical failure shortly after takeoff while entering IMC. The one item he remembered in detail was how the crew used their PRCs to communicate intercockpit, as well as with their playmate that joined on them. ECMO 1 has briefed that piece of information on every FCF "A" card since.

Majors Roell and Musoff, and 1stLt. Berth fly with VMAQ-3.

Photo composite image.

THE DISTRACTION

By Maj. Tod Schroeder, USMC



I'm an experienced flight instructor, with more than 900 hours in the TH-57, and more than 1,100 hours in the CH-46E. So, how did I, on a routine flight, almost end up crashing an aircraft and killing myself and my student?

We briefed our night flight and covered the standard discussion items. The brief, preflight and startup were uneventful. The weather was VFR—good visibility, with a broken layer at 4,500 feet and southwest winds at nine knots.

We flew our TH-57 to a nearby OLF for normal and steep approaches. After completing the required landings, we headed to the "hospital route." That route allows us to visually navigate over the four hospitals in the Pensacola area. Per our wing's course-rules directives, the student and I set our radar altimeter decision-height-select "bugs" to 300 feet. At the conclusion of the route, we flew back to NAS Whiting Field. The last event we needed was night practice autorotations.

ATIS reported runway 14 in use, with winds from 200 degrees at nine knots, so I expected right-to-left crosswinds. After reporting the initial western entry point to the field, we did the landing checklist and got permission for a night autorotation.

From the 90-degree position, I completed the standard "down, right, idle, turn," scanned the instruments, and verbalized the mantra, "attitude, Nr, ball." I then adjusted my course to compensate for the winds. At 200 feet, we were on course line; at 150 feet, the collective was full down; and at 100 feet, I started my flare. Just then, the radar altimeter's low-altitude-warning system (LAWS) activated the decision-height tone and light.

The LAWS system in the CH-46E is disengaged through the use of the "pinky switch," and I fell back on this habit. Unfortunately, in the TH-57, the pinky switch turns the stabilization system off and on. So, as we descended through 85 feet, the stabilization system was secured. I still had the low-altitude tone going off in my helmet.

These self-induced distractions caused me to forget the most important recovery item: bringing the engine back online. Instead, I took my right hand off the cyclic, reached forward and twisted the radar altimeter decision-height bug off, and then reengaged the stabilization system. The twist grip still was at flight idle, and at 50 feet, the tone again sounded. Momentarily confused, I looked over and noticed the student's radar altimeter decision-height light and tone were on. I told him to turn his off. However, we still heard a tone, and I finally realized it was the low-rotor-rpm horn.

AS EVERY HELICOPTER PILOT KNOWS, Nr is life. We were in a very bad situation. At 25 feet, I thought about completing a full autorotation (to the deck) at night, or trying a "low Nr recovery" maneuver. I dismissed both options as beyond my capability. Instead, I decided to roll the twist grip to the full-open position and pull collective for all it would give me—risking an overtorque. The engine took a couple seconds to spool up and, fortunately, in just enough time to complete a recovery at five feet. As predicted, the torque indicator was flashing, which indicated I had overtorqued the helicopter. The torque-indicating system showed a massive overtorque of 138.9 percent; we only are allowed 110 percent maximum.

The damage was just under $80,000, and we had an unusable aircraft for the next few weeks as maintenance removed and replaced the entire drive train. After my sheer stupidity that night, we were fortunate to walk away. I turned a distraction into a dilemma, and then almost into a severe crash. A hold-over habit from the CH-46E caused me to be distracted at a critical moment and to disregard the basic tenet of aviation: Fly the aircraft first.

I now check to make sure the decision-height-select bug on the radar altimeter is secured whenever completing a landing checklist. Most of all, though, I don't allow minor distractions to turn into a major problem.

Maj. Schroeder flies with HT-28.

Mishap-Free Milestones

VFA-113	150,000 hours	35 years

Silence Is Not Compliance

By Lt. Bill Friday, USCG

The call came in at 1800 (Alaska Standard Time) for a medevac of a 39-year-old male from the M/V Global Forwarder (a cargo tanker), located 250 miles south of Adak Island, Alaska. The rescue aircraft, our MH-60J, was located in Kodiak, 900 miles east of Adak. In the famous words of Larry the Cable Guy, "Git-R-Done." The ready crew was airborne on a law-enforcement mission and diverted to Cold Bay for our crew swap.

The aircraft commander (AC) and I (also an AC but copilot on this mission), with our crew of five, picked up the helo in Cold Bay for the SAR mission. The en route weather was solid overcast at 300 feet. We elected to go VFR-on-top to save transit time from Cold Bay to Adak, because it was only 536 miles. We had another 100-mile transit south of Adak to rendezvous with the cargo tanker.

To give you a perspective of time so far, the first crew flew for 2.5 hours before handing off the helo. We flew another four hours to Adak and still needed another hour to get on-scene with the vessel.

As we approached Adak airport, I explained to the AC that I previously had been in Adak on another SAR case and had transited through Little Tanaga Strait to get to the southern area. This strait was the widest channel connecting the Bering Sea and Pacific Ocean. The AC said we should try Kagalaska Strait to save in transit time because of the patient's critical condition. We decided to discuss this on-deck because we were getting ready to land.

