THE NAVY AND MARINE CORPS AVIATION SAFETY MAGAZINE

Approach

LESSONS LEARNED

A FRESH LOOK AT AVIATION MISHAP SURVIVABILITY

AIRBORNE MEDICAL EMERGENCY

TRUE CONFESSIONS

VOL.64, NO.2

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U.S. Navy photo by Mass Communication Specialist 3rd Class John Wagner - Illustration by Catalina Magee

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VOL.64, NO.2

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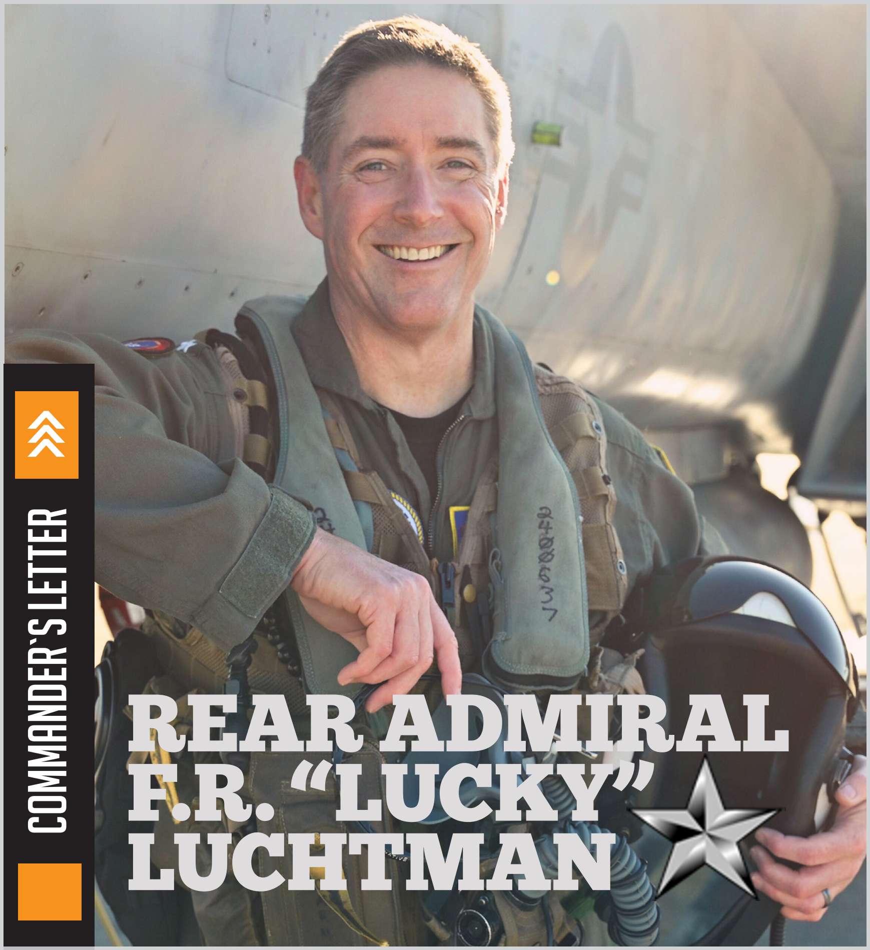
COMMANDER'S LETTER



REAR ADMIRAL F.R. "LUCKY" LUCHTMAN

NAVAL SAFETY CENTER **COMMANDER**

The new year is upon us, and we welcome the opportunity to extend greetings and appreciation to our Sailors, Marines, civilians and their families. During 2021, we continued to show resilience and a great ability to mitigate and overcome trials.

As you prepare for new year festivities, take a moment to plan your activities, create special memories and be a role model by putting safety first. More than 100 Sailors and Marines were injured in off-duty incidents during the fall season. To help reduce injuries and fatal mishaps, please review and share the Naval Safety Center`s Fall and Winter safety presentation at **navalsafetycenter.navy.mil**.

As the new year approaches, our goal of providing a safe environment for all Sailors, Marines and civilians continues.

Enjoy the holidays, stay safe and thank you for your service and commitment to our nation!

Approach is written by pilots, for pilots, and we are looking forward to reading and sharing your experiences across the Naval Enterprise. Take note that these articles identified small issues that could have been worse without risk management. Small things can turn bigger, so learn from these articles.

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FRONT COVER: Lt. Cmdr. Keith O'Brien prepares to disembark an F/A-18E Super Hornet, from the "Kestrels" of Strike Fighter Squadron (VFA) 137, on the flight deck of the aircraft carrier USS Nimitz (CVN 68). Nimitz, the flagship of Nimitz Carrier Strike Group, was deployed to the U.S. 5th Fleet area of operations to ensure maritime stability and security in the Central Region, connecting the Mediterranean and Pacific through the Western Indian Ocean and three critical chokepoints to the free flow of global commerce. U.S. Navy photo by Mass Communication Specialist 3rd Class Jose Madrigal.

BACK COVER: An F/A-18E Super Hornet, assigned to the "Golden Dragons" of Strike Fighter Squadron (VFA) 192, approaches the flight deck of Nimitz-class aircraft carrier USS Carl Vinson (CVN 70), Oct. 25, 2021. Carl Vinson Carrier Strike Group is on a scheduled deployment in the U.S. 7th Fleet area of operations to enhance interoperability through alliances and partnerships while serving as a ready-response force in support of a free and open Indo-Pacific region. (U.S. Navy photo by Mass Communication Specialist 1st Class Tyler R. Fraser.

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U.S. Navy photo by Mass Communication Specialist 2nd Class Quinton Lee

LOSS OF Oil Quantity

U.S. Navy E-6B Mercury aircraft - U.S. Air Force photo by Staff Sgt. Jacob Skovo

A Break in the Routine

By Lt. Zach Hester, VQ-4

Thursday, March 4, 2021, was as routine as can be. The weather at Naval Air Station Patuxent River, Maryland, was beautiful, the aircraft clean and the crew was highly motivated to fly their four-engine beast, the E-6B Mercury, in support of the Navy's "Take Charge and Move Out" (TACAMO) nuclear deterrence mission.

After takeoff, the crew proceeded to an Atlantic operating area for a training exercise that began with the extension of over 5 miles of training wire from the aft section of the aircraft. The wire extended normally, and the crew waited anxiously for the exercise message traffic to arrive and direct them to use their very low frequency (VLF) array to communicate with ballistic missile submarines operating in the vast Atlantic Ocean. By all accounts, the day was shaping up to be a very successful one for the crew and the nuclear deterrence enterprise.

With the wire "out and parked," the pilots and flight engineers (FEs) had very little to do but remain within the confines of the operating area. Suddenly, an FE trainee (FE-T), who had more than 500 hours in the now sun-downed P-3C, noticed a subtle decrease of oil quantity in Engine Number 4.

U.S. Navy Boeing E-6B Mercury- U.S. Air Force photos by Greg L. Davis

An FE-T may not recognize this among the vast sea of gauges and dials that make up the E-6B Mercury flight engineer panel, but because a thorough and consistent scan of instruments was conducted, ours did. Upon further examination, it was evident to the FE-T that oil quantity was steadily decreasing.

Without hesitation, the FE-T immediately brought the oil quantity issue to the attention of the FE and two pilots on the flight deck. At this point, the oil quantity on Engine No. 4 read approximately 5 gallons, roughly 6 gallons below the acceptable normal value. The FE confirmed the decrease in quantity and noticed a drop in oil pressure, a situation that calls for the flight deck crew to perform an emergency engine shutdown immediately per the E-6B Naval Air Training and Operating Procedures Standardization (NATOPS) procedure. The crew then executed the steps from the “Engine Failure / Fire” checklist on Engine No. 4 immediately. Upon completing the emergency checklist, the flight deck crew deliberated over the decision referencing the NATOPS manual to better understand the issue at hand. Although the crew shut down one of the four engines, the aircraft was handling well and there were no indications of secondary malfunctions that might pose further issues to the crew. With this information, the crew elected to turn back toward the coast and retract the 5 miles of trailing wire instead of cutting it.

Upon checking in with air traffic control, the crew declared an emergency with “no assistance required” and continued on to NAS Patuxent River. While the jet was flying well, the crew briefed contingency plans in case of an additional emergency to include landing at the nearest airport, one of the busiest airports in the country, John F. Kennedy International Airport.

Ultimately, the crew performed an uneventful three-engine, full stop landing at NAS Patuxent River. The FE, good crew resource management (CRM) and the skill displayed by the flight crew can attribute the happy ending to the solid panel scan. This particular event highlighted and demonstrated the application of CRM’s “critical behavioral skills.” The FE-T demonstrated assertiveness and diligent communication by alerting the crew to the situation. The aircraft commander and FE immediately began expanding upon the information provided and applied mission analysis, decision making, and superb leadership to formulate a plan to protect the crew and the aircraft.

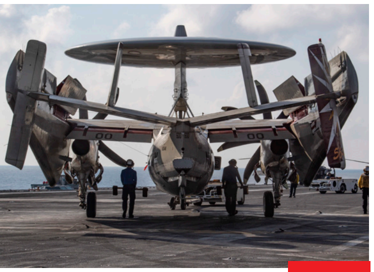
This incident also highlights the benefit of quality training. A multitude of events such as quarterly simulators and syllabus upgrade flights equipped the crew to perform the necessary actions in a deliberate fashion, while ensuring the safety of the entire crew. Upon landing, the maintenance detachment was excited to hear that the quick actions of the flight deck crew prevented the need for a full engine swap. More importantly, they were excited to see that the aircraft and crew returned safely. The crew’s actions and the speed at which they applied their critical action memory items prevented permanent mechanical damage to the engine, potentially saving the Navy millions in replacement costs.

Aviators should continue to learn and train for the unexpected. The events of that day demonstrate how quickly a routine day can turn into a potentially life-threatening scenario; however, because of the crew’s training, and excellent handling of this situation, they effectively prevented disaster from striking.

While no crew ever wants to encounter an emergency, the fleet reconnaissance training community can learn from the actions of this crew and continue to train future aircrews to be ready and able to handle whatever challenges are thrown their way.

U.S. Navy photo by Mass Communication Specialist 3rd Class Andrew Langholf

Is this really happening?



U.S. Navy photo courtesy of Brian Abbott.

By Lt. Cmdr. Brian Abbott, VX-20

One of the emergency items listed in the Air Test and Evaluation Squadron (VX) 20 Common Briefing Guide is search and rescue (SAR). Let's be honest, as something that's standard from brief to brief, discussing the same emergency procedures day in and day out can become routine and we sometimes rattle them off without really focusing on what we're discussing.

