THE NAVY & MARINE CORPS AVIATION SAFETY MAGAZINE

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Approach

SMOKE, FUMES, AND FIRE
Get to the source

Naval Aviation Centennial

The Navy & Marine Corps Aviation Safety Magazine

January-February 2011 Volume 56, No.1

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.

Approach (ISSN 1094-0405) is published bimonthly by Commander, Naval Safety Center, and is an authorized publication for members of the Department of Defense. Contents are not necessarily the official views of, or endorsed by, the U.S. Government, the Department of Defense, or the U.S. Navy. Photos and artwork are representative and do not necessarily show the people or equipment discussed. We reserve the right to edit all manuscripts. Reference to commercial products does not imply Navy endorsement. Unless otherwise stated, material in this magazine may be reprinted without permission; please credit the magazine and author. *Approach* is available for sale by the Superintendent of Documents, P.O. Box 979050, St Louis, MO 63197-9000. Telephone credit card orders can be made 8 a.m. to 4 p.m. Eastern time at (866) 512-1800. Periodicals postage paid at Norfolk, Va., and additional mailing offices.

Postmaster: Send address changes to *Approach*, Code 71B,
Naval Safety Center, 375 A Street
Norfolk, VA 23511-4399
Send articles and letters to the address above, or via e-mail to the editor, jack.stewart@navy.mil.

CON

Features

Naval Aviation—100 Years

The Centennial of Naval Aviation is celebrated in 2011. *Approach* magazine will share several related articles throughout the year, starting with Peter Mersky's account of Eugene Ely's first flight from the USS *Birmingham* (CL-2). This issue also features articles by Cdr. Walter Dalitsch and VAdm. Robert Dunn (Ret.) discussing the evolution of instrument flying, so critical to at–sea flying. The March-April issue will include Mr. Mersky's account of Ely's first shipboard landing.

Focus Topic

Smoke—Fumes—Fire

We all know the drill: Someone smells an odor that isn't normal or smoke is in the tube. The emergency procedure is initiated; the source of the problem is located and dealt with. Is there more to consider when you are confronted with this situation? Our aeromedical doc has a few points for you to consider, and we have several stories to share.

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Photo by Allan Amen

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Thanks for helping with this issue …

- Ltjg. Luke Hester, VAW-126
- John Wittrock, VQ-4
- LCdr. Edward Kinsella, VR-48
- Lt. Todd Nichols, VR-62
- LCdr. Patrick Smith, VR-55
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- LCdr. Clay Shane, HSL-51
- LCdr. Thomas Cronley, VR-55
- John Minners, CNATRA

Front cover: An MH-53E from HM-15. Photo by PH2 Michael J. Sandberg. Modified.

Naval Safety Center Resources for Mishap Prevention

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http://www.public.navy.mil/navsafecen/Pages/aviation/Aviation.aspx
Director, Aviation Safety Programs
Capt. Mike Zamesnik, Michael.Zamesnik@navy.mil
(757) 444-3520 Ext. 7225 (DSN 564)

Deputy Director, Aviation Safety Programs
Kimball Thompson, Edward.Thompson@navy.mil
(757) 444-3520 Ext. 7226 (DSN 564)

Aircraft Operations Division
Cdr. Monte Yarger, monte.yarger@navy.mil
(757) 444-3520 Ext. 7203 (DSN 564)

Culture Workshops
http://www.public.navy.mil/navsafecen/Pages/aviation/culture/AviationCultureWorkshop.aspx
Cdr. Duke Dietz, duke.dietz@navy.mil
(757) 444-3520 Ext. 7212 (DSN 564)

Crew Resource Management (CRM)
LCdr. Jeff Alton, Jeffrey.alton@navy.mil
(757) 444-3520 Ext. 7231 (DSN 564)

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Cdr. Duke Dietz, duke.dietz@navy.mil
(757) 444-3520 Ext. 7212 (DSN 564)

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Maj. Anthony Frost, Anthony.frost@navy.mil
(757)444-3520 Ext. 7223 (DSN 564)

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Cdr. Fred Lentz, frederick.c.lentz@navy.mil
(757) 444-3520 Ext. 7236 (DSN 564)

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(757) 444-3520 Ext. 7281 (DSN 564)

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Capt. Nick Davenport, nicholas.davenport@navy.mil
(757) 444-3520 Ext. 7228 (DSN 564)

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Maj. Anthony Frost, USMC, anthony.frost@navy.mil
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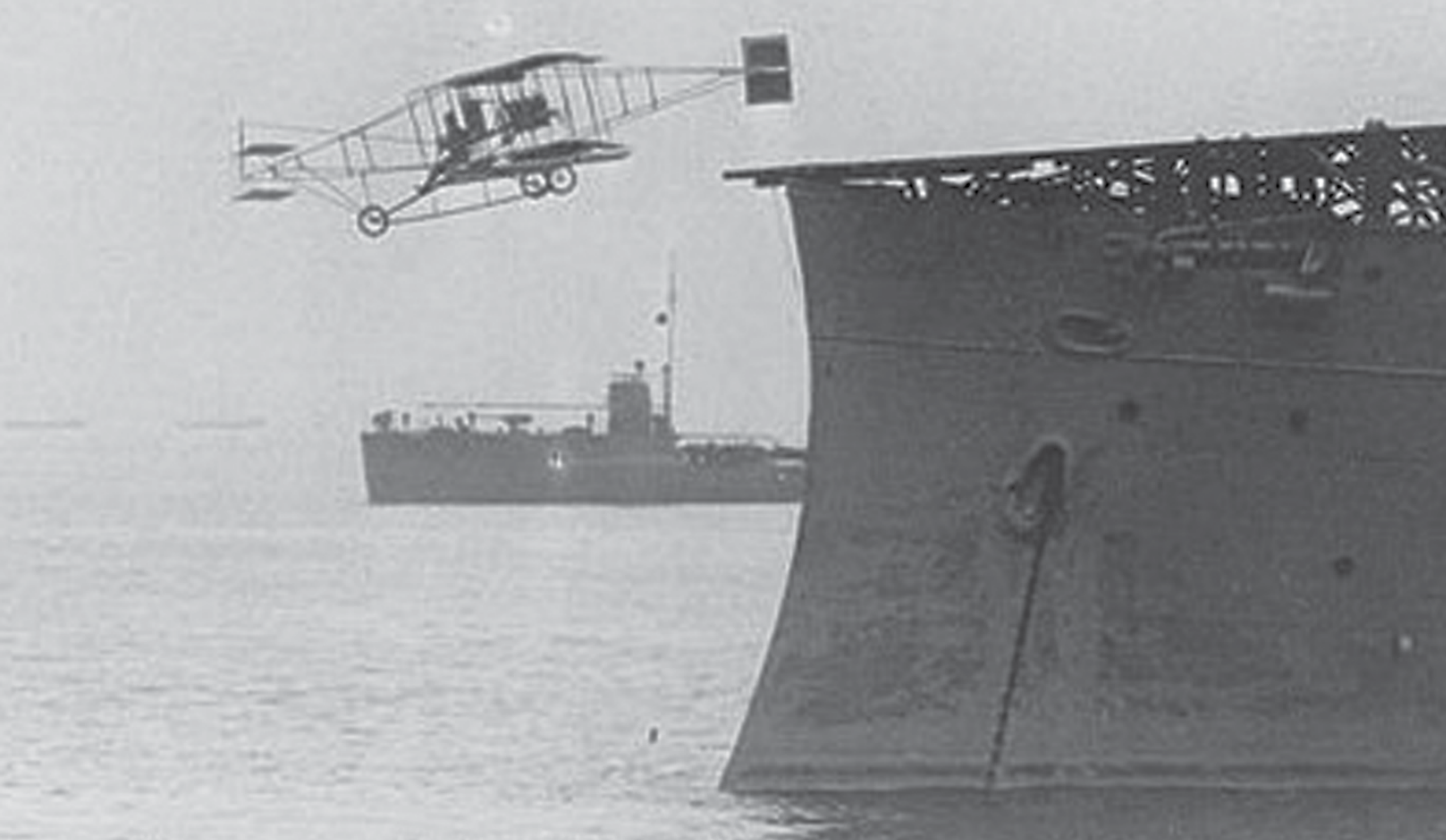
https://www.netc.navy.mil/nascweb/sas/index.htm

Command Safety Assessments
www.safetyclimatesurveys.org
Dr. Bob Figlock, (831) 641-9700/(888) 603-3170
surveys@advancedsurveydesign.com

Naval Aviation Safety Programs (OPNAVINST 3750.6R)
http://www.public.navy.mil/navsafecen/Pages/aviation/3750_Guidance.aspx

Naval Aviation celebrates its 100th anniversary. *Approach* will be sharing stories of historical note throughout this year to remind us of our heritage and instill the promises of our future.



ELY'S FLIGHTS—

Part 1, The First Launch

BY PETER MERSKY

The history of military aviation includes many ironic and unusual occurrences. When the Wright Brothers made their flight on December 17, 1903, they gave their country a seemingly unassailable lead in the field. However, they would have trouble in the following years selling their government on the possibilities of using the new air vehicle in military operations.

Instead, Wilbur went to Europe and was duly received as a conquering hero. His arrival in 1908 gave European aviation a push that lasted well into the 1920s. When America finally woke up to the need to develop the airplane for the military, World War I was well under way, and all the leading aircraft were coming from European companies in England, France and Germany, with Italy adding its own modest collection.

The same could be said for the back-to-back sequences involving flying on and off ships. A daring young civilian aviator, Eugene Ely, working as a company pilot for the Curtiss firm from western New York, took up the challenge of making the first takeoff—hardly a "launch"—from a ship in November 1910, followed by the first "trap"—sort of—aboard ship in

January 1911. Unfortunately, these two seminal events, performed under less-than-optimum conditions, were largely considered "stunts," and the Navy decided to devote its interest and money to other areas of aeronautical development involving flying boats that could be craned on and off ships.

This ignoring of what Ely's flights meant would cost America dearly. Again, it would take a European eye, in this case that of the British, to appreciate the meaning of the flights over the Chesapeake Bay and San Francisco. They developed what became the first aircraft carriers, which got into the war soon enough to fly operational missions in the waning months of the conflict.

Nevertheless, as we begin celebrating the centennial of naval aviation, we should take a brief look at the events of 1910 and 1911.