After 30 minutes on-deck and refueled, we lifted off from Adak airport and headed eastbound over the bay. Immediately after takeoff, I asked the AC, who also was the pilot-at-controls (PAC), what his intentions were. The options were: Climb eastbound above the 2,000-foot cloud tops and then turn south, or turn to the north and climb above the cloud tops and then turn south, or go out Little Tanaga Strait.

He responded, "Let's try the other one, because it will help cut down on transit time."

After I had looked at the map and discussed options with the crew, we decided to take Kagalaska Strait, the "other option." If the ceiling dropped, we would reevaluate or turn around. The crew approved of the plan and was extra vigilant because we were transiting through a narrow channel, nearly eight miles long and just one to two miles wide.

About six miles through the channel, the visibility dropped. About 15 to 20 seconds before entering a fog bank, the ceiling dropped to zero feet and zero visibility, and the PAC suggested we should turn around. He then asked me, "What's the elevation on the backside?"

I quickly checked the chart and said, "About 1,200 feet. I can't get an exact number, but according to the contour lines, it looks like 1,200 feet." We were 70 feet over the water and 70 knots.

As the safety pilot and navigator, I gave the PAC two more options besides turning around: Maintain altitude and heading because we were 6.5 miles into the pass and had no terrain or traffic in front of us, or maintain heading and climb through the clouds to 2,500 feet (the mountains to our left and right were only about 1,200 feet). Plus, we knew the cloud tops were 2,000 feet.

Because we didn't turn around before entering the fog bank, and the AC did not initiate a climb, I assumed the PAC had decided to maintain current heading and altitude. What's that thing they say about assuming?

After entering the fog bank, the flight mechanic (FM) acknowledged to the PAC this was his last chance to turn around. The PAC then initiated a right turn. About 180 degrees into the turn, I noticed the PAC was not rolling out on the reciprocal course.

It took a few seconds for me to realize the PAC was not going to stop his turn. I quickly scanned the radar, altimeter, compass, and with no movement of the cyclic, I called, "Stop turn!"

The radar was at its smallest scale, and all I saw was green. Our right-hand turn went through 180 degrees and stopped around 270 degrees. When the wings were level, I

noticed the radar showed terrain inside one-quarter mile.

I immediately said, "Come left."

Nothing happened. I looked over to the PAC and saw he was engrossed in his instrument scan. I then assertively, boldly, vigorously (choose your adverb) said, "Come left!"

The cyclic displaced to the left. After about a 90-degree left turn, I said, "Stop turn."

The cyclic centered. I looked at the PAC and stated, "Standing by to engage automatic approach… automatic approach engaged… radalt flashing… potentiometer (pot) is set to 35 feet and zero knots." This procedure was to bring the helo to a coupled hover over the water and to get us in VMC conditions.

The PAC replied, "Roger, engage automatic approach."

We spent about five tense seconds descending and decelerating before the PAC caught sight of the shoreline off our right side. We were within 300 yards and broke out at 50 feet and 35 knots.

We exited the channel to the north and punched through the clouds over open water. We completed the SAR case and saved one life.

A COUPLE OF WEEKS LATER, I approached the AC to talk about the mission and how we had gotten ourselves in that situation. I explained to him that I already had talked to the other crew members about it.

The AC and I determined we had misinterpreted terminology. When the AC had asked me, "What's the elevation on the backside?" he thought there was terrain at the end (backside) of the channel and wanted to know the elevation. He also said he had looked at the map before we took off. He thought he saw a sand bar at the end of the Kagalaska Strait, meaning that the passage did not connect both bodies of water. A vessel couldn't navigate from the north to the south.

I had the map and knew there was no terrain or sand bar at the end on the channel, so I thought he was talking about the elevation of the mountains on the backside of the channel. I knew the channel led to open ocean.

After talking to the flight mechanic, he said he spoke up because he did not hear a reply from the PAC when I gave the three options. The FM was unaware of our intentions. I assumed the PAC was going to maintain altitude and heading because he did not initiate a turn or start a climb. I looked at the PAC for a verbal or physical confirmation. Because I did not receive either, I assumed he gave me the physical response of maintaining altitude and heading. The FM had the sole intention of receiving a verbal response, followed by a physical response. That is the reason the FM stated, "This is your last chance to turn!"

Be accurate, bold, concise, and never assume. In most cases, a verbal response is expected to be the primary means of communication. Silence is not an admission of compliance.

Lt. Friday flies with CG Air Station Kodiak.

The Entire Plan

By Lt. Mike Pangrac


Photo composite image.

After a refreshing port call in Pusan, South Korea, we expected operations as usual, with plane guard, the occasional log run to the battle-group ships, or the always exciting ASW exercise. As we settled into our plane-guard rotation, we received tasking that an Army general wanted a demonstration of naval-helicopter capabilities, with HS-6 playing a central role.

The plan was to hoist the general and his staff from a submarine deck and take him to Gimhae International Airport. Although this task is common practice for HS squadrons, our JOs thought this event had too much risk and visibility for junior officers to lead. We had heard the crew would be a department head and a senior JO aircraft commander, so, as a non-HAC (helicopter-aircraft commander) at the time, my dream of *Hunt-for-Red-October*-like glory was crushed: I was not selected. But, I knew plans often change, and I still had a sliver of hope of getting the call to take the general into Pusan.

Sure enough, operational commitments and crew-rest requirements thrust me back into the mix. After I returned from an afternoon plane-guard flight, our operations officer approached me with the good news. The executive officer and I would fly the submarine-transfer event.