During a recent test flight for an anti-ship weapons system, members of Score 42, a VX-20 P-8A Poseidon team, found themselves managing an active SAR situation that none of them expected when they launched out of Naval Air Station Patuxent River in Maryland earlier in the day. In the middle of what, up until that point, had been a pretty quiet test flight, the crew received word that radar contact had been lost with an aircraft believed to be an E-2 Hawkeye, somewhere southeast of Score 42's current location along the Atlantic coast of Maryland. The crew was subsequently notified by NASA's Wallops Flight Facility, Wallops Island, Virginia, that the aircraft was believed to be an E-2C from Carrier Airborne Early Warning Squadron (VAW) 120, based in Norfolk, Virginia. Wallops personnel informed Score 42 that they received a communication from the E-2 announcing the crew's intention to bail out of the Hawkeye. The Score 42 team immediately vectored their P-8 toward the E-2's last reported position.

According to the aircraft commander, Lt. Cmdr. Megan Stateler, "When we first received the radio call from ATC, we immediately stopped our testing and headed toward the last known position for the E-2. It was a somber moment for the whole crew when our camera operator, [Naval Aircrewman (Operator) 2nd Class] Andrew Harlan, spotted the smoke with our IR camera."

Using all assets at their disposal, Score 42 worked with the P-8 Test Team engineers who were monitoring the flight from NAS Patuxent River and Bryan Smith, Score 42's tactical coordinator, and asked for their assistance with communication and passing information.

As local emergency medical service (EMS) personnel near Wallops, and SAR assets from NAS Patuxent River, worked to locate the downed E-2 aircrew, Lt. Cmdr. Nathan Durham, Score 42's third pilot, was able to establish communication with one of the Hawkeye aircrew who had not been located yet by EMS personnel.

As they operate the newest and most advanced Maritime Patrol and Reconnaissance aircraft in the world, P-8 crews routinely train for SAR scenarios and how to handle the challenging situations a SAR event can bring.

However, handling a real-time SAR is not something the VX-20 aircrew has to do very often. The quick reaction of Score 42's crew and their ability to quickly respond and coordinate efforts with various emergency service agencies is a true testament to the skill and training of VX-20 aviators.

Following the flight, Stateler remarked, "It was incredible to see how quickly all facets of the rescue came together, from the tower and radio controllers, to ground EMS and SAR helicopter, everyone's ability to act quickly and communicate effectively resulted in a successful outcome."

A flight like the one Score 42 found itself on that day goes to show that even though those emergency procedures in the briefing guide might seem routine, it's always important to make sure you're thoroughly discussing them, so you can be prepared when your routine flight suddenly takes an unexpected turn.

Nothing but PROBLEMS

By Lt. Jordan Riggs, Air Test and Evaluation Squadron, VX-1

WE WERE SCHEDULED FOR A FOUR-HOUR ROUND-ROBIN PROFICIENCY FLIGHT. AN EARLY LOOK AT THE WEATHER THE PREVIOUS EVENING INDICATED THAT CONDITIONS FOR THUNDERSTORM DEVELOPMENT WOULD PREVAIL DURING OUR FLIGHT WINDOW, MAKING ROUTE SELECTION A CHALLENGE.

The morning of the brief, my copilot and I checked the weather again and selected a route to Charleston, South Carolina, and back, which would keep us separated from two large storm systems to the east and west.

However, just before brief time, a convective significant meteorological information (SIGMET) advisory popped up just south of Charleston indicating a cell moving north. We elected to change our destination to Columbia, South Carolina, approximately 80 miles northwest of the convective activity. We had also learned that Maintainers were troubleshooting a recurring fault with the right engine's fuel control unit (FPMU). We held our NATOPS brief and discussed these issues among the crew. The troubleshooting by Maintenance delayed our walk time by approximately 15 minutes, as the FPMU fault reappeared after removing and reapplying all power to the aircraft.

Having seen this fault crop up on a recent flight, I was concerned that it indicated an impending failure of the FPMU and was inclined to down the aircraft for further troubleshooting.

However, after speaking with the Aviation Machinist`s Mates (AD), I was assured that there was little further troubleshooting that could be performed, short of replacing the entire engine control unit (PCMU), and that there was minimal concern of any actual failure or malfunction as long as engine and fuel flow indications appeared normal after start.

U.S. Navy photo courtesy of the French navy by Chief Petty Officer Bruno Gaudry

Once we finally manned up the aircraft, we discovered that the pilot's seat parachute was de-rigged. This is normally a cause for concern as it should have been discovered and corrected on the daily inspection. However, since there were maintainers in the cockpit just before the "man-up" to troubleshoot the FPMU fault, we attributed the discrepancy to an inadvertent pull of the seat lever during the troubleshooting. We called in a Aircrew Survival Equipment man (PR) to re-rig the seat, then manned-up the plane and performed the pre-start checklist. During these checks, we discovered that both the pilot and copilot right Beta indicator lights, which indicate that reverse thrust is available, failed to illuminate. Because neither light illuminated, it indicated a fault with the system, rather than burnt-out bulbs.

An experienced aviation electrician`s mate then entered the cockpit and stated that this was a common "hiccup" in the PCMU when the FPMU fault is present. He reset the PCMU by pulling and resetting the circuit breakers, which cleared both the FPMU fault and the Beta light issue. We were finally able to complete the pre-start checks and start both engines. All engine indications were normal, so we elected to continue with the flight.

Shortly thereafter, the pilot noticed that his seat had not been properly re-rigged. I then signaled to the plane captain that the pilot would be exiting the plane and requested a PR to come in and correct the problem. While this was occurring, I re-checked the weather radar picture and saw significant buildups along our route of flight. While the cells were mostly isolated, I anticipated difficulty staying clear of thunderstorms, since the E-2D Advanced Hawkeye we were flying does not have in-flight weather radar.

Once the seat was correctly rigged and the pilot was back in the plane, we called a "time-out" as a crew to discuss all the problems we had encountered and assess the prudence of continuing with the flight. We agreed that, despite all the aircraft issues, they were all satisfactorily resolved and did not point to any underlying issues that jeopardized airworthiness. However, the weather remained a concern, so we elected to cancel our clearance to Columbia and request a clearance into the local approach pattern, where we could monitor the Automatic Terminal Information Service (ATIS) and land quickly if weather started degrading.

On departure, we requested multiple practice approaches and were vectored into the Precision Approach Radar (PAR) pattern.
We completed the taxi, takeoff and climb into the PAR pattern without issue. With the aircraft configured for landing and approximately 2 miles from touchdown, the Radar Officer (RO) in the aft crew compartment noticed a significant amount of hydraulic (hyd) fluid emanating from the inboard side of the right engine nacelle, which he promptly relayed to the crew. All hydraulic indications in the cockpit were normal.

We had a touch-and-go clearance, so I informed the controller that we would be making a full-stop landing. We were cleared as requested and continued the approach to an uneventful landing. We taxied back to the line and requested an aviation structural mechanic, or "airframer," to assess and troubleshoot the leak. As we taxied into our parking spot, the "Combined Hydraulic Quantity" caution light illuminated. The airframer informed us that there was a significant amount of fluid leaking from the lines and we needed to expedite our shutdown to prevent cavitation of the hydraulic pumps. We did so and reported the discrepancy to Maintenance Control. The airframers quickly identified the source of the problem - a loose clamp on a hydraulic line in the engine nacelle. It was a quick fix; a new clamp, a refill of the hyd lines and an engine turn to confirm normal operation.

We were fortunate the RO visibly noticed the hyd leak before it was indicated in the cockpit, while we were already configured for landing and were in a position to do so expeditiously. The windows in the aft compartment are closed at altitude while the radar is operating, which would have prevented visual detection. Had we executed our flight plan to Columbia or continued to shoot approaches, the combined hydraulic system would likely have expended all fluid and lost hyd pressure. While there is a semi-redundant hyd system, this would have been an emergency and necessitated using the blowdown bottle to lower the landing gear, the electric override system for the flaps and an arrested landing due to the loss of nose wheel steering (NSW) and primary braking. The RO's attention to detail and exemplary crew resource management enabled a quick and safe resolution to a potentially serious emergency. Nothing went smoothly on that event. The entire evolution required continuous assessment of the circumstances and their potential to impact safety-of-flight.

Luckily, the four other crewmembers were all fully qualified and did an outstanding job staying abreast of the changing circumstances. Effective use of communication skills and crew resource management played a crucial role in ensuring everyone in the plane worked together to overcome each issue and ultimately enable a safe recovery. It is unfortunate that we could not fully accomplish our mission, even though it was only a proficiency flight.

But, the flight did serve as a powerful reminder of the importance of diligently working with the crew through each problem as it arised.

IT IS UNFORTUNATE THAT WE COULD NOT FULLY ACCOMPLISH OUR MISSION, EVEN THOUGH IT WAS ONLY A PROFICIENCY FLIGHT.

U.S. Navy photo by Mass Communication Specialist 1st Class Tyler R. Fraser

BEFORE THE TURN

- PERFORM AN ORM BRIEF TO ALL PERSONNEL INVOLVED WITH THE MOVE.
- ENSURE YOU HAVE ALL THE REQUIRED PERSONNEL FOR THE MOVE.
- ENSURE ALL PERSONNEL HAVE WHISTLES OR TOOLS (FLASHLIGHT, CRANIAL).
- PRE OP THE SUPPORT EQUIPMENT.
- ENSURE KHAKI LEADER PRESENCE.

FLIGHT CONTROLS HITTING OPENED PANELS DUE TO SWITCHES OR COCKPIT CONTROLS NOT IN CORRECT POSITION, PANELS THAT WEREN'T PROPERLY INSTALLED, FASTENERS THAT WERE NOT PROPERLY INSTALLED, AS WELL AS ENGINES INGESTING FOD HAVE BEEN A LEADING CAUSE OF HORNET AND GROWLER CLASS B AND C MISHAPS.

NO ONE WANTS TO BE 'THAT GUY'

By Lt. Kristen Cox
HSM-72

It's no secret the world of naval aviation is filled with Type A personalities. We pride ourselves on being true professionals, skilled in our craft, of possessing a deep level of knowledge to inform and back up our decisions and an intrinsic drive toward mission success. No one wants to be "that guy" who calls off a mission unless every possible means of execution has been exhausted. When adding external stressors like pre-embarkation and currency requirements in a high-tempo command, flight hour and scheduling limitations, complacency based on operational pace and experience level and any other personal and professional factors at play for crewmembers at any given moment, chances of risk increase. It quickly becomes clear how, without the appropriate mitigations in place and the right conversations taking place, the focus normally placed on safety can unintentionally move to the back of one's mind, with mission accomplishment taking the forefront.

