

FLIGHT DECK Awareness

Basic Guide

Fifth Edition 2008

A Special Issue
from
Mech

A Naval Safety Center Publication
www.safetycenter.navy.mil

Foreword

The flight deck of an aircraft carrier is one of the most dangerous places in the world, and the lessons of our past are filled with tragic events that prove it. In recent years, many improvements in flight-deck equipment, fire-fighting gear, and personal-protective devices have made this workplace cleaner, better and safer, but Sailors still can be at risk.



Navy photo by MC2 James R. Evans



Navy photo by MC3 Patrick Heil

Sailors and Marines are working hard each day in the unforgiving and dangerous environment that exists on the carrier flight deck. Fortunately, we have a pretty good safety record aboard our ships. In part, that success is because of engaged leaders who make operational risk management (ORM) a part of everyday operations.

In this fifth edition of the Flight Deck Awareness Guide, we have taken the liberty to expand the information available on ORM. Identifying and assessing hazards, making appropriate decisions based on the assessed risk, implementing controls to manage that risk, and supervising to ensure risk is minimized is essential to successful mission completion.

We also provide an introductory look at time-critical risk management process, using a mnemonic called A, B, C, and D. The flight deck is a dynamic place, and we don't always have time for a deliberate or in-depth ORM assessment. We needed a method to quickly assess and mitigate risk, so we developed this easy memory tool to use ORM on-the-fly.

We don't have to and can't afford to relive the lessons learned from the fires aboard *Forrestal*, *Enterprise*, or *Oriskany*, or more recent mishaps aboard other carriers.

This guide alone won't keep you from being sucked into an intake, blown down the deck, or knocked over the side. You must be aware of the dangers, which the guide provides, but you also must take your personal safety seriously, acting accordingly. Question unsafe practices and work together to mitigate risks and prevent mishaps.

We're doing a good job on duty, but we'd be remiss not to mention that our success on duty is a result of ORM, engaged leaders, and good safety programs. Take those same lessons learned at work home with you when you drive your car, ride your motorcycle, or work around the house. We can be successful at work and at home.

The air ops branch and media department at the Naval Safety Center produced this guide to provide the fleet with a tool to improve awareness, to increase readiness, and to save lives.

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The Workplace...

Aboard a deployed aircraft carrier, the flight deck serves as the workplace for nearly a thousand Sailors. Although fraught with danger, it is a place of beauty, skill and timing. Many writers have called the activity that takes place on the flight deck a “ballet.” When it comes to timing and interaction, the comparison is apt, but keep in mind that some of the other “dancers” are lethal, multi-ton aircraft that, at times, travel hundreds of miles per hour. The dance floor is a hot, stench-filled, steel deck that can be measured in acres and contains hundreds of hazards.

George C. Wilson—author of *Supercarrier*—said, “An aircraft carrier’s flight deck is a million accidents waiting to happen.” He’s right, but Sailors armed with the knowledge of places to avoid, things to look for, and sounds to be aware of are more able to manage risk.

The flight deck is filled with activity: aircraft taxiing, engines starting, people running, whistles blowing, and sirens wailing. It is so busy that everyone must maintain situational awareness at all times. Aircraft are launching and recovering, catapults are shooting no loads, mechanics are doing engine maintenance turns, people are re-spotting and parking aircraft, “grapes” are

refueling airplanes and helos, and other Sailors are handling ordnance. More than a hundred jobs are going on at the same time.

Each flight-deck task has the potential to end in a mishap. Our Sailors from ABs to AZs must get their work done, and they must do their jobs despite the danger.

The flight deck is our office, but it unfortunately has been a place for us to die, as well. Aviation Sailors must know the flight-deck rules. Understanding flight-deck markings, learning how to maneuver about the deck, and recognizing hand signals are critical. It takes the work of many to accomplish any single mission, and the ability to communicate is vital. We must know, understand, recognize, and follow all safety signs and signals. Everyone must work together to control hazards on the flight deck.

Navy photo by MC3 Jonathan Snyder





The People...



Various people make up the rainbow of colored jerseys that occupy the flight deck.

Air Officer (Air Boss or Boss)—Is responsible to the ship's commanding officer. He supervises and directs primary flight-control operations, aircraft-launch-and-recovery equipment (ALRE), aviation-fuel systems, aircraft handling on the flight deck and hangar deck, aircraft firefighting, and crash, salvage and rescue operations.

Assistant Air Officer (Mini Boss)—Aids the Air Boss by making sure that his plans, orders and instructions are carried out. The Mini Boss acts as the assistant department head. He also functions as the air-department training coordinator.