The transfer plan was simple. We would approach the sub and conduct a recce pass over the deck to make sure the winds were in limits, the deck was clear, and the sub crew was ready to support the operation. Once satisfied we could perform the task, we would make our approach to the sub's stern, establish a hover over the deck, and hoist one of our aircrewmen to the deck. He then would prep the general and his staff for their trip to Pusan. All this planning had been completed by another pilot, which was nice, so I focused entirely on learning the intricacies of getting the general into the helicopter.

As we briefed the mission, I couldn't help but think of all the potential pitfalls that might occur during the flight. What if we could not find the submarine? What if the rescue hoist malfunctioned? What if we lost an engine over the deck? Each of these details, and countless others, were briefed indepth to make sure the crew knew the plan and were ready for any contingency.

After sitting down with the XO for the copilot-only brief, his first words to me were, "The submarine transfer will be easy; all we are doing is hovering. Our biggest challenge is going to be the flight into Pusan." Being the nugget that I am, I was puzzled, so I quizzically nodded my head and asked him exactly what he was talking about. He replied, "Comms."

The submarine transfer went as planned. In a little more than 15 minutes, we successfully had hoisted our swimmer to the deck of the submarine, and brought him back, along with the general and his staff. As we departed, I pulled out the chart and silently reviewed our Pusan entrance strategy. We were presented with a number of challenges. The first was establishing radio communications with the Korean approach controllers without violating international airspace. For those unfamiliar with the topography of Pusan, mountains line the entire eastern side of the city, with the airfield located in a valley on the western side.

The approach end of the runway was to the south, with mountains lining the western side of Gimhae. This topography effectively prevented us from crossing to the other side to gain radar contact. Our plan was to stay outside of any airspace, climb as needed to establish communications, and receive clearance into the bustling international airport. We had a good plan in theory, but with the limitations presented by sometimes spotty H-60 radios and a language barrier with Korean controllers, we ran the risk of circling off the coast of South Korea with no comms, a general onboard, and limited fuel.

THIS SCENARIO UNFOLDED. As we approached from the east, I dutifully switched our radios to the appropriate frequencies and tried to contact approach. After 15 minutes of calls, where we could hear the controllers communicating with everyone but us, we decided we might just be a little too far away and not high enough, so we climbed and did a couple of circles—still nothing. In the distance, I began to make out the city of Pusan as we inched closer and closer.

I reexamined our chart, in the hopes I may have missed a potential break in the mountains or the airspace during the planning. I nervously wondered why no one could hear us. We called again—nothing. We continued our quest to gain radio comms with approach and decided it would be more logical to maintain our altitude and get closer to land. Once again—nothing. Few situations in aviation are more frustrating than being unable to establish radio communications. We were a few miles off the coast of a foreign country, doing circles. No one acknowledged our radio calls. We were exactly where we had briefed that we did not want to be. The XO's concerns had come true.

Although we weren't worried about fuel, everyone was becoming increasingly frustrated with our situation. After all the briefing and ORM considerations, something normally routine, like comms, had the potential to derail what was an otherwise successful mission. After 30 more minutes changing our radio configuration, troubleshooting, changing altitudes, and preparing for the possibility of a lost-comm arrival into Gimhae, we gained contact with approach control via Gimhae's tower frequency. We were cleared into the airport for our passenger transfer and then returned to USS *Nimitz* (CVN-68) without incident.

It's easy to overlook the small details that might derail a successful mission. With the complexity of the submarine transfer and the intensive crew coordination required for its execution, it seemed natural the transfer could present the most problems. But it is important not to bore-sight on any one part of any mission, no matter the complexity. Focus was my primary mistake. Because of my excitement about getting to go on the mission, and the fact that another pilot had done all the planning, I had neglected to consider the entire plan and understand other potential trouble areas, which is an important step in the ORM process.

From startup to shutdown, each flight has infinite dangers we cannot afford to overlook or get complacent about, as I did in the brief. We constantly must be alert to potential difficulties before they present a hazardous situation and put lives in danger. My story is a benign example dealing with radio communications and a lack of foresight. I was fortunate to have had an experienced flight crew teach me this lesson.

Lt. Pangrac flies with HS-6.


Photo by MCS2 Erik Barker. Modified.

Shut Up, New Guy!

By Ltjg. Jeff Drewiske

As a new fleet NFO, I was loving life. I had learned new tactics and had gotten to meet my squadron-mates. However, I had paid a high price to get flight hours. As a result, I was sitting in the back of the comfortable and spacious Hawkeye for events, such as FCLPs (field-carrier-landing practices) and stan checks.

Please send your questions, comments or recommendations to: LCdr Vincent “Chico” Garcia, Code 16
Naval Safety Center
375 A St., Norfolk, VA 23411-4399
(757) 444-3520, ext. 7266 (DSN-564)
E-mail: vincent.s.garcia@navy.mil

The pilots had become fed up with this repeated gripe, and **complacency** *had set in.*

We were on “the same old instrument check” we always flew. As we read the book on 602, we noticed it had a history of giving bad landing-gear-status indications. The gear problem had been griped and drop-checked, but the indications repeated. The maintainers again fixed it, and we were on our way.

