THE NAVY AND MARINE CORPS AVIATION SAFETY MAGAZINE

Approach

VOL. 65, NO. 3

The Dangers of Tactical Dehydration

Naval aviators are choosing to tactically dehydrate before flights at alarmingly high rates

PE Corner

Breathing dynamics, proper fit and wear of the harness and the reasoning behind the Strategic Air Break

+ *MORE*

Our Team

Approach Team

In This Issue

VOL. 65, NO. 3

NAVALSAFETYCOMMAND.NAVY.MIL

6

14

23

28

Let's Stay Connected

Aviation Safety Case Study – United Airlines Flight 173

By Lt. j.g. Christian Brumfield, VP-45


U.S. Navy photo by Mass Communication Specialist 2nd Class Lake Fultz

Lt. Riley Mita pilots a CMV-22B Osprey, assigned to Fleet Logistics Multi-Mission Squadron (VRM) 30, while preparing to receive fuel from a KC-10 Extender assigned to the 6th Air Refueling Squadron.

On Dec. 28, 1978, a Douglas DC-8 operating as United Airlines (UA) Flight 173 departed from John F. Kennedy International Airport for Portland International, with a single layover stop in Denver. The flight deck was crewed by a senior captain, first officer and flight engineer who cumulatively possessed more than 36,000 hours of flight time, of which over 8,000 were spent in this particular aircraft model. En route from Denver to Portland, Oregon (a 2.4-hour flight) with 189 people on board, the crew began to experience a landing gear malfunction while on final approach to the airfield. When the landing gear lever was actuated, the crew reported feeling an abnormal vibration and yawing motion of the aircraft, and seeing a gear indicator light out, suggesting the plane was in an abnormal landing gear configuration. At this point, the captain elected to wave off the approach and enter a holding pattern to troubleshoot the malfunction.

It was calculated before takeoff that Flight 173 required approximately 31,900 pounds of fuel to get from Denver to Portland. To comply with minimum fuel requirements, the plane ultimately took off with a fuel load of 46,700 pounds, which under normal circumstances would be more than enough fuel for any unforeseen circumstances, including the need to divert to another airfield. For the next hour, the crew troubleshot the malfunction while in holding above Portland in an attempt to identify the status of the landing gear. During this time in holding, extra drag from the gear being down and the flaps being left in a landing configuration caused flight 173 to burn significantly more fuel than what was expected and identified at the time. Because of a lack of adequate crew resource management (CRM), situational awareness and task saturation, a simple landing gear malfunction developed into a dual-engine flameout and subsequent emergency declaration. Unfortunately, due to the following compounding emergencies, Flight 173 ultimately crashed into a suburban neighborhood approximately 6 nautical miles southeast of the airfield. As a result of the crash, 10 people were killed (two crewmembers and eight passengers) and 23 were seriously injured. Luckily, air assets from the 304th Aerospace Rescue and Recovery Squadron were in the area conducting routine training operations and could transport many of the passengers to local hospitals for treatment.

A KC-10 Extender assigned to the 6th Air Refueling Squadron, and a CMV-22B Osprey assigned to Fleet Logistics Multi-Mission Squadron (VRM) 30, perform a mid-flight refueling.

Subsequent investigation of the incident revealed that when the landing gear handle was actuated, corrosion of the right main landing gear retract cylinder assembly caused a freefall condition of the gear, which led to a vibration condition and subsequent yawing motion of the aircraft. Unbeknownst to the crew, the right main landing gear still maintained a "down-and-locked" status; however, during the freefall, a micro switch was damaged, failing to complete the gear indicator light circuit.

Watch video about United Airlines Flight 173

Takeaways from UA Flight 173 and how this applies to Maritime Patrol and Reconnaissance Aircraft (MPRA) flight safety

The National Transportation Safety Board (NTSB) investigation revealed several key factors that led to the crash:

1. "The failure of the captain to monitor properly the aircraft's fuel state and to properly respond to the low fuel state and the crewmember's advisories regarding fuel state. This resulted in fuel exhaustion to all engines. His inattention resulted from preoccupation with a landing gear malfunction and preparations for a possible landing emergency."

2. "The failure of the other two flight crewmembers either to fully comprehend the criticality of the fuel state or to successfully communicate their concern to the captain."

Both of these statements from the NTSB reveal a critical lack of crew resource management and situational awareness within the flight deck. As a result of a hyperacute response to the landing gear malfunction, attention was taken away from normal procedures and the circumstances outside of that isolated issue. Although cockpit voice recordings revealed that fuel burn in holding was discussed, it was never addressed, suggesting that either there was a lack of assertiveness or communication of intentions within the flight deck or none of the crew was fully aware of the self-induced emergency they were about to find themselves in. As a direct result of this mishap, United Airlines developed and implemented a CRM program for pilots in 1981, which would eventually be used throughout the world of aviation and is still being practiced today.

Operating a multi-piloted platform similar to UA 173 as a professional military aircrew, we in aval aviation and the MPRA community are responsible for setting the example regarding safety. As a crew, employing the P-8 at its most lethal and efficient potential begins on the ground with solid CRM discussions and effective mission analysis. In flight, good situational awareness by all crew members is paramount and leads to good decision-making in normal and abnormal circumstances. Finally, efficient and regular communication within a crew and flight deck is how future mishaps are avoided and how the mission gets done.

Don't Be Lucky; Be Right

U.S. Navy photo by Mass Communication Specialist 1st Class Rawad Madanat

Lt. Rachel Boelsche pilots an MH-60R Seahawk, attached to the "Saberhawks" of Helicopter Maritime Strike Squadron (HSM) 77.

By Lt. Rachel Boelsche, HSM-77

After I landed from a 5.6-hour double-bag, we discovered my transmission pumps were seizing. Initially you might think, "Wow, you're lucky!" But as you peel apart the flight, it's not so simple – and certainly not as comforting. Let's go back to the start:

My crew was identifying surface contacts and watching for any problematic players as our group of warships transited the Strait of Hormuz. We saw close power margins on takeoff due to extreme temperatures, but other than that, the flight started off normally. It was probably the hottest day I have ever encountered – around 107 F, and before long, a couple of armed, small, fast-moving crafts charged toward our force. We proceeded through our preplanned responses to engage and deter the contacts. It was the most dynamic environment a helo pilot could encounter on a peacetime deployment – literally the stuff of my fleet replacement squadron training simulations.

Within 30 minutes, we de-escalated the worst of the encounter. We were no longer engaged in defensive runs against the contacts, but remained in a close orbit prepared for any change in their behavior. That's when one of my crewmembers announced a "transmission hot" advisory. I started a timer, directed my second pilot to read out the emergency procedure and system limits, and stayed in position on the surface contacts. I found the oil temperature fluctuating on the line between the continuous and precautionary ranges. Based on my copilot's reading, I knew that the Naval Air Training and Operating Procedures Standardization (NATOPS) program specifies temperature continuously steady in the precautionary range as the landing criteria. The limit also discusses the effect that hot environments such as ours has on transmission temperature, and while NATOPS didn't explicitly apply a forward flight condition to this susceptibility, I allowed myself that logical leap. I told my crew we received the indication because of the heat outside, assured them we weren't steady in the precautionary range, and stayed on station.

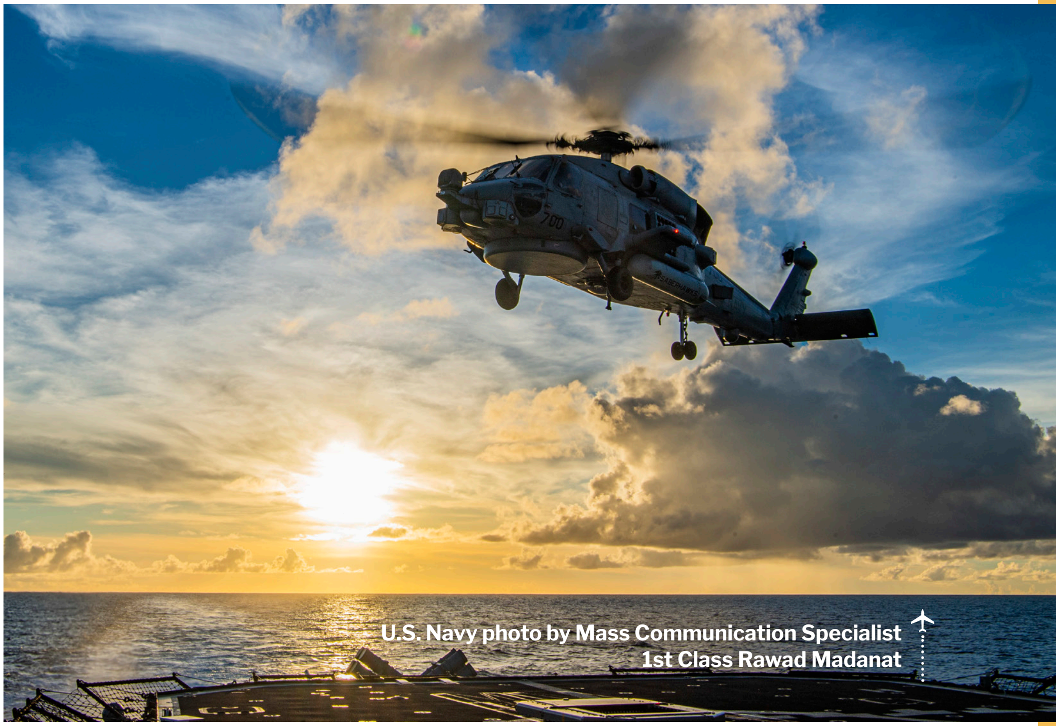
Twenty minutes later, my same observant crewmember found an extended transmission pressure differential indicator (PDI). I told the crew that NATOPS says an extended PDI does not require immediate maintenance attention and directed my second pilot to read out the corresponding passage, which seemed to confirm my initial instinct. Again, we continued on station without altering our landing time or flight plan. When I landed to refuel, the troublemaking fast craft were no longer on station and the contact picture was much calmer. There was no guaranteeing what the remainder of the transit had in store, but in that moment, we were not engaged in any time-sensitive encounter. I communicated to maintenance that the popped PDI needed to be replaced at the conclusion of the flight schedule, but I left out any mention of the borderline temperature.

We took off for the next leg, during which we briefly orbited a much more subdued small craft but otherwise experienced an uneventful flight. Borderline oil temperature indications continued, this time a little hotter and a little steadier. We climbed for cooler ambient temperatures but otherwise did not alter our plan. We landed as scheduled, shut down the bird and reported our indications to maintenance. Armed with the new information about our temperature fluctuations, they inspected the transmission over the next 24 hours and eventually found the malfunctioning pumps. I was lucky we landed on a ship and not in the ocean.

Through the calm of hindsight, it's clear where I went wrong in my risk management process. From step one, I failed to properly identify my hazard. I explicitly told our landing signal officer I did not have an emergency condition when I gave maintenance a heads-up about the popped PDI. Two specific mistakes led to this misdiagnosis.

First, I overly attributed the abnormal indications to my environment. I overemphasized the NATOPS entry concerning ambient temperature and misapplied it to my flight condition, which is not the condition NATOPS specifies. Second, I neglected to link the PDI to the temperature, misreading the paragraph calling the popped PDI a nonemergency. A reasonable professional would read that paragraph as a PDI extension on its own is not an indication of a transmission malfunction. Next, I failed to properly supervise and watch for change. Confident in my interpretation during the first leg of my flight, I recklessly underplayed the more excessive temperature indications presented during the second leg. I failed to maintain a questioning attitude and re-analyze each subsequent "transmission hot" advisory as a new emergency. If I allowed myself the liberty of saying it wasn't fully in the precautionary range, by that same logic, I should have recognized it wasn't comfortably in the continuous range either. Had I looked closely, I would have seen the system was exceeding limits.

My training gave me the tools to avoid those failures. Before every flight, we brief the terms "terminate" and "knock-it-off." If ever there is a time to pause and clarify a situation, it's when you see unusual indications in your transmission. Yes, there was a period during my flight when the tactical picture required the majority of my focus. However, by the time we identified the transmission issue, that moment was over. I could have – and should have called "terminate" on my orbit long enough to fully evaluate the safety of my aircraft. This could have prevented biasing my crew with false interpretations before reading what the pubs actually said, as well as allowing me the time to read with my own eyes to correct crucial misunderstandings. From there, I skipped the "communicate" step of my emergency procedure response. I had resources ready and eager to aid me on deck, and I should have attentively proceeded through "aviate, navigate, communicate" to inform them about the abnormal temperature indications. Even if I still misinterpreted those indications, they could have helped me connect the dots. After that, we could have safely stayed on deck to troubleshoot during my hot pump, thus avoiding the dangerous, and tactically unnecessary, second leg of flight under an emergency condition.


U.S. Navy photo by Mass Communication Specialist 1st Class Rawad Madanat

An MH-60R Seahawk takes off from the flight deck of the Ticonderoga-class guided-missile cruiser, USS Shiloh (CG 67).