Yellow Jerseys

Aircraft Handling Officer (ACHO or Handler)—Exercises overall supervision of embarked aircraft and assists the Air Boss in conducting of flight operations. The handler also is in charge of the Air Department Training Team (ADTT).

Flight-Deck Officer—Is responsible for safe and timely operations, training of personnel, readiness of aircraft handling support equipment and overall maintenance and material condition of the flight deck.



Navy photo by MC3 Gary Prill

Catapult Officer (Shooter)—Is directly responsible to the Air Boss, via the handler, for the safe and efficient operation of launch equipment, and for the crew's performance during launches. He has the ultimate responsibility for the safety in launching of all aircraft from the catapults. Shooters wear a green helmet with



Navy photo by MC2 James Evans

three orange stripes and a yellow vest.

Aircraft Crash and Salvage Officer (Air Bos'n)—Supervises crash crews and fire parties in handling of aircraft emergencies during flight operations and general quarters. The Air Bos'n also ensures the readiness of assigned personnel, firefighting, and salvage equipment. The crash-

and-salvage officer also is responsible for the overall training of air department and air wing's flight-deck personnel in aircraft firefighting and crash and salvage operations.

Arresting Gear Officer (AGO or The Hook)—Responsible to the Air Boss via the handler for the safe and efficient operation of the recovery equipment and crew during recovery operations. The AGO must understand and comply with aircraft-recovery bulletins, CV NATOPS, and NavAir operating instructions. The AGO also enforces operational precautions. The AGO wears a green helmet with three green stripes and a yellow vest.

Plane Directors—Provide visual signals to cockpit crews (pilots) in guiding aircraft movements.



White Jerseys

Safety Officer and Crew—Responsible for the overall safety of flight-deck operations. They make sure all activities are in accordance with procedures.

Air Transport Officer (ATO)—Coordinates the loading, unloading and movement of all air cargo and passengers.



Navy photo by MC3 Justin Blake

Landing Signal Officer (LSO)—Ensures that each aircraft remains within safe perimeters during landing approach through radio communications and light signals. LSOs are stationed portside aft. They initiate the wave-off of aircraft that are outside the safe-landing envelope.



Navy photo by MC3 Nathan Laird

Squadron Plane Inspectors (Troubleshooters)—Identified by the black-and-white checkerboard pattern on the front and back of their jerseys with squad-

ron designator and green helmet. They are responsible for safety and inspection of aircraft.

Medical—They provide immediate medical assistance and treatment to any flight-deck personnel casualties. A large red cross on the front and back of their jerseys identifies them.

Blue Jerseys

Aircraft Handling and Chock Crewmen—The blueshirts are responsible for handling and securing all aircraft with wheel chocks and chains. They also operate the handling equipment, which includes tractors and aircraft-starting units on the flight deck.



Navy photo by MC2 Katrina Parker



Navy photo by MC3 Joseph Pol Sebastian Gocong

Elevator Operators (EOs)—Operate the carrier's aircraft elevators, which move aircraft to and from the flight and hangar deck. They wear white cranials.



Red Jerseys

Crash and Salvage—This flight deck “fire department” fights aircraft fires and rescues personnel on the flight deck. They operate all mobile firefighting and crash-and-salvage equipment.



Navy photo by ATAN Ashley Houp

Ordnance Officer—Responsible for the movement, handling and loading of aircraft ordnance. Their jersey has a black stripe and “Safety” on the front and back.

CAG Arm and Dearn Team—Ordnance personnel assigned to the carrier air wing for arming and dearming weapons.



Navy photo by MC2 James R. Evans

Explosive Ordnance Disposal Officer and Crew—They dispose of, disarm and neutralize defective ordnance. Their jerseys have “EOD” on the front and back.

Ordnance Handlers—The “BB Stackers” move, load, and unload, ordnance on aircraft. Their jerseys have black stripes and their squadron designator on the front and back.

Purple Jerseys



Navy photo by AN Michael Minkler



Navy photo by MC2 James Evans

Aviation Fuel Crews—Known as grapes because of their jersey color, purple shirts fuel and de-fuel aircraft from fueling stations strategically located around the flight and hangar deck. The grapes also supply automotive gasoline, lubricating oil to the catapults, and fuel to the jet-engine test cell.



Green Jerseys (Catapult Crew)

Catapult Safety Observer—Is a direct representative of the launching officer makes sure people follow launch procedures and precautions.