Capt. Washington Irving Chambers was an experienced sailor. A member of the Annapolis class of 1876, he had commanded the battleship USS *Louisiana* (BB 19) before being sent to Washington in 1909 to head the newly created aviation section. He had watched the Wrights fly along the Hudson River to Grant's Tomb in New York City from the bridge of his battleship, but like many ship drivers of the day, he thought the new invention held little promise for the military, especially the Navy.

As part of his new job in Washington, Chambers attended air shows, which had become the rage. In October 1910, he went to the racing mecca of Belmont Park on Long island. There, he met Glenn Curtiss as well as Eugene Ely, an enthusiastic, and capable young pilot. By the end of the week, Chambers had seen perhaps 40 different aircraft and had become a convert. The Navy definitely needed airplanes.

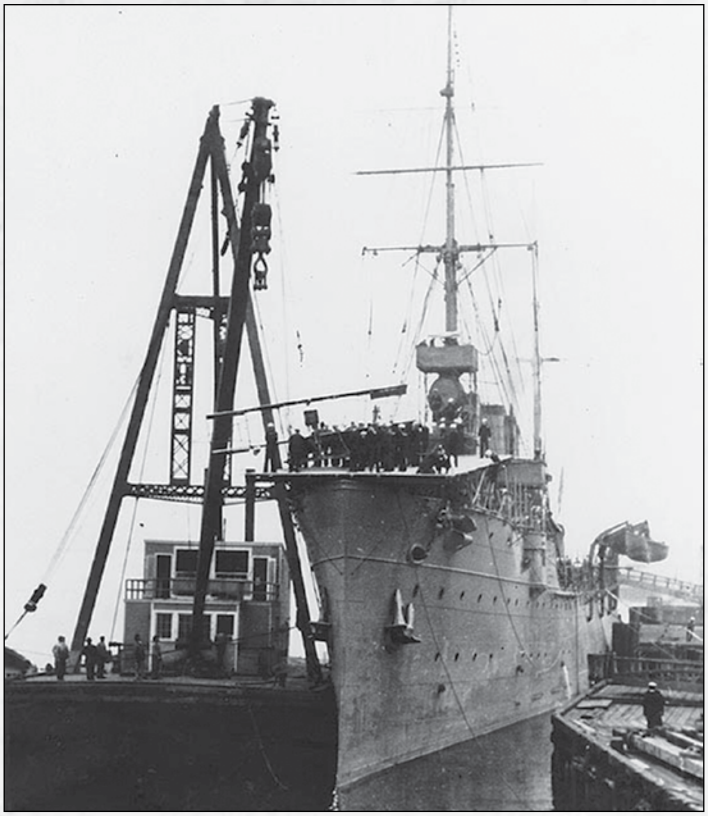
A month later, Chambers' and Ely's paths crossed again in Baltimore. At the time, the Navy, spurred on by Chambers, was planning a demonstration of shipboard operations. However, mechanical problems as well as medical problems with the pilot were changing the schedule. Ely jumped at the chance and forcefully volunteered his services.

Originally, Chambers had asked the Wrights to supply a plane and pilot, but the brothers had flatly turned him down, saying the planned excursion was too dangerous. Chambers had been surprised at the Wrights' refusal: their hope that the Navy would be interested in aviation had generated the idea in Chambers' head in the first place.

Ely had apparently thought along the same lines as Chambers and promised to even supply his own plane, a Curtiss. Chambers agreed, but found resistance from the upper Navy levels in Washington. There was no money, he was told, for such endeavors. Eventually, with a good deal of pushing from several civilian organizations that offered a $1,000 prize even though the Navy was still reluctant to sponsor the experiment, permission was granted to proceed.

The scout cruiser USS *Birmingham* (CL-2) was selected and modifications began to equip the ship with an 83-foot-long ramp, sloping at 5 degrees over the bow. The ramp's forward edge was 37 feet above the water.

Originally intended to compete for a $10,000 prize



offered by the "New York World" newspaper for a flight between Albany and New York City, Ely's plane was a stock Curtiss pusher named the "Hudson Flyer." It received a number of modifications including cigar-shaped aluminum pods under the wings and a splash-board on the landing gear.

WHEN THE FLIMSY-LOOKING BIPLANE was finally positioned on the ramp, there was only 57 feet remaining ahead of the plane. Not a confidence-inspiring setup, but Ely remained undaunted.

Aboard the *Birmingham*, Ely helped with last-minute checks, including installing the engine. The ship, commanded by Capt. W.B. Fletcher, was heading toward Norfolk in dismal weather, but Ely pressed on. Squalls played havoc with the immediate plans to launch as the captain anchored off Old Point Comfort. Hail obscured the Chamberlain Hotel at Fort Monroe across the channel. Finally, the squalls moved north and at two o'clock, Ely settled into the little biplane's seat. The deck crews scurried around, as the ship telegraphed the proceedings ashore. Everything was ready.

But another squall line was making its way north. Ely gave the signal to release the plane. At 3:16, his mechanic yanked the release and the Curtiss trundled down the ramp. Spectators gasped as the plane rolled off the deck and dropped from sight. Disaster seemed to be in the making. But wait! Capable pilot that he was, Ely fought to remain airborne and climb away from the ship. The wireless operator tapped out, "Ely just gone."

Today, of course, we take notice of approaching weather but don't let it hinder operations. Our planes are tough and fast and can usually climb out of any "stuff." But in 1910, with aviation just barely airborne, it didn't take much to smash a plane to the ground. Thus, Eugene Ely's courageous decision to launch using a type of system that had already demonstrated its danger is worth noting. Today, it would not have been the pilot's decision to make.

After leaving the *Birmingham's* little flight deck and getting control of his aircraft, Ely set course for the Norfolk Navy Yard. His damaged plane had planted a wingtip in the water and damaged the propeller, setting up an engine vibration that would last the remainder of the flight. The weather had deteriorated and his forward vision was almost nil. He knew he couldn't make Norfolk but would have to set down quickly, whether in the water or somewhere on the land he could just barely make out.

Fortunately, he found Willoughby Spit, a strip of land jutting out into the channel, with beach homes dotting the cold, gray expanse. Ely put down on the beach, where Julia Smith came out of her house. Ely's flight had taken him barely 2.5 miles from the ship. When the young aviator enquired as to his whereabouts, she replied, "Right between my house and the yacht club." By now, many other people had joined the pair on the beach to welcome the wayward pilot and help him as they could.

Later, Chambers told Ely, "I'm glad you did not head for the Navy Yard. Nobody could find it in this weather."

The exact spot where Ely landed has long been forgotten, but his history-making flight has not. It did take a lot of convincing from Chambers that he had, indeed, accomplished the main intent of the flight, that is, to take off from a ship, Ely turned his attention to his next project, that of landing aboard a ship.

MR. MERSKY WAS THE ASSISTANT EDITOR THEN EDITOR OF *APPROACH* FOR 16 YEARS. HE HAS WRITTEN MORE THAN A DOZEN BOOKS AND 100 MAGAZINE ARTICLES ON U.S. NAVY AND MARINE CORPS AVIATION. A RETIRED NAVY RESERVE COMMANDER, HE RECEIVED THE ADM. ARTHUR RADFORD AWARD FOR EXCELLENCE IN NAVAL AVIATION LITERATURE IN 1999, AS WELL AS TAILHOOK CONTRIBUTOR OF THE YEAR IN 2003.

The story of the first landing will be published in the March-April *Approach* issue.

Blind Flying

What We Didn't Know That Didn't Kill Us … Most of the Time

BY CDR. WALTER DALITSCH, MC

It is ironic that the individual who made the most significant contributions to early instrument flying, and paved the way for aviation to expand into unknown bounds, predicted that flying would remain an unnatural means of travel. Major William C. Ocker was an Army aviator who first published the article "Blind Flying" in the Journal of Aviation Medicine in September 1930. Thanks in large part to his contributions, his prediction that aviation would never become a means of natural transportation did not hold true.

Ocker was assisted in his work by Army aviator 1stLt. Carl J. Crane, and flight surgeons Col. Isaac H. Jones and Capt. David A. Myers. Much of Ocker's medical knowledge was based on Dr. Jones' 1918 book, Equilibrium and Vertigo. Until about 1926, Ocker and his colleagues experienced tremendous opposition to the idea of flying "solely on instruments when flying under conditions of zero visibility." The problem was in understanding the vestibular system. Dr. Jones developed a continuing rivalry with Navy flight surgeon John R. Poppen on the nature of the vestibular system and its contribution to equilibrium. Dr. Poppen stated that "complete dependence on reliable instruments" was necessary to fly in instrument meteorological conditions (IMC).

Their rivalry included semantics. In 1936, Dr. Poppen presented a paper stating, "What a horrible pity that we ever permitted ourselves the habitual use of this expression [blind flying]—the world's worst misnomer. It will take a generation to weed it out. In the words of the familiar vernacular, 'there ain't no such animal!'" His presentation "was followed by some of the most spirited discussion the [Aero Medical] Association has ever witnessed," with Ocker and Jones in adamant support of the term "blind flying." A year earlier, Ocker and Jones had said, "Any good pilot who understands his vestibular sense, and who is taught to fly blind, can now do so with complete safety. Today we fly by instruments of precision—tomorrow by robot. Consequently flying becomes safer and safer as the years roll on." Today Dr. Poppen's term "instrument flying" is now in general use.

Dr. Myers' involvement in blind flying came about after subjecting Ocker to the Jones-Barany revolving chair during that exam. Myers demonstrated to his patient the phenomenon of the human vestibular system's tendency to fool a pilot with what came to be termed by pilots as "vertigo." Ocker thought that he had been the subject of a deliberate trick: "My first impressions were, of course, that either there was some trick to the test or that I had developed some physical or mental defect."

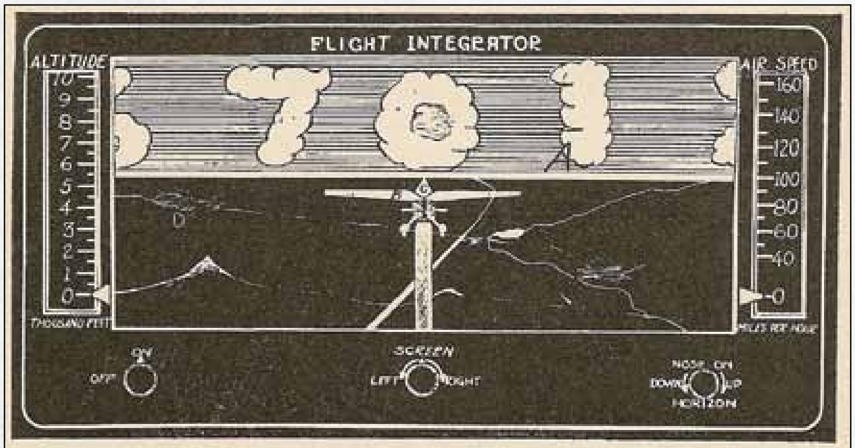


FIG. 27.—Flight Integrator.