The truth of the matter is my aircraft tried to tell me what was going on – but I didn't listen. The aviation community takes its verbatim knowledge of the publications very seriously for good, necessary reasons. However, I learned that a pilot can go too far in parsing apart NATOPS paragraphs – to the point of losing sight of the big picture. I was flying around with two abnormal conditions, both related to the same system. I turned to the pubs to manufacture a way to be comfortable with that, and my overanalysis resulted in negligent misinterpretation. Over the course of deployment, justifying myself with "real-world tasking" and pressurized missions, I developed a mindset of fly until proven an emergency rather than land until proven safe. That is the wrong mindset. Next time, I don't want to be lucky; I need to be right.

Unmanned Aircraft Emergencies

A Unique Set of Challenges

U.S. Marine Corps photo by Lance Cpl. David Getz

A MQ-4C takes off from Marine Corps Air Station Iwakuni, Japan. Due to its geographic location and co-located airfield and harbor, MCAS Iwakuni is uniquely postured to provide advanced naval integration in support of regional security.

By Lt. Michael Chang, VUP-19

It was our squadron's first flight out of Marine Corps Air Station Iwakuni, Japan; a new detachment location. After several weather and maintenance cancellations, the stars finally aligned for an aircraft launch. It was my second time signing for the aircraft; I had less than 65 total and 1 ½ pilot-in-command hours in this type/model/series. An hour into the flight, we received a chip light indication and the procedure for this malfunction directed us to land as soon as practical. Due to the high traffic volume of the approach and departure corridor combined with limited maneuverability of the unmanned aircraft (UA), a letter of agreement (LOA) - akin to course rules - mandated strict arrival and recovery windows, and routing and altitude constraints that were in effect for roughly the first and last three hours of all flights.

When we received the malfunction, we were outside our LOA recovery window. We attempted to coordinate a return to base (RTB) with Kobe Control, but they were unresponsive. The lack of response was most likely due to heavy traffic volume; however, our scheduled recovery window was not for another 14 hours or more. Ultimately, I decided the only way to receive a response and clearance was to declare an emergency. Air traffic control (ATC) responded to the emergency declaration immediately and began clearing aircraft out of our way for the one-hour RTB.

In our UA construct, there was a local forward operating base (FOB), from which I was operating, and the main operating base (MOB) at our home station, Naval Air Station Jacksonville, Florida, with two additional pilots and mission crew. My copilot was also very junior with less than 25 hours in the aircraft. However, the MOB pilot crew was comprised of two very experienced, senior instructors. In UA aviation, the same principles of aviate, navigate and communicate apply, but there are additional resources available due to the FOB/MOB construct. In this scenario, I maintained control of the aircraft, communicating my intentions with ATC and directing the MOB pilots to calculate landing performance numbers and monitor aircraft systems. The mission crew notified the chain of command and my copilot communicated with our local maintenance control team.

A unique provision of being a UA is we have a ground-based safety vehicle observer (SVO) that follows us during taxi, takeoff and landing to ensure our path is safe and clear. The SVO is an integral part of the crew and key to safe operations. Having never departed from MCAS Iwakuni before, we discovered there was significant interference on our maintenance-to-SVO-to-aircrew radio frequency, to the point that all transmissions were broken and unreadable. With the SVO being a critical component to safe operations, let alone in an emergency, we had to quickly adapt to this threat to crew resource management (CRM). We decided the SVO would use a cellphone to call the FOB landline and we put the call on speaker.

Ultimately, we recovered the aircraft safely. Effective CRM and promptly declaring an emergency were crucial to our success as a team. Having previously flown the P-8, I was not accustomed to ATC's unresponsiveness when requesting clearance due to a malfunction. Declaring an emergency was something I had mentally reserved for land-as-possible emergencies. Hesitation to declare an emergency is often discussed among the Maritime Patrol and Reconnaissance Aircraft community, and in this case, we learned such communication is a useful tool that is always available.

Respect the Storm

By Cmdr. Michael Matagrano, NR TACGRU-1

Courtesy photo by Matt Udkow

We were scheduled for a routine night currency flight consisting of two pilots, two crewmen and a flight surgeon in a UH-3 Sea King helicopter. This was briefed as a visual flight rules (VFR) out-and-in to Panama City, Florida, and back to NAS Pensacola/ Forrest Sherman Field at an altitude of 150 feet and 100 knots airspeed cruising down the beach line. We had checked weather and notice to air missions, or NOTAMS, and at the time of briefing, the current weather was VFR. Forecast weather was a concern, calling for thunderstorms and marginal VFR around the time of our scheduled return, but not a show-stopper. Pilots stationed long enough in the Pensacola area become intimately familiar with the weather patterns and their predictability. We had seen this weather pattern many times before and were confident it would not develop as it had during the past several weeks. We decided to take off as scheduled and check the progress of the weather during the return leg. I was the helicopter aircraft commander (HAC) and would be sitting left seat, and my helicopter second pilot (H2P or "2P"), who was fairly new to the unit, would do most of the flying in the right seat. The flight to Panama City was uneventful aside from a 30-knot headwind and slight crosswind.

We checked the weather forecast for the return leg, and it had degraded more than we anticipated. The weather graphic showed Pensacola clearing up, as it was at the tail end of a nasty thunderstorm moving through from southwest to northeast and showing signs of breaking up over the north Pensacola area. My 2P and I concurred the storm would dissipate by the time we would arrive in the terminal area, an hour after takeoff. Our plan was to assess the weather as we neared our divert at Hurlburt Field. If conditions compromised our destination and divert, we would return to Panama City, which was forecast to be VFR all night. I briefed the plan to the crew and said if anyone was uncomfortable, we would not launch. Everyone felt comfortable with the plan.

Most of the return leg was uneventful aside from a stiff tailwind and crosswind. About 20 miles east of Pensacola over Navarre Beach, we checked in with Pensacola approach, who advised us that Pensacola Regional was instrument flight rules (IFR) and Sherman Field was VFR. Approach then advised us of an area of weather at our 12 o'clock with light rain, to use caution and that they did not have weather radar. My 2P and I nodded at each other with a confident smile, we were right again: VFR at NAS Pensacola. We missed a pretty important detail here - we hadn't considered the unknown. We expected a little rain as advertised, but with no weather radar, we didn't know what was actually waiting for us.

We decided to press on. After a few more miles, the weather started to degrade. To maintain VFR, we turned north toward the Intracoastal Waterway. As we closed in on Pensacola Regional, approach advised us to stay clear of Regional's class C airspace. We still had a nice buffer, but to put approach at ease, we turned back toward the west.

We were losing sight of the city lights but able to keep flying through breaks in the clouds and maintain adequate visual ground reference. The weather continued degrading in front of us, so we turned to the southwest, back toward the beach line, where I visually called outside references while we flew through breaks in the clouds. My 2P was on gauges and periodically scanning for visual reference. We were still at 150 feet and managed to fly into a promising sucker hole. Almost as soon as we entered, it closed in on us, and we both called lost sight. I immediately called approach, declaring inadvertent instrument meteorological conditions (IMC) and requested an IFR pickup. Approach accommodated instantly, almost like they were waiting for it, with instructions to turn to a heading of 250 degrees and climb to 3,000 feet.

As he turned and climbed, my 2P fought turbulence and crosswinds that demanded everything from the aircraft. Controllability was becoming more difficult, and the turbulence was pushing us against our straps. The lightning was constant and lit up the cockpit brighter than daylight. What we didn't know was we just punched into the bottom of a mature thunderstorm with 60+ knot crosswinds. After what seemed like a slow climb and a struggle to get there, we were barely hanging on, passing 600 feet when I called approach and asked for a lower altitude. Approach gave us 1,500 feet – the lowest IFR altitude available.

Continued on Page 10»


Courtesy photo by Matt Udkow

At 600 feet, I noticed the airspeed bleeding off through 60 knots, and my 2P acknowledged my call to correct it. The cockpit suddenly became very busy. Because my attention was divided between scanning the gauges, talking to approach control and setting up for the instrument landing system (ILS) approach, I missed the significance of a 40-knot drop in airspeed during an IFR climb.

The storm above us was becoming more relentless as the aircraft started to struggle against the crosswinds and downdrafts. Making it to 1,500 feet was becoming more doubtful, so I started looking for a sucker hole – I obviously hadn't learned the first time. I glanced at the airspeed indicator; the airspeed needle was bouncing between 0 and 30 knots. I called out "airspeed" as I came on the controls to assist. My 2P tried to recover, and at this point he calmly asked, "Mike, can you take the controls?"

I realized he was overwhelmed. I took the controls, put in a correction for airspeed and quickly scanned the attitude gyro, airspeed and altimeter. We were 20 degrees right wing down, 5 to 6 degrees nose high, airspeed was still bouncing between zero and 30 knots and altitude was 200 feet. We had descended from 600 to 200 feet when we were supposed to be climbing. The significance of this did not immediately register because I was missing one vital piece of information - vertical speed. The crew chief called out that we were descending at 2,000 feet per minute. I had missed the vertical speed indicator (VSI) in my scan because it was blocked from my view by the cyclic, which was in a forward position as I attempted to recover airspeed.

The rate of descent, at our altitude, gave us six seconds before terrain impact. As my crew chief called out our descent rate, both he and my 2P realized the gravity of our situation and simultaneously called "POWER! POWER! POWER!" I pulled in collective, everything she had, and my scan became entirely focused on the radar altimeter (RADALT), which was pegged at 200 feet.

So there we were: airspeed behind us, altitude above us, and behind the power curve. At this moment, I knew we were finished. I was suddenly overcome with a metallic taste and my torso felt as hard as steel while my limbs still felt relaxed. I wasn't afraid, but rather more defiant and determined to get out of this. Approach kept calling us, and as we were task saturated, I should have ignored them – aviate first, but I replied, "Standby approach." This was when they declared an emergency for us.

I had all the control input corrections in, but we were still descending. We were now along for the ride, and I stared at the RADALT, just watching, waiting for it to hit zero, knowing there was nothing else I could do. All I could think in the moment was "Damn," which probably didn't resonate well with the rest of the crew.

While our rescue swimmer, aware of our dire situation, was positioned at the cabin door with one hand on the life raft and the other on his belt quick-release waiting for the opportune time to jump, the crew chief stood between the seats calling descent rates. "Still descending at 2,000 FPM … 1,500 FPM …

1,000 FPM ... 500 FPM ... leveled out." During the descent and level-out, which took much longer than six seconds, the RADALT never moved from the 200-foot mark.

The recovery took place in IMC. Rapidly applying power with minimal airspeed and right wing down had increased yaw, causing the aircraft to turn from 250 to 090. We were unaware of this.

Now straight and level at 200 feet in IMC, still getting knocked around in the storm, my 2P confessed to having a severe case of the leans, possibly vertigo, and lost his situational awareness. I had also developed a case of the leans after the recovery and lost situational awareness. We discussed whether to stay low and look for a break in the weather or try to climb back to 1,500 feet. The problem was that we didn't know where we were and what obstacles we might encounter, so we chose the known threat and I began a climb. I told my crew if they saw an opening - and I didn't care if it was someone's back yard - we were taking it.

I asked approach for help navigating, since we were still IMC and disoriented. Approach advised us of a tower 1 mile east of our position and requested our heading. I responded "090," but in my mind, I thought we were heading 360. There was clearly a disconnect between what I perceived and what I said. For the rest of the flight, while IMC, my bearings remained 90 degrees off.

Approach said we were heading directly toward (Midway) antenna and called for an immediate left or right turn to avoid the antenna. I turned north, to the left, and missed the antenna by 1,000 yards. Now I was scared.

I was still fighting a case of the leans as we encountered heavy turbulence, rain and lightning. Our crew chief and copilot were backing me up on gauges, calling out attitude, airspeed, altitude and ball. Looking down at the tactical navigation display, both I and my 2P saw we were in the vicinity of Pensacola Regional - so I asked for a landing there and approach accommodated and coordinated a recovery at Regional.

A few minutes and a few miles later, we began to break out of the clouds when Navy Pensacola came in full view. I canceled our approach to Regional and made an uneventful recovery at home field.

We debriefed the event and acquired the radar tapes to get a full picture of what happened. For an experienced crew, we made several mistakes that night, starting with the preflight planning when we had an opportunity to cancel and reschedule. We could have broken the chain of events at multiple points, but instead we did what we were taught not to do – second-guess the weather, push a bad situation, use poor head-work, use poor crew resource management (CRM), enter an unusual attitude and let complacency get the best of us.

We briefed and then executed a bad habit, prevalent among fleet aviators — calling for an IFR pickup if we encounter inadvertent IMC. Do not wait until you are in IMC. If you think you might go IMC, file for it. We were fortunate that air traffic was minimal that night and air traffic control was able to immediately accommodate us. The outcome could have been disastrous if not for the attentive crew chief who called out the missing critical detail, a 2,000 FPM rate of descent at 200 feet.

We will never know for sure whether we flew below 200 feet that night. We never saw the RADALT move below 200 feet, and neither one of us heard the 100-foot and 35-foot low altitude radar altimeter warning system tone go off. An eyewitness on the ground reported seeing a large helicopter "falling out of the sky" while in a right turn as it popped in and out of the clouds and disappeared as it passed over her house. The witness also said she knew it didn't look right and was "waiting for the fireball." Proper preflight planning, respecting the weather, following your divert plan and practicing good CRM will help keep you away from situations like this.