U.S. Navy photo by Mass Communication Specialist 3rd Class Justin Stack

The night in question started out just like any other in northeast Florida with a typical pattern consisting of warm, humid days leading into a late afternoon chance of thunderstorms. That forecast could be copied and pasted from one day to the next and this evening was no exception. While there was some threat of rain and possible thunderstorms in the late afternoon, the current weather was holding and we expected any storm cells to pass relatively quickly.

Two aircraft were scheduled to conduct nighttime deck landing qualifications (DLQs) with a destroyer just off the coast. This mission consists of each pilot conducting six approaches and six landings on the flight deck of an air-capable ship, such as a cruiser or destroyer.

To recertify as many individuals as possible, each aircraft had four qualified aircraft commanders on board who would cycle through flying their approaches and landings, plus one qualified aircrew member. While this is a relatively routine mission, the pressure to accomplish these flights that night was slightly higher. If we weren't able to recertify our aircraft commanders' DLQs, we would hinder our ability to complete our upcoming underway work-up period. Weather issues canceled multiple, previous scheduling attempts and time was running out.

The first aircraft launched successfully two hours before sunset to ensure completion of the daytime approaches required for their crew's currency before progressing into night.

As our aircraft crew did not require any daytime landings, we were scheduled to launch an hour before sunset. Just before walking to the aircraft, a pop-up storm took us slightly by surprise, but after a few minutes of heavy rain, the system passed and we were able to preflight the aircraft and start up.

After successfully troubleshooting a few minor maintenance issues on deck following start up, we taxied out to launch about 10 minutes later than scheduled.

However, immediately after takeoff our post-takeoff checks revealed one of our engines was supplying less power available to the aircraft than it should and we were forced to turn back.

U.S. Navy photo by Mass Communication Specialist 3rd Class Justin Stack

U.S. Navy photo by Mass Communication Specialist 3rd Class Justin Stack

After multiple system functionality checks and a swap to the backup aircraft, we were finally ready to launch again. The switch to a new aircraft meant we were going to be an hour late.

We would now be taking off right after sunset and right in the window of the predicted bad weather. Despite the forecast, "weather" was calling for 5 statute miles visibility and 1,700-foot ceilings, which were well above what we needed to safely launch and make it outbound to the ship. We also maintained the ability to conduct an instrument approach on return if required due to degrading weather. With a final check of the forecast and radar, we were off.

Once again, this launch didn't quite go as planned. In the approximately six minutes it took us to taxi for takeoff and subsequently fly 5 miles north along the St. Johns River, the ceilings had dropped to about 500 feet with decreasing visibility and increasing fog. Still, we were meeting our weather minimums and with the forecast showing the weather clearing along our route, we continued to press eastward. In about another 3 miles, the weather had decreased another 200 feet and visibility now appeared to be approximately 1 mile.

We were all surprised by this rapid and unpredicted change in weather conditions and elected to lower our altitude, slow our speed and orbit momentarily in our current position over the water while we decided our next move.

This orbit allowed us to remain visually clear of the obstacles we knew lay just beyond the fog along the river bank, such as the multiple bridges, large towers, cranes and the tops of the buildings framing downtown Jacksonville that had suddenly disappeared in the clouds. Despite growing more uneasy with the devolving weather, we continued brainstorming ways that we could get past the weather and accomplish our mission. We all knew the potential operational fallout if we failed. We discussed options that included following our original planned track but at a drastically reduced airspeed to increase time available to see and avoid obstacles, picking up an instrument clearance to attempt to get above or past the worst of the weather, or diverting to the south and attempting to circumvent the clouds and fog.

After about two orbits during which we assessed the options and surrounding weather, the crew's majority was leaning toward continuing overland. Meanwhile, I was becoming less convinced of the viability of our plan but didn't want to discount the opinions of three other aircraft commanders. I began to question if we would even be able to see a tower or other obstacle in advance regardless of our speed once we crossed overland. The fog seemed to intensify past the banks and I knew that I had to speak up.

"I hate to be that person and ask this, but are we making a smart decision right now?"

Several seconds of silence followed, after which we all agreed to turn around and return to base. In the short but treacherous 8 miles creeping back down the river toward base, it took all of our combined efforts to maintain a visual reference to the ground and stay within the river's banks to help provide lateral separation from towers and ensure altitude clearance over the bridges that make up the iconic scene of the Jacksonville skyline.

It was now dark enough to attempt our night vision goggles, but they only further degraded our visibility so we continued unaided. As a final last-ditch effort to determine if we could circumnavigate the weather to the south, we reached out to aircraft that were in holding to enter the airspace for landing under visual flight rules. Their reports of the weather, combined with the audible stress in their voices, revealed they had similar harrowing experiences. That was enough of a confirmation for us to follow suit and we finally accepted we were done for the night. We were on deck moments later without further incident. While the flight lasted less than 15 minutes, it felt much longer and we were all relieved to be safely back and going home that night.

It's easy to do your proper preflight planning and brief how you're going to avoid weather or not push a potentially bad situation to accomplish a flight, but it's equally easy to get caught up in what you're trying to accomplish and to allow the brief to drift to the back of your mind. The moment you experience an event such as this, the lessons learned in crew resource management training suddenly shift from a lofty ideal to sharp reality.

Assertiveness and flexibility are simple but powerful tools that can be put into practice in a moment. Never be afraid to be "that guy" who speaks up to stop a bad situation from progressing when you start to see the Swiss cheese holes aligning. Sometimes an honest moment of asking yourself, "Is this a smart decision?" is all you need to realign your focus on the bigger picture and stop a potentially dangerous track.

VFA-27

Silent Jettison

By Lt. Cmdr. James Wilson
Lt. Daniel Barringer
Lt. Dillon Hamrick

It was June 19, 2021, and I was scheduled to fly in the first event of the day as the primary tanker. It was a short cycle and the weather was clear. The aircraft I would be flying for the event was last flown June 8 and had been in the hangar bay for maintenance since then.

There were no remarkable gripes on the aircraft and nothing was out of the ordinary during preflight. During the start sequence pre-launch, I did not note anything unusual during my aircraft's external tank transfer checks. I placed each external tank switch into "ORIDE" (override) individually and waited for the "EXT TNK" (external tank) caution to display on the "DDI" (digital display indicators) before returning the respective switch to "NORM" (normal). Then I waited for the caution signal to disappear before testing the next switch. The transfer check process from start to finish was unremarkable.

U.S. Navy photo by Mass Communication Specialist 2nd Class Samantha Jetzer

At one point during my startup, a troubleshooter had to plug into the aircraft to help with the Link 16 network. Initially, I was unable to get into the network, and the guidance was to remain on deck until I achieved network entry. Eventually, with the troubleshooter's assistance, I was able to enter the network, which would end up being more important than I could have possibly imagined at the time.

As the primary tanker, I was the first Super Hornet launched off the deck for the event. I executed Case 1 departure procedure, then climbed to 8,000 feet mean sea level and remained within 10 miles of the aircraft carrier.


U.S. Navy photo by Mass Communication Specialist 2nd Class Quinton Lee

> By far the biggest takeaway was how beneficial it was to have all aircraft in Link 16. If this emergency had been truly NORDO, we would have been unable to communicate the invalid configuration after selective jettison of stations 3 and 4 only.


U.S. Navy photo by Mass Communication Specialist 2nd Class Quinton Lee

Day Case 1 launches are "zip-lip" with regard to radio communications (comms), so the quiet on the radio was not unusual. I pre-coordinated with the other two pilots from my squadron to give me a package check to ensure an operating aerial refueling store (ARS) at the start of the event and that I would supply them with opportunity fuel before their event.

As I monitored the launch, I saw the back radio light up, indicating that someone was transmitting on Tanker Common, but I did not hear anything. Then I noticed the front radio light up, and again, I heard nothing. My first reaction was to check the volume knobs, thinking I must have turned the radios down, but the volume was up. I attempted to transmit, but all I was able to do was key the radio. I realized something was wrong with my connections and began troubleshooting the comms cords on my gear as well as the connections to the aircraft itself.

During this time, I was able to give fuel to other aircraft in my squadron, but I was unable to transmit to tower that I was a functional tanker, or communicate my fuel state. With other aircraft joined on me, I was able to communicate via hand signals that I was "no radio" (NORDO). They were able to relay to tower the status of my comms and that I was a functional tanker. Once both aircraft were "tanking complete," I retracted the drogue, received affirmation that the ram air turbine on the ARS stopped spinning and cleared them off to proceed on mission via hand signal.

After an additional 20 minutes of troubleshooting comms and cords, I transitioned to using free text via Link 16 as my primary means of communication, where I relayed my intentions to my squadron mates. I would package check the oncoming primary tanker at the start of the next event, and then I would cycle myself into the recovery. If for some reason I needed to hawk an aircraft in fuel extremis, they would free text the side number of the aircraft I needed to hawk.

However, the situation would soon become more complicated.

In addition to being unable to transmit or receive radio communications, I was also unable to hear aircraft warnings. I discovered this when I noticed an "EXT XFER" (external transfer) caution displayed on the DDI, with the master caution light illuminated. I noted that the mid-board tanks were empty, and the inboard tanks had not yet begun to transfer. Initially I selected ORIDE on the inboard wing tank switch. This caused the right Inboard tank to begin transferring, but the left Inboard tank remained full. I pulled my pocket checklist (PCL) out of my helmet bag and began to go through the steps for EXT XFER caution. While I was going through the procedure, I began to free text other airborne aircraft in my squadron. Initially I relayed my aircraft status, and that I was executing the procedure in the PCL. The limits in the white pages of the PCL indicate that you need less than 800 pounds of fuel in a tank to take an arrestment and a full tank is in excess of 3,000 pounds.

My squadron mates began to coordinate everything that would eventually occur from then until our recovery aboard the ship. The lead aircraft in the section went to our squadron's medium holding altitude, acting as a radio and free text relay while the other aircraft flew in relative proximity to monitor my status. Over the next 45 minutes, I methodically went through the EXT XFER caution procedure in the PCL multiple times, to include positive and negative G, inducing side forces on the aircraft, configuration changes, Signal Data Computer resets, tanking, cycling the bleed air knob, and changing the position of the various fuel transfer switches in the cockpit. During this process, they gave me the required space to execute the procedure and also assisted with tower and squadron representative (rep) coordination.

Once we determined the tank would not transfer, the other aircraft coordinated with the squadron and tower reps to have the space to selective jettison (SELJETT) the non-transferring tank. The procedure indicates that the adjacent midboard tank must be jettisoned prior to jettison of the inboard tank, but the squadron rep informed me that I needed to jettison the symmetrical midboard tank as well.

