

THE NAVY AND MARINE CORPS AVIATION SAFETY MAGAZINE

Approach

VOL. 65, NO. 4



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Differences in
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**Let's Stay
Connected**



Striking a Balance

By Lt. Madeleine Wackerman, HSM-40

We relentlessly brief and debrief events in an effort to continually improve our processes and performance. We have Naval Air Training and Operating Procedures Standardization briefs, risk management briefs, mission briefs and debriefs, and post-action trainings with lessons learned to prepare, execute and learn from the good and bad parts of events. Almost everything in the naval aviation enterprise has been extensively studied and gouged up so everyone can benefit from each unique experience. However, one thing we do not currently emphasize well is the importance of allowing ourselves the time for closure after a significant event.

I was doing a tactical formation grade sheet for a helicopter second pilot during my tour with HSM-51, when we experienced an “INPUT CHIP” caution and made a precautionary emergency landing at a nearby helicopter pad. We never had any secondary indications, and the caution was ultimately suspected to have been a computer gremlin. At no point during this emergency procedure (EP) was my crew or I in any real danger; it was essentially just a light. We executed a precautionary landing uneventfully, and the aircraft was safely returned to base following maintenance action.

Despite the hindsight that we were never actually in extremis, I still had immense trouble falling asleep that night, and when I did, I slept very poorly. I flew again the next night, and my heart would speed up any time the “ECS SHUTDOWN” caution and “MASTER CAUTION” indication would appear after turning the aircraft’s contingency power on for takeoff, even when I knew full well they were coming and were a normal occurrence. After about 24 hours, I finally felt normal and rested to the point that my heart didn’t skip a beat whenever I saw a yellow light in the cockpit.

This was not the first emergency I had encountered in the aircraft, or even the worst, but for some reason, this one affected me differently. Perhaps it was because I was not embarked on a ship and didn’t have the luxury of setting emergency flight quarters, instead having to land on a Japanese helo pad. Maybe it was because if it had been more than a light, it would have been one those EPs helicopter pilots hope never to encounter. Either way, it made me realize I needed time to process what happened.

The communications from back to the front intensified, but it wasn’t overwhelming. I followed the checklist up front and asked questions when necessary to ensure no steps were missed in the back. After 20 minutes our aircrewman was able to get the dome into the aircraft, but was unable to lock the dome or get a seated light. We encountered persistent 114C (stress sensor fail), 126C (sonar cable tension too low) and 1367 (locking device fail) codes.

After going through the same checklists two more times, we agreed to terminate the training event and return to the airfield for troubleshooting on deck. Halfway through the 25-mile transit, our aircrewman got a “Slip” indication and noted the dome was starting to leave the funnel. The HAC quickly transitioned the aircraft to a hover and we went through the checklist again. Still unable to lock or seat the dome, we continued the transit to the airfield with our aircrewman keeping the dome in the funnel using the auxiliary hydraulic hand wheel.

Once safe on deck, cycling computer power, mission power and appropriate circuit breakers produced the same results. With crew day limits on the horizon, a technician was sent out to assist. The maintenance inspection revealed a broken locking harness, broken retention nut and a malfunctioning transducer. We removed the reeling machine front panel, placed the dome in the cabin and returned to North Island uneventfully.

While I didn’t get to drop a REXTORP or complete my TACEVAL, I did gain invaluable experience fighting the aircraft and developing crew resource management. That day we left focused on an ASW mission, but it quickly transformed into a materiel preservation mission. I realized though, that all EPs, no matter how small, have an effect on us mentally. We must focus on both learning lessons from significant events while also giving ourselves time to process our thoughts and feelings following a stressful flight. Correctly striking this balance will help us become more well-rounded pilots who are capable warfighters and also resilient enough to handle whatever challenges may come our way. Communicating clearly and keeping a level head helped us bring it home safely.



Ride the Lightning Home

By Lt. Max Vidaver and Lt. Theodore Hung, HSM-70

Our combat element was embarked on a destroyer off the coast of Jacksonville, Florida, with a single MH-60R. We were completing an Initial Ship-Air Training Team (ISATT) refresher ahead of an underway to South America to participate in UNITAS, the longest-running annual multinational maritime exercise in the world.

This was the second full day of the ISATT refresher, and our crew was scheduled to fly day deck landing qualifications (DLQs), immediately followed by night DLQs. The following day, we would complete our events and then to return to Jacksonville for a short break, while the ship refueled in port before proceeding south. There was nothing unusual leading up to our late afternoon launch, and weather was typical for mid-summer Florida – that is to say intermittent precipitation and convective thunderstorm activity. Flying in the vicinity of summer storms is not an uncommon occurrence in flight school in Pensacola, or in the fleet replacement squadron and fleet squadrons in Jacksonville. Afternoon “lightning within 5 miles” is the regularly scheduled afternoon programming in Jacksonville.

Day DLQs were uneventful, although we noticed on the final deck landing that reported winds had shifted considerably. Our landing safety officer (LSO) confirmed that winds had in fact shifted by almost 90 degrees, despite the ship being on the same course and speed. However, we had 30 minutes until sunset and would take off to let the ship reposition while we discussed fuel calculations and how to proceed with night landings.

Our first approach was somewhat turbulent in the landing environment, but DDG- and CG-class ships are known to cause mechanical turbulence on the flight deck due to the airflow around the hangar and superstructure. This turbulence was not a major cause for concern among the crew because reported winds were still well within our landing envelope, and we felt comfortable to continue. The sun had set by this point, and we were ready to switch to aided lighting and don night vision goggles, or NVGs, for the remainder of the night.

Helicopter pilots are trained during takeoff to call “positive rate of climb, airspeed off the peg.” Airspeed will normally begin indicating at 10-20 knots, but this varies based on winds. On this takeoff, we were already moving at 50 knots ground speed before indicated airspeed came alive. In simple terms, we now had a tailwind pushing us along. We reported “Ops normal” and turned to downwind.

“Sir, do you see that lightning? Under the goggles, it’s really close ...,” the Naval Aircrewman – Tactical Helicopter (AWR) second class reported from the cabin. This announcement was immediately followed by the LSO reaching out over the land and launch frequency announcing “712, winds have shifted again and are no longer in the envelope.”

We felt a substantial increase in turbulence – to the point that our 21,000-pound aircraft was being blown around like our flight school training TH-57 that weighed one-tenth as much. We checked our instruments and the flight display showed 70 knots over the ground. Our indicated airspeed showed zero knots. As with the takeoff, we were now at the mercy of a 70-knot gust pushing us further away from our ship, with the potential to put us in a dangerous unusual attitude if not quickly corrected.

Within two minutes of our last takeoff, weather had deteriorated to the point we found ourselves inside a lightning storm with massive wind gusts causing uncommanded fluctuations in altitude, and a ship no longer in a suitable position to recover our aircraft. We climbed up from 200 feet to give us altitude margin from the downdrafts produced by the storm, but found the cloud ceiling at 500 feet. The lightning was so clear and bright you could trace it with a pen, striking every two to three seconds. The lightning also had the unfortunate side effect of temporarily rendering our NVGs useless with each bolt due to the bloom-out effect. We called to the LSO and told him we needed him to set up to recover us ASAP!

Our new weather front, while not stealthy from a distance with its prevalent lightning, was using its sheer size and scale to mask its aggressive speed. Between our onboard radar, which is not a weather radar but can be slightly better than nothing in the right mode, and available ship resources, we estimated the cell to be at least 20 miles in width and unknown in length. We were 40 miles east of the coastline, and the only clear path we saw from the cockpit was heading northeast, away from land and staying ahead of the storm. After conveying this to the LSO, who was also the designated aircraft advocate aboard the ship and fortunately happened to be the air boss, we received “712, we need to get winds in the envelope. Ship needs to head northwest.”

As we looked outside the helicopter in that general direction, we saw a real-life version of Metallica’s “Ride the Lightning” album cover, glowing with threatening force. Going that direction meant going through the front line of the storm, which according to our radar picture, had not even fully arrived yet. We found temporary sanctuary in a pocket and were desperately looking for a clear path back to a safe landing site.

“712, we’re going to go through the storm, and it should pass in 15 to 20 minutes. We’ll recover you then.”

This wait would entail flying our helicopter through a severe weather front in night instrument meteorological conditions (IMC), less than 500 feet above the water with limited assets in the area and no guarantee of better results.

Continued on Page 6»



The MH-60R Naval Air Training and Operating Procedures Standardization (NATOPS) flight manual states: “A severe lightning strike to the aircraft is likely to result in the loss of all electrical power sources, except the battery (including the APU generator even if it is not operating at the time), and damage to a majority of electronic circuits.” We had lots of experience in avoiding storms from our land-based Florida flying but realized we had no way to protect ourselves against this particular immediate threat over water with only one place to land. Annual instrument check flight and emergency procedure simulators often include the dreaded “Electrical Power/Dual Generator Failure” at night – often to less-than-desirable results.

At this point, the two AWRs and myself as the helicopter second pilot (H2P) simultaneously voiced our discomfort with the situation. I was feeling the combined stress of potential vertigo, lightning flashes through my goggles and airspeed fluctuations I’d never seen before with roughly 150 hours in model. I felt myself begin to go internal.

The helicopter aircraft commander (HAC) must have noticed and calmly asked, “Hey man – need a break? I can take controls.”

Taking control of his crew’s obviously high emotions, the HAC began tasking and involving each member. We discussed our options as a crew and determined the most prudent course of action would be to stay as clear as possible from the lightning and clouds. On radar, there appeared to be a viable southwesterly course along the leading edge of the storm we could use to funnel us toward land. We informed the LSO and control that we had sufficient fuel to divert and checked off. The crew got to work finding all available divert fields, calculating time, fuel and distance for each, and doing our best to navigate clear of clouds and lightning.

Turbulence limited our speed to 80 knots, and the initial leg of our trip home was filled with tension from the uncertainty of our exact situation, as we still did not know the weather conditions back on

land. That was 30 long minutes ahead of our present position. We could only hope weather was “good enough,” but otherwise would need to figure out how to execute an instrument approach to an airfield in these conditions. In a worst-case scenario, helicopters are uniquely capable of taking advantage of beaches, parking lots or high school soccer fields.

The HAC, recognizing the anxiety in the cockpit and the cabin, verbalized over the incident command system, “Gents, we are OK. Engine instruments are looking good, we have the gas, RADALT (radar altimeter) hold is working; we are OK.” Hearing that was absolutely critical. As a crew, we felt reassured, backed up by objective instruments and gauges, and more importantly, re-caged.

Soon after, we lost two-way communication with our parent ship, but had not yet gained communication with the fleet area control and surveillance facility. We were now flying at 450 feet over the water with limited visibility, underneath an electrified plasma ball, approaching the air defense identification zone with no agency tracking us. We hoped our ship still had radar contact on us, but we couldn’t reach them on the radio. Climbing for communication range would put us into dense clouds with certain probability of a lightning strike. Any benefits gained from radio communication at that moment would likely be immediately negated by complete loss of electrical power due to a strike. We continued to press in toward home beneath the clouds, switching frequencies, radios and antennas to no avail.