After takeoff, we headed to fly some approaches. As we descended and lowered the gear, we had unsafe indications. We were surprised but also were prepared. We canceled our request and pointed our collective nose toward home. We pulled out a PCL (pocket checklist) and went through the emergency procedures. We called base and requested they rig the arresting gear.

We were confident the gear was down and locked, but we didn’t get the proper indications. We had another Hawkeye join on us and inspect our gear. They said it looked fine. Our discussions focused on the appropriate course of action. We figured we could land and let maintenance have a look.

As the NFO in the back, my job was to sit there and read the procedures out of the PCL. Because both pilots recently had seen this EP in this plane, I felt my efforts were unnecessary. As we went home, they decided to land without catching the wire, and I was fine with their plan.

I ASKED ONE MORE TIME to confirm the course of action, “So, we are not going to take the wire? What does that buy us?”

Out of ignorance, as a new guy, I expected an answer referencing some pub or instruction. Rather, I heard a sigh over ICS, and, “Well, I suppose we should take it. It’s just a pain in the butt.”

The pilots had become fed up with this repeated gripe, and complacency had set in. In actuality, we probably were safe to land without the gear. We caught the wire, which was not as painful or drawn out as we had feared.

By my speaking up, we all had become more aware of the possible consequences and the safest course of action. Whether you are the new guy or the skipper, your voice has a place. Be assertive.

The maintainers checked the plane later in the day and found no major malfunction.

Ltjg. Drewiske flies with VAW-124.

Breaking Routine

By AWO1 Fred Hamby

My student and I walked toward our Orion for preflight on a beautiful, partly cloudy afternoon at NAS Jacksonville. Every FRS instructor knows the difficulty of simultaneously keeping inexperienced students safe on the flight line, teaching them something valuable and ensuring mission accomplishment. I felt confident in my abilities because, as I recently had bragged to a counterpart, I had more than 2,000 flight hours and was at the pinnacle of my career. In other words, a perfect time to be humbled.

During preflight, my student and I noticed the port landing light on our P-3C completely was shattered, so I told the flight engineer about it. He said maintenance control already had been notified, and the AEs were on their way. My student and I continued our preflight and completed all of the steps except the coordinated checks. These checks require hand signals from an outside observer (my student) to a qualified person in the flight station. This step verifies the operation of various outside lights, flight controls, and brakes. The observer also makes sure all danger areas are clear of personnel and obstructions.

Once we were ready for the checks, the flight engineer reminded me to skip the landing-light portion, because the AEs now were fixing the light. I did not want to extend down the landing light on the maintainers or electrocute them if the light inadvertently was turned on. However, I noticed they were not below the flaps, so I thought the flaps could be extended, and the check could be accomplished.

We walked to the front of the aircraft. I again reminded my student to make sure he did not give the signal to check landing-light operation. I positioned myself behind the student to make sure his signals were correct and to verify everything was working.

We proceeded with the checklist.

"Taxi lights."

"Check."

"Top and bottom strobe lights."

"Check."

We skipped the next step, which was the landing-lights check. The flaps were next. The proper procedure for the check is to lower the flaps to the land position and then back up to the requested position, which would have been "takeoff." My student correctly gave the hand signal to lower the flaps, but the flaps began moving up. I quickly shifted my scan to the port flap and saw the AE supervisor pull the other maintainer from the ladder and out of the flap-well area. I immediately held up a closed fist; the flight engineer secured hydraulic power to stop flap movement. I was shocked—I couldn't believe what just had happened.

After a discussion with the startled maintainers, I found out they were not just replacing a light bulb; they were replacing the entire landing-light assembly, which required them to have their hands inside the flap well. When the flaps finally stopped moving, they were about six inches from the maintainer's wrists before his boss pulled him out of the flap area. I was so fixated on the landing lights, I hadn't noticed the flaps already were down when the check started. I was worried about downward-moving flaps hitting the maintainers, not upward-moving flaps taking off someone's hands.

In retrospect, a few things could have prevented these events from happening. First, we should have waited to do the checks until the maintainers were done fixing the light; we had plenty of time to complete the event. My rush was self-imposed. Alternatively, I could have briefed the maintainers to remain clear of the area until the checks were done. Second, I should not have fixated on the landing lights. The hazard was real, but by focusing on one danger, I overlooked another. Last, I should not have let my experience lull me into overconfidence. Despite my 2,000-plus hours, I cannot afford to let things become so routine I fail to see something out of place. Are the flaps really down?

AWO1 Hamby flies with VP-30.

BACK UP THE BINGO

By Lt. Brad Gilroy

"310, at two miles, discontinue approach, level Angels 1.2, cleared left to the downwind, heading 235."

This was the first time I had decided to tell the ship I would be bingo-plus-one on the next ball call. With two unexpended LGBs (FLIR stuck in STBY), and a 33,000-pound MOVLAS (manually operated visual landing aid system) recovery, my max trap already was much lower than normal. This approach also was the first time I had considered a MOVLAS recovery on an event with four sections, carrying air-to-ground ordnance—probably not a smart idea. After all, this was only TSTA (tailored-ships-training availability), and paddles could pick and choose which events they wanted for the green machine. Did we really need to voluntarily drop down to 33,000 pounds, with all this unexpended ordnance?

"Too late now," I thought. I already had commenced and dumped down.