Courtesy photo by Matt Udkow


U.S. Navy photo by Mass Communication Specialist 3rd Class Charles DeParlier

Bad Vibes in the Bahamas

By Lt. Riley Emerson, Helicopter Maritime Strike Weapons School Atlantic

There are few more breathtaking sights to see in naval aviation than lifting from the pads at the Atlantic Underwater Test and Evaluation Center (AUTEC) to fly over the crystal clear waters of the Bahamas. Training with students during the Helicopter Advanced Readiness Program (HARP) at Helicopter Maritime Strike Weapons School Atlantic is an incredibly rewarding task and this ceiling-and-visibility-unlimited day with a well-prepared student was no different. An aircraft malfunction the size of a pinhole would change that outlook.

We launched as “Mauler 21” in an MH-60R belonging to HSM-60 with two students from HSM-48 to conduct two hours of surface-to-air counter tactics training on an open ocean range. During these integrated flights, we train as a crew. The crew included a student copilot who was qualified in model, an instructor aircrew member, a student aircrew member and myself as aircraft commander.

This HARP training flight follows a specific routine and regimented curriculum, including demonstration and instruction. The training maneuvers are dynamic and aggressive, intended to expose students to the edge of the MH-60R’s operating capabilities.

After the initial climb out, the student flew at 50 feet over the shallow water, then climbed to 1,000 feet for aircraft handling warmup maneuvers. After evaluating his proficiency, I took controls to demo a couple of items. My immediate thought was, “This aircraft is rough.”

Those of us who fly H-60 platforms know that individual aircraft have varying degrees of control feel within the Automatic Flight Control System (AFCS) and vibration tolerances that are adjusted during functional check flights. This particular aircraft felt sloppy. Vibrations did not seem out of balance and the track of the blades in tip path plane looked normal. I noted the condition and continued training.

In transit to the range at 120 knots-indicated air speed, I took controls again and immediately returned to my first thought: “There is something wrong with this aircraft.”

The trim didn’t feel like it was holding well, and the stability augmentation system (SAS) felt like it was not dampening control inputs. As naval aviators, we’re implored to make decisions based on sound judgment, but I wasn’t willing to knock off a flight based on a hunch. I told the crew about my gut feeling and elected to troubleshoot.

We ran the accelerometer null checklist to allow the AFCS to reset, then a controllability check. Rolling into a 30-degree right turn, the copilot let the aircraft return to trimmed straight and level flight. Instead of returning to trimmed straight and level as it should, the aircraft passed through neutral into a 30-degree left wing down and 5 degrees nose down. Now we had an intuition and evidence but couldn’t identify the malfunction. Either way, this helicopter was not safe to conduct the dynamic maneuvers we were set to do. We discussed as a crew and knocked off the flight.

On the 30-mile return to AUTEC, a relatively austere airfield, we declared a controllability malfunction to base. The copilot was not experienced in hours, but his checklist discipline was that of a seasoned aviator. He attempted to isolate SAS and trim channels for a malfunction, but the aircraft’s controllability continued to degrade, becoming unable to hold pitch or bank. With no particular system failure alert in the cockpit, the crew transitioned from troubleshooting to conducting a safe landing.

We discussed conducting a slow, shallow approach to final to avoid major control inputs. On short final, upon slowing below bucket airspeed and adding power, the problem became very apparent. The aircraft began to gallop, exhibiting a strong 1 vertical vibration per revolution, or as NATOPS describes it: the “rotary excitation of the fuselage that feels like a lateral oscillatory roll to the pilot.”

Before we took off, after the brief, the instructor aircrew member and I had been discussing the recent ground resonance incidences that had occurred in the fleet, which drove the replacement of all H-60 model damper lines and addition of new NATOPS "*Ground Resonance*" emergency procedures (EP). The new NATOPS procedure reads "If ground resonance is encountered and a safe takeoff is possible: *1. Takeoff immediately. *2. Unusual Vibrations in Flight emergency procedure — Perform." Coincidence or not, it became clear with those vibes that there was something wrong with the main rotor head, most likely a dampener failure affecting the lead-lag lateral movement of the rotor blades.

Short final is where I made a mistake. With unusual vibes presenting themselves in a high-power setting and pretty clear evidence of a dampener failure, we had two options: 1. Wave off to reassess or 2. Land. I elected to land. I declared my only game plan as we approached the pad: "If we feel any ground resonance, we'll take back off." A pretty thin plan for a malfunction we had recognized only seconds earlier.

Because we were loaded out with flares and chaff for the training mission, two aviation ordnancemen (AO) were acting as plane captains at the pad to de-arm before taxi. We hadn't pre-briefed the "*Unusual Vibrations on Deck EP*" or run through "*Unusual Vibrations in Flight EP*." We also had not declared an emergency, so no personnel were prepared for the air emergency to become a ground emergency. With the decision to land, we allowed ground personnel near an aircraft with unusual vibrations, potential ground resonance and potential rollover.

Aviation Structural Mechanic (Safety Equipment) 3rd Class Austin Whitehead performs maintenance on the rotor head of an MH-60R Seahawk helicopter.

At the controls, I landed the aircraft vertically as briefed. The plane captain awaited our signal to let the AO into the rotor arc, but the lateral vibrations became exponentially worse with all crew members noting an accelerating circular motion in the seat. I felt a hard pounding in the collective and cyclic. In the five seconds or so of on-deck time, it was difficult to discern if the vibrations would have led to ground resonance, although the set of parameters was there: an abnormal lead-lag condition that could potentially compound the blade center of gravity out of limits. With a time-critical game plan and a brand new EP fresh in my head, I chose not to find out. I pulled in collective and brought the aircraft to a hover. The vibrations subsided to a manageable 1-per. The copilot gave the signal for wave off and we took off into forward flight.

With a recognized malfunction, we needed to reset the risk management (RM) process. Airborne the second time, the crew became adhesive. Identify Hazards: We likely have a main rotor head dampener failure. Assess the Risks: Most severe? Ground resonance resulting in aircraft rollover. Make risk decisions: The copilot conducted the Ground Resonance Emergency Procedure, which led to the Unusual Vibrations in Flight Procedure. We briefed the Unusual Vibrations of Deck Emergency Procedure, which dictates an immediate shutdown upon landing.

Implement controls: The aircrew monitored local common traffic advisory frequency for inbound traffic so I could monitor our base frequency. The copilot turned down his radios to focus on the checklist. I declared an emergency, assigning the location for emergency services well away from the pad in the event the aircraft rolled over. The copilot cracked the power control lever out of the fly detent on short final. Supervise and watch for change: Land as soon as practicable.

We made a similar approach, smooth and controlled, this time with the intent to immediately shut down knowing there would be on-deck vibrations. With wheels on deck, the PCLs were brought off, collective full down, per the critical memory items. The vibrations continued to increase even with engines offline, and I directed the copilot to exceed the NATOPS limits of the rotor brake to expedite arresting the rotor head.

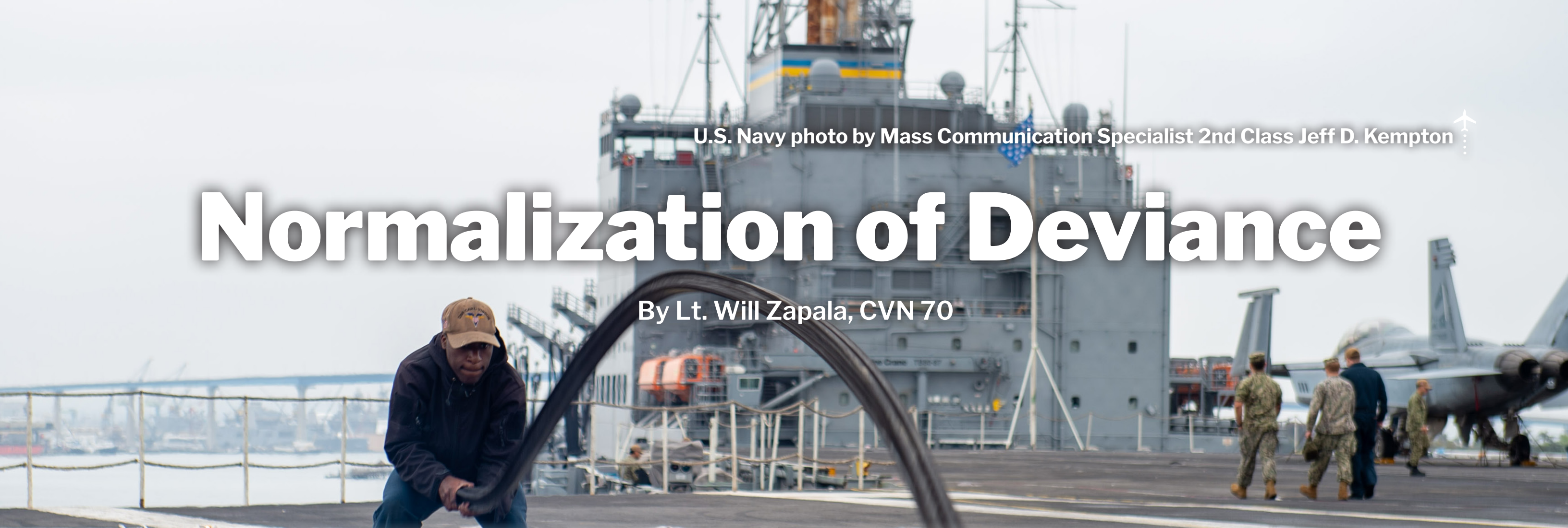
With our feet on dry land and the rotor head stopped, the maintenance team climbed up to find a small hole in the blue dampener line. This had caused the nitrogen-pressurized hydraulic fluid in the reservoir to completely bleed out, inducing the condition we suspected while airborne.

At debrief, we discussed our mistakes. We should have reassessed the unusual vibrations on short final, which would have alleviated the risks to ground personnel and made for only one landing with a serious malfunction. There are procedures for it, after all. For most of the flight, the problem wasn't readily apparent, but when the malfunction revealed itself I made a questionable time-critical decision by prioritizing getting on deck quickly instead of taking the time to make a safe landing.

We did some good things too, though. There were no cockpit warnings for this emergency, but we trusted our intuition when the aircraft was not handling correctly and knocked off training. We knew our aircraft systems and conducted troubleshooting in the interest of mission completion and after aborting, in the interest of safety. We followed our checklists and procedures where we could identify the emergency. When we made mistakes, the crew had the resilience to reevaluate the RM process. In the case of ground resonance, we accepted no unnecessary risk by taking appropriate action during both landings. Lastly, we worked well as a crew, assigned roles, applied teamwork and CRM to bring the aircraft back safely.

Normalization of Deviance

By Lt. Will Zapala, CVN 70



U.S. Navy photo by Mass Communication Specialist 2nd Class Jeff D. Kempton

As America's favorite carrier hits its stride and begins workups in earnest, it's important to keep safety in mind and effectively manage the increased risk of transitioning from planned incremental availability to an operational footing. In that spirit, there is an important safety concept relevant to what USS Carl Vinson (CVN 70) is doing right now – addressing the normalization of deviance.

A normalization of deviance occurs when improper or nonstandard procedures replace the by-the-book approach, to the point that these procedures take the place of the actual procedure. This deviation from procedural compliance can occur through the reliance on corporate knowledge and techniques, or can be the result of not having the means, e.g., the training or equipment, to properly perform the task at hand. If a normalization of deviance is allowed to continue unchecked, this use of the wrong approach will lead to equipment breaking down due to improper maintenance, readiness dropping as Sailors are not adequately and correctly trained in their positions, and even injury or death as safety precautions are ignored or bypassed.

Often, a normalization of deviance is the result of an individual believing they know a better way to perform a task than what is prescribed in the manual. They then take it upon themselves to do things their way instead of following procedures. The new method is often "good enough to get by," and is passed to other people until it is widely adopted despite being against the published procedure. This is not to say publications are always perfect. Our documents often change and improve to account for better ways of doing things. When you have a better way, the key is to use the change request procedures for the publication in question. This allows for an in-depth look at the new method, which will account for any potential consequences or side effects. If the new method is better, it will be added to the publication and become the new standard for the entire fleet.

A normalization of deviance is not necessarily done maliciously; sometimes it is the result of environmental factors. This can be due to lack of training or proper equipment. For example, when I deployed to Sigonella, Italy, with VP-26, the airfield we used did not have aircraft wash facilities capable of supporting the P-8. This meant that for the duration of our deployment, the squadron would be unable to conduct required washes and maintenance because the equipment wasn't available. As a result, the squadron was forced to accept a deviation from procedure due to outside circumstances. However, instead of simply accepting the change and blindly continuing to the point of normalization, we took a couple steps to ensure we remained safe to operate. The first was to notify our chain of command of the lack of required equipment. By letting the commodore know we lacked adequate wash facilities and that this lack would lead to increased risk due to lack of proper maintenance, we were able to get the ball rolling to install a bird bath that could support a P-8. This, however, would take time, which lead us to our second step.

While we waited for a new facility, we held a safety standdown, where we openly discussed the problem, talked about possible interim solutions, and planned how we would monitor these solutions as the deployment progressed.

In other words, we used the five steps of risk management (RM) to mitigate the increased risk we were taking on. By identifying the hazard, assessing those hazards, making risk decisions, implementing controls and supervising those controls, we were able to mitigate the risk to the point that we did not accept any unnecessary risk.