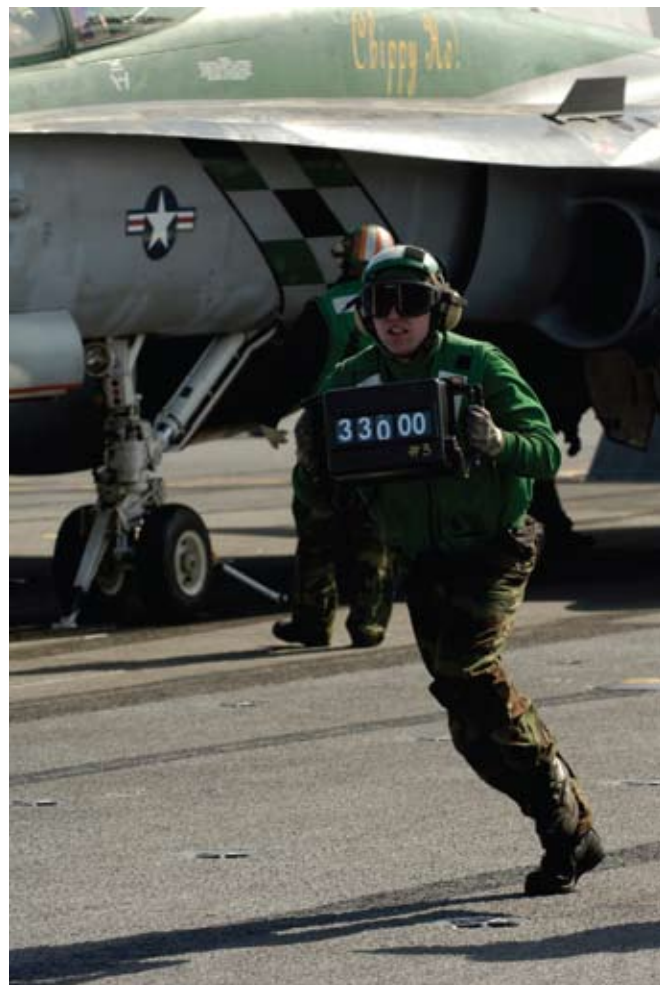
Topside Safety Petty Officer (TSPO)—Ensures that holdbacks and repeatable-release assemblies are installed, and that the aircraft's launch bar is seated in the shuttle spreader. For bridle aircraft, the TSPO makes sure the bridle is engaged with the spreader and the aircraft's tow fittings. They are the last people to exit from under the aircraft.

Holdback Personnel—Install holdbacks and repeatable-release assemblies. They install tension rings and bars and holdback assemblies. They also verify position.

Centerdeck Operator—Communicates with catapult control, relaying aircraft type, gross weight, side

number, and catapult selection valve settings for the launching officer.

Jet-Blast Deflector (JBD) Operator—Raises and lowers the jet blast deflectors for each aircraft. The JBD prevents jet blast from hitting personnel and aircraft aft of the catapult launching area.



Navy photo by MC3 Kyle Gahlau

Weight-Board Operator—Verifies the aircraft gross weight with the aircrew as a final check before launch. Each plane requires a different catapult CSV setting based on aircraft weight.



Green Jerseys (Arresting Crew)

Topside Petty Officer (TPO)—Supervises the arresting-gear topside crew. Responsible to the AGO for ensuring topside arresting-gear equipment is in good working order.



Navy photo by PHCS Mahlon Miller

Deck-Edge Operator—Retracts the arresting gear after recovery of each aircraft. Is stationed in the catwalk.



Navy photo by MC3 Jonathan Snyder

Hook Runners—Ensure cross-deck pendant and purchase cable have been disengaged from the aircraft tail hook, and, when the landing area is clear, they give retract signal to the deck-edge operator.

Deck Checkers—Ensure the landing area is FOD free, the wire is in position for aircraft recovery, and all personnel are clear of landing area.

Green Jerseys (Other Crew)

Aircraft Maintenance Crew—Maintain the aircraft. Their jerseys are marked with a squadron designator and black stripe on the front and back.

Helicopter LSE (Landing Signal Enlistedman)—Directs the takeoff and landing of all helicopters with visual hand signals. The LSE wears a red helmet.



Photographers—Capture images and videotape flight operations for documentation and media requests with a safety rep.



Brown Jerseys

Plane Captains—Make sure aircraft are inspected and serviced before and after each flight. They are responsible for the cleanliness and general condition of the aircraft. They also supervise ground-starting procedures. Their jerseys are marked with their squadron designator on the front and back.