On the second approach, I had a tanker hawk at my 3 o'clock. I made it all the way to the ball call, then I heard, "Wave off, wave off, foul deck, 310 clean-up, climb straight ahead to Angels 2.5, your signal is tank."

I could tell the tanker was having issues when he asked me to slide to the outside of the formation, and I saw him cycle the basket—twice. Two plugs later, still no go for me. I was just above my bingo numbers and behind a sour tanker.

I didn't wait to find another tanker, which gave me an early start on what appeared to be a typical bingo profile. At about 15,000 feet, the headwind picked up. By the time I leveled off at 33,000 feet, I already had a low-fuel caution (standard), but the winds now were 110 knots and only 15 degrees off my nose. When I started my descent, I noticed the airfield was about seven degrees nose low (also standard), but my velocity vector required about 10 degrees nose low to maintain 250 knots, even with the nozzles puckered. I was going to be short; the question was, "How much?"

Nobody can read a blue-colored bingo chart in a single-seat Hornet, with green NVG lighting and small font. I don't recommend even trying to look at the headwind correction page: It only will make your eyes hurt more. I had gone from being ahead of the bingo numbers to well behind in a matter of seconds.

Next came the usual problems with every bingo profile. The first was Jacksonville Center's complete disregard for a 7700 Mode 3C squawk. I could see and easily avoid the distinct color scheme and lighting of a Southwest jet from more than 15 miles away. It still baffles me that Center felt it was more important to waste radio time arguing with me to level off at 25,000 feet and deviate from my emergency profile, when they had more than 50 miles to reassign Southwest to a new altitude with just one simple call. When I reported I had less than 10 minutes of usable fuel remaining, I guess he figured at least five of those minutes belonged to him.

Once I "politely" corrected the Jax controller and cleared the Southwest traffic—who now was in a descent, a minor victory—I debated switching to NAS Mayport, which was a little closer. Unfortunately, I could not see Mayport behind the clouds, and I wasn't confident in my ability to get in there IFR at midnight on a weekend, when Jax clearly was in sight.

THE LAST HURDLE IN THE APPROACH appeared about two miles from the runway on final. After switching tower and dropping the gear with just a few hundred pounds to spare, tower reported a light, civil aircraft transiting VFR up the James River. The pilot was not talking to anyone. When I did spot him, I was able to maneuver around him (unlike the Southwest jet), but not by much. The result was a downwind, straight-in landing to NAS Jacksonville, with only a few hundred pounds of useable fuel left.

Anyone who has been on a bingo profile knows the numbers are padded by a few hundred pounds and normally are nothing to worry about. However, this was a case where I used almost every one of those extra pounds. The entire situation also was completely avoidable, from the decision to rig MOVLAS, to the CATCC rep checking on tankers and winds aloft, to the man in the cockpit "backing up the bingo numbers."

Lt. Gilroy flies with VFA-83.

BRAVO Zulu

MAJ. JOHN BAILEY, USMC, AN ADVANCED, flight-training-instructor pilot, and LCdr. David Rauenhorst, an instructor-under-training, both with VT-7 at NAS Meridian, Miss., were scheduled for a night formation flight.

During the takeoff roll, at 110 knots, their T-45C Goshawk struck a deer, which hit the starboard main-landing gear. Realizing the inherent danger of continuing the takeoff and possible foreign-object damage (FOD) to the engine and flight-control surfaces, they executed a high-speed aborted takeoff.

During the rollout, the aircraft lost normal braking. LCdr. Rauenhorst released the brakes, as Maj. Bailey deselected anti-skid and dropped the arresting hook in preparation for a long-field arrestment. They caught the wire and completed the emergency-shutdown procedures, preventing further damage to the aircraft. Maj. Bailey and LCdr. Rauenhorst's calm application of NATOPS procedures, quick thinking, and superior airmanship averted a mishap.

ENS. LASSEN LOOP WAS SCHEDULED for his last T-34C solo aerobatics flight in first block of aerobatics training. He completed the aircraft preflight, checklists, engine run-up, and then taxied to the active runway for takeoff.

After receiving takeoff clearance at NAS Whiting Field, Ens. Loop taxied onto the active runway, completed the final line items on the takeoff checklist, conducted an instrument check, and got airborne. Shortly after raising the gear, he heard excessive wind noise and could see the rear cockpit, instrument-training hood blowing around—the rear-cockpit canopy had opened inadvertently.

Ens. Loop immediately contacted tower, explained the situation, and requested to enter a downwind for the active runway. After some initial confusion, tower cleared him to enter the downwind, following another aircraft already in the break. After lowering the landing gear and leveling off at the home-field-pattern altitude of 1,000 feet MSL, Ens. Loop realized the aircraft required more power than normal to maintain altitude and airspeed. He compensated for the increased drag in the down wind and through the 180 to landing.

After landing, Ens. Loop taxied to the maintenance hot spot for replacement of the aft-canopy stops. Ens. Loop then continued and completed his solo without further incident.

LIEUTENANT CHRISTOPHER METZ, A FLIGHT instructor with VT-2, was instructing a student naval aviator (SNA) during a T-34C, day contact flight. While concluding a slow-flight, minimum-controllability maneuver in the local area, Lt. Metz's student increased power toward maximum-allowable-per-maneuver procedures. At about 850 foot-pounds (fp) torque, they heard a loud bang, the aircraft lurched, and a puff of black smoke blew from the starboard exhaust stack. Lieutenant Metz took control of the aircraft, declared an emergency, and reduced power to clear the compressor stall in accordance with NATOPS procedures. He then increased power to 800 fp torque, climbed to within dead-engine-glide altitude of North Whiting Field, and requested a precautionary-emergency landing (PEL) with Pensacola Approach. He flew a by-the-numbers, emergency-landing profile and recovered the aircraft.