Aboard the ship, squadron reps used the Weaponeering and Stores Planning program to check the validity of the potential remaining load-out of the aircraft. It was determined that having external fuel tanks on Stations 8 and 9 only is an invalid load for carrier arrestment. The game plan would then become to SELJETT the two midboard tanks on a single pass abeam the ship, circling back around, and then SELJETT of the non-transferring inboard tank on its own on a second pass. I received the game plan for the jettison and was joined by another aircraft to assist in the process. After we arrived at the pre-coordinated area to jettison the tanks, my wingman passed me the lead and gave me a thumbs up, indicating a "cleared hot" to jettison the tanks. With the tanks jettisoned, I passed the lead to the other aircraft, and they brought me back into the break for an uneventful day trap.

While the issues of being without radio and having trapped fuel presented their own unique challenges, it was important to use effective crew resource management (CRM) across the flight and with the tower to formulate a game plan. It was essential to have and know how to use Link 16 free text for this. Additionally, having a dedicated aircraft relay to the rep as well as a procedural back up led to the execution of a viable and repeatable game plan. We compiled several lessons learned from everyone involved. This particular situation included all of the standard challenges and requirements of an emergency around the ship; however, the NORDO nature challenged all aspects of CRM and flight leadership. Below are the primary takeaways.

Once we quickly realized free texting was our only viable mode of communication, it was immediately clear we needed a dedicated platform to type and transmit procedures and game plans. The disparity in fuel between the assisting aircraft made it clear that the lower fuel aircraft should proceed to medium holding and set maximum endurance. We also agreed that the rep who was typing and emergency aircraft should send free texts to all three aircraft to keep everyone on the same page.

The next challenge became verifying steps in the checklist were complete. Communication became arduous, and often confusing – as one person sent a response, the other presented a new update or problem. It would have taken too long to cover each step in the PCL via free text. Instead, we resorted to directing and confirming that entire pages had been completed. This action allowed us to communicate with the tower and squadron reps that all troubleshooting had been exhausted and a selective jettison should be performed.

Our next lesson learned was hand signals, if not standardized, often detract from situational awareness and rarely communicate a clear message. If in doubt, keep it simple. During the actual jettison, a closed fist to wait for clearance and a big thumbs up to drop seemed like the most clear and directive signals.

By far the biggest takeaway was how beneficial it was to have all aircraft connected to Link 16. If this emergency had been truly NORDO, we would have been unable to communicate the invalid configuration after selective jettison of Stations 3 and 4 only. This discussion is lacking in the PCL, and if it was not for the assets available on the ship, we may have placed the aircraft in even more danger.

A Fresh Look at Aviation Mishap Survivability

By Michael Knott

Naval Air Systems Command, Human Systems Engineering Department

During the launch of the vehicle 16 days earlier, the aircraft experienced a foam strike, which compromised the thermal protection system on the leading edge of the port side wing. During reentry, the compromised thermal protection system allowed critical structure to fail causing the aircraft to depart controlled flight. The crew were exposed to many life-threatening injuries due to the dynamic, high altitude, hypersonic environment as the orbiter and crew module was ripped apart at an altitude of over 100,000 feet and at speeds over Mach 15.

If you have gone through Aviation Safety Officer school or have taken courses on how to conduct mishap investigations, you are familiar with the acronym CREEP: Container, Restraint, Environment, Energy Absorption, and Post-Crash Factors. CREEP is the industry standard used to study survivability during a mishap investigation. Using this acronym, the survivability of a mishap is classified as one of three outcomes: survivable, non survivable or partially survivable.

CREEP has been in place for a long time as the tool for evaluating survivability, but there are several problems with it. When investigating a mishap, the terms survivability and crashworthiness are currently synonymous. CREEP's emphasis on a crash is best illustrated by its last component: post-crash factors. But what about accidents that don't involve a crash, or accidents where survivability is independent of impact with the ground? It's short-sighted to assume that all aviation accidents involve aircraft impact with terrain. What about survivability concepts that fall outside of a crash altogether?

On April 17, 2018, Southwest Airlines Flight 1380 experienced an engine failure inflight. Parts of the failed engine struck the fuselage resulting in rapid decompression of the aircraft and the death of a passenger. The pilot was able to regain control of the aircraft and landed without further incident. In 1996, Delta Airlines Flight 1288 experienced an uncontained engine failure before reaching their decision airspeed while attempting take off from Pensacola Regional Airport in Florida. The aircraft aborted the takeoff and came to rest on the runway having never gotten airborne. Failed engine components penetrated the cabin of the MD-88 resulting in the deaths of two passengers.

Neither Flight 1380 nor Flight 1288 experienced a crash, but both were fatal accidents. When discussing the Space Shuttle Columbia, while pieces of the orbiter did eventually fall to the earth, the fate of the crew was determined long before their contact with the ground.

By only focusing on the crash, the current definition of CREEP neglects many considerations that impact survivability in modern aviation. Many military aircraft use egress systems such as parachutes or ejection seats. These systems are designed so that aircrew are no longer onboard the aircraft by the time it impacts the earth. Currently CREEP is completely ineffective at evaluating the survivability of a mishap investigation when occupants onboard the aircraft use egress systems.

The evaluation of survivability needs to be expanded. CREEP should be redefined as Container, Restraint, Environment, Energy Absorption/Egress, and Post-Event factors. This new definition would be used in exactly the same way to determine the survivability of a mishap.

As part of a mishap investigation, investigators evaluate each aspect of CREEP, starting with container.

CREEP Defined

The term *Container* refers to the airframe's structural integrity and ability to provide survivable space for the occupants of the aircraft throughout the flight. For example, Container includes concepts such as what is used on the V-22 Osprey, which has wings designed to break away in a crash to protect the cabin by shedding the high mass items attached to the wing.

The airframe needs to maintain survivable volume, like the cabin of this MH-60R.

Pictures by Michael Knott

CF-18 Ejection

Image by Copp, D., Riley, C., Walsh, H,. (Producers) (2015). Survival in the Skies, Episode 02 Ejection Seats [Television Series]. Arrow International Media and Smithsonian Networks.

Blade-deflection systems used on rotary wing aircraft are there to help ensure survivable space is maintained when the main rotor blades droop enough to contact the cockpit. Container should also consider the airframes' resistance to high energy projectiles such as failed engine components or wildlife strikes.

Restraint applies to all the systems used to establish the tie-down chain which mitigate the occupants' energy and minimize flail. The tie-down chain is formed by components such as the airframe structure, seats and seat belts. Every component must work together to ensure occupants are properly restrained. Restraint should be evaluated for the entire flight, not just during a crash. Improper restraint allowed the passenger's torso on Flight 1380 to be sucked out of the cabin resulting in fatal injuries to her head and neck. Improper restraint also resulted in fatal injuries to the Challenger space shuttle crew as their vehicle departed controlled flight and broke apart.

Environment relates to the immediate surroundings of the occupants throughout the flight. It is important to "safe the environment" by minimizing flail hazards such as aircraft controls, panels, racks, cargo and other rigid surfaces during a crash or dynamic event. If components must be in the flail envelope of the occupant, they should be soft, frangible or specifically designed to be struck in a crash. The delethalization of the occupant's surroundings as well as proper restraint are critical in minimizing environmental hazards during dynamic events. Environment should be expanded to consider the environment around occupants for the entire flight. This includes protection from hypoxia, ebullism and decompression sickness when exposed to the high altitude, low pressure environment. Other considerations for environment are the presence of high energy projectiles such as uncontained engine components, unrestrained cargo and in-flight fires.

The next component of CREEP is Energy absorption / Escape. Energy absorption and escape can be evaluated together or separately if necessary. If the aircraft involved in the mishap is not equipped with an escape system, escape can be ignored. If an aircraft is equipped with ejection seats and everyone successfully egressed, energy absorption can be ignored. If parachutes are used and not all of the crew bail out, then both energy absorption and escape can be evaluated.

Energy absorption refers to the systems in place that reduce accelerations experienced by the occupants. This is critical for taking the energy state of the mishap and bringing it to within human tolerances. The concept of energy absorption is identical to that of crumble zones in cars and is accomplished through systems such as specifically designed structures, landing gear, skids and crashworthy seats. By using energy absorbing technologies, the loads experienced by the aircraft occupants are lowered significantly reducing the likelihood of experiencing serious injuries during a crash.

Escape systems, parachutes and ejection seats are very unique and have their own survivability considerations.

Some of the survivability considerations for parachutes include safe aircraft separation, stable free fall, avoidance of midair collisions, successful parachute deployment, avoidance of ground hazards, descent arrestment at landing, and successful parachute recovery. When discussing ejection seats, some survivability considerations include ejecting in the system's safe escape envelope, proper aircrew positioning before ejection, in-seat stabilization and descent, successful parachute deployment, seat-occupant separation, avoidance of midair collisions, avoidance of ground hazards, and successful landing.