Just as VP-26 used proper feedback channels and RM to fight the normalization of deviance, so too can any Sailor met with environmental pressures to deviate from what is right. By making the problem known, and exercising appropriate RM within the chain of command – even if the problem cannot be fixed immediately, the Sailor can overcome such pressures instead of accepting improper procedures.

Carl Vinson is in the middle of a significant change in day-to-day operation tempo. As we transition from a maintenance period to preparing for deployment, there are deviations we have had to accept while the ship was being taken apart and put back together. We also had a lot of personnel turnover, leading to many new Sailors who haven't had to operate underway and lack training. As we continue through workups, remaining vigilant and enforcing a by-the-book approach are critical to fighting a normalization of deviance and ensuring we prepare for deployment effectively and safely.

RMI Review Addresses Users' Concerns

By Rebecca Coleman, NAVSAFECOM

More than 70 Navy, Marine Corps and civilian representatives from across the naval enterprise gathered here at Naval Air Station Oceana, June 14-15, to address feedback on the Department of the Navy's Risk Management Information (RMI) system.

The Naval Safety Command (NAVSAFECOM), which oversees RMI, hosted the first RMI External Standards Review to discuss nearly 325 comments the command received in response to a request for feedback. Since the Navy's RMI launch in August 2020, NAVSAFECOM has rolled out a series of modules to expand and improve the safety reporting system, which consists of four capability areas: Streamlined Incident Reporting, analysis and dissemination, safety program management and single point of entry.

RMI promotes a safer environment for the naval enterprise by capturing and analyzing safety incident reporting data and streamlining the reporting process. RMI, which replaced the Web-Enabled Safety System (WESS), was built for the Navy and Marine Corps and expands and adds new capabilities onto the Air Force Safety Automated System (AFSAS). Four of the five services, as well as other Defense Department agencies, use the AFSAS platform.

Chris Tarsa, NAVSAFECOM executive director, opened the meeting with an RMI overview, noting the 137 minimum data elements required in RMI are mandated by the Department of Defense (DoD), and the continuous improvement cycle with the phased release of RMI's safety program management modules or capabilities.

"We continually solicit feedback from our customers to make this program better, to hear what our RMI customers are saying and to be responsive and transparent," said Tarsa. For example, one area of improvement addressed the quality of internet bandwidth. Following testing, the Navy implemented enterprise-wide changes making at-sea bandwidth speeds comparable to shore-based speeds, increasing RMI consistency and behavior for users at sea.

During the conference, a robust discussion took place on a number of issues that RMI stakeholders had submitted to NAVSAFECOM before the meeting. Comments addressed a wide range of RMI categories including hazard abatement, analytics, inspections and training; however, the majority of feedback received centered on the investigations portion of RMI. Each comment was discussed with proposed resolutions provided or tabled for further action and follow up either by NAVSAFECOM or by an integrated project team.

Examples of comments ranged from RMI being too cumbersome, the need for additional drop-down fields while inputting data or duplicative drop-down fields and lack of clarity in some sections. A few comments conflicted with the DoD-mandated elements, which were quickly acknowledged.

For the attendees, the meeting was an opportunity to hear what issues other users had encountered, how they addressed problems, and that NAVSAFECOM was listening and receptive to their concerns.

"With any type of system, you're going to have different perspectives, different intentions," said Kimberly Cannon, director, safety engineering, Naval Surface Warfare Center headquarters.

Communication is very important to ensure stakeholders know what to expect, she said. For example, if a module isn't ready by the scheduled delivery date, communicating any delays ahead of time will help alleviate stakeholders' frustration.

One frustration expressed by several stakeholders was a request for additional, or a lack of, training, which NAVSAFECOM Commander Rear Adm. Christopher Engdahl noted. "RMI training is one of the most critical items NAVSAFECOM is working through," said Engdahl.

"We're working hard to figure out the right delivery method to Sailors and government employees. The training has to be ready and relevant to the individual. We may leverage train-the-trainer models, regional SMEs or include online training. NAVSAFECOM is receptive to all suggestions," he said.

WESS was the first of five safety reporting systems that RMI will replace or consolidate. The other four systems are the Enterprise Safety Application Management System, the Injury/Illness Tracker, the Medical, Mishap and Compensation, and Portsmouth Naval Shipyard's Occupational Accident and Injury Report Systems.

To date, the following RMI Safety Program modules are complete: Inspections, Hazard Abatement, Training and Confined Space. The remaining modules are scheduled for delivery through fiscal 2027: Job Hazard Analysis, Medical Surveillance, Self-Assessment, Respiratory Protection, Fall Protection, Operational Risk Management and Safety Committee. Once fully implemented, the modules will help ensure all safety information is captured to help support mitigation and that the functions will perform sufficiently regardless of location.

"The real goal of this program is mishap prevention," said Tarsa. "Learning is lost when we don't really look at the factors that lead up to an event."

At the end of the second day, the commander thanked attendees for their participation and candor and encouraged them to keep the feedback coming. "The goal is to make RMI better," said Engdahl. "It's the program we have, and feedback from the fleet ensures it is getting better every day." He added subsequent meetings will occur at least once a year with next year's agenda building upon this first one.

"You are all part of a growing RMI community of interest, and we must collectively work to make mishap reporting, analysis and investigation better," said Engdahl.

U.S. Navy photo by Mass Communication Specialist 3rd Class Leon Vonguyen

The Dangers of Tactical Dehydration

By Senior Chief Naval Aircrewman (Helicopter) Erica Gibson and Lt. Jarrett Moore, NAVSAFECOM

Proper hydration is a critical element of human performance. However, naval aviators are choosing to tactically dehydrate themselves before flights at alarmingly high rates. Tactical dehydration occurs when aircrew purposely do not hydrate before and during flight to avoid in-flight bladder relief. Tactical dehydration negatively affects the individual as well as the mission. In a recent survey, 92.6% of female pilots and aircrew reported they tactically dehydrate to avoid in-flight bladder relief. This statistic comes from a 2023 survey conducted by the Naval Safety Command (NAVSAFECOM) during safety assessments of naval communities in California, Japan and Spain.

Dehydration by the Numbers

Female aviators and aircrew reported flying between 4 and 8 1/2 hours without drinking water to avoid relieving themselves. Even at rest, the body is losing fluid to insensible fluid loss from the skin, respiration and even water in the stool. Insensible fluid is the amount of fluid the human body loses in a day, without us noticing, which can be almost a liter. Once you add the fluid loss from urine and sweat, you can lose over 2 liters in a day.

It is very easy for us to become dehydrated, and it only takes a 1% loss in bodyweight due to dehydration to affect cognition. To put this into perspective, 1 liter of water is 2.2 pounds. Before stepping into the aircraft, you can place yourself in a significant performance deficit just from not drinking fluids. The aerospace environment is significantly less forgiving for fluid loss. Heat, dry air, activity level in the aircraft and the thermal burden of flight gear all contribute to accelerated fluid loss in flight.

A dehydration study published in 2018 for helicopter and tactical aircraft (TACAIR) pilots found the average fluid loss in flight was 462 milliliters per hour. Although the TACAIR pilots in the study lost the most fluid per hour, an average of 692 milliliters, the helicopter pilots lost the most fluid per flight due to longer flight times. In hotter environments, fluid loss due to sweating may increase to over 1 liter per hour.

Contrary to popular belief, acclimatization does not decrease sweat output. Acclimatized individuals sweat more, but do so more efficiently and earlier than nonacclimatized individuals. Acclimatization will not fully protect you from the threats of tactical dehydration. Research has shown that even before you realize you are thirsty, dehydration is already affecting your cognition. This dehydration places you at higher risk for making a mistake, becoming air sick or spatially disoriented. The NAVSAFECOM survey respondents also reported dehydrating in-flight had caused headaches, dizziness, lightheadedness, airsickness, limited movement, inability to focus – especially during landings, distraction and reduced mission effectiveness.

Survey Results

In the NAVSAFECOM survey, 27 Navy and Marine Corps female flyers responded across helicopter and fixed-wing platforms. In-flight bladder relief was avoided for the following reasons: lack of two-piece flight suits, lack of urinary and containment devices, aircraft configuration, lack of privacy, need to completely remove aviation life support system gear, wearing drysuits, inconvenience to the crew or flight plan schedule, and mission requirements. With this in mind, what can naval leadership do to implement change toward alleviating these issues?

Two-piece Flight Suits

One of the primary issues is two-piece flight suit funding. The current cost difference between the CWU-27/P traditional flight suit versus an open purchase two-piece flight suit is about $500-$600. Squadrons are hesitant to spend the difference when it comes to managing their 7F funds. As a result, many flyers – enlisted and officer – purchase two-piece flight suits out of pocket. Naval Air Systems Command's (NAVAIR) Aircrew Systems Program Office, PMA-202, submitted a cost adjustment sheet to the resource sponsor, N98, to plus-up 7F funds to help address the cost difference.

Two-piece flight suits provide a convenient way for pilots and aircrew to relieve themselves in-flight without having to remove their vest and helmet, which subjects them to other hazards. This is as much of a safety issue as it is a biological problem to solve. Last year, the Navy rolled out flame-resistant, two-piece organizational clothing to enhance safety and protect shipboard Sailors during fires, at no cost to the Sailor. It's 2023, and we are still issuing flight suits originally designed for male aviators in the 1960s. One solution for our flying warfighters is to outline a requirement that addresses current capability gaps in flight clothing and equipment to mitigate tactical dehydration.

Lack of Privacy, Devices and Training

Lack of privacy in the aircraft is another concern for in-flight bladder relief. For aircrew, you can work with your paraloft or flight equipment (FE) work centers to build privacy curtains with Velcro for easy installation and removal in the back of the aircraft. If female aviators are in a platform constrained to the cockpit that does not allow movement around the aircraft (MH-60R, MH-60S, F-18, F-35, etc.), there is an in-flight bladder relief device in the supply system called Skydrate, formerly called the Advanced Mission Extender Device. Training and ground testing are vital to ensure successful in-flight use of this device. Many aeromedical safety officers (AMSOs) are trained on this device and can provide squadron-level training for aircrew. Your AMSO can also contact Omni Defense Technology to send one of their team members to provide local training on the device. The Skydrate device can also be integrated with drysuits with an approved modification in paraloft or FE work centers. Finally, it is important to note the Skydrate is a hands-free system, which frees pilots to focus on mission tasks.

Many pilots and aircrew are not confident in these devices, or even know they exist, due to lack of familiarity or training. In the NAVSAFECOM survey, 88.9% reported they do not fly with a relief or containment device. Unfamiliarity or lack of education with NAVAIR 00-80T-123, Aircrew Systems NATOPS Manual, is also an issue. Although not an extensive list, pilots and aircrew can find a few relief systems approved for in-flight use in Chapter 13. Several survey respondents reported purchasing and using the "Shewee Flexi," a flexible female funnel cup with a tube extension that can be purchased with a case online. Whether this will fit into aircraft pre-installed relief tubes is questionable, and flyers will still need to acquire some type of containment device.

Reporting

Due to a lack of reported data, NAVSAFECOM requests all aircrew submit an Aviation Safety Awareness Program (ASAP) report when issues with bladder relief impact the warfighter and the mission. The ASAP data can be used to bolster and increase the attention given in hazard reports (HAZREPS). HAZREP and ASAP data can help NAVSAFECOM work with stakeholders to provide better materiel solutions to the fleet. Whether submitting an ASAP or HAZREP, include the following: Did you tactically dehydrate out of necessity? Did it affect your performance? What do you need to fix this issue? Tactical dehydration is an insidious and widespread problem across the fleet. Although it affects male and female pilots, naval flight officers (NFOs), and aircrew, it is a significant concern that presents unique but solvable challenges for our female flyers. Currently, 12.4% of operational pilots and NFOs are female and 15.9% of student naval aviators are female, which is an upward trend. The TACAIR community has adopted in-flight bladder relief systems to greater effect than the rotary community, despite the fact that helicopter sea combat squadron and helicopter maritime strike squadron communities currently have the highest proportion of female pilots and aircrew in the Naval Aviation Enterprise. Moving forward, these numbers will continue to grow – and so will the problem if we do not fund solutions and educate our warfighters on in-flight bio relief options.

BRAVO ZULU

★ SAILORS AND MARINES PREVENTING MISHAPS ★

Maj. Brendan O'Donnell
VT-21

While flying as a wingman during a formation student training sortie, Maj. Brendan O'Donnell's T-45C suffered a Hydraulic 2 failure shortly after takeoff from Naval Air Station Kingsville, Texas. O'Donnell informed his flight lead of the malfunction and turned back toward the airfield while coordinating with the tower to enter the delta pattern. After reviewing the emergency procedures checklist with his flight lead and the wing duty officer, O'Donnell safely recovered his aircraft from the delta pattern. Without O'Donnell's timely recognition of his aircraft's malfunction and expert troubleshooting, an uneventful landing may not have occurred. Bravo Zulu to Maj. Brendan O'Donnell for executing textbook procedures, demonstrating expert decision making and displaying superb airmanship that resulted in the safe recovery of his aircraft!

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

5G Interference

By Lt. j.g. Kevin Bender, VP-45

5G is the fifth-generation telecommunications technology used for broadband cellular networks that cellphone companies began deploying worldwide in 2019. This technology is the replacement for the 4G service that many cell phones currently connect to. All 5G cellular devices are connected to the internet and telephone network through a local antenna housed inside the cell phone. 5G provides the user with greater bandwidth, leading to faster download speeds and allowing more users to connect to the internet in crowded areas. However, because of the frequency spectrum in which 5G operates, concerns regarding interference from the new technology have surfaced in the aviation industry.