At 20 nautical miles from shore, we reached out to Daytona Approach on guard. They tersely replied in a robotic tone, “Navy Helicopter 712, go for Daytona Approach.” We declared an emergency as we were unable to maintain visual flight rule conditions and still did not feel the benefits of climbing into the clouds outweighed the cost of a lightning strike. We weren’t out of the woods, but we finally had mom and dad watching us on radar and able to provide a clear path



to our divert field of Flagler Beach. Approach ensured most air traffic would remain clear of us and was able to provide the “warm and fuzzy” that weather at our divert had light winds, good visibility and decent cloud ceilings.

By this point, the lightning was still strong but turbulence levels had subsided, suggesting we had passed the strongest part of the storm to the south. We finally gained visual contact on our airfield beacon about 10 miles in the distance. We gratefully completed our landing checklist and began looking for our desired runway. We presumed we were lined up for one with favorable winds; however, our NVGs were mostly useless due to the bloom-out from the persistent lightning combined with dark ambient lighting conditions.

We keyed the pilot-controlled lighting to maximum intensity. Directly ahead of us illuminated a 5,000-foot holiday tree and we aimed for the green threshold lights to conclude our flight with a satisfying landing on a stable deck with gas to spare. After a well-deserved moment of “we made it,” we asked where we should park.

How could we have better prepared ourselves for this flight? We briefed inadvertent instrument meteorological conditions and emergency procedures in our NATOPS brief but didn’t address how we would monitor weather during the course of the flight. Planning and weather resources are limited when operating independently on air-capable ships. We’re taught in flight school that the 90-degree wind shift we saw during our initial DLQs is typically indicative of frontal movement. If we had spent a few extra minutes on deck 30 minutes prior, maybe we would have opened a discussion with the crew and ship about a game plan if we needed to recover early.

During our NATOPS brief, we also briefed that our instrument capability would permit us to climb into the clouds to obtain an instrument approach if required. We didn’t discuss the possibility that there could be a greater risk of lightning strikes in the cloud. What would we do in that event?

In the end, the safe recovery of aircraft and crew required incredible crew resource management from the HAC. What began as noticing the crew’s anxiety quickly and effectively turned into demanding information from each member to draw a complete picture and make the best decision at each critical point in the flight. With the AWRs giving constant radar updates, and myself as the H2P breaking out charts, approach plates and tuning radios training command style, there was no question the entire crew was on the same page with every decision made.

Our flight was not one of heroic wartime action while fighting compound unrelated emergencies. We were naval aviators and aircrew members, executing a simple mission with the ultimate objective of getting the aircraft and crew back home. However, we encourage crews to continually analyze and question their environment, since the foundational knowledge base (in this case, weather) would have allowed us to better assess the risks that our crew was late in identifying.

Bravo Zulu to our combat element maintenance team that works 24 hours a day to keep our aircraft flying, leaving no questions about our capability to operate in an all-weather environment!



U.S. Navy photos by Lt. Scotty Davids

Learning From the Past

Making the Next Flight Safer Than the Last

By Lt. Scotty Davids, HSM-48 Det. 3

The naval aviation community has a healthy culture of carefully analyzing mishaps and debriefing issues that occur during events and evolutions. Quite effectively, we learn from our past and we share knowledge of lessons learned with other squadrons across the Navy. In essence, this practice makes every flight and every flight crew safer than the last, as everyone is more informed and more attentive to what could go wrong.

Ground resonance, particularly caused by damper failure, is a highly important topic within all communities that fly the H-60. On Aug. 31, 2021, the Navy lost five sailors aboard USS Abraham Lincoln (CVN 72). An MH-60S experienced uncommanded and increasingly violent vibrations upon landing. Within seconds, the aircraft rotated, the main rotors hit the flight deck and the aircraft fell over the starboard side of the ship.

Before this incident, the Naval Air Training and Operating Procedures Standardization (NATOPS) procedure for unusual vibrations on deck was to lower the collective, turn power control levers off and apply the rotor brake. The mishap spurred a community-wide discussion on how pilots should approach this emergency. Within four months, NATOPS revised the emergency procedure for unusual vibrations on deck and incorporated a lengthy discussion on how ground resonance develops throughout the aircraft. The procedure now directs the

pilot to “take off immediately” if a safe takeoff is possible and perform the *Unusual Vibrations in Flight Emergency Procedure*. This procedure articulates that the aircraft may be safer in the air if it can take off. This clarification provides pilots more time to troubleshoot and to prepare for however the helicopter may need to be landed.

Less than two months after these changes were published and incorporated, I had my own experience with unusual vibrations in flight. I was nearing the end of the Helicopter Advanced Readiness Program (HARP). The helicopter aircraft commander (HAC) and I took



off for my surface-to-air countertactics flight (SACT). A SACT flight requires extremely dynamic maneuvering of the helicopter, as the pilot brings the airframe to its aeronautical limits. The flight starts with a series of warmup exercises to get both pilots comfortable with the sight picture and flight regimes that will be encountered during the maneuvers. Once on range, the HAC and I swapped controls, each getting the feel of a 45-degree angle of bank turn and severe nose-down sight pictures. But

early on, both of us individually commented on how the trim system seemed rather unresponsive. Due to the nature of the flight, it was difficult to differentiate between unnatural aircraft performance and the aircraft at its limits. As we began to troubleshoot exactly what felt different, we started to also notice how severe the vibrations had become.

Understanding the risks associated with dynamic maneuvering low to the ground with a faulty flight control system, we decided to knock off the flight and return to base. En route, we took note exactly how the system was behaving. From a trimmed straight and level flight regime, we input a 30-degree roll and released the cyclic. The flight control system should roll the helicopter back to its original attitude, maintaining altitude appropriately. Instead, the cyclic sluggishly overshot through level attitude to a 30-degree roll in the opposite direction. Concurrently, the aircraft developed a 1,000 feet-per-minute descent rate. The aircraft continued to fight to find the original flight profile, responding with a 500 feet-per-minute climb to reach its original altitude. Within five to 10 seconds, it returned to its original altitude and attitude.

The crew brought out NATOPS to review the automatic flight control system (AFCS) and complete the Unusual Vibrations in Flight procedure to ensure we completed all relevant troubleshooting. We concluded there was some issue with the flight control system and decided to complete a normal approach to a 20-foot hover – a procedure we commonly practice in the event of a faulty AFCS.

We came over the pad with the aircraft and vibrations controlled and took out power to set it down on the spot. We settled into the struts, but quickly, a circular vibration began to violently build. The HAC immediately applied power and took off. Climbing safely away from the deck, we brought out the unusual vibrations on deck emergency procedure, the very procedure that had been revised less than two months before. After all the troubleshooting and alerting the maintenance crews, the HAC delineated responsibilities for the landing. Once we were ready and briefed, we touched down, immediately pulled the PCLs to the OFF position and applied the

rotor brake. The blades came to a stop without incident. Following an inspection of the rotor head, the maintenance team confirmed that the vibrations were caused by a pin-sized hole in one of the four blade damper lines.

As a direct result of the updated procedures, the entire crew was more informed on how to respond to circular vibrations on deck. Ground resonance is a particularly unique and challenging emergency for two reasons. First, it is one of few emergencies that need to be recognized within seconds before it can become unrecoverable. The pilot does not receive any warnings or cautions that something is wrong – it is dependent on the crew noticing abnormalities and calling for the takeoff. Secondly, it is the only emergency procedure that directs a takeoff rather than provide a landing criteria. Helicopters are innately unstable, and most pilots will hesitate to lift off the ground if they sense anything wrong with the aircraft. The updated NATOPS procedure is critical to break past pilot's natural instincts and articulate that the aircraft may be safer in the air rather than on the deck.

Safety is a constant iterative process that relies on real-world experience to make every flight crew safer than the last. At the flight crew level, briefing and debriefing promulgates progress by internalizing lessons from each event iteration. In this example, flight crews can recognize that effect of a pin-sized hole on a line, the necessity of decisively reacting in accordance with the NATOPS procedures and the importance of delegating assignments during an emergency. Naval aviation is constantly learning, and while we will never reach a point where there are no mishaps, we can find clear examples that we are continuing to progress.

U.S. Navy photo by Mass Communication
Specialist 3rd Class Lake Fultz



CRM REFRESHER

ADAPTABILITY AND FLEXIBILITY: KEY PRINCIPLES IN AVIATION ENVIRONMENT

The impact and importance of adaptability cannot be underestimated. “The ability to adapt to internal and external environmental changes”¹ is paramount in a line of work where failing to accomplish an objective can carry grave consequences. Starting with the first sea tour, an aviator sees just how dynamic this lifestyle can be. Some of the variables that can impact a squadron’s day-to-day operations include budgetary constraints, medical readiness, aircraft functionality, aircrew qualifications, weather, temporary flight restrictions, pop-up taskings, personal relationships, maintenance constraints and even internet access. From its origin to the present, military aviation provides a countless number of examples showcasing the importance of maintaining operational flexibility.

As aircraft became more integrated into warfare, problems arose that needed immediate answers. For example, determining how to prevent bullet fire causing an uncontrolled fuel leak was no easy task. Left unchecked, a punctured fuel tank could

By Lt. John
Kazanjan,

HSM-37

result in either total fuel depletion or an airframe fire. American inventor George J. Murdock filed for a patent in 1918 for his “self-puncture-sealing covering for fuel containers.”² Murdock’s design featured fuel tanks surrounded by specially cured rubber that would react with the fuel and expand, thereby sealing the hole when the outer rubber shell and inner fuel tank were punctured by a bullet. This technological adaptation was critical in ensuring the preservation of both lives and aircraft and is still incorporated

into the construction of modern-day military aircraft.

Squadrons continue to shift the way they train to improve safety and cost-effectiveness. Before the widespread use of flight simulators in instructional courses, aviators could only learn from actual flight at the expense of added cost and increased safety risk. In 1931, Edwin Link patented the very first flight simulator made from a series of bellows and various parts from his father’s piano and organ company. The U.S. Army Air Corps was the first to adopt the Link Trainer, using