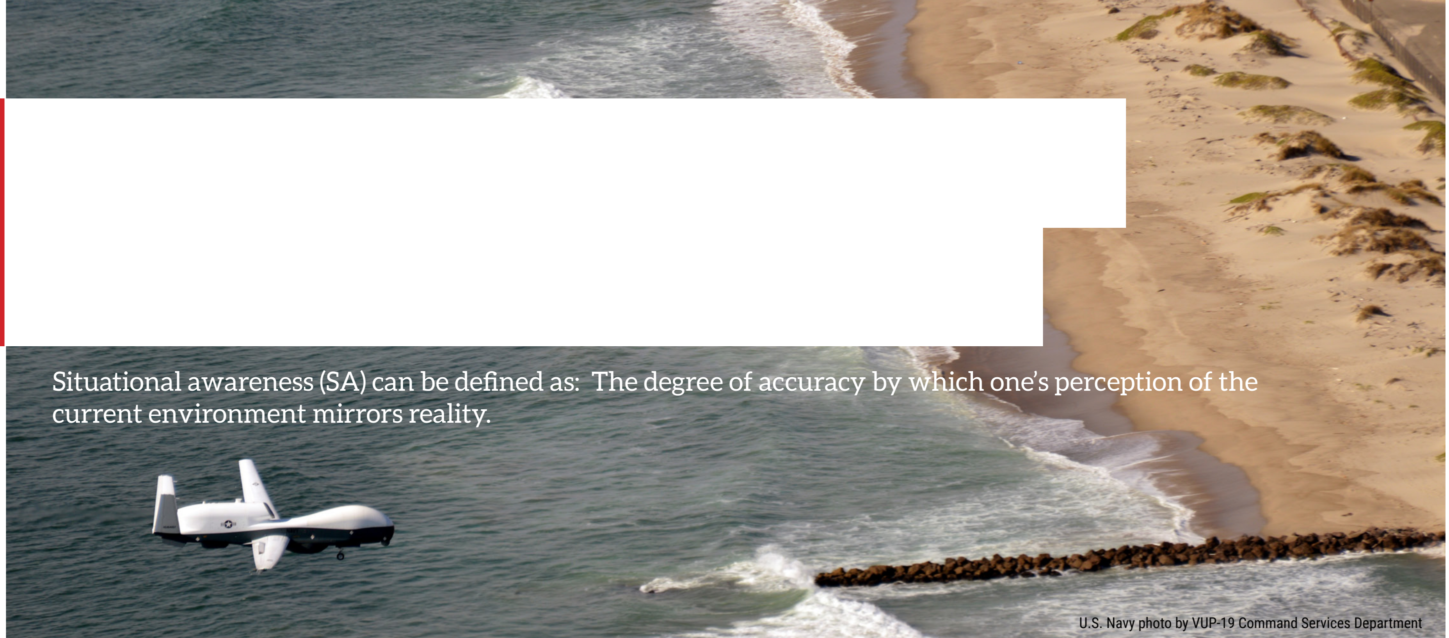
Post-event factors refer to anything that arises after the event is over to include post-crash fires, underwater egress, drown-proofing, weather-related hazards, cold water immersion and wildlife interactions, etc. A significant factor for survivability post-event is timely egress. This reduces the risk of injury due to post-crash fire and underwater egress. Water survival is another major consideration. The availability of flotation systems assist in drown-proofing and anti-exposure suits can assist in surviving in cold water. Prompt emergency response, rescue and access to first aid can also contribute to post-event factors.

Mishaps that involve water create several issues that impact survivability.

Moving Forward

The proposed new definition of CREEP is a fresh look at how survivability is evaluated. As military aviation constantly evolves to meet the demands of the warfighter, the investigation tools used to study incidents need to adapt accordingly. While CREEP has served as an important tool that has been used for decades, the evaluation of survivability needs to be as dynamic as the systems we use to fly. The new definition is more robust and comprehensive. It doesn't just focus on what happens during a crash.

The new definition of CREEP can be applied more broadly to a wider range of applications. With the addition of escape systems, it applies to helicopters and fighters alike. Survivability isn't just about what happens during a crash and neither should the tool be that is used to evaluate it. By using the new and expanded definition, investigators can evaluate each component of CREEP to determine the survivability of a mishap. By studying survivability, we can learn from mishaps and make improvements moving forward. This helps to ensure that even when our aviators experience the worst, they can still survive to fight another day.



U.S. Navy photo by VUP-19 Command Services Department

Situational awareness (SA) can be defined as: The degree of accuracy by which one's perception of the current environment mirrors reality.

By Lt. Cmdr. Daniel Madanat, **VUP-19**

Situational awareness (SA) can be defined as the degree of accuracy by which one's perception of the current environment mirrors one's reality.

My first tour with an EP-3E squadron culminated in leading a crew of 24 in the real-time execution of intelligence surveillance and reconnaissance (ISR) missions. In doing so, I listened to five different radios and six different internal communication networks all routed to the same headset and tuned to varying volumes and specific ears. I grew accustomed to monitoring more than 20 chat rooms and coordinating with multiple external sea, land and air platforms. To aid in keeping a high degree of SA, we flew with two additional naval flight officers (NFO) and a cryptologic officer onboard.

When I later transferred to my current assignment, Unmanned Patrol Squadron (VUP) 19, based out of Jacksonville, Florida, due to my background in flying manned ISR aircraft, I felt relatively confident going into my first flight in the MQ-4C Triton Mission Control Station.

I remember that first flight in the MQ-4C Triton MCS clearly and the helmet fire I hadn't enjoyed since my initial NFO training over a decade ago. I had spent hours in the Triton Mission System Trainer simulator preparing for this flight, learning to operate the systems safely and familiarizing myself with their limitations. I was excited to operate the MQ-4C Triton unmanned aircraft system (UAS) and prove Triton's place in the combatant commander's kill-chain. Instead of checking for correct sensor indications and developing a scan for malfunctions and adherence to higher headquarters' guidance, I was opening spreadsheets, updating trackers and annotating PowerPoints (PPT). I was using three different computers located at opposite corners of the same 30-foot room. While waiting for a classified webpage to load, I ran to an unclassified computer in the corner to send preflight updates. Luckily, I was under the direction of a seasoned instructor who was giving me the differences between the simulator and a real UAS flight. I had very little situational awareness about anything other than how many spreadsheets I had opened and what time the next required report was due.

In fairness, on that first flight I often didn't know where I had moved a Word document, minimized a PDF, or which spreadsheet I wanted to click on, and the instructor assertively reminded me about my required reports. Clearly, even my administrative SA was low. There were very few points in that first flight I would have noticed if my mission computers had critical errors requiring my attention. I was too focused on trying to capture data points and inform people, who would ask later for information such as at what percentage a piece of gear was operating without faults or what time engines were started.

If task saturation occurs, one can easily forget they are commanding an air vehicle thousands of miles away, flying at 300 knots around flight level 500 (FL500). Unlike manned aviation, there are no physical reminders, no bumps from turbulent air, and no sensation while turning. There are just five large television screens and three computer monitors emanating blue light at them. Additionally, flight physiology training usually focuses on hypoxia and spatial disorientation - not going screen blind.

I left that first flight feeling much the way I imagine many first-time Triton tactical coordinators (TC) have; frustrated and looking to improve the process. Questions I knew the answers to persisted in my mind, in addition to those I did not have answers to. For example, why was the TC focused on developing PPT presentations and updating trackers and spreadsheets instead of directing the mission payload operators (MPO) in executing of priority tasking? Why was I more concerned about annotating a post-mission PPT product correctly and executing an improvised 10-step procedure to download the GPS trail for a preplanned flight route, instead of keeping my head on the tasking, crew, aircraft location and sensor health?

I knew the "why." When programs fail to deliver, the operator overcomes. But that didn't answer the "how." Not knowing the "how" left the squadron with the task of developing a process to maintain tactical awareness and to reduce the complete loss of their SA while airborne.

Since that first flight 18 months ago, the NFOs working with the intelligence team and pilot cadre put in an amazing amount of work to streamline processes and identify task-sharing opportunities. By leveraging other elements of solid crew resource management, such as communication, decision-making and mission analysis, VUP-19 has seen vast improvement. Outside intelligence entities such as the Marine Corps Intelligence Agency and Office of Naval Intelligence support the Triton crews remotely in near-real-time-relieving some of the post-mission product burden on TCs.

Additionally, the VUP-19 intelligence department standardized a dummy-proof presentation to identify only mission highlights for non-real-time dissemination. Furthermore, breaking cultural norms, pilots spend more time backing-up NFOs on mission-related communications in chat rooms than is typical on other platforms.

The process isn't perfect, but it is better. It is still fair to expect a small amount of helmet fire and frustration from TCs during their first few real flights. Unfortunately, the simulator will never be a perfect representation of the actual flight, but we look forward to the next interim flight capability upgrade, IFC-4. Additionally, we hope these lessons learned while trying to maintain the TC's SA will inform future unmanned improvements in functionality and capability.

Airborne Medical Emergency

By Lt. Matthew Schwall, **VQ-1**

Through much of our aviation training we are taught to deal with aircraft-related emergencies, such as how to quickly execute memory procedures for an engine fire, locate and isolate a fire in the fuselage and efficiently ditch the aircraft need practice in a training environment so in real circumstances proper procedures are carried out as if it is second nature. However, it is less common in military aviation to practice emergencies unrelated to the aircraft or the mission. In this instance, my crew experienced a non-aircraft-related emergency thanks to turbulence.

On our initial descent into Kadena Air Base, Japan, we noticed we had to descend through a large layer of turbulent-looking clouds to set up for the approach. As a precaution against possible light turbulence, I called for the approach checklist early and for the crew to set Condition 5. The crew expeditiously took their ditching stations while the assigned crew member and observer trainee walked the tube to verify Condition 5 was set properly.

Approximately three minutes after calling for Condition 5, our aircraft hit a turbulent air pocket and rapidly descended 1,000 feet in a few seconds, then reentered smooth air. The observer trainee lost his footing due to the negative G-forces and was thrown in the aircraft. He landed on his ankle wrong and was unable to put any weight on it. A few crew members helped him to his ditching station as his ankle and leg began to swell.

We coordinated the most expeditious route back to Kadena with air traffic control (ATC). Upon check in with the terminal area controller, we declared a medical emergency to ensure priority landing status and requested an ambulance meet our aircraft to transport the crew member to the hospital.

Upon landing, the Kadena fire department assisted the injured crew member off the aircraft and transported him to the emergency room. X-ray results revealed he had fractured his tibia and fibula. He also had a severe ankle sprain. It was his first flight in the EP-3E Orion in four years and unfortunately his last for a couple of months.

Our crew's unified effort and real-time planning, combined with our coordination with ATC and ground resources, resulted in a successful outcome. While not commonly trained to in military aviation, airborne medical emergencies occur and can be just as critical as an aircraft malfunction.

As professional aviators, we need to bring this hazard into our scan and into our wardroom discussions. As aircrews, we must be aware of the resources, particularly external to the aircraft, we can use when an emergency arises to facilitate the best outcome, especially when it's outside our expertise. This incident and our crew's exceptional coordination and decision making have impacted how we train our mission commanders and senior enlisted leadership.

U.S. Navy photos by Heather Judkins

Images courtesy of Anderson Medevac

RESCUE IN THE PACIFIC

Aeromedical Transport in the Northern Marianas Islands

Aviation Safety and Lessons Learned

By Lt. Cmdr. Erik Kumetz, Lt. Nathan Gordon, Lt. Tracey Kim, Hospital Corpsman 1st Class Patrick Shea, **HSC-25**

"Rescue 00, departing." As the high-pitched whine of the MH-60S transmission wakens the rotor blades to action, the familiar radio call from the HSC-25 search and rescue (SAR) crew rings out in the operations office. Averaging over 30 rescues and 70 medical evacuation (MEDEVAC) missions per year, the pilots and aircrew of Helicopter Sea Combat Squadron 25, the "Island Knights," have become well-versed in the dynamics of patient transport and lengthy personnel recovery searches along the treacherous reef lines of the Northern Marianas Islands. The aeromedical challenges encountered in performing these MEDEVAC and SAR missions have provided invaluable lessons in aviation and aeromedical safety when performing en route care in the West Pacific.