The first instrument to allow flying in IMC was the turn indicator, developed by Elmer A. Sperry in 1917, with assistance from his son, Lawrence. Most pilots and aircraft manufacturers as late as 1930 felt the turn indicator "was just one more gadget that added weight to the airplane." However, it was Ocker who demonstrated its value in 1918 when he transported the Chief of the Army's Air Service, MajGen. William Kenly, through mountain fog from Washington, D.C. to New Philadelphia, Ohio. After his experience in the rotating chair, Ocker returned with a turn indicator installed in a black box. While monitoring it without any outside visual cues, he correctly deduced the direction of rotation with 100 percent accuracy. Ocker and Myers then realized the true nature of the vestibular system's role in spatial disorientation.

One of the best demonstrations of the utility of blind flying was conducted in 1929 by a young Army Lieutenant named "Jimmie" Doolittle, who completed "a 15 mile circuit which included blind take off and landing." By the time Ocker and Crane published their book Blind Flight in Theory and Practice in 1932, the concept of instrument flying was beginning to catch on. Early pilots were limited by night flying, clouds and fog. The continued work by Ocker and his colleagues, and further instrument development allowed expansion of flight into these realms. By 1932, the Army, Navy and Marine Corps had all established a regular course in blind flying. The necessity of these schools was well demonstrated when blind flight tests conducted by Ocker and Crane between 1929 and 1932 concluded that "[less] than 3 percent of all pilots tested could maintain control of the airplane (suitably equipped with instruments and a hood) for more than 20 minutes."

Instruments available for spatial orientation by 1932 included the inclinometer, turn indicator, climb indicator, air speed indicator, spinning top, Sperry Artificial Horizon, Sperry Directional Gyro, the pitch-azimuth indicator, the flight integrator (described below), and the Air-I-Zon (an early version of angle-of-attack).

One of the most interesting was the flight integrator. Developed by Ocker and Crane, it never entered mass production. They described it as "an instrument for spatial orientation which incorporates all necessary information for proper execution of blind flight in one indicating face… It will be seen that the face of the instrument presents a picture to the pilot that resembles, very closely, the pilots' natural instrument." The design of this instrument remarkably premonished today's glass panels. The background screen

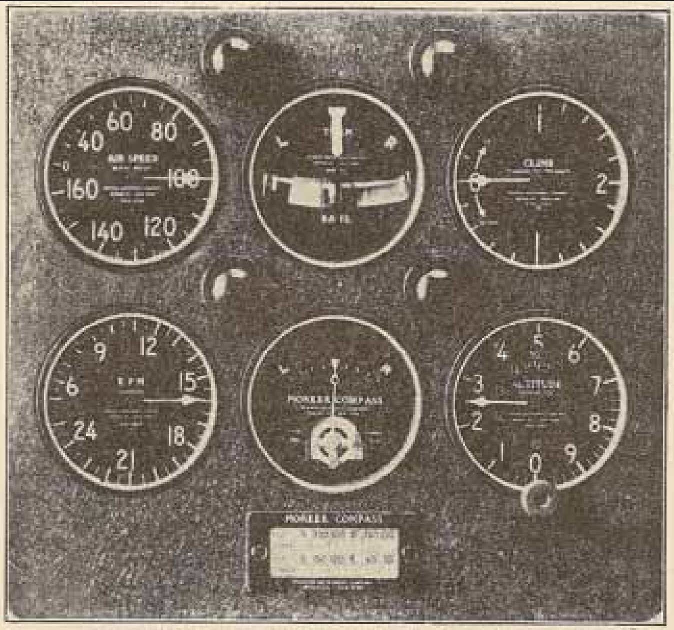


FIG. 76.—Turn Indicator grouping for airplane having a cruising speed of 100 miles per hour. Remote reading Compass Indicator may be replaced by 2¾ inch Magnetic Compass.

depicting an artificial horizon would slide left or right in conjunction with aircraft turns, while the miniature airplane would bank, climb and descend in relation to the actual aircraft.

Today

Despite nearly a century since the first experimentation with blind flight, and more than 75 years since instrument flight gained general acceptance, we are still slaves to our own physiology. Perhaps this is what Ocker was referring to as "not natural." Naval Safety Center data shows that spatial disorientation is still the leading aeromedical causal factor of Class A mishaps. It is second only to fatigue as the leading aeromedical cause of all mishap classes and hazard reports combined. Unrecognized spatial disorientation continues as one of the leading causal factors of controlled flight into terrain (CFIT). We would do well to heed the advice of Dr. Jones, who in 1937 said, "To master blind flying, the pilot needs just two things: a knowledge of his instruments and a knowledge of his ears."

FIG. 2. The applicant is being turned in the chair while he looks in the box. The directional instruments are in the box. He is receiving a demonstration of the fact that his sensations tell him one thing and the instruments another.

We train extensively on our instruments to scan, interpret and react to them, and how to maximize our performance through them. Our vestibular system, however, continues to fool us. The shortcoming of this internal gyroscope is that it was developed for use in a one G, zero AGL environment. When we transport that system to altitude, subjecting it to different airspeeds and attitudes, our sensations may be erroneous because our brain continues to interpret each stimulus as if we were still where the system was developed: back on the ground.

How far have we come? In terms of safety, not so far as we should hope. We must fully understand our physiology, its limitations, and how to overcome any shortcomings. Ocker and his colleagues were already fully aware of this by the 1930s. But as far as aviation becoming a natural means of transportation, with nearly 600 billion passenger-miles per year and second only to automobiles, it seems that William Ocker, known today as "The Father of Instrument Flying," was fortunately a bit disoriented on at least one subject. As long as we consider the true nature of our own physiology as seriously as we consider the limitations of our aircraft, flying is as normal and natural a means of transportation as any other.

CDR. DALITSCH IS A FLIGHT SURGEON CURRENTLY SERVING AS THE AEROMEDICAL INSTRUCTOR AT THE SCHOOL OF AVIATION SAFETY IN PENSACOLA, FLA.

The AOA Indicator

SMALL DEVICE, HUGE IMPACT

BY VADM. ROBERT F. DUNN

From the post-WWII Banshees and Panthers to the Hornets of today, naval aircraft have steadily improved: engines, navigation, hydraulic, electrical, control and weapons systems have gradually modernized. Some improvements are less visible, but at the time were revolutionary. Here is a description of one of them: The angle of attack (AOA) indicator.

Today's Navy and Marine fixed-wing aircrews take this device for granted. It is a relatively small instrument (a dial) on the instrument panel or a unique indicator on a multi-function or heads-up display (HUD) that shows in analog fashion the aircraft's angle of attack at any moment.

Patrol aircraft have only the dial. Carrier aircraft have other devices, one usually on the glare shield (the "indexer"), and another group of three lights arranged vertically in the vicinity of the nosewheel strut showing a red, amber or green light when in a landing configuration. The latter two displays show the pilot and the LSO the landing attitude of the aircraft relative to the optimum for landing.

The dial can also be used to establish the optimum landing attitude, but it is much less convenient than the indexer or a HUD. Neither the indexer nor the nose-strut lights will illuminate if the wheels are up.

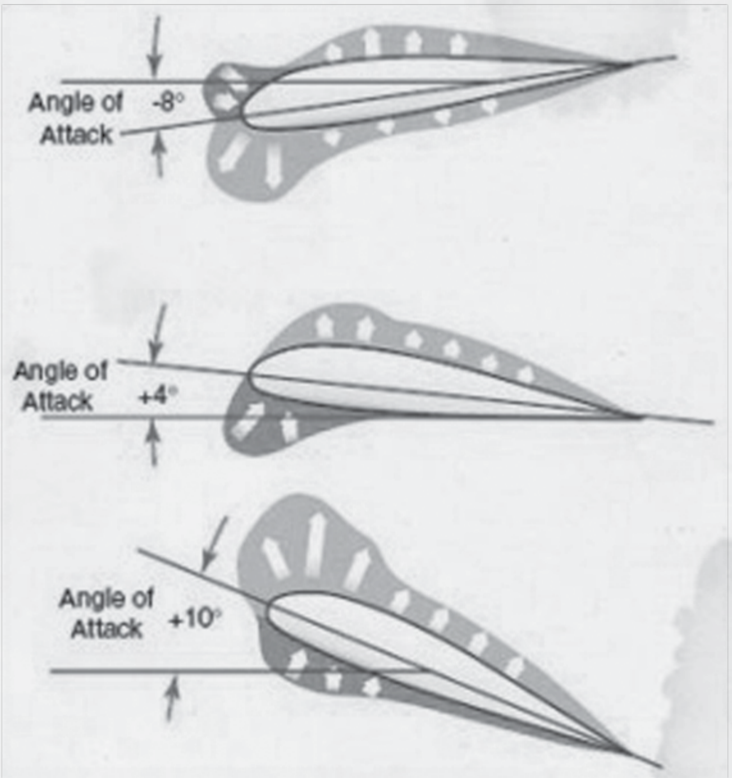
Wheels-up landings were much more common years ago, and some of the improvement has to be attributed to the installation of AOA systems. Unfortunately, for the analyst or the historian, data is available only on mishaps, not mishaps avoided.

The AOA system is simple; when first seen in the 1950s, it elicited such comments as, "Why haven't we had this all along?"

Landing approach speeds on a carrier, whether too

The indicator is actually a servo device: either a cylindrical-slotted probe or a vane extended outward from the fuselage in an area of relatively undisturbed airflow. Air passing into the slots or over the vane activates a detector that lines up with the air flow and sends electrical signals to the indicator dial and to the lights.

Angle of attack: The angle between the chord of the wing and the relative wind.



slow or too fast, will prompt a waveoff from the LSO. Before AOA indicators the pilot calculated his landing approach speed according to the aircraft weight, its configuration and external load. Flaps up or down or partial. Speed brakes in or out. The optimum airspeed could vary by as much as 9 or 10 knots.

Maintaining the indicated airspeed required looking at the instrument panel, while also looking out to line up on the ship's centerline. Trying to fly the proper glide slope as indicated by the LSO or the mirror was often a serious and sometimes deadly task. Earlier jets had a small margin between stall and approach speeds. A hung bomb or unused fuel could make a significant difference. More than one jet in the 1950s went into the water astern of the carrier because of miscalculated approach weight. The AOA indicator solved this problem.