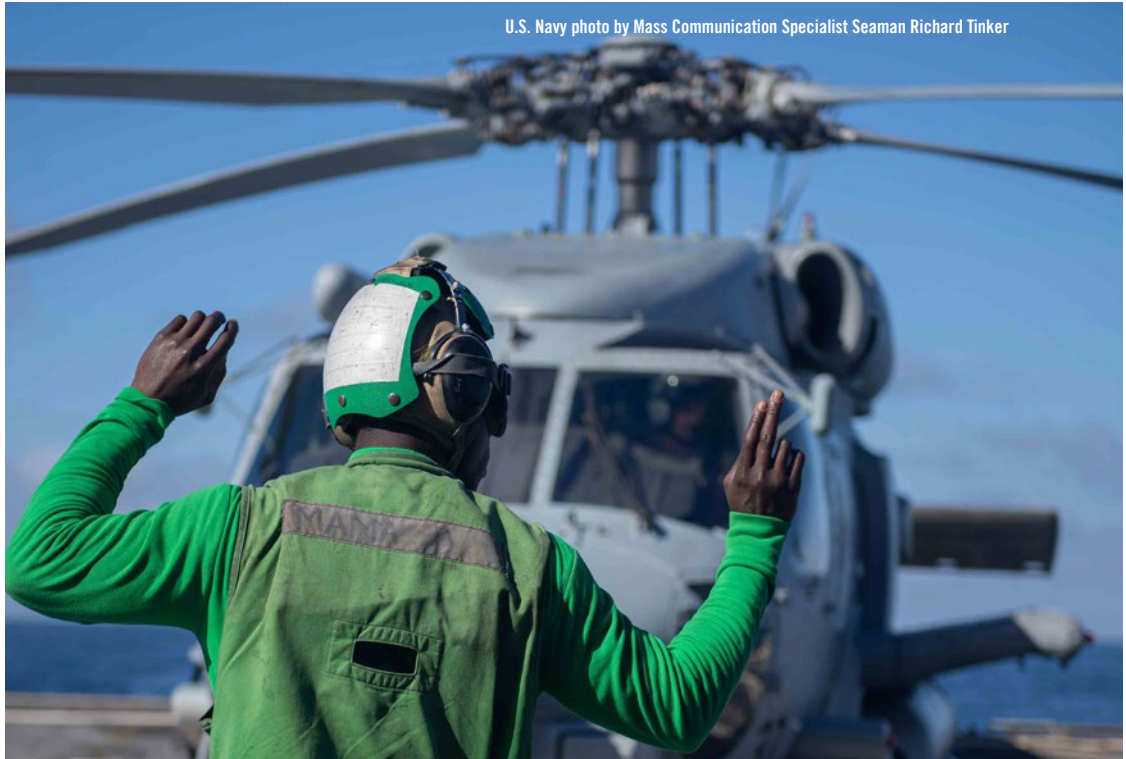
U.S. Navy photo by Mass
Communication Specialist
Seaman Tajh Payne

it to train their pilots for flight in inclement weather.³

This critical shift in developing aviators saved an immeasurable amount of lives and resources. In 1973, then-Comptroller General of the United States Elmer B. Staats wrote a congressional report revealing the specific benefits to cost-savings and safety that would result from regularly using flight simulators. Staats wrote that, at the time, the hourly operating costs for the Navy and the Air Force exceeded “\$1,500 for certain operational combat aircraft” and that “the Navy and Air Force could save \$390 to \$1,400 an hour in operating costs when simulator training replaces flight training in combat airplanes.”⁴ Staats’ second major discussion point was safety, where he referenced statistics from 1971 stating “Navy and Air Force noncombat-related accidents cost about \$542 million and 69 Navy pilots and 67 Air Force pilots were killed.” The flight simulator’s use allows aviators to continue to maintain a safer and more effective approach to training without sacrificing our competitive edge in mission execution.

The advent of the aircraft carrier influenced the way Naval aircraft were designed. Shortly before World War II, after realizing the potential application and value of forward-deployed aircraft, the Navy demanded an increase in the number of aircraft aboard carriers. The solution was presented by American innovator Leroy Grumman, who perfected and implemented the Sto-Wing wing-folding mechanism on the XF4F-4 Wildcat. With aircraft now featuring wings that could fold, carrier aircraft capacity increased by nearly 50%.⁵⁶

Adaptations to strategy are just as important as those made for technology. The last century saw the advent and increasing strategic impact of electronic warfare (EW). Navies worldwide continue to aggressively compete to maintain superiority in fields such as surveillance, communication, tracking and targeting. Having recognized the



U.S. Navy photo by Mass Communication Specialist Seaman Richard Tinker

significance EW brings to the carrier strike group, the MH-60R community adopted EW as one of the aircraft’s primary missions. As a result, the community developed EW-based readiness tasks and incorporated EW events into its training syllabuses. Pilots flying the MH-60R now frequently train and refine their skills in localizing, identifying and detecting emissions along the electromagnetic spectrum.

Adaptability is a skill that every leader and professional should practice in their given field. Though CNAF 3710.7 states crew resource management – and subsequently adaptability – is used “as an integral part of every flight,”⁷ its use and teachings should not be limited to flying or military matters. Our ability and experience with solving complex problems in a constantly dynamic work environment is sought after in any organization. Be able to cite your experience with adversity and how you dealt with it. Whether the solution was temporary or permanent, an employer will take note of the fact that you did not let a problem go unnoticed.

Footnotes

¹ Chief of Naval Operations. NATOPS Flight Manual Navy Model MH-60R Helicopter. (Commander, Naval Air Systems Command: 2021)

² Murdock, George J. 1921. Self-puncture-sealing covering for fuel-containers. US Patent 1,386,791, filed January 1918, and issued August 1921.

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PE Corner

By Capt. (Dr.) Jonathan Erpenbach

In this edition of Approach, the Physiological Episodes Action Team (PEAT) at the Naval Safety Command focuses on decompression illness in the aviation setting as our main article.

The principles associated with this topic frequently form the foundation for discussions during Quick Look meetings after an event. They also are relevant to

aeromedical professionals as they work to determine the cause and potential treatment for any adverse symptoms.

Most importantly, aircrew need to have a working understanding of this topic so they can make informed decisions that appropriately assess the risk of altitude decompression illness while operating aircraft.

Please continue to send PE-related comments or suggestions to us at: PEAT@us.navy.mil.

Slam Sticks

Each edition highlights the top three Slam Stick data matching squadrons. Bravo Zulu goes out to the following squadrons for the fourth quarter of fiscal 2023!

1. VAQ-131 - 97.3%
2. VAQ-142 - 96.3%
3. VFA-31 - 95.5%

Altitude Decompression Illness in Naval Aviation

By Capt. (Dr.) Jonathan Erpenbach

As a result of research and practical information highlighting the low risk of decompression illness in aviation, the requirement for Recompression Chambers (RCCs) on deploying aircraft carriers was discontinued in the fall of 2021.

Decompression illness (DCI) has been a studied focus in aerospace medicine for over 100 years. As aircraft capabilities developed to include flight at higher altitudes, pressurized cabins and more complex life support systems, research into altitude decompression illness accompanied technological developments. Encompassing the two distinct clinical entities of decompression sickness (DCS) and arterial gas embolism (AGE), the term DCI is often used to describe both as they share common causes. When the body is exposed to lower pressure either gradually or rapidly, the gases within the body must adjust to that new pressure. Nitrogen, composing almost 80% of the air we breathe, is typically the most important gas in the setting of DCS and will be the representative gas discussed in this article, although others can play a role in the aviation setting.

During initial efforts to evaluate physiological events (PEs) by the Physiological Episodes Action Team (PEAT), DCI was proposed as a possible mechanism for some of the unexplained symptoms. A conservative approach was established where symptomatic aviators were frequently evaluated for treatment at RCCs until more information could be gathered. As the incidence of PEs continued to climb from 2010 to 2016, portable RCCs were provided on deploying aircraft carriers in 2017 as a precautionary mitigation.

The subsequent F/A-18 and EA-18G PE Root Cause and Corrective Action Final Report, representing the compiled evaluation of subject matter experts across multiple organizations and fields, was released on June 4, 2020 finding that aviation-related DCS is highly unlikely. The Navy's Bureau of Medicine and Surgery Clinical Practice Guidelines, which drive evaluation and treatment of potential PE events, were subsequently revised in 2020 to reflect this improved understanding. Since January 2020, only one aviator has been treated in a RCC for a PE. In this case, the pressure data from the aircraft was not fully available

to the team when making the treatment decision so the RCC was used out of an abundance of caution. Later evaluation of the inflight pressure data showed DCI was not a realistic risk to the aviator in this case. While extensive research is ongoing to better understand all potential causes of PEs, rates remain near historic lows; the research resulted in the discontinuance of RCCs on aircraft carriers in 2021.

As scuba divers may remember from training, Henry's Gas Law states that a gas dissolved in solution (the tissues of your body since we are mostly water) is in proportion to the partial pressure above the solution (cabin pressure). When your body experiences a transition to a lower pressure, the gases must equilibrate by leaving those tissues. How this occurs depends on a number of factors including the amount of gas dissolved in those tissues, the pressure differential and the rate of the pressure change. We enjoy the bubbles from Henry's Gas Law when popping a frosty beverage on a Friday evening. When that process occurs within our body, those bubbles end up in our tissues, joints or can migrate into the blood vessels which we then term DCS. Development of an AGE is dependent on

the gases in our lungs undergoing a rapid expansion due to a relatively large pressure decrease within a closed space, such as when holding our breath. This action can result in the air sacs (alveoli) rupturing and the gas migrating into the adjacent blood vessels, an occurrence which does not develop frequently in the aviation setting. While both phenomena occur much more often during diving, the same process may occur during flight while ascending or with rapidly decreasing cabin pressures.

Despite some similarities, there are several important differences between DCS in the aviation and dive settings.

1. When we go from a higher to a lower pressure environment, the gases within the body tissues equilibrate to that change. As we take off and climb to higher altitudes in an aircraft, we experience this as the cabin pressure at altitude is less than the ambient pressure we previously experienced at the airfield or on the flight deck. The gases adjust to this lower pressure by gradually leaving the tissues until they reach a new state of equilibrium. This adjustment means that as soon as we take off and our body is exposed to a lower cabin pressure as we climb, gases are leaving our tissues and lowering our risk of DCS. The diving equivalent would be an extended decompression stop (essentially hanging out at a certain depth underwater) to allow the gases time to equilibrate before continuing to the surface. While not all dives incorporate this safety step, every flight has this protective factor to some degree.

In tactical aviation platforms that can have scheduled cockpit pressures equivalent to altitudes into the mid to upper teens mean sea level, the amount of nitrogen leaving the tissues can significantly decrease the risk of DCS should the aviator suddenly be exposed to a much lower pressure.

2. Breathing air containing higher percentages of oxygen is another protective factor compared to breathing normal compressed air in diving. When we breathe air containing greater than 21% oxygen, with a correspondingly lower nitrogen percentage, the gases in our tissues equilibrate to that condition.

Since aviators wearing masks typically breathe air containing oxygen in the 50% - 90% range, this drives a significant purging of nitrogen from the tissues that is then exhaled.

This “de-nitrogenation” due to breathing a higher concentration of oxygen is the same process astronauts use to minimize DCS risk before an extravehicular activity (EVA). This decreases the amount of residual nitrogen left in the tissues to potentially form bubbles and cause DCS should the aviator experience an even lower pressure.

3. When DCS or AGE occurs in the dive setting, the treatment is to take the diver back down to greater pressure to facilitate the shrinking of bubbles and allow the tissues to reabsorb the gases. In the aviation setting, if there is a possible DCS or AGE event, the aviator will automatically receive



U.S. Navy photo by Mass Communication Specialist 1st Class Stephen Hickok

a treatment of higher pressure simply by returning to ground level. This treatment reduces the size of any current bubbles that might cause symptoms and prevents any further from developing.

Research has demonstrated the practical envelope where aviation DCS becomes a consideration. Based on experimental studies exposing 124 human participants to different lower pressures, DCS was first observed with sustained exposure to an altitude of over 21,000 feet. As the amount of time spent at an altitude is a key factor in DCS developing, over two hours of continuous exposure at 21,000 feet was required before the first subject

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(From left) Divers from the Philippine Navy Naval Combat Engineering Brigade observe Navy Diver 1st Class Kolby Konopacky operate a recompression chamber during a training exercise aboard USNS Salvor (T-ARS-52), Feb. 6, 2023. (U.S. Navy photo by Mass Communication Specialist 2nd Class Heath Zeigler)

experienced symptoms. Statistical analysis concluded a 5% risk of DCS with exposure to an altitude of 20,500 feet; however, an extended amount of time would be needed at this altitude to produce that risk in most individuals.

These findings are consistent with prior research showing an 18,000-foot cabin altitude increase as the practical lower limit for even considering DCS in the aviation environment under most circumstances. Even with exposure to an altitude of 25,000 feet, it took several minutes for DCS to develop in the first subjects. This finding underscores the protective effects for preventing DCS, even in an explosive decompression at altitude, of immediately descending.