The importance of rapid transport for critically ill or injured patients to definitive care has been well established. Demonstrating a significant mortality benefit, rotary-wing transport has become an integral component of combat casualty evacuation since the Vietnam War. HSC-25 uses the MH-60S Nighthawk helicopter, the interior of which may be configured to hold up to three litter-bound patients. Crew composition includes up to six personnel: two pilots, three naval aircrew members consisting of two rescue swimmers and one search and rescue medical technician (SMT) and one flight surgeon. Each HSC-25 rescue helicopter is outfitted with medical equipment to respond to trauma casualties and cardiopulmonary emergencies. Missions are coordinated via Coast Guard Sector Guam when a patient's condition or location warrants urgent evacuation by rotary wing.

The vignette that follows highlights lessons learned in aeromedical safety and crew resource management (CRM) that may prove invaluable to other aviation units performing patient transport in austere settings.

The Call

At 0200 hours, the bulk cargo vessel, MV Ruby Enterprise, was still beyond the range of the MH-60S helicopter. Steaming toward the island, the vessel carried a critically injured sailor on board: a 55-year-old civilian mariner who had fallen more than 20 feet onto the metal deck below, suffering a significant injury to his left side and pelvis. The day following the accident, the patient experienced altered mental status, profound weakness, hip pain with an inability to ambulate, blood in his urine, and an elevated heart rate (tachycardia) with normal blood pressure. Based upon the patient's presentation, his possible injuries included: internal bleeding, bone fractures, head and spinal injury, and chest or abdominal trauma. Time was of the essence.

Lessons Learned – The patient's presentation was consistent with a traumatic pelvic fracture. The development of disorientation, weakness, and progressively worsening tachycardia following the injury was highly suspicious for severe bleeding into the pelvis and injury to the genitourinary system. While the patient had already survived for more than 24 hours following his fall, this may lull crews into a false sense of security, as the patient's body may be temporarily compensating for an underlying hypovolemic shock, a life-threatening condition resulting in inadequate perfusion to organs due to the loss of circulatory volume, e.g., blood loss.

In major trauma situations, the development of decompensated shock should be anticipated. As a crew, it is important to ask, "Based upon the patient's mechanism of injury: How soon do we need to launch? What interventions may be required on deck and in the aircraft? What extra equipment is needed to ensure the safe recovery and transport of the patient?" Pending mitigation of any other operational risk factors, this patient's presentation would necessitate launching as soon as possible. Stabilization of the pelvis and aggressive en route fluid resuscitation, ideally with blood products, are anticipated time-critical, life-saving interventions; his non-ambulatory status and potential for spinal trauma would require extraction via litter hoist (versus rescue basket or double-lift technique). At the time of presentation, HSC-25 lacked a formal mechanism for obtaining and delivering blood products in the aircraft.

Mission Planning
CRM began right at the start of mission planning. The patient's unstable condition was a recognized pressure in meeting the vessel as quickly as possible; however, in the near-zero-illumination night, environmental factors including transient rainstorms in the vicinity, a sea state of 3-4, and obstructions on the deck site selected for hoisting significantly increased the operational risks in carrying out the rescue. The decision was made between the commanding officer, helicopter aircraft commander (HAC), and flight surgeon to delay the launch of the aircraft by a couple of hours to reach the vessel at first light, where hovering near the obstructions would be markedly safer and provide additional crew rest. The patient's vital signs would be monitored in the interim and passed to the flight surgeon via the Coast Guard Sector Guam Command Center.

Pre-mission analysis of the possible injuries the patient could have sustained, including the interventions available and time required for crewmembers on deck, were briefed with the entire crew. By planning the prospective rescue step-by-step, a bingo corresponding to 20 minutes on deck was established and monitored by all members of the crew. Two locations on the vessel were deemed suitable for hoisting: a mid-deck location flanked between two 80-foot cranes (primary site) and an aft site proximal to the mainmast (secondary site) (figure 1).

Lesson Learned – Mission planning is a team effort. By coordinating the rescue between pilots, aircrewmen and medical personnel, the crew was able to safely monitor the patient while pushing the launch time to the right by two hours to meet the vessel at first light in order to mitigate the dangers of performing a litter rescue in zero illumination.

Cargo vessels of this configuration typically offer two suitable locations for hoisting: main deck and aft deck. Main-deck transfers have the advantage of offering a wider available space to maneuver but may feature hazardous obstacles requiring consideration. Aft-deck transfers are generally free of obstructions but have limited maneuver space due to proximity to the ship's masthead and funnel, requiring the crew chief to "swing" the rescuer onto the ship if the aircraft cannot maneuver directly over the aft deck.

Figure 1

Rescue at Sea
Upon reaching the MV Ruby Enterprise, the relative winds were estimated to be originating 45 degrees to the ship's starboard, resulting in a crosswind at the hover location, which was amid ship. The ship was requested to reorient its course; however, a significant language barrier during radio calls between the cargo ship and aircraft resulted in degraded communications and the ship ultimately remaining on its original heading. Using time-critical risk management (RM), the pilot briefed the crosswind to the crew. It was decided to enter the hover amid deck at 100 feet to ensure adequate clearance above the 80-foot cranes. The aircraft approached the vessel from its port side with the right-side cabin door of the MH-60S facing the vessels stern. The rescue proceeded with hoisting of the SMT and flight surgeon, followed by rescue swimmer with maritime litter, onto the main deck.

On deck, the initial medical evaluation was notable for a pale, weak-appearing male with positive pelvic crepitus, an abnormal movement of the pelvic bones, signifying a fracture, a significant source of internal bleeding. A rapid medical assessment and interventions were performed, including the application of a pelvic binder, a life-saving device used to maintain the stability of the pelvic bones and minimize bleeding.

After the patient was positioned in the maritime litter with a blanket for hypothermia management, the flight surgeon was hoisted into the cabin first to assist the crew chief with the retrieval of the litter. The patient was then hoisted into the aircraft followed by the SMT and rescue swimmer. The patient was resuscitated with one liter of IV fluids and transported back to Guam, where he was admitted for blood products and intensive medical specialty care.

Lessons Learned – From day one of flight school, every Naval and Marine Corps aviator learns the importance of RM. By communicating observed deviations from the mission brief after arriving on scene — such as the unanticipated crosswind and a language barrier in communicating with the vessel — and formulating a plan to mitigate the risk of such factors with time-critical RM, the crew was able to perform the safe evacuation of a patient in critical condition at sea.

Drawing upon lessons from combat casualty care in Iraq and Afghanistan, whole blood is the preferred method for resuscitation in severe hemorrhage. In practice, packed red blood cells (PRBCs) are more readily available at a major military treatment facility (MTF) than whole blood, which requires a "walking blood bank" at the mission launch site. Following the completion of this MEDEVAC, it became evident that the squadron required a formal mechanism for obtaining and delivering blood products in case of future casualties. By working with Naval Hospital Guam Emergency Department and Blood Bank, a protocol was established to request and obtain emergency blood products at the aircraft.

Conclusions
In the remote setting of the western Pacific, nearly every MEDEVAC mission involves rescuing a patient in extremist at the boundary of the MH-60S's range. RM and CRM are crucial in these settings where events on-scene are constantly changing.

At times, the safest option may be delaying a mission for a short time to mitigate significant operational hazards and ensure the safety of the crew and patient. Mission planning should include, if possible, communicating with the vessel ahead of launch to request specific ship positioning and obtaining life-saving interventions, such as blood products, before launch. In the event unforeseen problems arise, mishap prevention requires clear communication of the situation with the crew and altering the course of action to adapt to the situation.

As the United States pivots toward the Pacific, the key to ensuring high-quality aeromedical transport and rotary-wing safety over long distances hinges on the use of all available resources and communication for safe operations.

"*From day one of flight school, every Naval and Marine Corps aviator learns the importance of RM.*"

An Imperfect STORM

By Lt. Michael Kaiser
VT-28 Rangers

"Have you ever seen a precautionary emergency landing at night?" I asked Miles, my student.

"I have not," he replied.

"All right, my controls."

"Your controls."

"My controls. So basically," I said, "PELs at night are pretty challenging because it's incredibly difficult to make out ground reference checkpoints."

We were holding over a VHF omni-directional range (VOR) at 4,000 feet above mean sea level (MSL) and 4 miles to the west of an airfield near our home base. We had taken off about 45 minutes earlier, just after sunset, and it was Miles' first nighttime flight.

I'm a primary flight instructor and Miles, my onwing, had about 20 flight hours in the T-6 Texan II, all of which had been during the day. I was far more comfortable in the aircraft, having flown a significant number of night flights in the local area as an instructor.

Miles and I were part of a new test syllabus named Project Avenger that upends the traditional syllabus and allows more leeway in individual flights to practice different skill sets. Think "part task training" taken to the extreme and you would have a reasonable approximation of the test syllabus. In the traditional syllabus, students progress in a linear fashion: they learn how to fly the plane while seeing the ground, then they do formation training, then they learn how to fly without seeing the ground and finally they graduate and move on to advanced.

U.S. Navy photo by Anne Booher

In Avenger, a student might launch on a flight in formation, split up their section, conduct individual contact maneuvers and then finish the flight with instrument approaches.

As this particular flight was part of the Avenger syllabus, we had launched under instrument flight rules (IFR) and proceeded northbound to a nearby towered field, where we conducted an instrument approach and the published missed approach to hold over the VOR. I knew Miles had never flown at night, so I wanted to show him some of the contact maneuvers he had practiced over the course of his first 10 days of flights, pointing out the differences between day and night flying, physiology and reliance on instruments. With the controls and my brief introduction about ground reference checkpoints complete, I contacted our approach controller.

"Houston Center, Ranger 752, complete in holding, looking to cancel IFR and proceed VFR (visual flight rules) to Victoria," I said over VHF.

"Ranger 752, Houston Center, roger, cancellation of IFR received, squawk VFR, frequency change approved," came the reply.

"Ranger 752, squawk VFR, switching, thanks."

I made a switch on the up-front control panel to the VHF tower frequency.