5G Rollout and Aviation-Related Effects

In January 2022, wireless providers including Verizon and AT&T strongly disagreed with government transportation officials over the rollout of the long-awaited 5G service. The Federal Aviation Administration (FAA) and Department of Transportation expressed worries about the potential for the new 5G package to create interference. Verizon and AT&T spent a combined $81 billion to secure the wavelengths needed for the 5G network from the government and were ready to begin providing the service. FAA representatives stated because 5G operated in a range of wavelengths referred to as the C-band, spanning from 3.7-3.98 GHz, they believed it could affect aircraft radar altimeters, which operate in the neighboring 4.2-4.4 GHz range. The FAA warned some older aircraft use radio frequency (RF) filters in their altimeters and would lack protection from interference from neighboring RF bands. This interference could render radar altimeters temporarily useless, leading to safety hazards during low-visibility approaches and landings. The FAA issued a series of airworthiness directives regarding their concerns before the release of 5G:

"The FAA is adopting a new airworthiness directive (AD) for all transport and commuter category airplanes equipped with a radio (also known as radar) altimeter. This AD was prompted by a determination that radio altimeters cannot be relied upon to perform their intended function if they experience interference from wireless broadband operations in the 3.7-3.98 GHz frequency band (5G C-Band).

"This AD requires revising the limitations section of the existing airplane/aircraft flight manual (AFM) to incorporate limitations prohibiting certain operations requiring radio altimeter data when in the presence of 5G C-Band interference as identified by Notices to Air Missions (NOTAMs)."

The excerpt above is from the FAA Airworthiness Directive Docket No. FAA-2021-0953; Project Identifier AD-2021-01169-T; Amendment 39-21810; AD 2021-23-12.

The Future With 5G

Following a two-week delay of the originally planned rollout in early January 2022, an agreement was reached with government officials on Jan. 18, 2022. Beginning Jan. 19, Verizon and AT&T introduced 5G across the United States, agreeing not to place 5G transmitters and receivers near the 50 largest U.S. airports for six months – until a solution was worked out. With the end of the six months behind us, the impact of 5G is still yet to be fully determined.

On June 17, 2022, the FAA provided an update stating progress had been made, but cellular companies agreed to keep some level of voluntary mitigations on the technology until mid-2023. The FAA, in turn, agreed that "airlines and other operators of aircraft equipped with the affected radio altimeters must install filters or other enhancements as soon as possible." The current timeline is aiming at near-completion by July 2023, which would allow 5G to run with minimal restrictions.

Since the rollout of 5G, U.S. safety regulators have received hundreds of statements on pilot-reported interference. However, some reports of 5G interference have occurred in places without C-band, suggesting no connection with the service. The FAA has been testing different aircraft model altimeters and clearing the models they find resistant to the interruption. However, this is only a short-term fix

– not a definite solution to the issue. Although 5G is here to stay, aircrew must remain informed and aware of potential risks to remain safe in an ever-changing aviation environment.

Managing the Threat of 5G

Prepare
On any flight, a good preflight and thorough brief can make all the difference. FAA AD 2021-23-13 states its "report further concludes that the likelihood and severity of radio frequency interference increases for operations at lower altitudes." Therefore, aircrew should prepare for the potential of 5G inference most during low-level operations and critical phases of flight. The preflight process does not change in preparing for the threat of 5G interference; however, a more in-depth look at airfield information can help a crew mitigate the threat.

When checking airfield NOTAMS, make note of any notices pertaining to 5G interference. This should automatically clue the aircrew into the mindset that 5G interference could be a threat at the airport. However, just because there isn't a NOTAM for 5G interference at an airport doesn't mean the crew shouldn't remain vigilant.

Checking weather for a flight is always a critical component; however, the threat of 5G interference can add some extra factors. For the maritime patrol and reconnaissance aircraft (MPRA) community, P-8A-IFC-045, a change to the Naval Air Training and Operating Procedures Standardization program that was published around the time of 5G unveiling, states "When operating in US airspace, CAT II Instrument landing system instrument approach procedures requiring radio altimeter are prohibited in the presence of 5G C-band wireless broadband interference as identified by NOTAM except in VMC." If the weather at a certain airfield is projected to be instrument meteorological conditions (IMC), and the potential for 5G interference exists, a more thorough crew discussion should take place about the potential threat and hazards of 5G obstruction in IMC conditions. Lastly, during the preflight brief, have the crew resource management discussion with the crew about the potential for 5G interference and how the crew can safely repair and recover.

Repair
Erroneous radio altimeter inputs could cause other systems to behave abnormally at any time during flight, but most critically during takeoff, approach and landing. The pilot may not be able to recognize these unusual signals in time to maintain a safe flight and landing. Aircrew and pilots should be aware of aircraft systems that integrate the radio altimeter and follow all standard operating procedures and emergency procedures related to auditory warnings and alerts from aircraft safety systems. Automation could create issues with flawed radar altimeter information, therefore pilots should consider turning off automation and hand-flying the aircraft until recovering from the undesired aircraft state.

If at any time the aircrew experiences what they believe to be 5G interference while operating, maintaining safe control of the aircraft is paramount. Discontinuing an approach or going around while taking time to troubleshoot and identify the issue may be the best course of action. Inform air traffic control (ATC) of possible 5G interference, as well as your intentions, and continue to troubleshoot.

Recover
Once the aircraft is in a safe position and no longer in an undesired aircraft state, a more in-depth report should be given to ATC about the 5G interference.


Courtesy Photo

As an example, the MPRA P-8A-IFC-045 states, "Pilots who suspect radio altimeter anomalies due to 5G interference shall report per Para 5 as soon as practical. Reported incident details shall include but are not limited to: a) Erroneous, lost or unexpected change in radio altimeter altitude; b) Intermittent availability (frequent OFF flags); c) False warning indication (lower altitude); d) Errant EGPWS cautions/warnings and e) Where the incident took place (airport, runway), distance from airport and altitude." These reports provide ATC and the FAA with data points about 5G interference and provide warnings for other aircraft. After experiencing 5G interference and if in a training environment, aircrew should consider knocking it off and either returning back to their origin airfield or conducting training at an alternate airfield. If in visual meteorological conditions (VMC) and the aircraft state is in a safe position to land, a visual landing should be made. If in IMC conditions and the use of radar altimeter is essential to land the aircraft safely, a divert should be made to an alternate field with better weather where a safe landing can be made.

Editor's note: Information in this article is current as of May 2023.

U.S. Navy photo by Mass Communication Specialist 1st Class Juan Sebastian Sua

PE Corner

By Lt. Cmdr. Philip DeNicola

In our third edition of PE Corner, we have a few short notes and a focus piece on breathing dynamics, proper fit and wear of the harness and the reasoning behind the Strategic Air Break (SAB).

First up, a reminder of the physiological margin degraders and the impacts these have on performance during a flight. Adequate sleep, hydration, nutrition, fitness, stress management and fatigue awareness each play a vital role in how effective your body will be at performing and coping with G-forces, dynamic maneuvering, cabin pressure, altitude changes and breathing dynamics, to name a few. Being well rested, hydrated and fueled will allow your body to handle these rapid and sometimes unexpected changes to our environment.

As we discuss further in our focus article, the importance of using the SAB cannot be understated. Allowing your body to have a break from the mask's increased pressure and oxygen levels enables your body to return to a more normal state and relieve stress from your cardiovascular system. Just remember to double-check your cabin altimeter before removing the mask.

As we mentioned in the last edition, below are the top reporting squadrons for Slam Stick data for January and February. Of note, there was an issue with March data that is being resolved.

January

1. VAQ-129/VAQ-132 100%
2. VAQ-136 96.77%
3. VAQ-134 96.61%

February

1. VAQ-132 98.21%
2. VAQ-131 97.47%
3. NFDS 96.85%

Additionally, Capt. Luke Davis has departed PMA-265, and in his place is Maj. Ben Keller, who is currently filling the F/A-18E/F and EA-18G Class Desk role at PMA-265.

NAVAIR Assist (Oceana)

During the week of April 17, a team from Naval Air Systems Command was onboard Naval Air Station Oceana, Virginia Beach, to evaluate and support squadrons with Environmental Control System (ECS)-related maintenance and supply issues, flight gear wear and provide training on Hornet Health Assessment and Readiness Tool and other changes in the pipeline for flight gear and F/A-18 EFG ECS. During the visit it was noted not everyone was losing the anti-rotation straps on the harness before flight gear don/doff, torso buckles were touching on the back of the harness, torso harness chest straps were too low and life preserver units were placed too high on the neck. If you or your aircrew survival equipmentmen (PR) are having issues with proper flight gear fit and wear, contact the PEAT and we can assist or get you in touch with subject matter experts (SMEs). Also, if you or your PRs would like to have someone come in to help train maintainers and aircrew, PMA-265's team is happy to help.

RMI & HFACS 8.0

The DoD HFACS 8.0 went live for all Departments of the Navy and Air Force events starting April 1, 2023. Based on feedback from fleet users, safety analysts and human factors SMEs, the update is intended to reduce loaded terminology, improve cross-platform applicability and enhance the clarity of code definitions. Within Risk Management Information (RMI) and the Air Force Safety Automated System, the shift to version 8.0 is accompanied by a change in business rules that will link human factors (HFACS) codes directly to mishap factors rather than to findings.

For more information on HFACS 8.0 changes, view the new flipbook

The current version of the RMI Operating Guide is version 5. Check the Naval Safety Command (NAVSAFECOM) Aviation Safety Officer Toolbox page, or contact your NAVSAFECOM analyst for a copy.

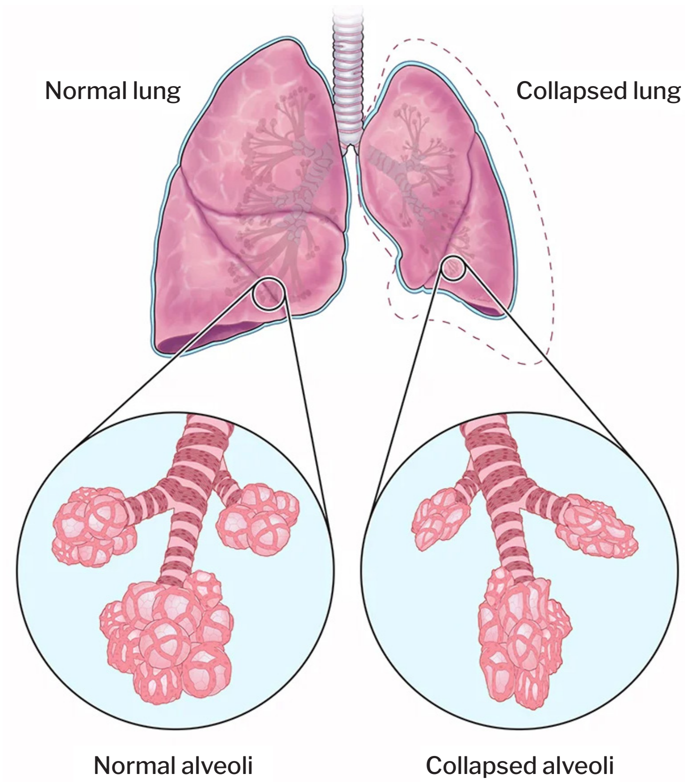
View the ASO Toolbox page

Contact us at PEAT@us.navy.mil.

Just Breathe

Breathing is a seemingly automatic process for most healthy adults until it is done in a high-performance aircraft capable of pulling 7.5 G's while wearing a mask and flight gear. In this environment, breathing can become a more conscious task that requires additional effort to keep you safe and alive. Executing a proper anti-G straining maneuver, especially the breathing component, is emphasized early in your career and is crucial for keeping the lights on after saying “fight’s on!” What you may not know is that your breathing during nondynamic portions of the flight impacts performance during the dynamic phases. Lessons learned from efforts to understand and mitigate physiological events (PEs) has taught that small degradations across several variables can stack up to produce meaningful performance deficits or adverse physiological symptoms.

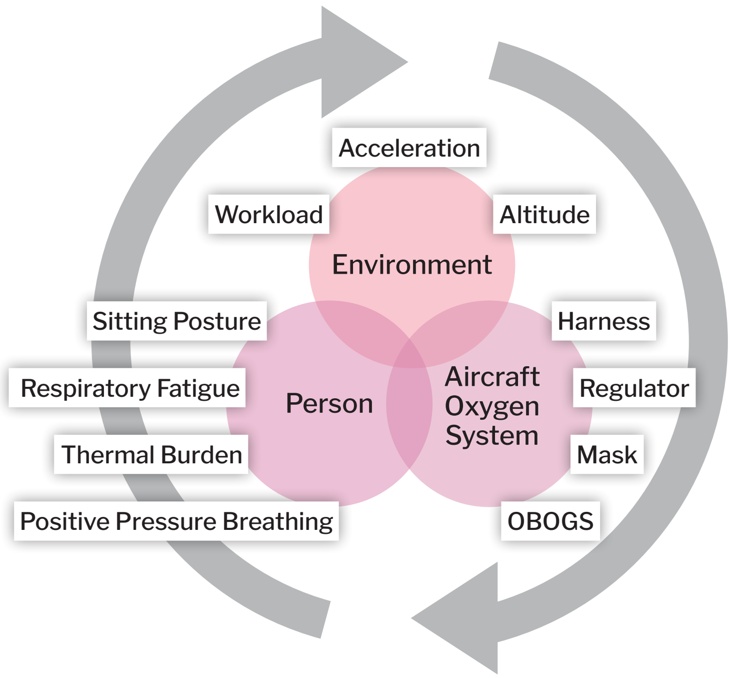
Atelectasis



Atelectasis in the lung(s) leads to the collapse in alveoli which reduces or stops gas exchange. Illustration by the Cleveland Clinic.