As previously mentioned, the cabin pressurization schedule also allows for gradual gas equilibration within the body as the aircraft ascends. The aforementioned studies did not incorporate this protective factor, so from a practical perspective the probabilities of DCS occurring following a decompression event should be even lower than what has been observed in research environments.

As we have learned, altitude DCS is not common while flying in our pressurized aircraft and typical mission envelopes. Should symptoms develop consistent with

altitude DCS, studies have shown that severe manifestations are much less frequent than in diving-related DCS.

An Air Force research study reviewed altitude chamber exposures occurring over two decades and found that descent to ground level resolved symptoms in the vast majority of cases. A total of 1,699 individual symptoms were documented in 315 participants that developed DCS. Of those symptoms, 88.2% resolved completely before reaching ground level and another 6.9% resolved on the ground while breathing oxygen before RCC treatment. Some of the profiles and altitudes in this study also represented extreme exposure scenarios – atypical for the Naval aviation environment. Simply descending to ground level and breathing supplemental oxygen if needed effectively treats well over 90% of altitude DCS symptoms when they do occur.

Compared with diving DCS cases where neurological symptoms are more common, altitude DCS much more frequently presents with less severe musculoskeletal symptoms as opposed to the more concerning neurological manifestations.

A different 11-year study of 447 individuals who developed DCS in an altitude chamber showed over 83% had presenting musculoskeletal symptoms with only 0.5% presenting with neurological symptoms.

A related study performed in 2019 at the Navy Experimental Diving Unit exposed participants in a chamber to pressures fluctuating at various rates between 6,000 and 15,000 feet. There were no cases of DCS or AGE in participants and no bubbles were observed in their blood vessels during ultrasound monitoring. Research studies like these provide objective information that both improves understanding of altitude DCI and enables a framework for data-driven decision making.

Naval aviation effectively manages risk every day accomplishing missions around the globe. Decades of experience working in austere environments and performing flight operations, bolstered by the findings of ongoing research, support the conclusion that DCI is a rare occurrence in the Naval aviation environment. While the risk can never be entirely eliminated, aircrew are capable of controlling this risk through ongoing professional education, using proper procedures and consultation with aerospace medicine providers. By doing these actions, we can continue to safely and confidently expand the performance envelope in which naval aircraft and aircrew operate.



An F/A-18E Super Hornet from the "Kestrels" of Strike Fighter Squadron (VFA) 137 launches from the flight deck of USS Nimitz (CVN-68), April 8, 2023. (U.S. Navy photo by Mass Communication Specialist 3rd Class Carson Croom)

Divert! Storm Approaching!

By Lt. Pat Stone, HSC-22

On July 8, 2022, HSC-22 Det. 1, attached to the USNS Robert E. Peary (T-AKE 5) was conducting vertical replenishment (VERTREP) with USS Harry S. Truman (CVN 75). The Truman was in connected replenishment with USNS Supply (T-AOE 6), and Peary was about a mile aft on Truman's starboard side. The Dragon Slayers of HSC-11 provided two aircraft attached to USNS Supply to go along with our aircraft, Avalanche 02, for the VERTREP.

The majority of the flight went quickly and was uneventful, but toward the end of the VERTREP, all aircraft noticed a storm 3 to 4 miles off Truman's port bow. Once VERTREP was complete, all three aircraft were holding in the port delta waiting for retrograde to commence. At that point, one of the HSC-11 aircraft departed the delta to obtain a pilot's report of the rapidly approaching storm. Upon its return, the aircraft commander reported strong downdrafts and heavy winds. Internally, my crew and I acknowledged the need to keep a close eye on the storm as we completed the retrograde.

After the retrograde was complete, both HSC-11 aircraft landed on Truman to pick up passengers to bring back to the Supply. Upon landing, the storm that was 3 miles away was now right on top of the carrier. Radio calls over the tower frequency quickly became hectic with reports of blades being broken off static aircraft and a potential man overboard. Meanwhile, while still airborne, my crew and I recognized the carrier was no longer an option for landing. I saw the Peary still had retrograde on the flight deck, but enough had been removed to where a nonstandard landing could be attempted. During the course of attempting to land on the Peary, waterspouts began forming all around us and forced us to wave off the approach about a half-mile from the ship. We rolled out at 220 feet over the water and immediately began experiencing 40-degree yaw excursions and almost instantaneously descended 70 feet. In the midst of everything, one of our crewmen asked, "Sir, I know you're busy flying and making comms, but how fast are we going?" After scanning my gauges, I reported, "100 knots and accelerating." He replied, "Okay, this storm must be moving at least 90 knots because it looks like it's going to swallow our tail."

Fortunately, we were able to remain ahead of the storm as we sought clear air, but we later found out the microburst had been clocked at 97 knots.

Shortly after narrowly escaping the extreme weather, we found ourselves in visual meteorological conditions. The predicament we were in was that the nearest airport was 78 nautical miles away, and our fuel state was 890 pounds. I told my copilot to break out the bingo charts in the pocket checklist (PCL) as we accelerated to max range airspeed in the direction of the nearest airport. By our calculations, we estimated we could cover 96 miles before potentially flaming out due to fuel starvation.

The tower frequency was very busy, but when we were able, we inquired about the status of the weather as we headed east toward Greece. The Supply offered a green deck, as did the Peary, which was reporting a half-mile to a mile visibility. Under the impression the storm had cleared, we turned back around toward the ships and away from our divert, but we quickly realized the green decks were still 20 miles away. One of our quick-thinking aircrewmembers inquired about the location of the storm, so I asked the Peary for clarification. The Peary said the storm was to the east of the ship on radar, which placed the storm between us and the ships. We immediately reversed course yet again, climbed to 1,000 feet and resumed diverting toward Greece.

At this point, we were 60 miles away from Kefallinia Airport, and our fuel state was 650 pounds. I turned the boost pumps on, we recalculated max range using the bingo charts and determined it was 72 miles at 128 knots. We changed our Mode 3 transponder code to 7700 as we headed toward land. Both the copilot and I were using ForeFlight for situational awareness, and the chart we were looking at showed nothing but sloping terrain 8 to 9 miles prior to the airport. With this in the back of my mind, no communication established with the airport and the current 12-mile bingo buffer, I decided to continue with both engines online rather than reconfigure

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for a single-engine bingo profile.

About 50 miles from the airport, we were hailed on guard by Greek air traffic control. I declared an emergency due to fuel extremis. We were 45 miles away from the airport and began to acquire the mountainous island on our multispectral targeting system. At 38 miles from the airport, we hit 450 pounds (minimum fuel) at which point the precision fly-to-point we had placed on the airport read 16 minutes and 30 seconds time of flight remaining. The Naval Air Training and Operating Procedures Standardization states that 450 pounds theoretically gives you 20 minutes of flight, so we discussed the need to remain highly alert until we were safe on deck due to the potential for flameout.

The aircraft went feet dry at 190 pounds of fuel, 10 pounds of which were trapped in the aux tank. We had calculated that at 200 pounds of fuel, the max range was 24 miles. The airport was 8 miles away and in sight while the terrain below us was very rough and mountainous. We considered the dangers of maneuvering the aircraft for a landing at an unprepared site versus continuing on a steady-level glide slope toward the runway and determined the airport was the first site we could land safely. We flew over land for 4 miles as we approached a densely populated beach with a 4-mile-wide bay before the runway. We crossed the bay and continued toward the airport with a gradual descent from 1000 feet at a level attitude.

I performed a running landing in order to maintain a level aircraft attitude and touched down with 140 pounds of fuel – 130 usable, since 10 pounds were trapped in the aux tank. We taxied to the parking area and shut down the aircraft with 120 pounds of fuel displayed – 50 pounds in the left tank, 60 pounds in the right tank and 10 pounds in the aux tank.

After shutdown, several airport officials came out to the aircraft to greet us. The officials brought us to their office so we could call our ship to report safe on deck. They provided us Jet A-1, coffee and snacks. We owe special thanks to Efthalia Papadimitriou, Margrette Moore, Mr. George and the entire team at Kefallinia Airport in Kefalonia, Greece, for their help and hospitality that day.

Our crew met with a weather representative from the Hellenic Air Force, and he showed us a radar picture of the storm. He recommended we wait a couple hours for the weather to clear before launching, which we did. Once the storm cleared, we were able to take off and immediately gained communication and a tactical air navigation lock with the Peary. We flew back and landed uneventfully, thankful that such an eventful day had finally come to an end.

We learned several lessons from our experience. If I could share anything with the fleet, it would be that bingo charts are in the PCL for a reason, and it's important to know how to use them, since we operate overwater so frequently. Also, ForeFlight is a great resource, especially in a foreign country. I'd recommend every squadron in the Navy have accounts set up for their pilots. Lastly, I'd emphasize the importance of the entire crew being fully focused on the mission at hand and mindful of the potential for rapidly deteriorating weather. Thankfully, effective crew resource management kept us safe and every crewmember in the aircraft, both front and back, played a significant role in Avalanche 02 making it safe on deck in Greece that day.



BRAVO ZULU

SAILORS AND MARINES PREVENTING MISHAPS



Lance Cpl. Andrew Busby
HMLA 773

Bravo Zulu to Lance Cpl. Andrew Busby! Due to his mechanical aptitude and attention to detail, Busby directly contributed to enhanced aircraft readiness and mission accomplishment. In February 2023, an AH-1Z helicopter that was slated to depart for a training exercise in a week returned from a familiarization flight with collective control interference.

While assisting the flight line quality assurance representative in troubleshooting the issue, Busby, a dual plane captain, discovered the collective flight control tube was binding on a wire bundle harness behind the No. 1 side cheek panel.

Although the troubleshooting tree would have led to the fix eventually, Busby saved the unit hours, or potentially days, of maintenance troubleshooting on a primary exercise aircraft. The issue was promptly fixed in time for the aircraft to conduct the Jaded Thunder exercise in support of the nation's top tier special operations forces operators. Bravo Zulu!

Bravo Zulu is a naval signal originally sent by semaphore flags and in English, simply means "Well done."

A Stormy Flight

By Lt. Ryan Speir, VP-26

It was the peak of Florida summer thunderstorm season and the VP-26 Tridents were participating in an anti-submarine warfare exercise off the east coast of the United States. We planned to have required fuel for the transit, on-station period plus 30 minutes and calculated conservative fuel reserves for an alternate as forecasted weather at Naval Air Station Jacksonville was deteriorating at the time of our arrival. Due to a tasking modification while in-transit, our operating area (OPAREA) was almost 200 nautical miles (nm) further off the coast than mission planned. This shift resulted in using some of the extra 30 minutes of on-station fuel for the unanticipated transit to the new OPAREA. In-flight tasking updates are an area where we, as aviators, must always be flexible and quickly exercise our risk management processes to accomplish the mission.

It became apparent we would need to be conservative with fuel, so we set max endurance on-station. About halfway through our on-station period of three hours, we called the NAS Jacksonville flight weather briefer, who provided us with a thorough analysis indicating all of Florida was covered in thunderstorms.

According to the Jacksonville meteorologist, Savannah, Georgia, provided the only potential refuge from encroaching storms. We fulfilled our on-station requirements and began to transit back to NAS Jacksonville knowing the weather was not ideal. We used the

U.S. Air Force photo by Senior Airman Antwain Hanks



flight management computer to determine our predicted optimum altitude and implemented step climbs in transit, which saved 15 minutes of fuel.