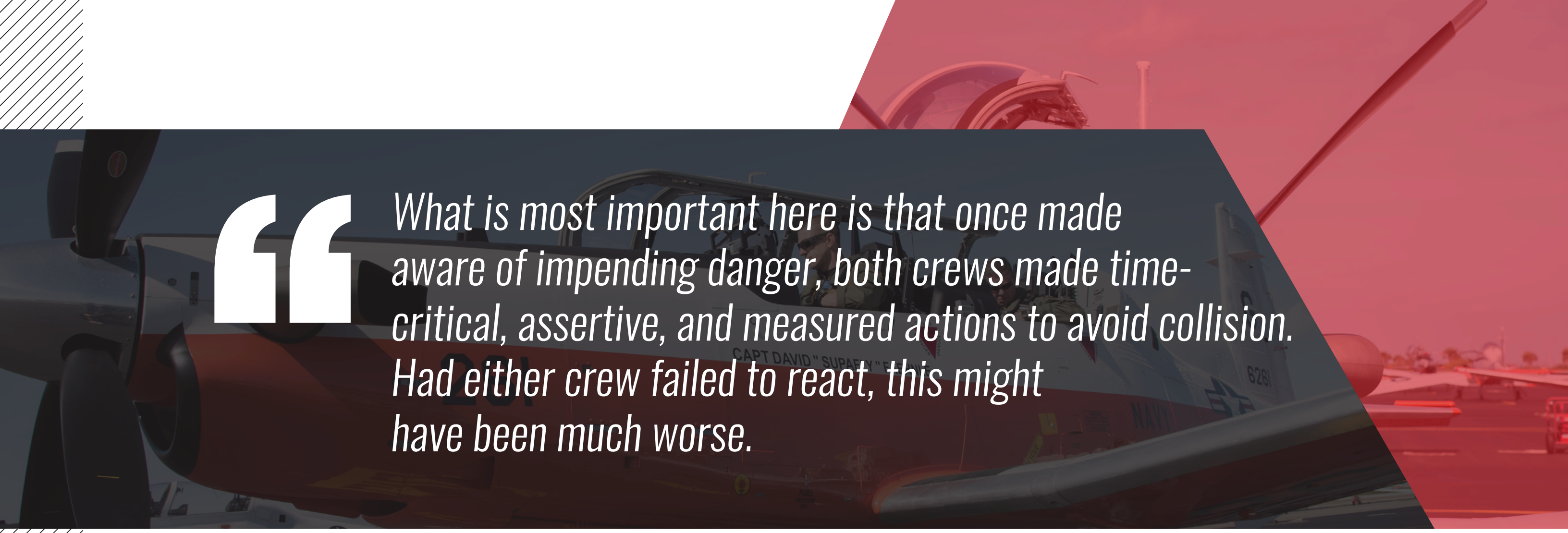
"Victoria Tower, Ranger 752, VFR at 4,000 feet just over the VOR, looking for High Key," I said.

"Ranger 752, Victoria Tower, roger. Proceed direct to High Key. Report High Key," they responded.

"Ranger 752, wilco," I said over the radio before switching to the intercommunications system (ICS).

"Oh no, we have a simulated chip light; I hate those," I said, as I began working through the emergency procedure.

The T-6 has a decent glide ratio. In an emergency scenario, when we have enough energy to glide to a suitable landing site, we can set a specific amount of torque to simulate the amount of drag a failed engine with a feathered propeller would produce. Then, if the engine does fail, we can simply move the power control lever (PCL) to off, feather the propeller and have the exact same rate of descent and profile as before the engine failure and continue the glide to our landing airfield.



> *What is most important here is that once made aware of impending danger, both crews made time-critical, assertive, and measured actions to avoid collision. Had either crew failed to react, this might have been much worse.*

The profile itself begins with High Key, which is 3,000 feet above ground level (AGL) directly over the approach end of the runway. It then spirals down, usually to the same side as the traffic pattern, reaching Low Key on a reciprocal of the runway heading and at 1,500 feet AGL. We'll then continue the turn until lined up on final and, if flown properly, land the aircraft safely while never having manipulated power. When flown properly, it's effective.

"Okay, so we've slowed to our optimal glide speed and established our glide to High Key. Right now I'm looking outside the aircraft at the airfield itself and then back inside to check our distance on the FMS (flight management system)," I begin. "You may notice the only real thing you can make out down there is the airfield itself; it's otherwise just kind of surrounded by darkness, so you're really going to have to trust your instruments on this one."

"I see that. You can't really see anything," Miles said.

Arriving at the field, I notice what might be fog at the far end of the airfield. Again, it's dark.

"Victoria Tower, is that a fog bank off the departure end?" I ask.

Tower's response is delayed a moment. "It doesn't look like it, and we haven't had any reports of fog."

I roger over the radio, lower our landing gear and report High Key. "Victoria Tower, Ranger 752, High Key, gear down."

"Ranger 752, Victoria Tower, cleared for the option Runway 13."

"Cleared for the option 13, Ranger 752," I respond, then, over ICS, "That's a little weird, they normally tell us to report Low Key, but no worries. OK, so here I'm mostly inside the cockpit ensuring I have the correct airspeed and appropriate angle of bank as I work around to Low Key. You don't have any ground references out here, so you just have to trust that the geometry works."

Coming around Low Key, I don't say anything over the radio - they've already cleared me for the touch and go, so I simply continue the turn. I talk a little about energy management as a function of airspeed and when to consider taking full flaps to dissipate kinetic energy. I touch down smoothly on the runway and conduct a takeoff so we can enter the pattern. I pass Miles the controls so he can begin a few laps in the landing pattern.

"Sir, I think there's fog ahead," Miles said.

"My controls," I said immediately. I initiate a climbing left hand turn as we punch into the initial portion of a fog bank. I want to turn around 180 degrees to an area where I know the fog is not. I know I'm not cleared yet, but the instinct to avoid inadvertent IMC (instrument meteorological conditions) is pervasive, especially at night, and to my knowledge, I'm alone at the airfield. "Tower, I'm starting my crosswind, there's a fog bank here," I said over the radio.

"Ranger 752, roger, left crosswind approved," Tower responds.

Then I hear it. A radio call from an aircraft I had no idea existed, indicating they were very close to me.

"Victoria Tower, Boomer 776, we're out here in the downwind."

My mind goes into overdrive. Inadvertent IMC was bad enough, but now there's a very real threat of a midair collision. My eyes are fully inside the cockpit now, because I have to level off. If I go up, I could hit the other aircraft at pattern altitude 900 feet above MSL. If I go down, I may hit a tower or the ground. But leveling off forces me deeper into the fog bank, so I have to get on my instruments to avoid vertigo or worse. I stare at the vertical speed indicator (VSI) and altimeter and all of my focus goes toward holding zero VSI at 670 feet above MSL in the left turn until we can regain visual meteorological conditions (VMC).

Eventually, we break out of the fog bank on a downwind heading, where I find the other aircraft above and to my left by a couple hundred feet. My heart and mind are racing as they come to grips with how close that was.

I can finally look elsewhere from my primary flight instruments and I see my Traffic Collision Avoidance System (TCAS) has failed, which is why I never had advance notice of the other aircraft. I don't know when the failure occurred.

The other aircraft had called inbound to Victoria Tower when they were about 15 miles northeast of the airfield (when I was checking out with Houston Center) and Tower had told them to enter a left downwind for 13. Victoria Tower does not have radar and relies solely on the aircrafts' position reports. Because the VOR was so close to the field, my radio switch was so quick I never heard that call. Because we didn't call Low Key (we were already cleared), the other aircraft didn't have perfect SA on where we were. And finally, the fog bank forced a decision that ultimately led to my early turn. It was almost a perfect storm for the proverbial Swiss cheese model in reality.

I later find out how close we came. The other aircraft saw my landing and taxi lights lighting up the fog just beneath them as their TCAS registered another aircraft just 100 feet below them, which is the lowest increment the TCAS has. When they saw this, they added power and climbed up directly over the airfield. Once both aircraft were safely VMC and deconflicted by altitude, the other aircraft went home to the southwest and our aircraft returned via the southeast.

It took a while to process the event described here. My skipper said something poignant afterward and I truly took it to heart: "What is most important here is that once made aware of impending danger, both crews made time-critical, assertive and measured actions to avoid collision. Had either crew failed to react, this might have been much worse."

Now, every time I go into similar airfields, I ask Tower how many other aircraft they have in their airspace in hopes I can improve my situation awareness to avoid anything like this in the future. I'll replay this event over and over and I don't know if I'll ever conclude I made the right decision, but a decision was made nonetheless by both crews and we lived to fly another day.

P-8A AVIATION GROUND MISHAP REDUCTION AND THE GROUND SAFETY TASK FORCE

By Lt. Nick Skeen, **VP-10**

Aviation ground mishaps (AGMs) are the largest and fastest-growing category of mishaps across naval aviation. These incidents are costly, dangerous and, all too often, preventable. On June 2, 2021, Commander, Naval Air Force Atlantic (CNAL) Rear Adm. John Meier directed all East Coast squadrons to develop proactive processes for preventing these mishaps:

"The desired outcome is to fire synapses, generate discussion in our ready rooms and Maintenance spaces, accelerate the speed of learning and shift our response time to the left of these incidents/mishaps… in other words, I'm tired of sifting through the wreckage to learn, and I want us to take a more proactive turn on AGMs."

U.S. Navy photos by Mass Communication Specialist 2nd Class Class Austin Ingram

Given this mandate, the Red Lancers of Patrol Squadron TEN (VP-10) examined the history of AGMs in the P-8A community. Using risk management information (RMI) analytics, the VP-10 safety team examined the 122 P-8A Poseidon AGMs and ground hazard reports (HAZREPs) published over the aircraft's young life. Three trends emerged:

1. P-8A AGMs occur during routine evolutions. They are unlikely to occur during major or complex evolutions for which significant time has been spent deliberately identifying hazards and implementing controls.

2. P-8A AGMs occur during off-peak hours. A disproportionate number of AGMs occur at night or during the lull between daily training launches and recoveries.

3. P-8A AGMs occur on detachments. Per aircraft, they are significantly less likely to occur at main deployment sites and at Naval Air Station (NAS) Jacksonville, Florida or NAS Whidbey Island, Washington.

With this understanding of *when* the prototypical P-8A AGM occurs in mind, the Red Lancers sought to determine *why* these mishaps occur. Using DOD Human Factors Analysis and Classification System (HFACS) 7.0 data obtained from RMI, the team identified three factors listed as causal or contributory to AGMs at a frequency of more than twice any other HFAC code:

1. Procedure not followed correctly (AE103)

2. Inadequate real-time risk assessment (AE201)

3. Complacency (PC208).

To achieve CNAL's vision of driving preventable AGMs to zero, VP-10 convened a ground safety task force. This task force consists of representatives from the safety, NATOPS and maintenance departments and is focused on improving communication between those departments and identifying areas for risk reduction to reduce the impact of those three human factors most likely to result in an AGM.

The task force decided early on their primary mission could not and should not be increased oversight, if for no other reason than it would be impractical.