The physiological process of breathing is one of those variables that can be significantly impacted by atelectasis in the flight environment. Atelectasis is the collapse of the alveoli (air sacs) in your lungs which serve as the critical location for gas exchange between your blood and the air you breathe. There are two primary mechanisms leading to atelectasis that are important to understand in aviation: absorption atelectasis and acceleration atelectasis. Different gases are absorbed by the alveoli at varying rates with oxygen being relatively quickly absorbed compared to other gases. Breathing normal ambient air with 21% oxygen and 78% nitrogen, the body absorbs the needed oxygen but there is still plenty of nitrogen left behind to keep the alveoli expanded. As you increase the percentage of oxygen in the inspired air, the body keeps absorbing the oxygen at a faster rate than the nitrogen, meaning that over time there can be less nitrogen left to keep the alveoli expanded. When those alveoli collapse, the blood continues to flow through the vessels around the alveolar walls but the gas exchange process is not occurring (or not occurring as effectively as it normally does). This process is a common occurrence in patients receiving high levels of oxygen during surgery as well. A related, often compounding, type of atelectasis is caused by the effects of Gs on the lungs. When the lungs are pulled down under G-force, the alveoli in the base of the lungs can collapse, producing a localized atelectasis. When you combine the two processes together, it can become additive and lead to further performance decline. In healthy aviators, you may not notice this change initially due to a large reserve of capacity that is able to overcome these temporary challenges.

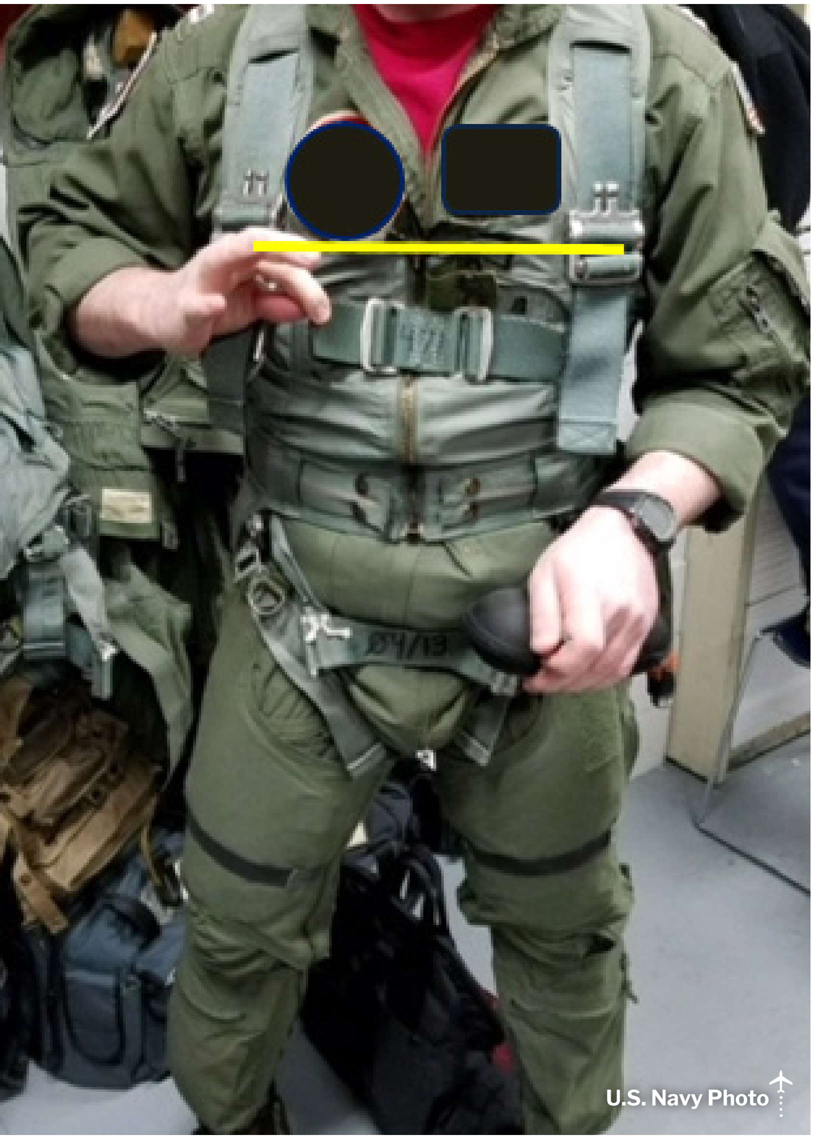
Breathing Dynamics



In-flight breathing dynamics.

Breathing dynamics in the flight environment are very different in sitting position, G-forces and other human factors. Acceleration atelectasis can be caused by as little as 3 G’s and as few as two subsequent 5-G exposures which can reduce your lung capacity by 60%. Breathing high concentrations of oxygen further exacerbates this condition. Another issue in flight is lung compliance, which is the ability of your lungs to expand. A reduction in lung compliance increases your work of breathing and can change your breathing dynamics. Poor posture, an improperly fitted or incorrectly worn parachute harness and expansion of the abdominal bladder in your G-suit can all lead to a reduction in lung compliance and make it harder to fully expand your lungs. All these factors can increase the likelihood of developing atelectasis. Taking deep breaths is an important way to re-inflate collapsed alveoli in your lungs. Maintaining good posture and avoiding the “helo-hunch” will also help with improving lung compliance. Pay particular attention to the fit of your parachute harness as a low chest strap placement will reduce your ability to take deep breaths. Ensure your chest strap is at or slightly above nipple level. Your G-suit must also fit properly to reduce the potential adverse effects it can have on your diaphragm movement. Ensure proper abdominal bladder placement and that you have at least two fingers’ worth of room

Continued on Page 22»



The yellow line indicates proper chest strap position on the parachute harness.

between your abdominal bladder and the lower edge of your ribcage. If you gain or lose 5 pounds, get your G-suit re-fitted!

Our breathing conditions also change while wearing a mask. Under normal conditions when not wearing a mask, inhalation is an active process driven by your diaphragm pulling down, while exhalation is passive. When breathing with a mask, you receive air with a slight positive pressure and then exhale against that same positive pressure. With a normally functioning mask, this effect may be mild, with the slight positive pressure not even noticed by the aviator. However, a dirty or improperly functioning mask can result in imbalanced mask pressures and flows leading to a significant increase in the work of breathing.

Clean your mask after each flight with approved isopropyl alcohol wipes that are damp and not saturated. Pay particular attention to inspecting your inhalation and exhalation valves if you ate before or during your sortie. Something as small as a crumb or hair can have a negative impact on the function of either valve.

The good news is there are simple, actionable steps aircrew can take to reduce the potential effects of absorption or acceleration atelectasis. Once these types of atelectasis are resolved and the alveoli re-expand in healthy aviators, there are no lasting detrimental effects to lung function or damage to the actual lung. The alveolar sacs re-inflate and function the same way they did before they collapsed.

The Root Cause and Corrective Actions (RCCA) initiative identified implementing strategic air breaks (SAB) and the Aircrew Controlled Breathing Cycle (ACBC) as part of the top 20 recommendations to decrease PEs. As a result of those recommendations, the SAB and ACBC were added to the CNAF M-3710.7 in 2020. A SAB involves taking the mask off during non-dynamic portions of the flight when your cabin altitude is below 10,000 feet. This allows for air containing more nitrogen to be reintroduced to your alveoli, helping to keep them expanded. The ACBC is a rhythmic cycle that uses deep breathing to provide the mechanical impetus to re-inflate the air sacs, thus allowing for their participation in gas exchange again. The ACBC is accomplished by taking a slow and deliberate deep breath for five seconds, holding the breath for three to five seconds, and then exhaling for five seconds. This process can be repeated up to five times. A SAB and ACBC are recommended at the following times:

1. Pre-G. Before entering a high-G engagement (not necessary if breathing from the mask for less than 30 minutes prior to the engagement).

2. Post-G. At the completion of the high-G engagement.

3. Post-Flight. After removing the chest restraint harness.

4. Transit. Every hour during long transits.

5. As required. Anytime aircrew feel "washed out," "not 100%" or overly fatigued during or after flight.

Cultural change is challenging. Traditionally, you were trained to stay on your mask from takeoff to landing. Based on years of research, you are now being trained to take off your mask and execute a SAB and ACBC periodically throughout the flight when the above conditions are met. This is a positive change that has the potential to minimize or eliminate breathing-related physiological margin degraders while improving performance. It is imperative to implement the SAB coupled with ACBC into your habit pattern during flights. Encourage students and nugget aviators/flight officers to do the same and explain the importance of this change. This is an important step toward treating aircrew like warrior-athletes instead of simply a pilot or naval flight officers. Executing this method and ensuring proper fit and function of flight equipment will allow you to expand your potential, prevent adverse symptoms and remain in the fight.

Stay safe and don't forget to breathe!

U.S. Marine Corps photo by Lance Cpl. Jacqueline C. Arre

Cold Weather Operations

By Lt. Matt Post, VP-45

Cold weather operations in the P-8A Poseidon aircraft have recently become more pertinent to the ever-changing world and the areas in which we operate. Cold weather operations add a significant complexity on top of already intensive standard procedures. Pilots must take the necessary extra steps to execute the mission safely. Successful cold weather operations start with the most important stage, flight planning. This stage is considered most crucial due to the mitigation or ability to avoid difficult situations to make the actual flight operation smoother with fewer difficulties.

In flight planning, looking at weather forecasts and trends are some of the most important indicators of what is to come when starting the initial assessment of how to prepare for cold weather. This planning will help prevent surprises and allow you to flex and make the preflight process easier until takeoff. Some surprises would involve icing on taxi or runway surfaces, overall bad weather in the area and alerts for de-icing or anti-icing procedures that may be required before takeoff. With this extra situational awareness, you, as the flight crew, can make appropriate decisions and better grasp the situation. Studying weather in the flight planning stage will also pay dividends in flight. Pilots can anticipate and avoid adverse cold weather conditions, icing layers and winter storms. Another essential step of the flight planning process is determining your airfield's cold weather capabilities and limitations. Look for things like de-ice and anti-ice fluid types and their application procedures, airfield snow removal equipment, runway condition reports or even the ability to issue SNOWTAMs, a special series Notice to Airman and Mariners (NOTAM) that provides a report describing the presence or cessation of snowy and icy surface conditions. Having information early on is vital to stay on the mission's timeline.

On top of routine preflight procedures, some additional steps and considerations make cold weather operations complex. In chapter 17 of the Naval Air Training and Operating Procedures Standardization (NATOPS) program, the exterior inspection and preflight procedures have additional steps and requirements that must be met. Steps like checking airframe surfaces, valves, static ports, intakes and universal aerial refueling receptacle slipway installation (UARRSI) doors become even more important. Most important is inspecting the wings and control surfaces. By properly checking these items, pilots can identify where residual ice and snow reside and can ensure de-icing and anti-icing is done correctly to remove the hazards. Ice and snow frozen in pitot tubes and static ports can create erroneous indications in the flight deck and result in stalls, overspeeds or total aircraft loss. Ice and snow buildup on lift surfaces can disrupt linear airflow, destroying lift and induce stalls. Cold soaking is one of the conditions that can put the wing surfaces in a degraded state. Cold soaking occurs when a large load of cold-soaked fuel touches the wing surface after long flights and causes frost on the wings' upper and lower surfaces. If there is significant frost buildup on the wings, the aircraft will need to be de-iced before takeoff. Another check that can affect whether you can complete the mission is the UARRSI door. If this door is not checked on preflight to ensure it is closed and free of snow and ice, it could prevent aerial refueling execution and jeopardize the mission. This is a small step that greatly impacts how the mission is executed. The cold weather operations preflight procedures in chapter 17 are imperative to understand and follow. Complying with these procedures will help prevent mistakes that could be fatal to the mission's success.

While ground operations for the P-8A are relatively benign during good weather conditions, cold weather ground operations become highly dynamic and must be approached with focus and care. One obstacle is single pack operations on the ground when using wing anti-ice. Bleed air is routed to the wing anti-ice system to provide warm air to the leading edge of the wings and is rerouted away from the on-board inert gas generating (OBIGGS) system. This could result in a delay in the inerting process or a fault that the air cannot be properly inerted. Another scenario that may occur is prolonged engine operation that requires periodic engine run-ups to minimize ice buildup. Ice shedding procedures require you to find open, ice-free areas on the airfield, which can hamper your ability to take off on time. Ice, snow, slush, or standing water are potential hazards when taxiing to the ramp or approaching the runway. The NATOPS states when taxiing during cold weather to use reduced speeds, smaller control inputs and symmetrical thrust application to help maintain directional control. Taking it slow and steady will pay big dividends in safely making it to your departure runway. De-icing or anti-icing procedures can have significant impacts on mission timelines. Something as simple as what type of fluid can determine how much time you have to get off deck or if you need to adjust to get off deck. Referencing the FAA holdover tables and calling the field to see what fluids they use in the mission planning stage can help you mitigate potential delays or the task's complexity. Ensuring range of motion with your flaps and your pre-takeoff engine run-up are key procedures that ensure vital system function before a critical phase of flight and mission effectiveness. These examples are but a small portion of what constitutes a safe and effective operational and capable crew in cold weather.