Our radar operator was providing us feedback to avoid thunderstorms during our transit back while we were proceeding visual flight rules due-regard. We picked up our instrument flight rules clearance about 100 nm off the coast of Jacksonville and observed the weather was deteriorating as forecasted. We avoided multiple thunderstorm cells and established a hold outside of hazardous weather to wait out the storms. Our fuel reserves only allowed 15 minutes until the decision would have to be made to either continue to our planned destination or divert to Savannah. After delaying as long as possible, we elected to divert and informed air traffic control of our intentions to proceed to our filed alternate, Hunter Army Airfield, Georgia. We completed an uneventful 25-minute transit and landed in Savannah to refuel and wait out the storm.

This scenario demanded our combat aircrew apply real-time threat and error management techniques to ensure shifts in the operational mission and unforeseen weather did not degrade safety margins. While we did not anticipate a pit stop in Savannah and an extended crew day, it was a far more favorable outcome than potentially flying

through destructive weather. We found approach and air route traffic control center controllers in the southeastern United States were incredibly responsive and provided invaluable situational awareness regarding hazardous weather avoidance. Maintaining vigilant fuel planning per CNAF M-3710.7 and resourceful coordination with air traffic control allowed us to complete the flight without compromising safety.



Cmdr. Lane Drummond and Lt. Ryan Speir, both pilots of VP-26, conduct simulated instrument training at Naval Air Station Jacksonville. (U.S. Navy photo by Lt. Cmdr. Eric Dube)

TURN THE LIGHTS OFF; CARRY ME HOME

By Lt. Kenny Healy, VFA-131 and Anonymous

U.S. Navy photo by Mass Communication Specialist 2nd Class Cameron Pinske

Seeing the visual cues to execute my attack window entry on a basic fighter maneuver perch set, I overbanked the jet and oriented my lift vector on the defender oblique nose low. Almost immediately, I recognized the excess airspeed on the jet and the indications that I was late to execute my attack window entry. I ripped the throttles to idle and simultaneously applied max aft stick. As my left arm moved aft on the throttles, I felt my left elbow catch on something but had no time to react. In the blink of an eye, I experienced complete vision loss; what aviation physiologists describe as an “almost loss of consciousness,” or “A-LOC.”

After this aggressive maneuver, my aircraft was now in a severe nose-low attitude and accelerating. My altitude was reducing rapidly and I had no bearing from which to initiate my recovery due to my A-LOC vision loss. I remained fully conscious, yet functionally blind, as I distinctly remember my instructor calling “Fox 2” in my descent. After an agonizing 10 seconds, my vision slowly began to return. First to appear in my vision were nose-low pitch lines and the altitude box reading 7,200 feet and descending rapidly. I rolled upright and initiated a smooth pull to the horizon. I slowly increased the G, ensuring no further vision loss and avoiding slipping into full “G-induced loss of consciousness” or “G-LOC.” Reaching a peak of 6.5G on the recovery without worsening symptoms, I bottomed out at 4,200 feet, 800 feet below our briefed hard deck, per CNAF M-3710.7 training rules.



An F/A-18E Super Hornet fighter jet, attached to VFA 131, prepares to land on the flight deck aboard USS Dwight D. Eisenhower (CVN 69), Jan. 23, 2023. (U.S. Navy photo by Mass Communication Specialist 2nd Class Asheka Lawrence-Reid)

I learned as we knocked off the fight, climbed away and began to return to base that my G-suit hose was disconnected. I remembered routing my three seat connections differently than normal in the man-up, which resulted in reduced slack in the G-suit hose. Through the snap shot drill and initial perch set, the G-suit functioned normally. However, the reduced slack, my body positioning and the force of my left arm pulling the throttles to idle likely combined to provide enough force to disconnect the hose.

The day's flight was my very first event in Strike Fighter Weapons and Tactics Level III: Offensive Basic Fighter Maneuvers. The day before, I had spent an entire Sunday not only preparing my OBFM lab, but also tending to a variety of ground jobs — updating the squadron's joint mission planning system machines, managing schedule conflicts and preparing the week's training and schedule flow. In maintenance phase, the squadron's reduced manning had increased each individual pilot's non-flying workload. Although I had an appropriate amount of sleep the night before, I was approaching this flight after spending a fair amount of time at work the day before, not giving my body much of an opportunity to rest mentally and physically.

After the incident, I briefed the squadron in a “true confessions” format and commiserated with fellow junior officers about the circumstances surrounding the event. Out of those discussions, we emphasize “all the small things” do matter. First, honestly self-assess during the risk management section of the brief. With the known risk of A-LOC and G-LOC during basic fighter maneuvers, analyze your ability to mitigate through properly worn and fitted gear, sufficient sleep, adequate hydration, proper nutrition, mental focus and physical fitness.

Second, the prevalence of A-LOC in the single-seat FA-18 community may be underreported. Do a service to others and report those incidents via hazard report and Aviation Safety Awareness Program channels to raise awareness. Last, never forget the danger inherent in this business. Flying a lethal and safe jet is our No. 1 job. There are times when our collateral duties compete, but task prioritization, time management and articulating and balancing risk induced by personal operations tempo cannot be overlooked.

WHEN TRAGEDY STRIKES

Reflections on a Class A Mishap by an AMB Member

By Lt. Cmdr. Robin Dirickson, HSC 14

On Aug. 31, 2021, Loosefoot 616 fell from the flight deck of an aircraft carrier into the ocean due to a mechanical issue after landing. Five crew members from HSC-8 perished due to the mishap. I was serving as a department head in the squadron when the mishap occurred. As an aviation safety officer (ASO) with maintenance and operations experience and a fervency to determine the cause of the mishap, I volunteered to be part of the aviation mishap board (AMB). In many ways, ASO school prepared me for the mishap, but there were innumerable lessons and challenges I did not anticipate.

Looking back two years since the mishap, I have reflected on the challenges I faced being a leader in the squadron and a member of a challenging investigation. In the Navy, the mishap squadron composes the majority of the AMB and leads the casualty assistance efforts through next of kin notifications and providing casualty assistance calls officers (CACOs) for local families. These two efforts tie many members of the squadron to the mishap for weeks and months while the squadron as a whole works through grieving, healing and moving forward. Below are my observations as a member of a fractured wardroom and an AMB member, lessons learned from both perspectives and a timeline of our investigation contrasted with the state of the squadron.

The squadron is devastated, at a standstill

The immediate action items covered in a squadron pre-mishap plan are effective for activating the necessary communication channels following a mishap. The first 12 hours after Loosefoot 616 went overboard were heavily focused on accomplishing those items and coordinating search and rescue for the crew. After that, when all the checklists were done and the search was being run from echelons above, the remaining members of the squadron faced a duality between an overwhelming flood of unfamiliar tasks and paralyzing grief. The AMB began to feverishly gather time-sensitive evidence. The administration and executive departments worked to navigate bureaucratic publications and resources for CACO requirements, next-of-kin care plans, public affairs and other survivor benefits.

The operations and maintenance departments sought answers on how closely the work and flight schedule should reflect business as usual to support operational commitments, while also supporting the health and well-being of the squadron. Meanwhile, questions began silently circulating among us, wondering what happened, and who, if anyone, was to blame. How could we continue to operate as a team with that question unanswered? Were our other airframes contaminated with the same causal factors?

For a month, my squadron focused on supporting each other and the families who had lost loved ones. We held informal gatherings to grieve and heal together. We planned a squadron memorial



and attended ceremonies organized by the families. Gifts and condolences arrived from around the world and filled our spaces. While the remaining aircraft sat, maintenance personnel worked through scheduled maintenance and prepared program binders for upcoming inspections. Pilots and aircrew set up meal trains and spent time with the families. Many people found comfort in their work, in helping others and in contributing to the squadron's response to the mishap.

Our operational schedule allowed for this downtime, but we all knew the day would come when we needed to get back in the aircraft. Some people craved the return to the air, but many approached it with trepidation, and a few – with extreme anxiety. The squadron was in the maintenance phase of the Optimized Fleet Response Plan, experiencing a drawdown in aircraft assets and minimal funding. As mentioned, this lull provided downtime, but it also created sentiments of purposelessness at a time when people were questioning why they accept the risks of being in naval aviation. It was awkward to return to flying when we'd all spent every day of the previous month grieving and wondering.

The then-Naval Safety Center investigator was the single most crucial resource in our investigation

One of the most reassuring lessons from ASO school is that in the event of a Class A mishap, the Naval Safety Center now the Naval

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Safety Command (NAVSAFECOM), will send an investigator to help. Within hours of the mishap, our duty officer was contacted by a Marine major from NAVSAFECOM to begin gathering information for his trip to guide our investigation. I later learned that he lobbied to begin his role in the investigation before the aircraft or crew were recovered. His presence alone reassured me that while I was distracted by grief, flight operations and operational commitments, I wouldn't accidentally commit any irreversible oversights in the investigation.

I also recalled that a team would be mobilized to support the investigation if required. Indeed, people and resources appeared whenever they were needed. What seemed like providence from my perspective was actually hard work and seamless coordination by the NAVSAFECOM investigator. Medical examiners, aircrew life support systems analysts, a salvage ship and crew, metallurgists and more experts arrived at key points in recovery efforts to give us the information needed to determine what happened to the aircraft and crew. He set up calls with subject matter experts (SMEs) across the country who have different roles in designing, modifying and analyzing aircraft. His team of experts ensured we recovered the black box from the aircraft and had it safely shipped for analysis without being corrupted by salt water or oxygen. Other contacts provided reports, performed modeling and analyzed fleetwide supply and maintenance records, which added to our understanding.

The NAVSAFECOM investigator played another important role: assisting the AMB with top cover and engaging public affairs officials and senior officers as required to ensure the board was free to proceed without distractions.

Mental health resources are abundant but could be better tailored for a warfighting unit

Our squadron was supported immediately by Special Psychiatric Rapid Intervention Team (SPRINT) counselors. Fleet and Family Support counselors and several chaplains also made time in their schedules for our squadron and family members to receive one-on-one counseling. There was no shortage of availability, and it was evident the counselors were eager to help however they could. Some people used their offices as safe spaces to break down or to talk through the range of emotions stirred up by the mishap.

The natural tendency for many after a mishap is to purposefully avoid conversations about fears, feelings and our own futurity in Naval Aviation, yet behind closed doors and at home, that was exactly what started to occur. On the other hand, many people did not want to voice how they felt or bring a stranger in to their private grief. For many of us, we just wanted to be together with our squadron mates who shared our feelings without question or explanation. We organized gatherings for ourselves to share memories of the lost. However, we avoided discussion about our own fears and feelings. We also didn't talk about how the mishap changed our thinking about flying and our careers in naval aviation. Perhaps the instinct to hide away doubts and fears comes along with the bravado associated with naval aviators and the same tendency for hiding medical conditions that may interfere with flying. There was a sense that these conversations should happen with a counselor outside of our professional community, lest there be long-term professional implications.

The month-long operational pause following the mishap allowed most members of the squadron the time they needed to come to terms with continuing their flight and flight-related duties. However, starting the second month and continuing through the 12-month mark, seven highly trained and qualified service members chose to terminate their work in naval aviation. Most of them received persistent mental health care before and after their decision.