THE AOA SYSTEM WAS BUILT with a damping system that permitted its use in turbulence without giving misleading or unreadable information, a feature not available in airspeed indicators alone. In aircraft with attitude gyros that could tumble at any moment, inadequate stabilization-augmentation systems and no automatic-power compensators, the AOA system was a godsend.

The AOA indicator also helped the LSOs. When compared with prop approaches, the jets had almost imperceptible variations in approach attitude that could mean significant airspeed changes. These variations were difficult to determine at night, and flying at night in the late 1950s was becoming more and more common. The LSOs continued to rely as much as possible on the relation between the wing and the horizontal stabilizer to determine attitude. The nose-strut lights working off the AOA indicator took a lot of guesswork out of the game.

Fleet-wide back-fit installations of the AOA indicator systems took place in the late 1950s and 1960, and all production aircraft after that were so equipped.

It matters not whether flaps are up or down, speed brakes in or out, or the weight and aerodynamics of external stores. With the airspeed at the optimum AOA the aircraft will be at the optimum speed for its configuration. Of course, weight and actual airspeed may be a consideration for arresting-gear engagement, but that's a different problem. At the optimum AOA the aircraft will be at the right attitude for touchdown. A "bug" displaying the optimum AOA on the indicator normally is set at 3 o'clock so that all the pilot has to do in the landing approach is to match the AOA needle with the bug.

The AOA indicator also can be used to establish maximum-range and endurance airspeeds, and speeds for other flight operations.

Commonplace today, the AOA indicator is one of those under-appreciated pieces of equipment that has contributed to the safety of fixed-wing naval aircraft. It has been key to the avoidance of numerous close calls and mishaps over the years, and continues to contribute to operational safety and efficiency.

VADM. DUNN IS A FORMER COMMANDER OF THE NAVAL SAFETY CENTER, AND CURRENTLY THE PRESIDENT OF THE NAVAL HISTORICAL FOUNDATION AND THE CHAIRMAN OF ASSOCIATION OF NAVAL AVIATION.

Inverted Off the Coast

BY LCDR. ROBERTO H. TORRES, USCG

OK, so I wasn't inverted, but it sure felt like it.

During those couple of seconds, many thoughts raced through my mind. I thought of my wife and daughter, of course. I didn't think we were going to die, but I figured we undoubtedly were going in the drink for an unexpected night swim. Surprisingly, an egress-procedure mnemonic my buddy had taught me went through my mind: Dr. See Bee—Door, Reference, Cord, Belt (for you purists out there, I know the procedure has changed, but this was the HH-65A baby, yeah!) I remember also thinking of other do's and don'ts, such as "do wait for all motion to stop,' and "don't apply the rotor brake."

Let me backtrack a bit. This significant emotional event occurred in 1999, when I was a newly-minted copilot, fresh out of my transition course. Ironically, as we said our goodbyes at Coast Guard Aviation Training Center (ATC) Mobile, my classmates and I joked about how one of us probably would have a scary flight in this aircraft, and we promised to be careful. Dang it, if it wasn't me that nearly soiled myself one particular night in the Caribbean soon thereafter.

About one month after being officially designated as a pilot in the "tupperwolf," I stood my first duty ever, flying with the saltiest pilot at the unit. My aircraft commander (AC), LCDR/AOPS/IP/FE/STANO, on this day was nearing the end of his second back-to-back tour at Coast Guard Air Station (CGAS) Borinquen, and at the top of his game. I also was fortunate to have among my crew a very experienced AMT1 as the flight mechanic (FM), and a very competent AST1 as the rescue swimmer (RS). Can you say "steep cockpit gradient"?

Our duty day started at eight that morning and got interesting around noon when we launched on a law-enforcement mission to find and track a possible yola. A yola is a makeshift, unseaworthy vessel, typically overloaded with illegal immigrants coming across the pond from the Dominican Republic to Puerto Rico. We flew all afternoon and late into the night, and after finding the suspect yola, we overtly followed them back toward their point of origin. On our third sortie, we found ourselves off the coast of Punta Cana flying low-level at night on goggles, in

I vividly remember seeing the airspeed indicator rapidly decrease from about 40 knots to zero.

and out of instrument-meteorological conditions. How about crew fatigue?

On one pass, we suddenly saw lights in the water. Thinking the overloaded yola finally had capsized, the AC told the RS to change out of his flight suit and into his wet suit, in case he had to make a water rescue. The FM and I shifted our scan to the left side of the helicopter, as the AC orbited to the left. Minutes earlier at the request of the AC, I had coupled-up the flight director with IAS-VS and HDG SEL. With 43 knots commanded, the AC "assisted" George (or as we called him in Borinquen, Jorge) with the steeper-than-normal left turns. Have you heard of mode confusion or automation complacency?

We abruptly departed controlled flight, spun to the left and dropped altitude. We started at 300 feet and finally recovered at 13 feet. I vividly remember seeing the airspeed indicator rapidly decrease from about 40 knots to zero, and seeing the heading gyro spin increasingly faster to the right, which of course meant, we were yawing crazily to the left. Uncommanded left yaw, perhaps? What about loss of situational awareness?

We literally were falling out of the sky, with brand new me along for the ride. A Coast Guard 110-foot cutter, just offshore and with its small boat in the water, was prosecuting the case with us. Our thoughts all focused on getting wet, and before we knew it, we would be onboard the cutter having a cup o' joe with the crusty chief boatswain's mate.

As the AC tried to recover the out-of-control helicopter, the FM started calling, actually yelling, for floats. I unsuccessfully tried to activate them by pressing the switch on the instrument panel. After cracking the plastic in a vain attempt to activate the floats, the AC yelled, "I have it. I have it."

I remember seeing the cockpit light up as the AC applied full right pedal and tried to tame our beast. Were our communications accurate, bold, and concise?

For the few remaining HH-65 A/B pilots reading this, you may remember the sound of Nr drooping (as we often heard it during an autorotation). Well, that night, we drooped it down to 86 percent (the minimum transient was 84 percent). The poor RS in the back of the cabin was holding on for dear life, unstrapped and half out of his flight suit. He later reported how dim the instrument lightning became with those alternators working overtime. Is this a good time to aviate?

To this day, I honestly believe that while the AC got us into this situation, he got us out. I always try to remember that aviation adage, "Truly superior pilots are those who use their superior judgment to avoid those situations where they might have to use their superior skills." Well, that night my AC used every bit of his skill to get us out of an imminent Class A mishap. Threat and error management?

SOMEHOW, WE MADE IT, and then yours truly continued doing the copilot thing. I called a Mayday and announced our intentions to land at the nearby international airport. Funny, because that particular aerodrome was made for 100-percent tourist traffic, so at that time of night, no one was around. Expecting to see numerous exceedances, we surprisingly had only overtorqued the main gearbox, and not even by that much. Now can we navigate and communicate?

With our "Abort Mission—Urgent SAR Only" instructions per the flight manual, we somberly flew the one-hour trek back to Aguadilla, Puerto Rico. It's interesting how the human psyche works; I remember we laughed and joked most the way home—it was that or cry. On a positive note, these are the times when crew-resource management (CRM) continues to work its magic. Still shaken up, we managed to land and taxi, despite our near impact (13 measly feet) with the water.

I ended my first duty night having a beer with my crew in the wardroom at CGAS *Borinquen*. Because we had bagged out, it was easy to explain to the Ops Boss that we really needed to not fly any more that night. I called the wife and explained it was perfectly normal for her to pick me up at two in the morning (we only had one car), and that Coast Guard pilots routinely get off duty with beer on their breath. I also had to explain to my bride that this was not some sort of unfortunate trend. One day earlier, while hoisting down a helicopter battery to a 210-foot cutter, the No. 2 engine cowling had become unlatched and was shredded by the main rotor blades. Although unusual and unexpected, it was uneventful, really.

I find it odd that after the safety investigation, I consider that event as a primary reason I chose to follow the safety career track, and look at me now, right? Not. All seriousness aside, I still disagree with some of the recommendations that came out of that investigation. The report stated the copilot (me) should have used the collective-float-activation button instead of the one on the instrument panel. Recently, during a helicopter-safety summit held at ATC Mobile, we discussed a similar issue with the hoist-shear switch. In the middle of an event, when the person at the controls is actively manipulating the collective, it probably is inappropriate for the other pilot to grab for and reach one of these switches, but this is just my humble opinion.

So began, my proverbial 15 minutes of fame (or was it shame) as ATC's HH-65 Branch made an "afghanistanimation" video of that event. The video made the CRM lecture rounds for many years; I was truly honored. Interestingly, about one or two proficiency courses later, they showed the video. The poor instructor made the mistake of not asking if anyone in the audience was involved. Ironically, both the AC and I were there, and we enlightened the group on what really had occurred on that particular dark and stormy night.

This emotional event, like so many other close calls that we have all fatefully lived to talk about, are often chock full of lessons learned. I invite you to gain knowledge from our mistakes that night through the analysis of this and other mishaps. We can all do a better job of continually packing and repacking our experience tool bag to avoid similar "there I was" stories. With that in mind, one can easily see the criticality of CRM concepts such as flight discipline, normalization of excellence, mutual support and risk management.

LCDR. TORRES IS WITH U.S. COAST GUARD AVIATION TRAINING CENTER MOBILE, AL.

VR-62

AWF2 ERICK PARSONS, a C-130T loadmaster with VR-62 at NAS Jacksonville, Fla., was on a mission tasked with delivering nearly 14,000 pounds of cargo from Rota, Spain, to Sigonella, Italy. During the load, Petty Officer Parsons had difficulty loading one of the pallets. Noting a tagged weight of less than 3,000 pounds on a nearly new pallet, he suspected a discrepancy in the weight and ordered the pallet to be reweighed.

He found the actual weight of the pallet was 7,000 pounds more than the tagged weight. Petty Officer Parsons decided to offload the aircraft and reweigh all six pallets. He discovered an actual cargo weight of 39,990 pounds, a 26,000-pound discrepancy.

His action averted a takeoff condition that have put the aircraft over its maximum gross weight and significantly outside its CG (center of gravity) limit.

BRAVO Zulu

VR-55

AWF2 JOSE MALDONADO was the C-130 2LM (loadmaster) trainee on a flight from Wake Island to Hickam AFB. During climb checks, he noted a significant drop in hydraulic fluid quantity for the utility system. After notifying the flight station and marking the fluid level to track further loss, he looked for any secondary indications. The cockpit reported no secondary indications up front.