Navy photo by PHAN Jessica Davis



Navy photo by MC2 Joseph Buliavac



Navy photo by MC3 Ricardo Reyes



Navy photo by MC3 Brandon Wilson

New Standard Procedures for Crossing the Landing Area

Rules for crossing the landing area (LA) are critical for safe maintenance and operations on the flight deck. Sometimes one voice can make a difference. Read this story of a Sailor's problem from the *Mech Winter 2002-2003* issue, and see the solution one proactive Sailor caused.



Navy photo by SN Kevin Murray, Jr.

Red Means Stop, And Green Means Go, But Not All the Time

By AME2 Katherine Robbins

Here's a riddle: When trying to cross a carrier's landing area, what's the difference between a red or a green flashlight waved vertically? In my case, it could have meant the difference between life and death from an F-14 on final.

On this particular night, our alert bird was parked on the finger, and I needed to cross the landing area to complete a daily inspection on an ejection seat. I was well aware of my location, the foul line, and the aircraft parked on the starboard side. I made my way back to where the arresting gear officer was positioned and got his attention by waving my flashlight vertically, signaling him that I needed to cross. He acknowledged my request and motioned to me by waving a green flashlight in a vertical direction. I recognized this as my signal to go and sprinted across the landing area to the jet on the finger.

As I did my inspections, the fact that jets were lined up for miles and would pass one by one very close to my head crossed my mind. I finished my work, closed the canopy, and crouched under the nose of my aircraft to wait for a jet at the two-mile mark. At this point, I thought about asking to cross before the incoming jet landed. Better judgment, a gut feeling, or my guardian angel saved me, and I chose to wait.

Once the jet had landed, and, before the next one was called at the four-mile mark, I signaled again. A red flashlight was waved vertically in response to my signal. As before, I interpreted the vertical motion as a signal to go. I was wrong! On this particular ship, a green flashlight waved vertically means "go," a red flashlight waved in the same direction means "stand fast."

When I had completed my flight-deck observer PQS, I was told that a flashlight being swept vertically meant "go" and one swept horizontally meant "standby." No one had said anything about the color of the flashlight used.

Three of the four people who had signed off my PQS did not complete a flight-deck PQS for this carrier. They had completed their books on other ships and were unaware of this specific procedure. The one person who had completed qualification on this ship was unaware of these signals.

This incident re-enforced the fact that I needed to keep my head on a swivel during flight operations. My incident did not affect flight ops but was a serious violation of safety, and I'm happy to be alive to tell the story.

AME2 Robbins works in the AME shop of the VFA-87 Golden Warriors.

I took Petty Officer Robbins' story to the Air Ops Branch Head at the Naval Safety Center, LCdr. Mark Persuitti, several months ago. I shared this story and told him I was surprised a standard set of signals didn't exist. He agreed and took it to the AirLant and AirPac Handling Teams. Because of this story, ComNavAirLant issued an urgent change recommendation (111331Z SEP 02) for NA 00-80T-113, Aircraft Signals NATOPS Manual, and NA 00-80T-120, CV Flight and Hangar Deck Manual. Great job, Katherine!—Ed.

New Standard Procedures for Crossing the Landing Area

No one shall enter the landing area to effect equipment repairs, or for any other reason, until the deck is "fouled" and until positive clearance has been obtained from the Arresting Gear Officer. If crossing the landing area is absolutely necessary during flight operations, the following procedures shall be followed:

Personnel shall stay clear of the foul line; and shall check the aircraft in the pattern.

If the pattern is clear, the individual shall get the Arresting Gear Officer's attention and indicate desire to cross by pointing across the deck.

The Arresting Gear Officer shall check the pattern. If the pattern is not clear, no response will be seen from him. The Arresting Gear Officer is busy and will continue with his duties.

If pattern is clear, the arresting gear officer will point at the individual and then swing arm in a horizontal motion to point to the other side of the landing area. A red wand will be used to point with at night.

After receiving clearance, the individual shall run straight across the deck, staying at least 10 feet aft of the No. 1 wire. This will prevent tripping over the wire supports or being struck by the No. 1 wire during the wire retraction.

The Safety Environment...



This section describes the knowledge, equipment and procedures that control risks and prevent mishaps.

FOD (Foreign Object Damage) Walkdowns

These are held before, during and after flight operations. Squadron, air wing, and ship's company air-department personnel participate by forming a line across the width of the flight deck, and they slowly



Navy photo by MCSN Laura Thuman

walk from bow to stern. The purpose is to search out loose objects on the deck that, if ingested into aircraft engines, would result in costly repairs. Flight-deck crews have been seriously injured by FOD that has been blown by jet blast. FOD always is a major safety concern on all aircraft carriers.