I attribute this loss rate to our failure to support these service members as they sought to reconcile their fears and doubts with their pride and impact in service. None of the myriad resources provided counseling on how to heal our squadron and return to warfighting. There is no psychiatric training for leaders on how to work through pain and distrust within the team. There is no guidance for the command triad regarding when to resume flight operations or how to talk to aircrew with doubts about getting back in the aircraft. The system we have encourages individuals to “get help” for their emotions – to sequester themselves until they are fixed and can return to work emotion-free. Individual counseling is valuable; however, having productive conversations about the doubts, questions and emotions produced by a shared tragedy would benefit the squadron.

I have two recommendations to better support the mental health needs of a traumatized squadron. First, to maximize organizational resiliency after a tragedy, an organizational psychologist or other specialist should coach the squadron back to a new normal rather than merely treating members as individuals. A professional who

can make appropriate referrals for individual counseling, group therapy for service members with similar concerns or experiences as well as make recommendations to squadron leadership regarding operations and communications would provide more cohesive mental health support than the current system of treating individuals in isolation. The stress of deployments, missions and mishaps that a military unit endures creates tribal bonds among its members. Mental health care should capitalize on those relationships to heal the wounds shared by all, returning a stronger unit to the front lines faster.

Second, the command triad needs dedicated guidance and support. There are overwhelming demands on the commanding officer (CO) between supporting the families and running the squadron during the first four weeks following a major mishap. The CO’s chain of command likely offers guidance and mentorship; however, there is a concern that showing weakness or indecisiveness will have professional repercussions. The command triad needs on-call support to provide advice and reassurance while they are in the midst of their own grief and leading service members and family members through theirs. In the same way the NAVSAFECOM investigator mentors and shepherds the AMB through the investigation, an experienced guide for squadron leaders to navigate the administrative, operational and emotional challenges of leading a unit through tragedy would be extremely helpful and contribute to long-term mission effectiveness for the unit and its members.

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Life in the Squadron and the AMB post-mishap

Squadron		AMB
<ul style="list-style-type: none"> • Search for survivors • Complete mishap plan notifications and other immediate action items • Bring personnel and aircraft home from detachment • SPRINT and other grief counseling • Initiate CACO process and begin next-of-kin notifications • Manage public affairs 	Week 1	<ul style="list-style-type: none"> • Provide RMI initial notification • Designate board members • Gather time-sensitive evidence • Interview eyewitnesses • Identify NAVSAFECOM investigator <p>Commitment: Daily</p>
<ul style="list-style-type: none"> • Operational pause • Establish family support plans • Organize and attend funerals and memorial ceremonies for individuals and squadron including multiple flyovers and receptions • Coordinate nationwide CACO efforts to ensure simultaneous and uniform updates and timely receipt of benefits • Identify and train personnel to take billets left open by the lost 	Week 2-4	<ul style="list-style-type: none"> • Gather and study records and historical information • Organize recovered components and send out for engineering investigation (EI) • Initiate root cause analysis and mapping • Study governing directives related to possible causes • Continue interviews as analysis brings up new questions and concerns • Send videos for analysis • Begin data entry in RMI • Regular teleconferences begin with aircraft SMEs to determine and discuss required assistance with modeling, research and fleetwide data analysis <p>Commitment: Daily</p>

Risk Management Information needs to improve usability and functionality. During the quality control (QC) process, the commander, Naval Air Forces (CNAF) safety officer and NAVSAFECOM community manager looked through our report and returned it for edits. When the report was returned to the AMB, a version was published in the Risk Management Information (RMI) system, which triggered a notification to all applicable users, allowing the rejected report to be downloaded and viewed hundreds of times in advance of official review and organized dissemination.

The NAVSAFECOM was unaware of this RMI feature and the unintended release created an uproar from the squadron up to CNAF, despite attempts by NAVSAFECOM to remove the draft report. The rejected report included confusing statements, mismarked exhibits and factors and recommendations that were changed before final release. The draft also included accurate and devastating facts about the cause of the crash, the events afterward and the fates of crewmembers, which the squadron had intended to release in a controlled, sensitive manner.

Life in the Squadron and the AMB post-mishap, continued

Squadron		AMB
<ul style="list-style-type: none"> Continued CACO support as updates continue and benefits are finalized Dignified transfer of remains to armed forces medical examiner for autopsy Additional funerals occur Continued family support Return to flight operations with multiple functional check flights required 	Week 5-8	<ul style="list-style-type: none"> Salvage operation recovers aircraft and crew AMB conducts in-depth analysis of aircraft and flight gear along with mishap investigation support team, metallurgist and Sikorsky experts Many components removed and sent for EI Flight data cards recovered and shipped for data extract AMB members reach out to other programs for information on water survival, vest design specifications, historical safety incidents and aircraft modeling <p>Commitment: Multiple days per week</p>
<ul style="list-style-type: none"> Operational tasking and regular inspections resume, driving squadron to return to business as usual 	Week 9-12	<ul style="list-style-type: none"> Aircraft parameter data received and flight playback constructed from flight data EIs begin coming back, eliminating and confirming root causes Majority of RMI report written, awaiting some details <p>Commitment: Weekly with solo work</p>
<ul style="list-style-type: none"> Operational tasking and regular inspections 	Week 13-24	<ul style="list-style-type: none"> Remaining EIs received, allowing finalization of RMI report Draft changes to publications that will be part of AMB's recommendations <p>Commitment: Weekly or less</p>
<ul style="list-style-type: none"> Squadron prepares to debrief SIR in fits and starts due to delays in QC process 	Week 24-28	<ul style="list-style-type: none"> RMI QC process Significant edits required to report aligns with NAVSAFECOM policies and preferences including reordering and subdividing factors, redundant manual privilege markings, updating responsible offices for recommendations based on personnel changes during the course of the investigation <p>Commitment: Weekly with solo work</p>
<ul style="list-style-type: none"> Squadron debriefed. Cause of mishap and fates of the crew disclosed. Grief counseling resumes. Process improvement and culture change are ongoing well beyond 32 weeks. 	Week 28-32	<ul style="list-style-type: none"> Report submitted and endorsement window opens Final actions completed to satisfy AMB recommendations Evidence and documents entered into long-term physical and digital storage as required <p>Commitment: Minimal with solo work</p>

The QC process took nearly a month, with most of the changes being innocuous but time-intensive administrative changes to ensure proper privilege markings were in place and the report aligned with NAVSAFECOM preferences, such as the order of factors.

Privilege is misunderstood and inhibits dialogue and learning

Privilege is an important component of naval safety investigations. It allows conversations and analysis to occur without concern for who will get in trouble when the truth comes to light. However, while it is important that safety incident reports are safeguarded, they should be easily accessible to naval aviation professionals. Once published and consumed, aviators should feel comfortable discussing conditions and lessons from the incidents to prevent recurrence. A general misunderstanding of privilege creates a fear of open conversation, reducing the utility of the investigations and increasing the likelihood of recurrence.

During our investigation, through privileged conversations and analysis, the AMB became aware of practices that were dangerous to continued flight operations for the fleet. We were concerned that any information that went outside our investigation before the conclusion of a separate legal investigation would influence that report and result in disciplinary action against witnesses we'd interviewed. Our NAVSAFECOM investigator guided us through options for reporting these practices while protecting our investigation.

Our report took about six months from incident to submission. This timeline would have been longer without pressure from CNAF on the responsible offices to prioritize our EIs. The investigation

was a challenging evolution particularly when paired with ongoing squadron responsibilities. I don't disagree with the Navy's model of a squadron investigating its own mishaps; however, this timeline demonstrates some of the challenges and conflicts that arise from the arrangement. It should also encourage ASOs to think carefully about who to recommend for an AMB due to the incredible amount of time, effort and expertise required. What if we were deployed and could not spare five of our six qualified pilots to conduct AMB and CACO responsibilities? We were fortunate to have a senior member from a different squadron who was able to be a sympathetic but largely impartial leader for our group.

Additional changes are needed to make naval aviation a stronger, smarter, safer community. Our report highlighted many areas in RMI with room for improvement, disseminating lessons learned and making risk decisions at the appropriate level, which received traction in the Memorandum of Final Endorsement process. The mental health issues I described above were not relevant to the safety investigation but are just as important to returning squadrons to combat readiness. Tailored mental health resources not only for individuals, but for the squadron as a unit and for leaders, may decrease the number of pilots, aircrew and maintenance professionals who choose to leave aviation or accelerate their return. Ultimately, safety is about warfighting effectiveness, and we must not only fix the causes of mishaps, but also improve the processes surrounding them to become a more resilient, effective fighting force.

U.S. Navy photo by Mass Communication Specialist 3rd Class Adina Phebus



TRAIN LIKE YOU FIGHT, MOSTLY



U.S. Navy photo courtesy VFA-151

By Lt. Cmdr. Ryan Corbin, VFA-151

One of the crucial metrics in preparation for an upcoming deployment is combat operational efficiency. While ensuring the ship and air wing team are capable of effectively sustaining a high operations tempo is of course an essential part of preparing to deploy, a combination of the metrics encourages not only operating in a manner different from how the team would actually fight, but also incurs additional safety risk to do so. While out on a sustainment exercise the Shogun/Lincoln team saw a spate of potential safeties resulting from the requirement to conduct tanker drills along with the desire to limit open deck time at the end of the recovery.

In one instance, one of the first fighters down from the case one stack was directed to put their hook up and proceed to a tanker hawking them at angels 1.5. The fighter coming off their touch and go then had to climb through the break altitude while being overtaken by another section coming in to break on their interval. While all players involved in this particular evolution had high situational awareness (SA) and there was no near miss, on another day it could have gone very differently.

A similar instance occurred during a night case 3 recovery with one of the first fighters down being waved off at $\frac{3}{4}$ of a mile and told to proceed to the tanker overhead at angels 2.5. The launch was not yet complete and aircraft were still launching off the bow at this time. This scenario put the tanker drill fighter directly alongside a fighter launching off cat 1 on a case 3 departure who had no SA of the tanker drill. A high SA call from the carrier air traffic control center enabled the tanker drill fighter to maneuver and de-conflict; however, again on another day this could have gone very differently.

While of course any combination of factors could result in one of the first fighters down being low on fuel, generally speaking a Rhino or Lightning will have at least a couple of looks at the ball before they need to head to a tanker, giving the rest of the stack time to enter the pattern or for the launch to finish. Having the section that broke the deck climb through breaking traffic to tank is a situation that would only arise through a combination of previous errors. Additionally, penalizing the units being evaluated for operating as air wings normally do for standard practices, like launching tankers five minutes early to conduct package checks and consolidate in sanitized air space, is directly opposed to both safety and efficiency, especially at night. Launching oncoming primary and secondary recovery tankers at night after the launch has begun incurs additional de-confliction requirements forcing joins aft of the bow and increasing the time required to package check and consolidate while artificially compressing the time available to do so.

COE metrics should not be opposed to operating as an air wing normally would. While aircrew and controllers with high SA can mitigate the elevated midair collision risk imposed by the tanker drill/open deck time requirements, this is not a risk worth incurring toward the end of COE. Having a serious discussion about mitigating these hazards or better yet working to change the metrics driving them, is worth the time of any unit preparing for COE.

Heed call on **squishy** brakes

By Lt. Hannah Elliott and Lt. Nicholas Dodd, VAQ-135

It was a calm, dry, and sunny afternoon at Kadena Air Base, Japan. The day's sortie was expected to be a local area integration flight with U.S. Air Force partners from all over the area of responsibility. After an uneventful startup and brake check, we pulled out of the line toward Runway 23.