LIEUTENANT EUGENE TRELLES, A PRIMARY flight instructor with VT-28 at NAS Corpus Christi, was instructing a student military aviator on a T-34C, day contact flight. While operating in the local area, they couldn't reduce the engine's torque setting below 700 foot-pounds. This condition indicated a fuel-control failure, making it impossible to reduce power for descent and landing. Lieutenant Trelles declared an emergency and navigated the aircraft to within dead-engine-glide distance of the airport. He shut down the engine and intercepted the emergency-landing pattern for a dead-stick landing at NAS Corpus Christi.

FIRST LIEUTENANT DANIEL HOUSER, USMC, a primary flight student with VT-2 at NAS Whiting Field, was flying a T-34C aerobatic solo flight. During an instrument, fuel and position check, his oil pressure, which previously had been within limits, indicated 90 psi. He followed NATOPS procedures for out-of-limits oil pressure and made a precautionary-emergency landing (PEL) to Navy Outlying Landing Field Brewton. After his safe recovery, maintenance discovered a faulty oil-pressure gauge. It was replaced, and he continued the flight without incident.

From left to right:
Capt Myette and LtCol Morgan.

CAPT. THOMAS SHORT WAS THE SECTION LEAD, call sign Hurricane 7-1, for a night flight of two AH-1Ws. The flight provided close-air support (CAS) and assault-support escort in a restricted area near MCAS Cherry Point. LtCol. Robert Morgan (aircraft commander) and Capt. Christopher Myette were the wingmen, call sign Hurricane 7-2.

During the initial rocket and gun attack on the target barges, Capt. Myette, the PAC, called, "Knock it off." The flight echoed the command and rolled out straight and level at 100 knots. Capt. Myette said they had gotten a master-caution warning, indicating a bypass on the No. 2 engine oil filter. They also had secondary indications of a steady decrease in engine-oil pressure and a slight rise in oil temperature.

The flight turned toward Cherry Point, expecting to fly a precautionary-emergency landing (PEL). Capt. Short checked out with range control, contacted Cherry Point approach, and told them about the situation and their intentions.

LtCol. Morgan needed to reduce engine No. 2 to flight idle to minimize engine damage. Capt. Short climbed the flight to 2,000 feet AGL to provide Hurricane 7-2 with more altitude (autorotational potential energy) and to improve LOS visibility and radio communication with Cherry Point.

LtCol. Morgan requested the flight slow to 90 knots to reduce the demand on the good engine. He reported they had a large torque and power margin available, based on the weight and power calculations, as well as the cockpit indications. He was confident they could make a single-engine landing. He reviewed the steps in the NATOPS pocket checklist to confirm the procedures for an engine-oil bypass and for single-engine failure. He needed to secure the No. 2 engine in accordance with NATOPS.

Capt. Short then declared an emergency for the flight with Cherry Point approach. They had visual contact with the airfield and requested a straightaway to runway 23R. Hurricane 7-2 maintained the wing position until one-half mile from the approach end. Hurricane 7-1 then sidestepped to the right of runway 23R, and let them fly their single-engine approach. Following the landing, Hurricane 7-2 had sufficient power to taxi to the combat-aircraft-loading area (CALA). Once there, the flight landed under the direction of the Cherry Point taxi director, and ordnance was safed.

Manned and Not Ready!

By AWR1 David Brandon

My crew was scheduled for a routine plane guard, SAR/ASW hop from the carrier during CompTUEx (composite-training-unit exercise). I was the crew chief, along with a junior rescue swimmer. We turned over with the previous crew on the spin and launched after a 15-minute delay as the ship turned. We headed around the stern to take up position in starboard delta.

The Air Boss called and requested our present position, and we reported being approximately one-quarter-mile astern. He immediately ordered a search pattern for a possible man overboard.

Calmly, the HAC called, "Automatic approach checklist, crew rig for rescue."

As the rescue swimmer and I prepared the cabin, we also began to work our outside visual-search scans. It was dark, and from my position in the cabin door, even with NVDs (night-vision devices), I had to concentrate on my scan pattern. My rescue swimmer scanned on the port side out the ASO window.

Then it happened.

I had placed my hand on the rescue-hoist-control panel, just inside and aft of the cabin door on the starboard side. I intended to turn on the rescue light to aid my scan. As soon as the light came on, I saw something fall off the aircraft. At 150 feet AGL and 60 knots, the time for that "something" to fall away and hit the water was just long enough for me to recognize it as the rescue hook.

My first thought was, "What did my inexperienced junior crewman or pilot just do?"

Then the pit in my stomach started to really tighten, as I switched on the cabin light to see that I was the one who had hit the shear switch. The protective, red-switch cover was up, and the switch was in the "SHEAR" position.

I had decided not to turn on the cabin light before the rescue light, because our NVDs would bloom out and significantly affect not only my vision, but my swimmer's, as well. This action also would have created an annoying glare on the windshield for the pilots, which could have caused spatial-disorientation problems for them. Also, the anticipation of an actual, at-sea rescue perhaps triggered a momentary lapse in my sense of touch, so that I hadn't recognized the red-switch cover.