Cold weather operations are a complexity that cannot be brushed off or taken lightly. That is why adhering to our normal and cold weather procedures is vital in ensuring the safety of the crew and aircraft and giving us the best chance to get off deck and execute our mission.

Deliberate Process Improvement

Promoting a Culture of Aviation Safety

By Lt. j.g. Jihoon Heo, CVN 77

U.S. Navy photo by Mass Communication Specialist Seaman Christopher Spaulding

The phrase "written in blood" is commonly used in aviation and aviation maintenance about procedures in publications to underscore the importance of following each step in sequence, and heeding notes, cautions and warnings. Even when maintenance is completed correctly, there may be room for error.

This was the case aboard the Nimitz-class aircraft carrier USS George H.W. Bush (CVN 77) on multiple occasions during pre-deployment training and an eight-month deployment to U.S. Sixth Fleet area of operations.

While moving an aircraft in the hangar bay, a SD-1D aircraft spotting dolly failed during the strike group's final deployment certification exercise. The arms of the dolly separated from the nose gear causing the aircraft to drop. When it dropped, it struck the dolly operator on their head which was protected by a cranial. Although the Sailor walked to medical under their own power, they were flown off ship later for further evaluation.

An investigation into the incident found the arms of the dolly failed due to a loss of hydraulic pressure. After reviewing the publications, including the pre-operational checklist, there was no step in the procedures to check the emergency spread valves. Had those been checked on the SD-1D dolly that struck the Sailor, it would have prevented the incident.

A few months later, the ship was rocking due to heavy seas and winds. A squadron checked out a utility crane to perform maintenance on a horizontal stabilizer. While performing a pre-operational check, the crane tipped over, fell, causing damage to the boom cable. Thankfully, no Sailors or aircraft were injured.

Again, an investigation into the incident found that Sailors performed required pre-operational checks. However, they hand-cranked the crane above the recommended height before the legs of the crane were spread. This caused the crane to tip over. The investigation concluded that the pre-operational checklist did not mention using tie-down chains with the crane when spreading the legs and bringing the crane at full height, despite the maintenance publication outlining the requirement. Investigators and Sailors alike thought, "If the maintenance publication says that, why didn't the pre-operational checklist say it as well?"

After discussion with engineers and subject matter experts from Naval Air Warfare Center Aircraft Division (NAWCAD) Lakehurst, they learned that this was not a first-of-its kind incident. The engineers and subject matter experts mentioned that it had occurred on several other afloat commands.

In both cases, George H.W. Bush's Aircraft Intermediate Maintenance Department (AIMD) submitted Category 1 Technical Publication Deficiency Reports (TPDR) which were immediately approved.

The moral of the story? Maintainers and leaders across the Fleet need to be familiar with and use the Navy's deficiency reporting programs when issues arise. It is the only way that we become more safe and efficient as an organization. The next time you are performing maintenance or conducting a pre-operational check, remember every step, note, caution or warning was written in blood.

Accelerate Your Stalls

U.S. Navy photo by Mass Communication Specialist Petty Officer 2nd Class Griffin Kersting

By Capt. John Morrow, VT-3

It was a normal T-6B contact training flight in the working block at 14,000 feet, conducting an approach turn stall following an uneventful departure and profile up to this point. The student was on controls, with gear and flaps extended. The initial recovery was less than stellar, but nothing out of the ordinary. After relaxing the nose just a little too much, the student yanked the stick back to get the angle of attack (AOA) back in standards; he's got his Navy standard score to worry about and isn't about to let that AOA drop. As soon as the AOA started to climb up, it was not going to slow down after that solid pull back, leading to a secondary stall and roll causing a spin.

The instructor pilot (IP) took the controls and positioned them for the appropriate recovery. With the altitude bleeding down rapidly and no sign of regaining flight, the IP was slightly more than curious as to why. Passing 10,000 feet, the IP looked around the cockpit for options, and those three green gear lights were the indication he needed. The IP quickly cleaned up the configuration and once those started coming up, the plane snapped out of the spin around 8,000 feet.

The venerable T-6B is a great platform to introduce burgeoning aviators to the fine line between controlled flight and falling through the sky. That line gets relatively thin during slower flight regimes, especially when gear or flaps are extended in the Texan; which tends not to recover from out-of-control flight (OCF) until you clean up. Until recent changes to the training syllabus, accelerated stalls were not on the majority of students' mind – until they mess up their stall recoveries just enough to experience one firsthand, creating a unique flight risk. Two commonly experienced inadvertent entries result from excessive nose-up during landing pattern stalls and nose-high unusual-attitude recovery with aggressive use of the elevator.

At no point during the landing pattern stall maneuvers should the aircraft reach a complete stall. At first indication of stall: apply max power, level the wings and control the rudder during a 14.0-17.9 AOA (the course training standards that the student is well aware will be the difference between getting his No. 1 choice or flying helos) recovery to a positive vertical speed indicator. Depending on the aircraft's "personality," once a full stall is reached with gear and flaps down, an aggressive roll-off sometimes results. The aggravated stall usually occurs once the nose has dropped, the student naval aviator (SNA) finally looks at his AOA, which is usually well below desired during early flights, and lurches the control stick back. The Naval Air Training and Operating Procedures Standardization charts indicate that anything more than 1.5 G's will put the plane into an accelerated stall. And if the IP does not immediately correct with appropriate nose-down before the stall, then the roll-off can lead to an OCF condition that is unlikely to recover without bringing the gear and flaps up.

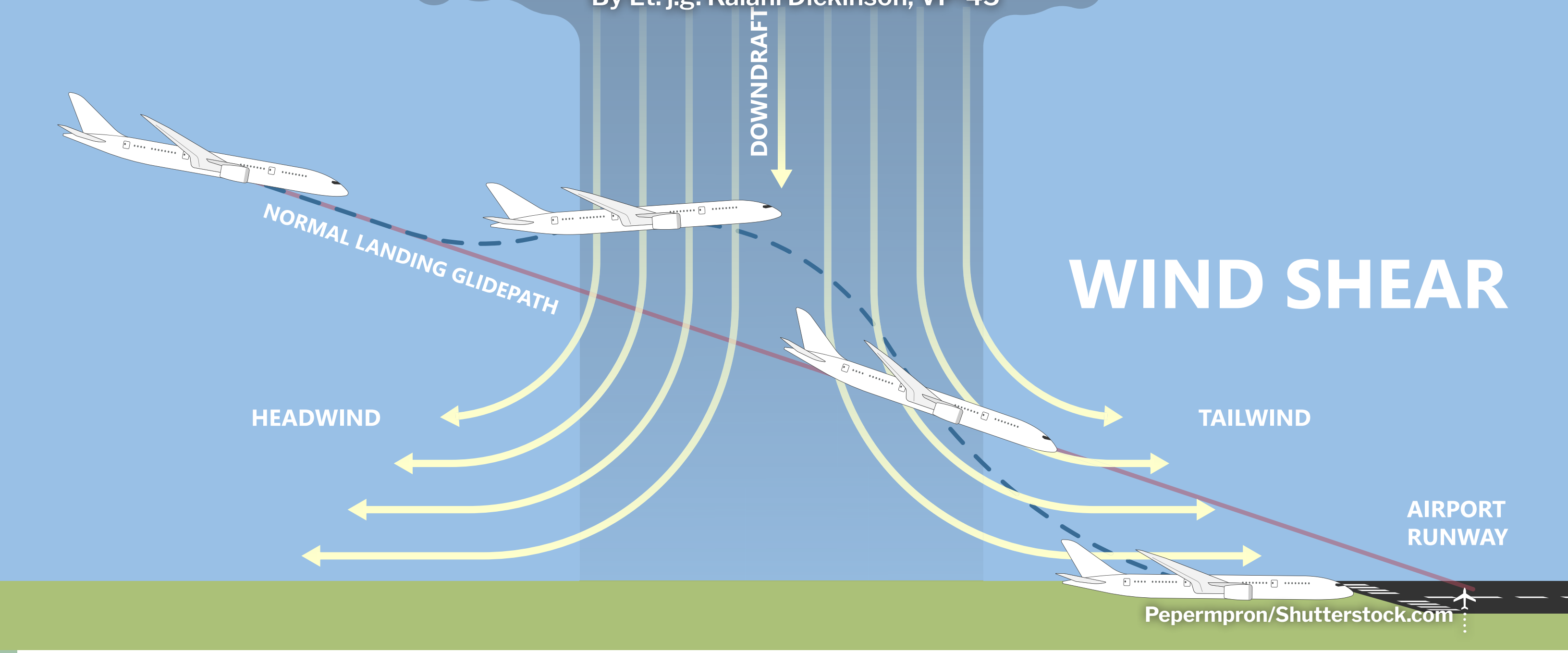
One litmus test to note how likely the student is to induce this error is to note the pneumonic that's used when briefing stall recoveries with the student. "Max-Relax-Level-Ball" or "Max-Freeze-Level-Ball." When the recovery is initiated, the plane should not be in a stall, and when taking out any angle of bank (AOB), the vertical lift usually increases. The majority of the time, only a lateral stick movement is required (freeze, i.e., no forward movement). However, if a full stall is reached due to improper recovery or bumpy conditions, without the "relax" step, the SNA will completely freeze. When the "relax" step is used and the nose-down step is part of their recovery procedure every time – starting from the first exposure, SNAs tend to have the muscle memory to initiate a proper recovery.

During nose-high unusual attitude recoveries, the IP can decide how aggressive the required recovery should be and how close to an OCF condition the plane is when given to the student. Arguably, the best training occurs further away from straight-level in this case. A common setup would be about 60 degrees nose-high, mid-range power setting, with airspeed decelerating through 130 knots. At the command of "recover," the SNA has enough control authority to delay a few seconds before putting in mostly correct, smooth inputs and recovering safely and comfortably for all involved. Overall, plenty of buffer is built in before IP input is required, if the student makes an incorrect input. However, the tendency for the SNA to pull more Gs usually leads to an accelerated stall with nose-high (to reach the accelerated stall in this regime is 1.3 G's). The plane is now inverted with the preconditions for a spin. The only AOA indicator on our plane is located on the left wing; pilots should recognize which controls and surfaces are stalled and what inputs are required to return the aircraft to a controlled state.

Both maneuvers are usually executed during the high-work portion of the event with ample altitude to recover. Most events during the contact phase tend to have both maneuvers on the planned profile. Every few months, someone comes back with a "good" story concerning one of these two accelerated stalls. But inevitably, it seems like the knowledge of these types of events comes and goes as time passes since the last "close call," with most newly minted IPs unaware of all but the biggest near-misses or mishaps of the past. With consistent ready room discussions, collecting and disseminating the "So there we were" firsthand accounts and demonstrating these types of flight errors during IP-IP events, squadron cadre will be better prepared to recover safely. One of the most tangible ways to instill that safety culture in the students flowing through is to teach the habit of mishap and hazard report reviews. Most pilots will not have enough fuel in their careers to make all the mistakes themselves. We need to get these potential aviators, and just maybe the warriors on the flight lines, to dig deep into the publications and look back at lessons learned.

Wind Shear Avoidance

By Lt. j.g. Kalani Dickinson, VP-45



Pepermpron/Shutterstock.com

> *" . . . shears exist that are beyond the capabilities of any pilot or airplane."*
>
> — FAA Advisory Circular (AC) 00-54, Nov. 25, 1988.

The advisory circular noted that a series of accidents and incidents from 1964 to 1986 identified wind shear as a contributing factor in over 600 fatalities and 250 injuries. As a result, the Federal Aviation Administration (FAA) commissioned the National Research Council to investigate the wind shear issue and develop training aids to combat the lack of knowledge and pilot training on the topic.

Today, wind shear recognition and recovery training is a crucial element of any initial or currency check; however, it cannot be overemphasized – avoiding wind shear is always the best course of action.

What is Wind Shear?

Wind shear is a change of wind speed or direction over a short distance. Wind shear can occur nearly anywhere and has been associated with a variety of meteorological conditions, but severe wind shear in particular has been tied most closely to thunderstorms. Thunderstorms are known to produce shearing winds that can result in airspeed changes of 15 knots and vertical drafts of 500 feet per minute (FPM).

The most hazardous form of wind shear is the microburst. A microburst is a short, concentrated downdraft with velocities of 2000-6000 FPM. Microbursts are extremely difficult to predict but occur in about 5% of all thunderstorms.