About half way through our taxi from the fighter ramp the pilot noted to the electronic warfare officer (EWO) that the brakes felt "a little squishy." More brake pressure was required than normal to slow the jet. This was a noted discrepancy in the book from a previous sortie that stated "brakes were spongy but worked fine above 50 knots". After the initial discrepancy, maintenance had thoroughly inspected the brakes, performed preventative maintenance and signed off the discrepancy. A sortie had launched and recovered uneventfully (with normal brake response) since the maintenance actions were performed.

After checking all gauges and a thorough discussion, we continued our taxi as the lead aircraft toward the hold short. As we neared the hold short we switched to tower to request takeoff. "Hold short 23L" were the instructions we received and attempted to comply with. With a slight downhill grade and the momentum from a 60k aircraft at roughly 8 knots, the initial brake application did not stop the aircraft. The pilot then stood on the brakes and the

jet skidded across the hold short, resulting in a wave off for a P-8 on short final. With a puff of smoke pluming off the tires the aircraft came to a stop (without pulling emergency brakes).

After a quick discussion with our wingman and base, aircrew elected to cautiously taxi clear of the runway and eventually back to the line.

Once we got back to the line, the maintenance team executed a more in-depth inspection of the wheel brake assembly. They found both brakes failed their standard on deck brake test and the anti-skid valve was installed incorrectly.

Lessons Learned

If it doesn't look right or smell right, don't take it.

Decision making is the first pillar of the Navy's Crew Resource Management (CRM) model. Between both crewmembers we have over 800 hours in the Growler and should have turned around after the brakes "didn't feel normal." It is better to be more cautious on deck then take a bad jet flying.

The decision to continue toward the runway with aircraft braking action less than optimal is a poor decision and a clear breakdown

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U.S. Navy photo by Mass Communication Specialist 2nd Class Jan David De Luna Mercado

of CRM. Electing to taxi back to the line after having suspect brakes was another potentially dangerous choice. In the future, with questionable braking action, asking for a tow back to the line to not cause further damage to the jet is always the more prudent option.

Mission analysis is another crucial pillar of the Navy's CRM model. We felt a perceived pressure to make the integration event we were scheduled to fly in. The perceived pressures of the event led us to continue our taxi. A thorough understanding of when taking risks is required and when the juice simply is not worth the squeeze is crucial to safe aviation practices. Additionally, the hazard report investigation from this incident identified further organizational and behavioral lessons to be learned.

The hazard aircraft (HA) was known to have questionable braking action, yet only a single complaint had been written against it. Ready Room and aircrew-to-aircrew discussions about the HA braking action without proper documentation resulted in what amounted to "anecdotal gripes" which were never properly documented and exhibited properties of normalized deviance from normal procedures.

Lastly, we as the hazard aircrew fell prey to our own cognitive biases. We assess that we were unaware of the confirmation and conservatism mental biases influencing our decision making. Confirmation bias occurs when a decision is made which typically confirms an individual's preconception. Conservatism bias happens when an individual does not adequately revise their decision-making process in the face of new evidence. In this case, the data points that maintenance actions had been performed and a preceding flight exhibited normal braking action combined with our real-time assessment of brake system operations lulled us into biased mental states where we ignored historical and anecdotal evidence of a degraded braking system.



U.S. Navy photo by Lt. Cmdr. Tyler Vitti



***Don't be nervous
Trust in your confidence, abilities***

By Lt. Thomas Trevino, HSM-79

It was my first time being the aircraft commander in a night tactical formation (TACFORM) flight and my second pilot was a senior lieutenant. In the other aircraft was the commanding officer of our squadron, and the flight lead was our squadron Seahawk weapons and tactics instructor. My experience dwarfed in comparison, both with flight hours and time in the Navy.

I was nervous and the night before the flight, I reviewed every publication and instruction I could think of related to flying TACFORM just to be ready. It's not that I felt I would be ruthlessly evaluated or scrutinized, but more like I wanted to ensure I did a good job and my skipper's trust to give me the aircraft commander qualification was not misplaced.

It may be because I struggled through the helicopter aircraft commander (HAC) process or I was overthinking everything, but ultimately, I was anxious about the event. Simply put, I was worried I would disappoint him and my peers by messing up. Not something so wrong that it would be a safety-of-flight issue, but more of an error a professional and skilled pilot would never make. I wasn't concerned they'd pull my qualification or prevent me from flying TACFORM again; it was that I did not want anyone to doubt my ability to maintain the conduct and discipline of the flight.

During flight school, and especially the HAC process, the concept that there's no rank in the cockpit is ingrained into your mind. Regardless of the experience or rank of crew members, the pilot in command is responsible and accountable for the safety and conduct of the flight and the crew's well-being. I had to remind myself I had been trained to do this, so all I had to do was stop overthinking everything and stick to the training and experience my squadron provided. When our commanding officer signed off my aircraft commander qualification, it was his official way of saying he trusted me with all the responsibilities of being a pilot in command. I reassured myself I was qualified, capable and ready to accomplish this mission. It was irrelevant who the other crew members were; there was no need to be worried or nervous.

Overall, the event went well. There were no safety-of-flight instances and we only had to call terminate once for minor confusion on one maneuver. Every concern I had about being the most junior pilot was entirely in my head and there was never any need to be. It was a good lesson learned that it doesn't matter who you're flying with. Just have confidence in your abilities and trust that with your qualification comes the capability to execute your assigned missions.



U.S. Navy photo by Lt. Lorenzo Armstrong

Crew faces undesired autofeather

By Anonymous, VAW-126

Naval aviators take great pride in being the best. It takes training and skill to achieve that goal. In the Hawkeye community, we train extensively to propeller and engine emergencies because we know there are two types of aviators: those who have had an engine or prop emergency and those who will. We train and brief so that we can handle any emergency and bring the aircraft and crew back safely to the field or the carrier. We train so that if it happens, our aircraft systems knowledge allows us to quickly and smoothly feather the propeller and properly configure the aircraft for single engine flight. This time though, we did it to ourselves. This time, the right conditions at the wrong time created a scenario where we lost a perfectly good engine for no good reason.

The aircraft my crew and I were getting into had just landed aboard the ship for a planned "hot pump and crew switch." I conducted a turnover with the previous flight's aircraft commander and was told the aircraft had zero discrepancies for their entire 3 1/2-hour flight. Thirty minutes later we launched from the carrier just after sunset for a single cycle. The weather was overcast from 2,500 feet up to around 6,000 feet with light to moderate icing. We climbed to our stationing altitude without any issues and proceeded on our airborne command and control mission.

The mission went smoothly and before returning to the ship we rendezvoused with an F/A-18 tanker jet for two aerial refueling proficiency plugs. Post aerial refueling we checked in with the marshal, commenced and proceeded inbound on the Case III CV-1 approach.

During our descent, we noted that the weather had deteriorated slightly, with the tops now around 8,000 feet and the bases around 2,000 feet. We also noted a slight increase in the icing conditions compared to our departure. However, we were able to properly deice all accumulations on our aircraft once we leveled off below the clouds at 1,200 feet. At 3/4 of a mile, we called the ball "603, Tracer ball, 4.9". Everything felt smooth until the very end when I added too much power and the ball began to rise in close, indicating I was high on glideslope. I made a play to stop the rising ball by bringing the power levers back. We touched down... but we didn't stop. As paddles would later call the pass: (TMP.DLIM) (HCDIC) TMPAR BIW - for the (OK) skip the 4 wire Bolter.

In other words, I got over-powered at the ramp and touched down just before the 4 wire but the hook skipped it resulting in us missing all available wires. I added power back in to go around and I felt a slight swerve in the aircraft as we went off the end of the carrier and back into the night.

The slight swerve during the power addition, along with the fact that the plane was not responding as it normally would, were our first indications that something was not right. Sixty feet off the deck and 120 feet above ground level (AGL), my co-pilot and I realized our rate of climb was slower than normal and I heard the words "keep your climb in". Very soon after I saw our engine revolutions

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per minute (RPM) indications rapidly decreasing, an indication that the left engine was shutting down. Seconds later the left engine indicated 0% RPM with a fully feathered prop. I pitched for 135 knots, which is the E-2D's single engine best rate of climb airspeed and we continued to climb as we executed the bold face for engine/fire/failure shutdown in flight. We coordinated to continue our climb past the normal bolter/wave off pattern altitude of 1,200 feet to the base of the cloud layer to get as much altitude below us as possible while still remaining clear of the clouds and icing. This move put us at about 2,000 feet AGL. Unsure of why the engine had shut down, but also knowing that we had a fully feathered prop and a controllable aircraft with a 6,000-foot layer of instrument meteorological conditions (IMC) and moderate icing above us, we elected to remain at our current altitude and recover as soon as possible.

We communicated our situation and intentions through our squadron representative back to the ship as we were vectored around to final for another approach. We completed all the requisite checklists items and performed a controllability check of the aircraft before finally discussing our situation with paddles. For the second time that night we called the ball at 3/4 of a mile, "603, Tracer ball, 4.2, port engine out". Fortunately, this time we caught a wire.

Once back safely on the ship in our squadron ready room, we took a thorough look at the maintenance data from our flight in an attempt to determine the cause of the engine shutdown. All engine recording and monitoring system data showed that the auto-feather system on the left engine had activated when I advanced the power levers on the bolter. Maintenance performed a thorough inspection of the engine and completed a low power turn, noting no abnormalities.

The E-2D has built-in software on each motor that will initiate automatic feathering of the propeller if it does not sense 500 pounds of thrust coming from the respective engine when the power lever is above 63.8 degrees power lever angle. There is a warning associated with the system:

"With the [autofeather] system armed should the power levers be rapidly advanced from near flight idle to above the autofeather arm point before the propeller can generate 500 pounds of thrust all autofeather conditions will be met and feathering will be initiated. As the blade angle increases toward full feather, RPM will decay and thrust will increase. When thrust is above 500 pounds the feather circuit will be de-energized.

During this sequence engine RPM may significantly decay and engine flameout may occur."

The autofeather system was inherently designed for safety of flight. As such, it does have a lot of positive attributes. In the event of an immediate engine failure at low altitudes this system should feather the engine with no input from the pilot as long as the power levers are above 63.8 degrees power lever angle and the system is armed. However, the system is not without fault, as illustrated by this incident and others in recent years. Un-commanded autofeather has been ranked as a top safety concern from our community for several years by the Safety System Working Group, a group which takes inputs from all of the squadrons in the community and prioritizes the top 10 E-2D systems which present a potential safety hazard.

Some unforgettable lessons were learned by a junior carrier aircraft plane commander that day. We have all been taught that NATOPS is written in blood and that going against NATOPS is a cardinal sin of any naval aviator. But I also learned a lot about the NATOPS review process and while the book goes through a systematic scrutiny, it is not without its flaws. In this instance, I was in between a rock and a hard place. On one hand, I was flying at the ship at night and I got myself into a place where I needed every ounce of power my aircraft could give me. But the book told me to be careful, because if I responded too fast to a screaming power call or a bolter, the engine would shut down. I could have flown better by not putting myself in a position where I needed to advance the power levers from flight idle to max. I could have made the power lever movement slower. However, as I thought through the incident I couldn't help but be frustrated that a power lever movement at a critical phase of flight would cause me to lose an otherwise good engine.