VP-10 deployed to U.S. 4th and 7th Fleet areas of responsibility in April 2021. In the following months, the Red Lancers have executed 13 detachments to 11 sites in seven countries. With squadron maintenance and safety personnel scattered across the globe, assigning additional personnel to oversee routine evolutions was simply not tenable.

By improving cooperation between the safety, NATOPS and maintenance teams, we hope to elevate every squadron member's ability to perform risk analysis during routine evolutions with limited supervision and eliminate those human factors known to directly lead to preventable mishaps.

U.S. Navy photos by Mass Communication Specialist 2nd Class Class Austin Ingram

Instead, the task force focused on empowering the personnel already assigned to oversee these routine evolutions by providing the necessary training and tools for every plane captain or shift supervisor to identify and mitigate risk. The ground safety task force's vision is the most junior maintainer or aircrew member can face an evolution taking place at an unfamiliar airfield in poor weather at night with high-visibility tasking and develop controls to address each hazard.

The Red Lancers are seizing this opportunity to actively attack the AGM problem. The results of such an initiative will not be seen overnight, but VP-10's deployment record of over 2,500 mishap-free flight hours while conducting high-tempo distributed operations across the globe proves the Red Lancers are earnestly and enthusiastically rising to the challenge.

By improving cooperation between the safety, NATOPS and maintenance teams, we hope to elevate every squadron member's ability to perform risk analysis during routine evolutions with limited supervision and eliminate those human factors known to directly lead to preventable mishaps.

True Confessions
Lessons Learned

By Anonymous

After nearly two weeks out of the cockpit due to post-deployment leave, I was scheduled for a "good deal" Monday morning tactical intercept flight and was looking forward to the event. Following an uneventful brief, walk, launch and overall flight, my thoughts shifted toward safe recovery and returning to the other items I needed to work on that day. After the landing rollout, I exited the runway and began to reconfigure the aircraft per the Naval Air Training and Operating Procedures Standardization (NATOPS) post-landing checklist, setting the ejection seat to "SAFE," the flaps to "AUTO," and the Landing and Taxi Light to "OFF." As I executed a left turn onto the main taxiway, I noticed the jet was difficult to steer and took significantly more rudder input than usual to generate the desired turn rate with what I assumed at the time was high gain, nose wheel steering (NWS). After taxiing for a short distance it was clear there was an issue with the aircraft so I stopped on the taxiway and called the squadron duty officer on the base radio to request assistance to start troubleshooting the issue.

My initial thought was that I had blown a tire, which could account for the aircraft feeling sluggish and difficult to steer. I informed ground control of the possibility of foreign object damage (FOD) debris on the runway and adjoining taxiways. Shortly thereafter, my flight lead was able to look back at my aircraft and noticed that while the flaps were up, the taxi light was still on. She immediately suggested I check the status of my launch bar switch and I was surprised to see it was in the "DOWN" position while the landing and taxi light was still in the "ON" position. I put the launch bar back up, coordinated with base to get a tow in case there was any damage to the NWS system, and advised "ground" there was no longer a FOD concern-takeaways other aviators may find useful.

In reconstructing the chain of events during the debrief, I concluded that after crossing the hold short line, I began my normal post-landing checklist where my first step is to place the ejection seat handle to the SAFE position.

Next, I raised the flaps and attempted to turn off the landing / taxi light. In the F/A-18A-G the landing / taxi light and launch bar switches are roughly similar in shape with the launch bar switch being smooth and located directly above the landing / taxi light switch.

As these two switches are located in approximately the same location and are roughly similar, the landing and taxi light switch has two small "domes" on it to help differentiate it from the launch bar switch by feel.

U.S. Navy photo by Mass Communication Specialist 2nd Class Mark Thomas Mahmod

The Launch Bar switch also requires the pilot to pull it out of a detent before moving it to the "Up" or "Down" position. In my attempt to turn off the Landing / Taxi light, I had inadvertently grabbed the Launch Bar switch and placed it in the "DOWN" position. When the switch is placed in the "DOWN" position, normal NWS immediately disengages and can only be reengaged by depressing the NWS button on the stick. Normally, pressing and holding the NWS button a second time will provide high gain NWS, but with the Launch Bar down, the pilot can only select a maximum of low gain NWS. Low gain NWS allows for plus or minus 22.5 degrees of nose wheel travel to the left and right while high gain allows plus or minus 75 degrees of nose wheel travel.

Since the Launch Bar was now down, I was only able to select low gain NWS even with the high gain NWS button depressed and held. This led to my assessment that I wasn't generating the desired turn rate with high gain NWS as expected during my turn on the main taxiway, which indicated a possible issue.

While this event overall may seem minor with no resulting damage or injuries, it is important to remember that it could have ended very differently. For example, as I cleared the runway and began taxiing at 10 knots, I put the Launch Bar down, which disengaged the NWS at a key moment. The airfield had several ongoing taxiway repair projects with barricades spotted in a number of locations, including the taxiway I was using. I was in a turn when the NWS disengaged, causing the nose wheel to track straight and nearly run in to several of these low lying barricades.

This could have damaged the aircraft's tires and landing gear and potentially led to engine FOD if the intake had ingested any pieces. On a more extreme note, a significant mishap did occur in March 2004 at Naval Air Station Lemoore, California, when an aircraft was flipped onto its back during the landing rollout. In the post-mishap investigation, it was determined that the pilot reconfigured the aircraft before clearing the runway. Similar to my situation, instead of placing the Landing and Taxi light to the "OFF" position, he inadvertently put the Launch Bar down and subsequently picked up the long field arresting gear with the lowered launch bar. As a result, the aircraft flipped over violently and came to rest upside down.

Luckily, there was no post-crash fire and the pilot was extricated from the aircraft with minor injuries. Due to this mishap, and in conjunction with the general, good head work that subsequently went into prioritizing pilot focus on controlling the aircraft during landing rollouts, the combined standard operating procedure (SOP) for both the Atlantic and Pacific strike fighter wings dictates that there shall be no changes to aircraft configuration while the aircraft is on the runway. Because I followed this protocol, in my case my mistake occurred at relatively low speed, which allowed me to detect my error before incurring any major damage.

Had I made this mistake while still on the runway and at a higher speed, the result could have been catastrophic. In a number of cases our SOPs are "written in blood," similar to many NATOPS procedures, and this SOP item potentially spared me from a more serious result.

Here are a few takeaways from this incident. The first big lesson learned is that the flight is not over until the aircraft is safely shut down and you're standing at the bottom of the boarding ladder. The second is that complacency and distraction have no place in the cockpit; especially in a single-place cockpit where the pilot is the single source for checks and balances.

Another factor contributing to my error was that I had recently returned from deployment so I was still knocking the rust off of my ashore procedures and habit patterns. Since the Landing / Taxi light is not used in the aircraft carrier environment (except during an emergency) its use was still outside my normal habit patterns with my limited recent ashore flying.

Additionally, this was only my fifth flight in the last 30 days with my overall flight hours totaling less than six hours, well below the tactical hard deck with regard to hours flown. We often consider currency (of qualifications) versus proficiency for tactical execution, but we may not apply this consideration as often to simple NATOPS procedures. I did adhere to my normal post-landing habit patterns and was mindful not to initiate any configuration changes until after exiting the runway, which was critical to preventing a potential mishap or damage to the aircraft. While the flight was not extremely difficult and nothing significant or noteworthy transpired while airborne, the potential to be lulled into a false sense of security during a simple administration portion of the flight was definitely present and I failed to recognize and mitigate.

In the end, seemingly small or insignificant tasks, deviations from our standard procedures, and habit patterns can result in substantial consequences. Slow down, be careful, be deliberate and fly safe.

U.S. Navy photo by Mass Communication Specialist 2nd Class Mark Thomas Mahmod

Rear Adm. John Meier, right, commander, Naval Air Force Atlantic, awards Naval Helicopter Aircrewmen 1st Class George Parsons III, assigned to Helicopter Sea Combat Squadron (HSC) 9, the Navy and Marine Corps medal, Dec. 1, 2020.

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All photos must be good, clear quality and in high resolution (300 DPI) or larger than one megabyte per image.

When you email your BZ nomination, include the file and photo. Also, use the author's name as the filename. Example: CatalinaMagee.doc.

Airman Salvatore Morena, VP-45

In August, 2021, Airman, Aviation Salvatore Morena discovered a foreign object (FO) in a wheel well of a P-8A Poseidon before engine starts at Kadena Air Base, Japan. Upon discovery, he immediately contacted maintenance control and quality assurance (QA). QA identified the piece of FO as a misplaced metal valve cap, conducted an inspection and deemed the aircraft FOD-free. Additionally, later in the month he helped another plane captain who had passed out on the flight line during engine starts. Morena's ability to rapidly flag down a duty driver and get his sick shipmate to medical quickly was invaluable. His attention to detail stopped these incidents from becoming mishaps, saved the Navy both time and money and he epitomizes what is expected in naval aviation. AN Morena is a valued member of the Pelican Maintenance team and was awarded the squadron`s quarterly Safety Pro award in September.

Aviation Structural Mechanic 2nd Class Mukeba Kabongo VAW-116

While performing his duties as airframes final checker on a night catapult launch of an E-2C aboard USS Nimitz (CVN 68), Aviation Structural Mechanic Mukeba Kabongo noticed the port-side main landing gear ground lock was still attached. Demonstrating exceptional attention to detail, he suspended the launch and removed the ground lock. If the ground lock had not been removed, the port-side main landing gear would not have retracted, requiring the mission to be aborted. AM2 Kabongo identified a serious safety of flight hazard that could have developed into a possible airborne aircraft emergency.

Aviation Support Equipment Technician Third Class Jeremy Santiago, CVN-76

On July 7, 2021, Aviation Support Equipment Technician Third Class Jeremy Santiago responded to a forklift trouble call in Hangar Bay 3. Upon arrival, he noticed smoke coming from the forklift. He opened the engine compartment cover, noticed excessive white smoke coming from the parking brake solenoid and immediately disconnected the battery, securing the power source. He directed another Sailor to report the class C fire to Damage Control Central. While the Sailor notified Damage Control Central, he had another Sailor stand watch while he retrieved a carbon dioxide bottle and extinguished the fire. His actions prevented the possibility of a larger casualty due to the forklift being in the vicinity of the supply mountain and the Hazardous Material storage and Issuing Office. Santiago's superb initiative and dedication has proven to be instrumental in keeping his shipmate's safety a No.1 priority, earning his selection as USS Ronald Reagan's (CVN 76) Safety Pro of the Month for July 2021.

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