AWF2 Maldonado spotted a massive amount of fluid streaming down the No. 1 engine. After analyzing the situation, the flight station executed an emergency shutdown of the engine and dumped fuel. They made a three-engine landing at Wake Island.

The leak was due to a failure of the hydraulic filter on the No. 1 engine, and could have caused a failure of the hydraulic system, including multiple pumps cavitating. Furthermore, the fluid streaming down to the tail of the engine could have caught fire.

VR-55

A C-130T FROM VR-55 departed NBVC Pt Mugu and was bound for NAS Atsugi, Japan. Lieutenant Commanders Brent Johnson and Tom Cronley conducted training while flying to their first stop at Hickam AFB, Hawaii.

About four hours into the flight, and when almost equidistant from their departure and arrival airports, AWFC Robert Kreiser reported, "Prop low oil light, No. 4." After deferring engine shutdown, the crew monitored the engine, reviewed procedures for the possible failure modes, told San Francisco Oceanic ATC of their intentions, contacted San Diego weather, and called Pt. Mugu base operations via satellite phone. They began the four-hour trek back to NBVC Pt. Mugu.

Just before descending into the terminal area, the now-pitch-locked No. 4 engine was secured and the propeller feathered.

Left to right, AWF1 Nick Maisonet, LCdr. Brent Johnson, LCdr. Tom Cronley, not pictured AWFC Robert Kreiser.

VT-2

CAPT. JUSTIN R. STORY, USMC, a flight instructor with VT-2, and Ltjg. Amy M. Keferl, USCG, a primary flight student, had a T-34C day contact training flight from NAS Whiting Field, Fla. While configuring for an approach-turn-stall training maneuver, Capt. Story noted the engine torque stayed at 600 foot-pounds with the power control lever near idle. After troubleshooting, they determined they could increase power to maximum, but the torque readings would not decrease below 600 foot-pounds. They concluded they had a fuel-scheduling malfunction. Power was controllable at settings above 600 foot-pounds but unresponsive to power-control-lever settings below this range.

With weather deteriorating, they flew to NAS Whiting Field. Ltjg. Keferl reviewed the emergency procedures, and the crew discussed the need to feather the propeller for the emergency-landing pattern. At Whiting Field, they noted low-end power had increased to more than 1,000-foot-pounds torque. Flying under low cloud bases, Capt. Story raised the nose, decelerated below maximum landing-gear-extension speed, and lowered the landing gear. Ltjg. Keferl monitored the flight path and engine instruments, staying alert to high torque or excessive vibrations that would require securing the engine.

Capt. Story feathered the propeller, flew an emergency landing pattern and landed. The maintenance inspection found a faulty fuel-control unit.

What the Nose Should Know

BY CAPT. NICK DAVENPORT, MC

You're flying along on a beautiful day, not a care in the world, and happy to be a naval aviator being paid for something you'd do for free. Then you smell something funny. Your magnificent olfactory apparatus is hardwired right into the center of your brain, and instantly, you retrieve similar life experiences in the past and announce to whoever is listening, "Smell's like something's burning." Your flight suddenly has become more interesting.

Lt. Alex Glass, in "What's Going On" [see page 18], makes an important observation about his aircraft EP for fire, smoke and fumes in the cockpit. He's right—they usually present in the opposite order. Firefighters refer to the fire tetrahedron of fuel, oxygen, heat and chemical reaction. Eliminate any one of those four, and you stop the fire. But how do most fires start? Imagine a wire that carries an excessive load. The wire heats up, starts to melt, and vaporizes the plastic or rubber insulation, releasing first fumes and then smoke. Finally, when the temperature of one or more of the volatile compounds reaches the flash point resulting in a chemical reaction, you have fire. Maybe a bleed-air leak starts to cook off some organic material nearby, or an electrical arc suddenly ignites an adjacent combustible source. The first indication that something's amiss may just be that funny smell.

Smoke and fumes depend on what's being heated and how high the temperature gets. Smoke is a combination of vapors, soot particles, and gasses containing hundreds of compounds, many of which are toxic and dangerous to life. Some of the more common constituents of smoke and fumes are cyanide, carbon monoxide, hydrogen sulfide, phosgene, dioxin, polycyclic aromatic hydrocarbons (PAHs), hydrochloric acid, hydrofluoric acid, sulphuric acid, sulfur dioxide, ammonia, and a few hundred other nasty compounds. The only thing that smoke doesn't have an abundance of is oxygen, which just happens to be necessary for life.

Most people who are killed in fires actually die from the inhaled smoke and toxic products of combustion, not the fire itself. Depending on the mixture of the smoke, the toxic effects can be numerous. Irritants such as ozone, sulfuric, hydrochloric, and hydrofluoric acids, sulfur dioxide, and others, cause immediate upper airway irritation, coughing and damage to the cells lining the respiratory tract. People cough, gag, and may have laryngeal spasm (choking, can't talk or breathe) as they frantically scramble to find clear air. Severe asthma attacks can be triggered in susceptible individuals.

Most people who are killed in fires actually die from the inhaled smoke and toxic products of combustion, not the fire itself.

Smoke can also contain more subtle toxins. Some compounds in smoke act as anesthetics, putting the brain to sleep and shutting down the brain's respiratory centers.

Phosgene and other cellular poisons may cause little immediate symptoms, but may cause severe cellular damage that shows up hours later. It's not uncommon to see victims of smoke inhalation shortly after a fire who appear to be doing well, who then six to 18 hours later develop progressive shortness of breath. The damaged cells lining their airways begin to leak fluids and the lungs fill with water (pulmonary edema). Smoke also has many compounds which can cause cancer years later. Dioxin, benzene and other PAHs in smoke are known for their carcinogenic properties (cigarette, anyone?).

Products in smoke have high odor thresholds compared to their toxic levels and can have toxic effects at concentrations below that which can be smelled. Cyanides and hydrogen sulfide act as tissue poisons, shutting down cellular metabolism (producing so-called histotoxic hypoxia).

Perhaps the greatest threat is from that old nemesis, carbon monoxide. Odorless, tasteless and invisible, it nevertheless acts to suffocate the blood's ability to carry oxygen. It poisons cells and stops their metabolic activity. Carbon monoxide is probably the single greatest cause of death in smoke inhalation, and it's particularly insidious. Lastly, smoke can act as a simple asphyxiant, as it displaces normal air and oxygen levels.

A classic example of the dangers of smoke inhalation occurred on Aug. 19, 1980, when a Lockheed L1011 operated by Saudi Arabian Airlines took off from Riyadh, Saudi Arabia. Seven minutes after takeoff, an aural warning indicated smoke in the aft cargo compartment. The crew spent five minutes and 20 seconds confirming the first fire warning before the captain elected to return to Riyadh. After touchdown, the pilot continued to taxi, then stopped on a taxiway two minutes and 40 seconds after landing. The engines were not shut down for another three minutes and 15 seconds, preventing rescuers from reaching the aircraft. All 301 persons on board perished due to toxic fumes inhalation and uncontrolled fire.

The captain was faulted for not instructing his crew to first go on oxygen, not advising the flight attendants to use portable oxygen, and not evacuating the aircraft as soon as possible after landing.

On your next flight, when you find yourself suddenly muttering, "Smell's like something's burning," putting on your mask and switching to a pure oxygen supply just might be your next best step while you're trying to guess just how interesting your flight is going to turn out.

CAPT. DAVENPORT IS THE AEROMEDICAL DIVISION HEAD, NAVAL SAFETY CENTER.

What's Going On?

BY LT. ALEX GLASS

The title of the emergency procedure (EP) is "Fire, Smoke or Fumes," and as a new guy, for some reason, I always thought it would occur in that order, and quickly. On one of our flights supporting Operation Enduring Freedom (OEF) the scenario was the exact opposite.

My story starts out on a routine flight halfway through deployment. I was the least experienced on our crew, with 14 months in the squadron and about three months on the boat.

On our return to the carrier, we smelled something funny. The pilot in command had just told the crew,"I'm going off ICS for a second."

My mission commander (MC) was in the rear of the plane. It was me, the junior pilot, and the second-most junior NFO on ICS together for only about 30 seconds, but in those 30 seconds a smell crept through the plane.

"Hey flight. Did you just turn on engine anti-ice?" I asked. I thought it smelled a little like a heater had just started up.

"Nope," came the answer from up front.

"I think there is something melting back here." I said, never thinking I would be so calm saying those words. It just wasn't happening as fast as I thought it would.

"Well, let's turn off the radar," said the other NFO.

"OK," I said, figuring that would do the trick, considering 70 percent of our plane is radar boxes with megawatts of power running through each of them. By this time, our MC and pilot in command were back on ICS.

"What's going on?" asked one.

"What are you guys doing back there?" said the other.

"We just smelled something strange and secured the radar. I think the smell has gone away," I replied.

"OK, we'll go forward and check it out," said our mission commander.

"Alright," said the other NFO.

He went forward and came back with nothing groundbreaking. Several boxes were hot, but this was normal because the radar had been running for more than three hours. The smell still was hanging around, just strong enough to notice, but not strong enough to pinpoint.

"Is it going away or am I just getting used to it?" someone asked.

This exchange continued for several minutes and this emergency procedure came to mind: If source cannot be immediately isolated, GEN SWITCHES OFF.

I thought, "This isn't us. We aren't actually doing this emergency procedure right now."

Then it dawned on me, we already had done step 2: Isolate affected equipment.

After I concluded that we were executing an emergency procedure, I completed the only other memory item we hadn't completed: don oxygen.

Someone else in my crew said, "I don't think we need to go on O2, it's kind of going away."

"I'm already on O2," I said, figuring my actions would speak louder than words.

"OK, well I guess we'll all go on O2 then," said our MC.

I felt good, we had completed all the steps of the emergency procedure short of turning off the generators, which is a major process for our plane. We decided to keep an eye on things and stay on oxygen as long as there were no secondary indications. It had been at

In a profession where the margin between life and death is sometimes only the air you breathe, that is an emergency.

least a half hour from when we first smelled the fumes until we all got on O2.

I thought, "This is happening so slowly. Isn't something dramatic going to happen?"

We landed and our maintenance personnel quickly tackled the problem. We had burned up the main breaker that connects our generators to the rest of the electrical system. There was no way to completely isolate it except for completing the final step of our procedure: GEN SWITCHES OFF. While we never made it through the EP, I would like to point out that going through the EP is free. If nothing more happened, at least I was on O2 for a little while. Why not just do it?