Since this incident occurred my community has taken an in-depth look at this and a multitude of other undesired autofeather scenarios and have decided that some significant changes in aircraft design and procedures to help prevent undesired autofeathers need to be implemented. Hardware changes and procedures are being tested and some have already been implemented into the fleet to help reduce the potential for unsolicited autofeathers, including leaving the autofeather switch off for approaches and implementing logic changes to the autofeather system itself.

Undesired autofeathers have been an issue in my community for years. But, instead of designing a better system, NATOPS procedures were devised to attempt to prevent undesired autofeathers from occurring. NATOPS will never replace good judgment, but it should never compensate for a poor design.



U.S. Navy photo by Lt. Lorenzo Armstrong

STATISTICAL IMPOSSIBILITY: THE SWISS CHEESE MODEL

By Lt. j.g. Jac Cortright, VP-45

The aviation industry has seen remarkable technological advancements and procedural changes over the years, but certain fundamental aspects remain constant. The following narrative sheds light on the challenges and lessons that persist through time, such as dealing with heavy air traffic, managing distractions, the role of experience and the danger of falling into monotonous routines. By examining this story, we can gain valuable insights into the ever-evolving world of aviation.

While my grandfather, Maj. Richard Swift, was an instructor pilot in the KC-135 stationed at Patrick Air Force Base, Florida, he experienced what might be referred to as a statistical “impossibility:” a gear up landing in a multi-piloted aircraft. On a routine instructor under training (IUT) flight, he and his aircrew were victims of what we call the swiss cheese model. They had a normal takeoff and quick transit of 30 minutes to use a field with an instrument landing system (ILS). They entered the box pattern and made a few ground controlled approaches before a windshift caused them to rotate the active runway.

On the next approach, they were on a dogleg to final, in the middle of the landing checklist, when air traffic control directed a 140-degree turn because of departing jets that had priority. They then received vectors back around to re-enter a downwind about a mile and a half ahead of another aircraft without completing the checklist. Once again on final and running the checklist, another vector was given to break off the approach. Several more vectors followed and eventually they were back on a base leg for the precision approach radar (PAR). Just as the checklist was once again started, ATC terminated the PAR due to a power failure on their end. The ATC directed them to break off the approach to the right and contact tower for instructions.

At this point, due to lost training and time passed since the last landing, the instructor pilot (IP) sitting in the jump seat went heads down in the charts to try to find another suitable field with an ILS. With the tower frequency crowded, it took longer than anticipated to

get in contact with ATC, and once contact was made, my grandfather and his aircrew were told they were number two behind two jets and to continue the approach. The IUT started a descent and pulled the throttles just above the limit for the horn to blow. They lowered flaps and were cleared for the touch and go but no check wheels down call was given. The throttle had somehow been in the perfect position so as not to set off the landing gear alarm. At 50 feet, my grandfather looked out the window and saw that the USAF captain who was standing wheel watch was not indicating that they should go-around. At the same time, the flight engineer calmly asked if it was going to be a touch and go and the IP in the jump seat looked up from the charts as he said “yes.” Right as the word came out of his mouth, he immediately pointed at the gear handle in the up position as everyone’s eyes went to it as well. The go around was initiated and they departed VFR after narrowly avoiding a major mishap.

This story is one that could happen today. While the technology and procedures for flying have changed since the 1960s, that does not make us immune from the same mistakes. Heavy traffic at airfields will always be an issue with crowded comms creating added stress for both aircrew and controllers. Being heads down in charts has changed with the use of iPads, but with such vast amounts of information at our fingertips, it can easily occupy all our attention just as fumbling around with paper charts can. The “check wheels down” call can be omitted and a “down three green” call can be vocalized without actually checking the lights. The level of experience one possesses can serve as a valuable support when confronted with uncertainty in managing a novel situation. However, that experience can also cause you to make mistakes. Repetitions and routines are great until something does not go as planned. As pilots we want to be purposeful and intentional, not automatic and reflexive. In order to keep ourselves honest, we have to avoid the redundancy that comes with doing the same thing over and over again. Putting ourselves in situations we have not experienced before forces us to practice not just procedures but being comfortable with being uncomfortable.

In conclusion, my grandfather’s story from the 1960s aviation world serves as a valuable lesson that still applies today, particularly to multi-piloted aircraft like the P-8. Despite technological progress, human factors continue to play a significant role in aviation safety. Heavy air traffic, reliance on technology, automatic responses stemming from experience, and the perils of complacency are challenges that persist today. To excel in this dynamic field, pilots must strike a balance between experience and intention. Embracing discomfort and adapting to change are essential principles for ensuring safety. My grandfather’s story reminds us that remaining adaptable and purposeful is the key to safe flights and successful missions.

DESPITE TECHNOLOGICAL PROGRESS,
HUMAN FACTORS CONTINUE TO PLAY A
SIGNIFICANT ROLE IN AVIATION SAFETY.

Established Systems

Evolving Problems

By Lt. Matthew G. Kraljic, VP-16

The U.S. Navy's Maritime Patrol and Reconnaissance Force (MPRF) has a long, storied history of providing long-range airborne anti-submarine warfare (ASW) capabilities to fleet commanders globally. This unique mission set comes with a fantastic array of complex problems a Maritime Combat Air Crew must solve. How do you locate a proverbial needle, when your haystack is hundreds, if not thousands, of square miles in size? How do you assure you don't miss what might be your one on your first and only chance to best a target that is purposely built to hide and to evade you? How do you perform this task, day or night, under extreme weather conditions, in any waterspace on Earth?

The platform that answers this difficult call is the Boeing P-8A Poseidon; carrying the torch handed down from previous ASW legends, such as the Lockheed P-3C Orion. Like its predecessor, it is equipped with a wide set of special set of tools that permit crews to excel at ASW prosecution and weaponeering, which includes the capability to expend tactical sonobuoys. Precise placement and timing of sonobuoy drops allows the P-8A to exploit acoustic energy in the water and gain/maintain contact on a submerged target. This placement and timing is what allows MPRF to keep the kill-chain tightly wound around any potential undersea adversary.

One of these sonobuoys in particular, the AN/SSQ-62 DICASS (Directional Command Active Sonobuoy System) has been fielded by MPRF since 1980. Since the original design, the buoy has seen multiple upgrades to include battery performance improvements and the introduction of GPS capabilities. Over the past four decades, hazards related to the DICASS buoy have been discovered through aircrew usage that facilitated engineering investigations, redesigns and ultimately drove subsequent Naval Air Training and Operating Procedures Standardization (NATOPS) changes. Despite over 40 years of experience flying with these sonobuoys as a community, we continue to face new challenges that require us to examine how we manufacture, store, handle and operate the AN/SSQ-62.

A new failure mode of an established system typically results from an unidentified deficiency early in production that eventually makes itself known when sufficient wear is placed on the system. One example of this modal failure was the sudden increase in wing spar failures on the Piper PA-28 aircraft in 2018, which ultimately resulted in a FAA Airworthiness Directive. That same wing spar design had been in use since the early days of the PA-28's production, but following enough cycles and wear on the system, the spars eventually suffered catastrophic failures. Sonobuoys incur similar stresses throughout their life cycles from manufacturing, transportation, storage, uploading, downloading and ultimately employment.

In contrast to the PA-28, the DICASS buoy has been mass-produced for one-time use with a manufacturing process that has remained largely unaltered for the past 40-plus years. A new failure mode in such an established system is rare and nearly impossible to predict. The unpredictability of such a failure presents a dilemma for aircrews operating with sonobuoys or any other long-standing system within the military enterprise. How does a crew manage such a failure when no procedure or community-specific tribal knowledge exists?

On May 28, 2023, while conducting an ASW mission, a Patrol Squadron SIXTEEN (VP-16) crew discovered an unknown fluid leaking out of an AN/SSQ-62 DICASS that had a thick consistency and an odor similar to superglue. After donning oxygen masks, the crew elected to run the specific Emergency Checklist for a venting sonobuoy, although it was not immediately apparent if the leaking fluid fell within the scope of the emergency procedure. The crew, presented with a new and unknown malfunction, elected to follow the intent of the venting sonobuoy checklist and ultimately jettisoned the questionable ordnance through the P-8A's freefall chute. Upon further inspection, the crew's tactical coordinator (TACCO) discovered several other buoys in the storage racks that were also leaking a similar fluid. Out of an abundance of caution,

U.S. Navy photo by Mass Communication
Specialist Seaman Apprentice Anthony Lagunes



the crew elected to also jettison these affected buoys, since the root cause of these leaking fluids was unable to be determined. A combination of effective Crew Resource Management (CRM) and Risk Management (RM) allowed this P-8A combat air crew to apply sound judgment to their situation and ensured a safe aircraft recovery with no injury to personnel was made.

VP-16 experienced a similar malfunction on June 15, 2023, while on a scheduled ASW mission departing Clark Air Base in the Philippines. In this incident, the buoys were contained in two of the P-8A's Sonobuoy Rotary Launchers (SRL) and were found to be leaking a deep red fluid at a high rate. The decision in this case was made to execute the venting sonobuoy checklist, which calls for jettisoning all the sonobuoys in the affected SRL. Unlike the previous incident, the choice to use this checklist in its entirety was clear, as although the leaking fluid could not immediately be categorized as "venting", the sonobuoys were in an ideal location (inside the SRL) from which this checklist could be executed with no risk to crew, should the buoy fail catastrophically. The crew also chose to use oxygen in response to an odor emitted from the sonobuoys and proceeded to return to Clark. Again, a combination of effective CRM and RM applied with sound technical knowledge led to a safe result.

As shown by these two occurrences, established checklists dealing with unknown failures or malfunctions are challenging as the specific observations may not fall within the scope of the checklist. NATOPS para. 11.3 (Situations Beyond the Scope of Emergency Checklists) tells us, "In the event of a situation beyond the scope of the checklists, the flight crew may be required to do multiple checklists, selected elements of several different checklists applied as necessary to fit the situation, or be faced with little or no specific guidance except their own judgment and experience." Crews must remain alert to the possibility of encountering a malfunction where no checklist or specific background experience exists. The Air Anti-Submarine Warfare Systems Program Office (PMA-264), conducted an engineering review which determined there were manufacturing flaws that led to water intrusion of the Sonobuoy Launch Containers (SLC), causing corrosion which ultimately led to the crews' observations.

These events highlight the importance of engaged crew resource, threat and error and risk management discussions. As NATOPS states, "no manual can address every situation completely or be a substitute for sound judgment." The intent here is to make a call to the community to renew the focus on CRM/TEM/RM training beyond the typical presentation. Our community must strive to expose aircrew to case studies of a complex nature in which unprecedented malfunctions occurred so we can collectively learn how to remain agile during emergencies. We need not discuss only malfunctions from our community; we can draw lessons learned from other similar platforms across the naval aviation enterprise as well as other military branches and allies. The rich experiences they may have to offer can only be of use if we call express attention to the need for it. This emphasis on complex scenario-based training will force a fresh perspective on the concept of CRM/TEM and will allow MPRF aircrew to conceptualize thinking "outside the box," individually and as a crew.

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An F/A-18F Super Hornet from the "Fighting Redcocks" of Strike Fighter Squadron (VFA) 22 launches from the flight deck of the aircraft carrier USS Nimitz (CVN 68). (U.S. Navy photo by Mass Communication Specialist 3rd Class Caylen McCutcheon)

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