However, my comfort level was excessive after so many years flying in an SH-60F. I should have turned on a light or used a flashlight to confirm the switch I was about to operate. That factor and my lack of touch recognition were the causal holes in the Swiss cheese and led to my "fat fingering."

Because we were down a rescue hoist, and therefore down SAR, another helo on a dedicated ASW mission more than 40 miles away had to return and assume our plane-guard duties. The silver lining in this event is the ship had an accurate muster, our playmate already was airborne, and there was no impact to the airplan's launch and recovery timing.

The bottom line takeaways from my "dark night" are these:

1. The rescue-hoist-shear mechanism works 4.0.
2. Do not test this reliability on an actual search-and-rescue operation; you might search but not rescue.
3. Make the red-switch cover and shear wire a good preflight-turnover item.
4. Take a deep breath, pause, and settle down before moving forward with checklists and other tasks.

AWR1 Brandon flies with HS-5.

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

CRM Contacts:

Naval Aviation Schools Command
Crew Resource Management
181 Chambers Ave., Suite C
Pensacola FL 32508-5221
(850) 452-2088/5567 (DSN 922)
Fax (850)452-2639
https://www.netc.navy.mil/nascweb/crm/crm.htm

LCdr. Jeff Alton, Naval Safety Center
(757) 444-3520, Ext.7231 (DSN 564)
jeffrey.alton@navy.mil

Routine Flight

By Captains Brian Gray and Mike Shull, USMC

HMH-461 is often "fragged" to support units during their predeployment training. A common frag for us is casualty evacuation (CasEvac). One such mission took our aircraft away from our home field of MCAS New River, N.C., to Fort A.P. Hill, Va. The transit time for the flight was one and a half hours. To complete the training, a tactical bulk-fuel-delivery-system (TBFDS) tank, with 4,000 pounds of fuel, was installed in the aircraft. The only unusual aspect for this flight was the unfamiliar training area. The transit to and from and the CasEvac training would be familiar to all of us. Originally designed as a section flight, our squadron had to support the frag with only one CH-53E, because of maintenance issues.

After supporting 2nd Battalion 8th Marines for the CasEvac training, the crew pointed the aircraft's nose south to New River, in what they assumed would be an uneventful flight home. An hour into the flight, at 1,000 feet AGL, we got a master-caution light, with no associated caution lights or emergency indications. The routine flight quickly became extraordinary. The copilot looked for a "just in case" airfield to land, while the HAC continued to fly, and the crew searched for possible secondaries that may have caused the master-caution light. As the crew chief came to the cockpit to increase the crew's situational awareness, he discovered the main-gearbox circuit breaker had popped. With no other secondaries, the crew reset the circuit breaker.

Within one second of resetting the circuit breaker, an electrical fire started in the cabin, just above the crew door. Aerial observer two (AO2) fought the fire, while aerial observer one (AO1) retrieved the second fire bottle from the rear of the aircraft. That took extra time because AO1 had to climb around the TBFDS tank.

The copilot and the crew chief called out possible landing fields and continued to fight the emergency in accordance with NATOPS. The HAC set up for an emergency landing to a farmer's field directly ahead of him.

At 500 feet AGL, the crew realized that an irrigation system stretched the length of the field. The HAC repositioned the aircraft to land in an adjacent field. The AO2 and crew chief continued to fight the fire as it burned through three of the four bundles of wires located above the crew door.

As a result of the subsequent wiring failure, the automatic-flight-control-system (AFCS) computers, all of the chip detectors, the 1080Y (attitude

Photo by MCSA Joshua Adam Nuzzo.

gyro), and the attitude-heading-reference system (AHRS) failed. With the loss of the AFCS computers and the primary attitude-reference systems, the CH-53E requires much closer oversight and input from the crew.

The crew dealt with the problems and made an emergency landing. While the HAC marked the aircraft's position on the GPS, the crew chief exited the aircraft to assist the crew in the emergency shutdown. The AO2 extinguished the fire. The crew completed the emergency shutdown and egressed the aircraft without further incident.

The aircrew continued trying to figure out what had caused the fire, hoping to provide as much information as possible to the investigation and maintenance efforts.

What did this crew do right? They handled the emergency with professionalism and sound decision-making skills. From beginning to end, the crew dealt with the emergency to perfection, and CRM played a pivotal role. We met the standards we train to and handled the contingencies we train for.

During the emergency, the pilot at the controls continued to fly the aircraft and immediately sought out a place to land. The pilot not at the controls began working the emergency from the cockpit, while the crew chief assisted by coming to the jump seat to lend his eyes and expertise. A crew chief's assistance in an emergency can be the difference between a successful landing or losing the aircraft or crew. The aerial observers handled the fire in the cabin and used all assets at their disposal. The location of the TBFDS tank presented an obstacle to the firefighting efforts, but the aerial observers worked together to communicate their intent. We didn't have a single set of idle hands throughout the emergency, and the entire crew employed time critical risk management (TCRM).