My crew debriefed and we went through the standard safe-on-deck quarterbacking. What would we have done differently if we were farther away from the carrier? Did the fumes really go away or were we just slowly getting used to the fumes?

I didn't have any answers, but I know I could answer to myself that day. Did we do everything right?

Yes.

We may not have executed the EP in order, but I recognized a hazard and dealt with it. I know this is a question that every aviator struggles with when they first have to learn EPs in flight school. Will it be cut and dry when I have an emergency, and will I know how to deal with it? I am here to tell you that there are not always bells and whistles that go off to tell you something is wrong. Sometimes, you will find yourself in a spot when things aren't exactly right. In a profession where the margin between life and death is sometimes only the air you breathe, that is an emergency. Just ask yourself, why not just blow down the gear even if I know it's just a stuck flag on the gear-position indicator? Why not just turn the jet around a little earlier and start the boldface EP items?

Just to be safe. Why not?

LT. GLASS FLIES WITH VAW-126.

Do I Have the Only Nose that Works?

BY LTJG. MELISSA HIATT

We were scheduled for a morning functional-check flight (FCF) "A," which requires every system to be turned on and tested for operational employment. We also needed to secure each engine to ensure successful airstarts.

Aircraft 601 had not flown in over 30 days, and during that time major work had been done throughout the aircraft. We briefed in detail, covering the engine shutdown and restart procedures, crew contracts during the various portions of the flight, and emergency procedures for situations we might encounter. We read the aircraft-discrepancy book and noted outstanding maintenance discrepancies to look for while airborne. No discrepancies were noted that would cause us to question safety of flight.

Once airborne and at altitude, we began the engine-shutdown portion. As the radar operator, my seat was forward. I scanned the instruments, the starboard engine, and the forward equipment compartment (FEC) for any indications of malfunctioning equipment. Once the prescribed five minutes had elapsed, the pilots began airstart procedures on the starboard engine. The engine came back online as advertised without any indications of degradation or failure.

The pilot then started to shutdown the port engine. I immediately smelled intense fuel fumes, and notified the mission commander, who was in the air-control-officer's seat in the rear. He did not smell any fumes. As we talked about what I smelled and where it was coming from, the pilot had shut down the port engine.

ONCE ALL OF THE CHECKLISTS were completed, the mission commander told the pilots about the fuel fumes. He then came forward to where I was sitting, but he still didn't smell any fumes. He strapped back into his seat and the crew decided to restart the port engine but to leave the generator off because of the NATOPS warning that states, "The generators should not be turned on or off in the presence of fuel fumes or vapors."

Because I was the only one who had smelled the fumes, which had since dissipated in intensity, we did not don oxygen or proceed with the procedure for fire, smoke, or fumes from unknown origin. We terminated the FCF, and immediately landed at our home field which was only six miles to our southeast.

To check my sanity, I called for the mission commander to come forward, and he immediately was taken aback by the smell.

After landing, we left the wings spread, and immediately shut down the engines once we were chocked. During the crew postflight and egress, the mission commander opened the aft-equipment-compartment (AEC) door and smelled intense fuel fumes. As I exited the aircraft, transiting through the forward-equipment compartment (FEC), the smell was more intense than while airborne. To check my sanity, I called for the mission commander to come forward, and he immediately was taken aback by the smell. The two pilots, who had not smelled anything up to this point, were entering the FEC from the front of the aircraft and immediately smelled fuel. We exited the plane without any further incident.

The power-plants shop furiously inspected the plane for any fuel leaks, (I hoped there was some fuel, somewhere in the plane, so I didn't sound crazy), but nothing was found.

The next day, another crew flew the plane, which still had a residual fuel smell, and did the FCF as scheduled, despite the previously mentioned warning. The FCF was completed without incident and 601 landed that afternoon.

The very next day, I again was scheduled to fly 601, with the same pilot and mission commander from the first FCF attempt. We briefed extensively and noted there may be a faint residual fuel smell inside the aircraft. Because the same crew flew both fuel-fumes events, we accepted a level of residual smell on man-up which we should not have. Also, we briefed if we smelled the fumes again, we would immediately don oxygen and proceed with the NATOPS procedures. This should have sent a clear message to the entire crew that there was a problem that needed to be fixed.

We completed our event, and on our return, I again smelled fuel. However, as we continued to NAF Atsugi, air traffic control vectored us toward heavy traffic, which was a result from an earlier emergency landing. Because of the language barrier we occasionally experience with Japanese controllers, the pilots were patient yet persistent in trying to communicate that we wanted to cancel our IFR clearance, request flight following, and head to the south while the other traffic was cleared from our airfield.

We also had a breakdown in communication between the pilots and the CIC crew. While the pilots tried to figure out how to convey their intentions to ATC, the CIC crew never told the pilots about the smell. We eventually flew south to get clear of the heavy traffic, still trying to figure out our next move. I failed to don my oxygen mask as briefed and never pushed the issue of telling the pilots. The pilots were unaware of the fumes in the back.

Once we finally touched down, more than 30 minutes later, the mission commander mentioned to the pilot that we should keep the wings spread and immediately shut down the engines because of the fumes. This immediately began a discussion of when the fuel smell was noticed, for how long and why this situation was not communicated to the front end. We shut down the engines, quickly got out of the airplane, and debriefed the incident.

Our crew-coordination skills had been put to the test, and we had failed as a team to communicate. The pilots had one thing in mind, which was to get away from the traffic, while the mission commander was trying to figure out the safest route of flight. During this entire time, I was worried about the fuel smell. We were focused on our own current issues instead stepping back and working together as a crew to figure out the best solution to the competing interests at hand.

After the third flight in aircraft 601 within the past 30 days, two incidents occurred with fuel fumes during flight. I was a crew member on both of those flights, and also was the only one who smelled the fumes.

MAINTENANCE DOWNED THE PLANE for power plants to dig around and find the source of the problem. Three weeks later, they found fuel leaking from the fasteners of the left wing fuel tank, and an accumulation of fuel inside the left wing. Also, a drain line installed in the FEC, which is used to dump accumulated water overboard, was leaking. Fuel in the left wing mixed with the water in the drain line, and then leaked into the FEC and caused the smell. Because most of the antiquated electronic wiring and avionics boxes are located in the FEC, any arcing or sparking of these components could have caused a spontaneous, catastrophic fire. We certainly had not used our crew resource management to the fullest during each flight.

The five of us on the third flight, collectively having over 2,750 hours in the E-2C, learned a valuable lesson that day. As a multi-crew aircraft, everyone has a role in making decisions that could affect the lives of the other four members. If any member of the crew has a concern about the safe conduct of flight, they should continue to voice that concern until a course of action is determined and the hazard is mitigated.

LTJG. HIATT FLIES WITH VAW-115.

Assault by a Battery

BY LT. JENNIFER SCHMIDT

The standard mission began just like any other E-6B flight at NAS Patuxent River. About an hour and a half into the oceanic flight, our reel operator and in-flight technician (IFT) smelled fumes in the aft section of the aircraft. Immediately, the aircrewmen called the flight deck, and the pilots initiated the fire, smoke and fumes checklist.

After the initial sweep of the aircraft, the crew had not found the cause of the fumes. In the process, the flight engineer shut off the aft outflow valve to allow the fumes to remain in the jet, but the crew still could not locate the source. Earlier in the flight, the technicians had been troubleshooting the VLF receivers, so this equipment was turned off to determine if they were the cause, but to no avail. With no progress made after 15 minutes, the technicians went back to the VLF receivers and decided to pull the battery-cover assembly (KGV-61A) from the parent assembly to check the batteries.

Upon removing the cover plates to the batteries, the source was instantly recognizable because of the overwhelming fumes; the battery was in a thermal-runaway condition. The IFT acknowledged the need for the battery to be jettisoned, called the flight deck, and the pilots began an emergency descent to 5,000 feet.

While descending, the second flight engineer (FE) strapped into the safety harness and descended into the forward lower lobe along with the IFT, who carried the KGV battery. The pilots completed a surface sweep and the FE was cleared to open the radio access hatch, but couldn't until an emergency depressurization of the jet was done. The engineer opened the hatch and jettisoned the battery.

AFTER JETTISONING THE BATTERY, the mission commander cancelled the rest of the mission and headed home. Coordination with the squadron duty officer at Tinker AFB ensured the fire department and medical response teams were there to meet us. Only minor medical issues were incurred, including three crewmembers ill from the fumes. They were checked out by medical and cleared shortly thereafter.

The 15-man crew resolved the situation as a result of CRM training, periodic fire drills conducted throughout the deployment, and simple, yet effective communication. The crew learned that a thermal-runaway battery must be dealt with swiftly. We discovered that the battery's plastic cover melted, the metal shielding on the battery was black, and that the connecting wires completely melted. If it had taken us an estimated 15 minutes longer, this situation would have ended much differently.

LT. SCHMIDT FLIES WITH VQ-4.

Checklists and

BY LCDR. JOSEPH BROGREN

We had finished controlling a training mission. About 30 minutes from home, the crew in the combat information center (CIC) smelled an odor somewhere between hot metal and roasting corn chips.

I asked, "Flight, do you smell anything? Is anyone eating Fritos?"

One more normal breath and the fumes started to burn the back of my throat. "Flight, we have some fumes back here, we're going on O2, execute the fire, smoke, and fumes of unknown origin procedures. There is no smoke at this point."

My habit pattern was to quickly execute the memory items and get to the end of the emergency procedure. Then I'd decide what our next course of action would be. Everyone did step 1 by donning O2 masks.

Step 2: Isolate affected equipment by pulling circuit breakers and turning switches OFF.

NOTE:

Vapor Cycle off may be selected to quickly isolate RADAR, IIS, ESM, CEC, MATT, MC and DP (the ACIS units are not interlocked with the vapor cycle).

We still didn't know the source of the fumes. My priority was to turn off all the unnecessary avionics, except the radios. This action had no effect on fume intensity, which I passed to the aircraft commander (AC).

Step 3: Generator switches - OFF

The AC asked me if I was ready to go on emergency generator. If we did, we would go from three V/UHF and three UHF radios to one V/UHF in the cockpit and one UHF radio in the CIC. Also, the UHF radio in the CIC would only be useable below 15,000 cabin altitude. I would lose flexibility in tasking the other two NFOs to assist in coordinating clearances, copying ATIS, and communicating with the SDO on our base frequency. Still unsure of the source of the fumes, I rogered up that I was ready to go on emergency generator. I would continue to back-up the cockpit with the PCL, troubleshoot for the source of fumes, and wait for the remaining UHF radio to become useable to communicate with the SDO and copy ATIS.