Identifying Wind Shear

Flight crews should constantly search for any clues to the presence of wind shear. Convective significant meteorological hazards, moderate turbulence (Airman Meteorological Information (AIRMET Tango)), meteorological Aerodrome Reports (METARs), Terminal Area Forecasts (TAFs) and encoded wind shear (WS) reports are all great sources for recognizing possible wind shear. Additionally, any reported microburst activity, gust fronts, heavy precipitation or virga are all signs of wind shear and microbursts. Airfields prone to convective activity sometimes have low-level wind shear alert systems and warning notes on their approach plates due to local terrain and winds.

Below are examples of red flags pilots might see when evaluating the weather. AIRMET and the low-level wind shear line is something we might find when reading a TAF. AIRMET and TAFs are common weather products that pilots will use for flight planning.

- AIRMET TANGO (Turbulence): moderate turbulence, sustained surface winds of 30 knots or greater or non convective low–level wind shear.

- WS010/18040KT: Low-level wind shear at one thousand, wind one eight zero at four zero.

Avoid Known Wind Shear

Thorough knowledge of emergency procedures and emphasis on simulator training can help arm pilots against the threat of wind shear, but ultimately, the FAA concluded some wind shear cannot be avoided. The primary objective in any wind shear escape procedure is to keep the plane flying long enough to escape the shear. This doesn't inspire a lot of confidence but speaks volumes to the importance of wind shear avoidance. Below are some thoughts and techniques to incorporate in your decision-making process:

- Delay your takeoff. If there is hazardous weather in the area, consider delaying your takeoff by 10-20 minutes – the typical timeframe for microburst dissipation. FAA investigations determined several potential wind shear indicators were present in each accident; however, crews did not divert or delay.

- Constantly evaluate the weather; the evaluation process doesn't stop at takeoff. It is imperative crews continue to update the weather from takeoff, through climb-out, into approach and landing. Constant surveillance could be the difference in finding cumulative indicators to the presence of wind shear. Along with weather evaluation, consider briefing wind shear escape emergency procedures before takeoff and approach so it's fresh at a moment's notice.

- Safety first. Don't be a hero. If other aircraft are delaying takeoff or diverting from their destination, why aren't you? Protect your crew and aircraft and keep in mind that our naval enterprise is one that prioritizes safety. The decision to avoid wind shear altogether cannot be overemphasized.

U.S. Navy photo by Mass Communication Specialist 3rd Class Rodrigo Caldas

Aerographer's Mate 3rd Class Harpreet Jassal measures the temperature and wind speed aboard the Nimitz-class aircraft carrier USS Dwight D. Eisenhower (CVN 69).

No Flaps? No Problem!

By Lt. Brett Angerer, VAW-126

U.S. Navy photo by Lt. Lorenzo Armstrong

While deployed in the Adriatic Sea flying the E-2D Hawkeye, our crew was tasked with providing air control to support a NATO exercise with the Italian military. What was supposed to be a routine training event turned into a real-life lesson in crew resource management (CRM) and the first no-flap E-2 arrestment aboard a carrier since 2004.

We were scheduled to launch an hour earlier than the event to get on station and be the overall strike lead. The sun was out and there was barely a cloud in the sky. It was cold and very windy, but otherwise perfect winter weather for our planned double-cycle event. The launch off the ship was uneventful and we climbed away, heading to a station altitude at 25,000 feet where we could provide radar coverage. As we climbed to altitude, the master caution light illuminated. The carrier aircraft plane commander (CAPC) and I noticed the rudder speed actuator was no longer tracking in the "Auto" function and reverted to the manual mode of operation, which meant we could potentially not have the appropriate amount of rudder authority for our airspeed. As I continued to fly the aircraft, the CAPC and the mission commander worked through the emergency procedure checklist. Everything indicated the rudder should still be tracking in "Auto," but it was not. We elected to continue the mission and the CAPC would ensure he manually tracked the rudder to match our indicated airspeed, per the checklist. We began to contemplate how this would affect our recovery, but we still had plenty of time to execute the mission and troubleshoot later.

The station profile for the Hawkeye is typically flown with flaps at 10 degrees. As any Hawkeye pilot will tell you, when the outside air temperature is below freezing, there is always a possibility the flaps will freeze. This thought immediately crossed my mind when I selected the flaps to 10 degrees and they did not move. I moved the flap lever back to the up position and we broke out the pocket checklist to read through the procedure for stuck flaps. Even as we executed the stuck flap emergency procedure (EP), our rudder issues continued to be the more worrisome problem. With these two issues plaguing our aircraft, we handed over control of the event to the airborne spare and devoted our full attention to troubleshooting.

Looking at our fuel, we had plenty for a descent to warmer air with the hope our flap actuators would thaw. Fortunately, during the descent, the rudder control corrected itself and began to operate in the "Auto" function and was no longer a concern. However, after 40 minutes at 3,500 feet, the flaps were still stuck, so we decided to move forward with the procedure and use an emergency electrical system to lower the flaps. Before proceeding, we contacted our squadron representative to keep him apprised of our current situation. The aircraft commander explained the situation and our plan moving forward. The representative concurred and was standing by for further assistance.

The situation changed when the emergency electrical system failed to move the flaps, and we moved on to our final option: a rarely used emergency hydraulic system. Using this method requires a crewmember to move forward in the aircraft and depress an emergency actuator located in the forward equipment compartment (FEC). It has no asymmetric flap protection, so start and stop commands need to be clearly communicated and quickly acted on. At this point, CRM in the plane became even more critical. We read through the procedure and discussed what we were doing, what the impacts would be, and any additional considerations moving forward. The radar officer had never used this actuator before, so we sent her forward to orient herself with the button location and how to use it before executing the checklist. With all aircrew on the same page, our plan was hashed out. The radar officer went into the FEC and connected to the intercommunication set so she could communicate with the cockpit. On my command, she attempted to lower the flaps. Unfortunately, the flaps remained in the up position.

By now, we had gone through the entire stuck flap EP and exhausted all available resources to manipulate the flaps. We called our representative again and broke the news. He reminded us that the weather at the ship was visual meteorological conditions with very high natural winds and asked us our comfort level with a zero-flap landing. In the no-flap landing configuration, the E-2D requires much larger lateral control inputs and power changes to affect glideslope and lineup, resulting in a much higher pilot workload. Additionally, a 25% increase in net altitude loss can be expected during a no-flap wave off. After taking these considerations into account, we discussed our options. Even though dry land during deployment sounds nice, the divert options had no arresting gear available. An additional factor was the amount of landing distance available with carrier-pressurized tires, which limits our use of brakes at higher rollout speeds. These factors, combined with extensive fleet replacement squadron (FRS) training on this very situation, led us to our decision to bring the aircraft back aboard the ship.

Our representative agreed and coordinated our intentions with the commander of the air group and the CVN captain, who concurred. I executed a seat swap with the CAPC and he would bring the aircraft aboard. After discussing our plan with Paddles, we had everything in place to land. We maneuvered ourselves in the bullpen behind the ship and awaited direction from the air boss to proceed inbound. We would execute a practice approach using the procedures taught at the FRS. This would help us see and feel how the plane would respond at our required angle of attack (AOA) of 22 units. We had another directive CRM discussion at this time. The CAPC set out precise expectations for me on AOA callouts and verbal and control back up if the AOA started to climb. We did not want to approach stall speed or activate rudder shakers during this critical phase of flight.

Once the deck was ready, we executed the practice approach and wave off with the plane handling as expected. The biggest difference was the visual scan for the improved Fresnel Lens Optical Landing System. It was a little different than normal as the meatball and datums were much harder to see with the high-nose attitude required for our approach AOA at 22 units. The paddles talk-down helped mitigate this challenge. After the initial practice approach, our representative, tower and aircrew agreed we were ready to bring it aboard. We dumped down to max trap weight, set the AOA, and approached for a 3-mile straight-in. We used the bullseye as backup until we could see the ball. Fortunately, we caught a wire and made an uneventful shipboard arrestment on our first try.

Once the aircraft stopped, we reset the flap circuit breakers and attempted to move the flaps again, but to no avail. As our maintenance department soon discovered, five of the six flap actuators had failed. They also discovered the Aircraft Recovery Bulletins (ARBs) and the E-2D Naval Air Training and Operating Procedures Standardization (NATOPS) limit for the hook engagement speed did not match. The conditions for recovery that the ARBs dictated accounted for a higher hook engagement speed than our NATOPS allowed for. We would later find out the maximum hook engagement speed limit had been increased, but was not updated in the NATOPS. Fortunately for us, the CVN was able to produce enough wind to ensure compliance with the most restrictive of the two limits.

U.S. Navy photo by Lt. Lorenzo Armstrong

Overall, the flight was an exceptional learning opportunity. Because frozen flaps are such a common occurrence in our community, the entire crew expected this to be a “standard” EP. Extensive training at the FRS and continuation in the fleet provided a solid foundation for the aviators to land the E-2D aboard the ship. High natural winds and good weather also went into the decision-making and risk mitigation. CRM was crucial in keeping everyone on the same page and making sure that, outside of time-critical actions, everyone had a say and a vote in what happened in that plane.

But What Are We Doing Right?

By Maj. Brittany Webster, HT-18

The TH-73A will be assigned to Training Air Wing 5 on base and will replace the TH-57B/C Sea Ranger as the undergraduate rotary and tilt-rotor helicopter trainer.

Safety is paramount in naval aviation. It is the bedrock of our professionalism and the root of our risk management (RM) decisions. We often analyze where we went wrong with our RM process based on mishap reports and unfortunate circumstances, but it's just as important to highlight what we are doing right.

Naval aviators make split-second decisions and critical control inputs every day to prevent "that moment" from snowballing into a catastrophic event. We catch issues on preflight. We get that gut feeling the weather will turn bad despite the terminal aerodrome forecast, so we turn home early. We terminate the maneuver halfway through because one second longer would put us in a dangerous profile. It seems impossible to capture and catalog all these moments when they happen consistently on every flight, but the metrics are recorded with every flight hour and sortie safely completed from start up to shut down. Hundreds of flights are completed every day by highly professional aviators who are trusted with multimillion-dollar aircraft and the lives of their crews and passengers. In a time where it seems like we keep failing at safety, let's call attention to all the times we are doing it right. This business is dangerous, and we take flight safety very seriously.

Through training and experience, aviators develop the skills to make time-critical and deliberate RM decisions. We analyze what our mission is for the day, then determine what risk we're willing to accept to accomplish the mission. We stay proficient and current, conduct thorough pre-mission planning, and ensure we remain alert and avoid complacency during mission execution. In the training environment, the mission is to provide a safe and quality training event to the student naval aviator (SNA). While there is sometimes an intangible pressure to complete the event to advance the student in the training syllabus, there has never been an easier environment to hit the pause button and pick up the event the next day. The local training area in Pensacola, Florida, is saturated with new students learning to fly.

The TH-57 Sea Ranger is an older airframe, and the weather can roll in and ruin your flight plan at a moment's notice. In addition to weather challenges, there are plenty of opportunities to encounter a road block or near miss in such an environment, so we must be alert with high situational awareness while providing quality instruction to the SNA sitting next to us. The flight school instructor-to-SNA dynamic and tempo in the aircraft is vastly different from flying a low-light level close air support event in the desert with a new copilot, but safety principles remain the same. The task is always the mission, but the mission cannot be accomplished without making the right decision at the right time to turn a potential incident into a close call, or better – nothing at all.

One of my close calls was during an early stage TH-57B flight on a beautiful sunny day at Naval Outlying Field Spencer, Florida. My student was working on normal approaches in the pattern, making solid progress with each repetition. She was focused on basic air work while I focused on coaching her, all while listening to an odd, intermittent noise coming from somewhere in the aircraft behind me near the transmission and engine. I felt certain the noise was more than simply an old airframe rattle and asked the SNA if she heard it too. She said she did, so I decided to terminate the flight. I took the controls to land the aircraft back at the infield and shut down. I was unable to fully identify the origin of the sound or what exactly was causing it, but the sound was almost a grinding noise – not one I had heard


U.S. Navy photo by Mass Communication Specialist 2nd Class Jason Isaacs

before. Thinking worst-case scenario, I figured it was potentially a transmission issue – a failure more severe than an engine failure that still gives pilots the chance of a smooth autorotation down to the deck. A transmission issue might result in the aircraft falling like a rock out of the sky with no rotor to slow it down, or worse yet, it may have been the daunting failure of the tail rotor. This made the decision easy. Shut down at the field, get a ride home and re-attack the event tomorrow.

Once the aircraft was trucked back to Naval Air Station Whiting Field, Florida, a full maintenance inspection revealed the tail rotor hangar bearings were out of alignment, and the tail rotor shafts were grinding with each revolution. There is no way to know for sure how or if this issue would have ever manifested into a full failure during my flight because it never had the chance. My decision to shut down the aircraft at the field was only captured by a flight duty officer-generated "Abort Report," one of many for the day, emailed out to the masses to capture aircraft maintenance trends and flight event occurrences for the day. This close call or near miss is expected and part of the daily flight schedule allotment of incomplete or canceled events. But this incident, and all others not captured and reported in an email, make us the safety professionals that we are.

We will still face moments where our high degree of safety professionalism is not enough to prevent catastrophe, but we make many right calls and decisions every day to keep flying – hour after hour, day after day. It is how we as a naval aviation force can continue to execute hundreds of mishap-free flight hours a day and build a fleet of combat- and crisis-capable pilots and aircrew members ready to respond and accomplish the mission.

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