We have no shortage of EPs dealing with fires in the CH-53E NATOPS, but as we all know, every fire is disconcerting and original. We had no "helmet fires" to go along with the actual fire, and everything the crew had briefed and trained for happened naturally and without a second thought. We recovered from the en-route altitude with an electrical fire and limited flight-control assistance; this outcome does not happen by chance. It only happens with a solid foundation built on NATOPS and reinforced with a healthy dose of CRM. The crew controlled the fire, focused on landing, and executed a shutdown, all with controlled communication.

Captains Gray and Shull fly with HMH-461.

*This article is a textbook example of executing procedures and the time-critical risk management (TCRM) ABC*D *tool. As we have written in past issues, the ABC*D *tool enables all involved in mission execution to speak and think the same language, whether in normal or stressful conditions. The ABC*D *tool enabled the aircrew to effectively overcome a potentially deadly mishap.—Mr. Denis Komornik, ORM education and training, Naval Safety Center*

Got Any HF?

By Lt. Jeff Lessard

The aviation community attracts a certain personality type. Most of us have a "can do" attitude, want to succeed, and are competitive by nature: generally "Type A" personalities. These characteristics drive us to succeed, but in so doing, we may find ourselves pushing aside certain distractions in our life. Most of us learn early on to compartmentalize, so we can focus on our job in the cockpit. But how do we recognize when the distractors are too great? At what point do we admit we have too much going on and need to step back?

I was at an HSL squadron preparing for my second deployment. I had deployed once as a helicopter second pilot (H2P), and qualified as a helicopter aircraft commander (HAC). I had also earned qualifications as a night-vision-goggle instructor (NVGI), and most recently, a functional-check pilot (FCP). My assignment as the detachment maintenance officer on a carrier-strike-group (CSG) deployment kept me very busy. Besides my work responsibilities, I had a lot going on in my personal life–much more, it turns out, than I was willing to admit, even to myself.

I didn't realize my level of distraction until I had made a mistake. I was assigned to the FCF crew , on my third FCF since being designated an FCP. We also were flying one of my detachment's aircraft, and I felt self-imposed pressure to do all I could to complete the FCF and help my maintainers.

We completed the ground checks in the early afternoon. As we prepared for the in-flight checks, we kept getting delayed for one reason or another. By the time we were ready to launch, about 30 minutes were left until sunset.

During my preparation for HAC, and again for FCP, I carefully had studied OpNavInst 3710.7. I had read the section which states functional-check flights should be conducted during daylight hours in VMC. I knew this rule for my HAC board, I knew it when I completed my FCP exam, and I knew it on all other FCFs I had flown. However, on this day, I allowed myself to misinterpret this rule and briefed my crew: "We don't have enough time to complete all in-flight checks. We'll launch, do FCF checks until sunset, then knock it off and RTB." At no time did I, or my crew, question the logic of this plan. We launched, did what FCF checks we could, and once the sun had set, we turned back for home. Only then did I realize I was flying an aircraft still in an FCF status, and thus was unproven for regular flights at night. We returned to base, shut down, and I told my chain of command about my mistake.

It was days later before I fully could take stock of what was going on in my life and how it had affected my judgment that day. The stress of dealing with the serious illness of a loved one had affected me more than I realized. One person put it best by observing, "You had a lot on your plate." I had allowed the distractions of my work life and my personal life to interfere with my ability to make a sound decision in the cockpit. I thought I could compartmentalize everything, when in reality, I had not dealt with the stressors in an effective manner. I am thankful I did not make an error in judgment that led to injury or aircraft damage.

THIS INCIDENT GAVE ME two important lessons. The first focused on the failure to communicate. I failed to tell my chain of command about the stress in my personal life. I failed to communicate properly with my crew. I told them my plan, but I never solicited their feedback.

Communication is a two-way process. It cannot succeed unless you clearly pass information and then solicit feedback to make sure everyone comprehends. Everyone must be included in the decision-making process.

The second lesson was one of self-assessment. I did not take time to identify all my human-factor stressors and assess how they would affect me in the cockpit. Every crew member who steps aboard an aircraft has some stressors in his/her life. As professional aviators, we must take an honest look at ourselves and decide if we are capable of accomplishing our mission while dealing with stressors beyond the norm. We must communicate openly with the crew and the chain of command, so others can help manage the risk at the right level.

Every time I now brief before a flight, I think a lot more carefully during our ORM assessment when the question is asked, "So, does anyone have any human factors?"

Lt. Lessard flies with HSL-49.


Classic
BROWNSHOES IN ACTION COMIX
"The kind real aviators like"
By Lt. Ward Carroll
VF-3.14's new safety officer wants his term to be characterized by "innovation." . . .
"Now stick with me on this one, Skipper."
"We'll start by changing everyone's callsigns to important safety tips . . ."
"Hey, 'Head-on-a-Swivel!' have you seen 'Never-Gets-Complacent?' "
"No, 'Fly-the-Brief,' isn't he airborne with 'Centered-Ball-to-Touchdown?' "
100
"Then, I'll coordinate with the ship's TV guys the use of subliminal messages during football games."
"Gee, it's the middle of a no-fly day, and I have this urge to thoroughly preflight an ejection seat."
"Yeah, me too. Let's get down to the hangar bay."
"Finally, we can disguise NATOPS quizzes as letters from home . . ."
Dear Joe,
I miss you lots. The dog is fine. What is the max CV landing weight for your airplane?
Love,
Betty
"Well Sir, what do you think?"
"Have you been Personnel Officer yet?"

Safety

The best way to learn.

Knowledge

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