A key point that I missed was that the AC was asking if I wanted to turn off primary generators, not telling me to do so. Because I had detected the odor and raised the issue with the AC, I was responsible for executing the emergency procedure. I had the most situational awareness (SA) of the strength of the fumes. The AC had asked for my decision, not my concurrence.

Step 4: Personnel Air Conditioning Switch - OFF

Step 5: Cabin Pressure Dump Switch – DUMP

The purpose of steps 4 and 5 are to starve a potential or active fire of oxygen. After completing step 5, my expectations of the effect this would have on the fumes did not meet reality. Because we were at 18,000 feet, I had anticipated that as the aircraft depressurized,

Cornchips

the fumes would exit the aircraft along with the excess air pressure at altitude. The intensity of the fumes didn't change, so I assumed the contributing source of the fumes had not been isolated, and had replaced the fumes I thought should have been eliminated with depressurization.

My mindset shifted from land as soon as practicable, to land as soon as possible. We were 20 minutes from home, but 10 minutes from the closest emergency field. I recommended to the AC that we land as soon as possible. The AC trusted my recommendation. I had elected the most conservative course of action, but it had been based on incorrect assumptions.

I reread the memory items to make sure we hadn't missed anything, and it clicked that we had executed smoke or fumes of unknown origin, not smoke and fume elimination. Because I assumed that fumes still were emitting from an unknown source, flames could ignite once we descended to minimum cabin altitude and had enough oxygen for a fire. The fault in my assumption was that the intensity of the fumes should have decreased with depressurization.

THE SDO MADE A WELL-TIMED CALL, offering, "Not to get in your cockpit, but if the fumes aren't intensifying, think about bringing it back to base." He was right.

I started to back away from the decision that perhaps landing as soon as possible wasn't necessary because the fumes weren't intensifying. I readdressed the option of landing at home field with the AC.

This event taught me to execute the memory items in a methodical manner, and to evaluate the effect of each step. I had been in too much of a rush to complete each step and get to the end of the procedure. After securing the vapor cycle and avionics, we should have reevaluated fume intensity. It may not have been necessary to go on emergency generator and limit ourselves to two radios. It probably wasn't necessary to dump cabin pressure so soon.

As an aside, if your aircraft is equipped with the A/P22P-20, depressurizing at altitude may cause the sealed canopy assembly to partly inflate, and you'll feel it against your back.

From a CRM perspective, because I had initiated the EP and had the best SA as to the status of the fumes, I should have recognized the role I had in recommending if and when we proceed to the next step (landing as soon practicable or possible).

Finally, know the reason for each step and the effect that each step is going to have on the situation. If I had had a clearer understanding of depressurization, I would have recommended a more reasonable course of action.

In the scope of EPs, we had plenty of time during this scenario. If there had been vision-obscuring smoke, intermittent ICS, one or no radios, the communication and other CRM issues would have quickly compounded. A thorough brief that includes roles during a CIC initiated EP and NATOPS knowledge will mitigate these challenges and lead you to the best decision.

LCDR. BROGREN FLIES WITH VAW-115.

In-flight Emergency:

HOW WILL YOUR SHIP RESPOND?

BY LTJG. PATRICK SULLIVAN

With shipboard operations we often make many assumptions. We jokingly assume that when it's time to recover and land, the ship will find the one patch of bad weather or fog and set a green deck for recovery. Kidding aside, we assume that when we have an in-flight emergency, the ship will rapidly set flight quarters and set up the optimal winds or deck conditions whenever we need it. But, is your ship's watch section on the bridge and the flight-deck crew ready and trained when you need them?

NAVAIR 00-80T-122 (Helicopter Operating Procedures for Air-Capable Ships NATOPS Manual), the bible for air detachment and ship integration, dictates the requirements for the at-sea-workup schedule, commonly called week-one workups (WOWU). Included in the WOWU schedule and monthly training requirements are unannounced emergency flight-quarters drills and "crash 'n smash" fire-fighting drills. Also, the 80T-122 describes aircraft-emergency procedures for the watch sections on the bridge, in combat, and for the flight-deck crew.

On a low-light night with a barely visible horizon, our detachment OinC, our AWR2, and I launched off USS *Lassen* (DDG-82) in our SH-60B, Warlord 705. It was one of my first NVG flights off the back of the boat in my new fleet squadron. I was a pilot qualified in model (PQM), but I had extremely limited time behind the boat in the FRS. Most of my time flying around the ship had been on my initial free-deck qualifications a few days earlier.

The OinC had just completed a three-hour search, surveillance, and classification (SSC) mission with a senior H2P, and he was scheduled to fly again with me. As I stepped onto the flight deck, the darkness struck me. I quickly looked over the aircraft with my flashlight before strapping into the left seat. After goggling up, I promptly went

through the takeoff checklist. All cockpit indications looked good, and we called for "amber for breakdown, green deck for launch."

After completing the post-takeoff and tactical-combat checklists, we began the check-in process with Red Crown and Icepack. I distinctly remember commenting to the OinC how dark the night appeared. A barely visible horizon was made even darker with a strong overcast layer blocking any star or moon light. Under the goggles, I could see very little outside the windscreen. In stark contrast, my only previous NVG experience in Japan consisted of a flight around the Tokyo metropolitan area, arguably one of the brightest night-flying environments on earth.

After checking-in with Icepack, I noticed what seemed like a flashing light in my goggles. I heard the helicopter aircraft commander (HAC) feverishly ask, "What is that?"

I initially thought the utility light mounted above my head to illuminate the BDHI had become loose and was causing the flashing. It seemed like a police car with its lights on had pulled up behind us.

I LOOKED UNDER MY GOGGLES and saw arcing, and an orange and blue flame coming from the upper corner of the ATO windshield. Our aircrewman reported that he smelled something burning in the cockpit. My stomach dropped. Again, the HAC asked me what was the source of the flashing light, the blue-orange arcing and the acrid smell. I explained that we had fire coming from the windshield anti-ice harness. The crew executed the emergency procedure for a cockpit fire/cabin fire. I switched off the windshield anti-ice. Our aircrewman quickly unstrapped and came up the tunnel with the fire bottle.

The HAC turned toward the ship and directed the anti-submarine/anti-surface warfare tactical air controller (ASTAC), over datalink, to set emergency flight quarters. Within minutes, personnel manned their flight-quarters stations. In addition, the air detachment spread throughout the ship, making sure pilots were standing by to assist in the combat information center (CIC), the bridge, and the landing-safety-officer (LSO) shack. By this time, the ship was on foxtrot corpen, minutes away from green deck.

After communications checks with tower and the LSO, I ran through the landing checklist. The HAC shot the approach to an uneventful landing and trap. After shutdown, we got out of the aircraft and were greeted by the entire detachment and most of the flight-deck crew. It felt great to be back aboard that night.

The fully integrated air/ship team demonstrated their professional excellence that evening. The sometimes tedious crash-and-smash and emergency flight-quarter drills all ensured the crew was well-versed in setting emergency-flight quarters and capably dealing with degraded aircraft. Led by an experienced officer-of-the-deck (OOD), Lassen set emergency flight quarters in less than five minutes. Interestingly enough, the same OOD had been on the bridge earlier in the year when an SH-60B had a dual attitude-indicator failure in instrument conditions.

The maintenance inspection found the left windscreen potting had cracked and allowed water into the anti-ice heating element. The previous flight crew had turned on the windshield anti-ice to clear up some fog that developed during their flight. Hours of use, combined with water intrusion, caused electrical arcing and ultimately a fire. Because of the intense heat introduced into the windscreen, a large crack formed and was discovered after landing.

I had previously viewed emergencies in the typical "It won't happen to me." It did happen to me. I also wondered about some of the items covered in the WOWU process.

Emergencies seem to manifest themselves when you least expect them and under the worst conditions.

LTJG. SULLIVAN FLIES WITH HSL-51.

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

Cool, Shiny Things

BY LT. MICHAEL MCLAUGHLIN

I was embarked on USS *Harry S. Truman* (CVN 75) just one month after departing for my second combat deployment. The night's mission was a recovery tanker followed by surface surveillance and control (SSC). Just minutes after takeoff, we discovered our aerial-refueling store was inoperative, but with no other issues, we pressed on with our secondary mission. After level off at 5,000 feet, we searched for vessels of interest in our area of operation.

Roughly 10 minutes into the flight, our master-caution light came on, with four cautions on our display. As I climbed, my weapons system officer (WSO), a mid-tour JO, broke out the PCL and looked up our current emergencies. An initial scan showed we had lost all of our fuel indications, radar altimeter (radalt), radar, and the reduced-authority-thrust system (RATS). Also, our mission computers could not accurately display any further cautions that might appear (CAUT DEGD). We leveled at 16,000 feet, returned overhead the ship for troubleshooting, and contacted our representative in CATCC.

After working through the procedures with my WSO and our squadron CATCC rep, everything pointed toward a signal-data-computer (SDC) failure. That failure provides no fuel indications. The troubleshooting procedures recommended a SDC reset followed by cycling the mission computers; neither of these actions worked. Our maintenance department started working with the AEs to see if there was anything else we could do. Meanwhile, we focused on other aspects of this failure.

While flying around the carrier, fuel and weight management are key factors. A RATS caution and the inability to determine landing weight makes an arrestment much more complicated. RATS limits the Super Hornet from applying too much power during a trap in the event that afterburner is inadvertently engaged during landing. If RATS failed, as the caution indicated, the ship would need to create more

An initial scan showed we had lost all of our fuel indications, radar altimeter (radalt), radar, and the reduced-authority-thrust system.

wind over the deck to limit the arresting-gear-engagement speed. The arresting gear is set at 44,000 pounds for a Super Hornet, which equated to roughly 7,200 pounds of gas for our configuration that night. Without knowing our fuel state, we couldn't determine our landing weight.

The ship made the wind required to account for the RATS caution, but managing the fuel depended on good CRM in the cockpit and with the rep. The first question we needed to answer was, "How much fuel do we have?" We thought we had about 19,000 pounds when we lost our fuel display. We had been flying on a maximum endurance profile since the incident started, with the exception of our climb to 16,000 feet. Our mental math in the cockpit calculated around 15,000 pounds total fuel. Also, with a fuel-indication failure, the aircraft provides an estimated fuel state using a standard fuel flow. We initially found this useful because our estimate and the jet's were within 1,000 pounds of each other. We were feeling a little more comfortable.

We had enough fuel to remain airborne for the full cycle; the issue was how to manage it to get down to the proper landing weight. One option discussed in the jet and with the rep was diverting to Djibouti, about 150 miles away. We could land there at a much heavier weight, but based on the ship's intended transit the next day, we rejected this option.

Once the decision to recover aboard the ship was made, we had to figure out the time versus burn-rate for our inevitable night trap. We continued to monitor our fuel, and we noticed an increasing discrepancy between our manual calculations and what our jet was telling us. The jet estimated that we had more fuel than we thought. If we used the jet's fuel numbers, we could be putting ourselves in a low fuel state on the ball. If we went with our manual calculations, we could land heavy and part a wire.

TO COMPLICATE THE ISSUE, we were approaching our ramp time. Regardless of which fuel number we used, we needed to get rid of some gas. We had two options: dump the fuel at a constant dump rate of 1,300 pounds per minute, or simply burn it. We decided, incorrectly, to burn the fuel.

Remember when I mentioned the estimated fuel remaining assumed a standard fuel flow? Well, as we raged around in full afterburner for about three minutes to burn fuel more quickly, we noticed the estimated fuel remaining was not counting down anywhere near the rate

Photo by MCSN Daniel S. Moore.

When we tried to open the canopy, it would not open because the battery was dead.

it should have. Also, the afterburner fuel-consumption rates of the Super Hornet are not something either of us had in our back pocket. We ceased all maneuvering and realized we now had an unknown fuel state. In retrospect, we should have used a known dump rate, combined with timing, to adjust our fuel.

One tool that every tailhooker has at his disposal is the on-speed checks we do prior to any landing. If we fly the appropriate alpha for our landing configuration our airspeed will directly correspond to the weight of the aircraft. Once we were established in marshal, we dirtied-up and did an on-speed check with just one minute before we began our approach. Our airspeed was 139 knots, which equated to 45,000 pounds total weight, and about 8,200 pounds of fuel remaining. We later determined the on-speed check was accurate, because the postflight inspection had 5,500 pounds internal fuel and nothing in the external stores.

We commenced the CV-1 approach, coordinated with paddles, and leveled off at 1,200 feet. We had an uneventful recovery. After clearing the landing area and shutting down, we soon found the source of the problem. When we tried to open the canopy, it would not open because the battery was dead. A dead battery indicates a failure in the electrical system, which we had not suspected. The battery charger that provides 28vdc to the essential bus (SDC, radalt, radar, etc.) had gone bad. The battery powered this bus for roughly 10 minutes before failing. No information in NATOPS or the PCL indicates this was the failure we were experiencing. NATOPS is vague in its description of this part of the system.

Throughout this ordeal, one thing was on our side: time. We knew we had plenty of gas to troubleshoot and come up with a good game plan. The crew coordination was excellent from the task sharing in the cockpit, to the communication with the rep, maintenance, tower and paddles. One thing I will take away from this experience is that NATOPS knowledge, while it typically takes a back seat to tactics, is not just something to brush up on before your annual NATOPS sim. The Rhino has lots of cool, shiny things that provide a lot of information, but when the aircraft does not live up to its end of the deal, there is no replacement for NATOPS knowledge.

LT. MCLAUGHLIN FLIES WITH VFA-32.

The Light at the End of the Tunnel

BY CDR. ANDREW SCHMIDT

Okay, skipper, here's your SitRep: You're under a deployment order to CentCom, your two C-20G jets rotate through depot-level maintenance for about 180 days a year, you have 18 hungry pilots and 25 enlisted aircrew clamoring for flight time, and oh, by the way, you gave away most of your maintainers in anticipation of a transition to contract maintenance that ultimately will take an entire year to complete. We're all counting on you.

Sound like a typical day in the VR world? I sincerely hope not, but that's exactly the rock that squeezed my CO into a hard place last year.

This isn't really a rags-to-riches story. Although the year was a successful one and the CentCom deployment yielded 648 mishap-free flight hours and 57,000 pounds of cargo transported, this story is more of a "how you get from here to there" tale. Consider it a cautionary story for any squadron in a similar pickle.

From maintenance manning to aircraft availability to aircrew proficiency and currency, our squadron had some seriously large Swiss-cheese holes. But, that did't mean we were relieved of our responsibilities to provide logistic services to the fleet. On the contrary, we still had to satisfy a three-month-deployment order to Al Udeid, not to mention flying JOSAC/NALO missions, and keeping everyone trained, proficient and current.

To do all this, we needed a plan that would allow the squadron to operate under less-than-ideal conditions, while we simultaneously completed the transition to contract maintenance. The greatest unknown throughout the entire year was the disputed contract; we didn't know how long we would wait for resolution. The wing kept telling us there was light at the end of the tunnel, we just didn't know if that light was another train.

How do you embark upon such a bold task? Our command's first step was to analyze the problem—a little deliberate ORM planning definitely was in order. Our biggest challenge was the bridge, or interim contract. When a contract was awarded in the fall of 2008, it was appealed by the contractor that lost the bid. The unfortunate consequence of this action was that we were tasked to continue 4790 maintenance under a bridge contract with our remaining maintainers and a few civilian technicians. By that time, almost all of our SelRes and FTS maintainers transferred in anticipation of the new contract. This action resulted in a severe manning shortfall in the work centers, and an inability to operate our normal, robust schedule.

THE NEXT CHALLENGE TO OPERATIONS wasn't new to anyone in the Gulfstream business: Airplane inspection requirements are lengthy and ongoing. Long depot cycles frequently result in only one aircraft in the barn, reducing opportunities for aircrew training, proficiency and currency. Running operations in such an environment is a delicate balance because, for the most part, airplanes are never as plentiful as they should be.

Having identified our biggest ORM concerns, we knew there were many possible hazards to avoid. Recent top-10 hazards to aviation are prime examples: aviation

training, communication, get the "X" mentality, integrity and failure to use ORM beyond a superficial level. Our front office, well aware of these risks, came up with five areas of concern that guided our concept of operations until the full maintenance contract was awarded.

1. Communications: Keep the flow of information moving up and down the chain. It was essential that hazards were identified, risks assessed and everyone understood that they could call "time out" if they saw an unsafe practice, evolution or plan. The CO made it clear our mission was first and foremost to provide VR services to the fleet, but he also made it clear we had to focus on operating safely in spite of the "Get the X mentality." This awareness permeated every maintenance evolution, drill weekend and meeting. The safety department did its part by emphasizing the use of the CO's suggestion box, anymouse forms, all-hands read board, safety standdowns and ASO training sessions. It sounds like a cliché, but in many ways, the constant communication brought the squadron closer together and honed our ability to determine acceptable levels of risk.

2. Manning: One way we alleviated our shortfall was to reassign aircrew with maintenance experience back into maintenance workcenters. We also requested and received an augmentation of Sailors from other VR squadrons, a temporary fix that paid big dividends. We harnessed the collective manpower of the wing, even recalling a few of our former Sailors with Gulfstream experience. These individuals rolled right back into the shop without the need for extensive training.

3. Scheduling: The front office considered rest-and-manning requirements of work centers. To fulfill fleet mission requirements, the CO provided guidance to the department heads and CPO mess, who collaboratively devised a plan that wouldn't overextend our personnel. Many of the controls OPS and maintenance put in place complemented each other: Strict maintenance hours (because of limited shifts), creative scheduling blocks (no back-to-back, one-day missions or strenuous launch/recovery times) and days blocked because of no available maintenance support or aircrew. These three initiatives were extremely effective in alleviating pressures of being on call 24/7 with airlift scheduling agencies JOSAC and NALO.

4. Training: One of our tougher challenges. Managing proficiency and currency requirements of 43 pilots and aircrew, not to mention training opportunities for maintainers, was a constant concern. Limited assets plus limited flight time equals disaster for all those trackers that NATOPS and OPS so religiously worship every month. Mitigating risks in this regard was tricky: We had to balance proficiency, currency, and the needs of the squadron. That meant, essentially, "spreading the pain" among the pilots and aircrew, and hawking aircrew maintenance-shift hours. As flight time was scarce, we had no other choice than to dole out it out while still preserving our ability to meet the mission. That could mean aircrew not flying for a month or maybe more. While many of us technically were current, we were far from proficient. Our NATOPS department and ASO devised ways to keep our collective "heads" in the game through simulator sessions, recurrent training, chalk talks, NATOPS training and even some creative distance learning. Maintenance polished off ground-equipment quals and training to more effectively plan for depot inspections, engine changes, and to prepare for the impending contract decision.

5. Commitment to the culture: I am listing this one last, but it's a guiding principle for the previous four areas of concern. It usually determines whether your CO will have a band at their change of command. By demonstrating a strong commitment to the value and culture of safety, the skipper sets the tone for the squadron to follow. At a time when many squadrons are being asked to do more with less, our personnel look for leaders to support them in their decision making and to value their ability to provide honest and timely advice. They also want the front office to encourage them to make sincere risk decisions at the lowest levels, even when confronted with the operational pressure to perform. It is not enough for a CO to preach the values of safety and a strong safety culture—the CO must make sure that words and deeds are embraced by all within the command.

If you find yourself in a similar spot, or if you just happen to be going through one of those times when there seem to be far too many alligators swirling around your canoe, take a look at what my squadron did and ask yourself these four questions:

• Is the front office committed to a culture of safety?

• Is your squadron committed as well?

• Is your squadron encouraging ORM at the lowest levels of leadership?

• And finally, are you seeing the successful application of ORM across the various departments?

If you can answer yes to each, then you are well on your way to handling any problem your squadron may face. If the answer is no, then be afraid of that "light" at the end of the tunnel. Be very afraid.

CDR. SCHMIDT FLIES WITH VR-48.

"It has been said that aviation today is a normal and natural method of travel. The changes of time have made aviation as normal a method of travel as the railroad and automobile. It is doubtful, however, whether aviation can be considered a natural method of travel, and it is doubtful whether aviation can become a natural method of travel for man unless centuries of flying teach him new physical reflexes in response to the changes of environment he encounters in the air. Man has been an earthbound creature in his existence in this world for thousands of years. Every thought, every voluntary or involuntary movement, in fact, his entire physical being is based upon his relation to the earth, and his biological actions and reflexes have been developed to accommodate him to the earth's environment."

—Major William C. Ocker, 1930.
Quote provided by Cdr. Walter Dalitsch, MC