Flight-Deck Fire and Firefighting Symbols

“Fire, fire, fire on the flight deck!” Those sobering words and your immediate response can make the difference between minor damage and a catastrophe or between injury and death. Keep this fact in mind because you may be the first person on the scene. Will you be prepared? The firefighting-agent symbols illustrated below are painted at various locations on the wheel-stop coaming on the edges of the flight deck. You’ll see other firefighting-apparatus symbols on the island structure. Study these symbols when you walk the flight deck. Get familiar with the location, operating procedures, and intended purpose of all flight-deck firefighting equipment.

AFFF Station Markings

An 18-inch-wide green strip is painted up and over the deck-edge wheel-stop coaming. A white, 3-inch-high “AFFF” is painted



in the center of the stripe. At locations where coaming is not installed, the stowage location is marked by a green, 18-inch square painted on the flight deck with white “AFFF” letters painted in the center of the square.

AFFF is the primary extinguishing agent for aircraft fires on all Navy air-capable ships. Operating a typical flight-deck AFFF station is simple.

- **First** – Locate the activation button and the telephone (they are painted green).

- **Second** – Make sure the firefighting crew has pulled out all the fire hose from the storage box.

- **Third** – Push the button. This will activate the system and charge the hose. Note: Hard, non-collapsible hoses may be charged while on the hose reel.



- **Fourth** – Get on the telephone. This is how you will communicate with the pumping station that supplies the agent to the AFFF station, and how you talk with damage control central. Talk to the people at the pumping station if you have any problems or when it's time to secure the AFFF station. Note: You do not have to use the telephone before turning on the hose.

CO₂ Bottle Stowage Marking

A red, 12-inch-wide stripe is painted up and over the deck-edge wheel-stop coaming, and a white, 3-inch “CO₂” designation is painted in the center of



three stripes. Where coaming is not installed, the deck edge is marked with a white 18-inch-diameter circle with a red, 5-inch-high “CO₂” designation centered in the circle.

Purple K Powder (PKP) Stowage Marking

A red, 12-inch-wide stripe is painted up and over the deck-edge wheel-stop coaming, and a white three-inch high “PKP” painted on



the center of the stripe. Where coaming is not installed, a white 18-inch-diameter circle is painted on the flight deck and marks the stowage location. A red, five-inch high “PKP” designation is centered in the circle.

Salt-Water Station Marking

A red, 18-inch-wide stripe is painted up and over the deck-edge wheel-stop coaming, and a yellow, 3-inch-high “W” painted in the



center. Where coaming is not installed, the station is marked by a red triangle, 18-inches per side, painted on the flight deck. A yellow “W” is centered inside the triangle.

HALON Marking

The HALON agent is found only in the P-25 mobile firefighting and rescue vehicle.



Flight-Deck Basics



Navy photo by MC3 Roland Franklin Manipulated by Patricia Eaton

1. Wear all six items of flight-deck gear:

- Flight-deck helmet (cranial) which consists of a front-plate shell with (at a minimum) a 3-inch by 6-inch white reflective strip on front and a back plate with a 6-inch by 6-inch white reflective strip. Make sure the shells are connected to the liner and the sound attenuators.
- Use double hearing protection.
- Goggles: Always use clean, clear lenses. Make sure the goggles are attached to cranial. Tinted lenses are used for day operations only.
- MK-1 float coat: The fabric should be in good condition, the jacket must stay buttoned. Every day, check its overall condition, make sure the inflator assembly, light, and whistle all work. Ensure daily PMS is completed.
- Flight-deck boots: Must be steel-toed, with non-slip soles, and without any holes.
- Flight-deck jersey: Must be the right color and long sleeved. Keep the sleeves rolled down.
- Authorized fire-retardant gloves: Always wear gloves in good condition.

2. Keep your eye on anyone you think might be setting themselves up for an accident. Help to avoid that potential danger.

3. Lend a hand when an aircraft “push back” is called away. Caution—watch wheels, intakes and ordnance.

4. Clean up immediately any mess under and around aircraft. This will help stop foreign-object damage (FOD) and will help keep the deck skid-proof.

5. Take part in all flight-deck drills and FOD walkdowns.

6. Seek out a yellowshirt and ask for assistance if you are unsure of a situation.

7. Avoid walking in front of jet intakes or behind jet exhaust, especially if you aren’t sure whether the aircraft’s engines are turning. This is very important at night.

8. Assume an aircraft’s engines are turning if you see someone in the cockpit.

9. Avoid an aircraft’s moveable surfaces while the engines are turning.

10. Always enter the flight deck from behind the starboard side of the island.

11. Keep trainees an arms length away or closer to the trainer.

12. Stand clear of safe-park and safe-shot lines when flight operations are in progress.

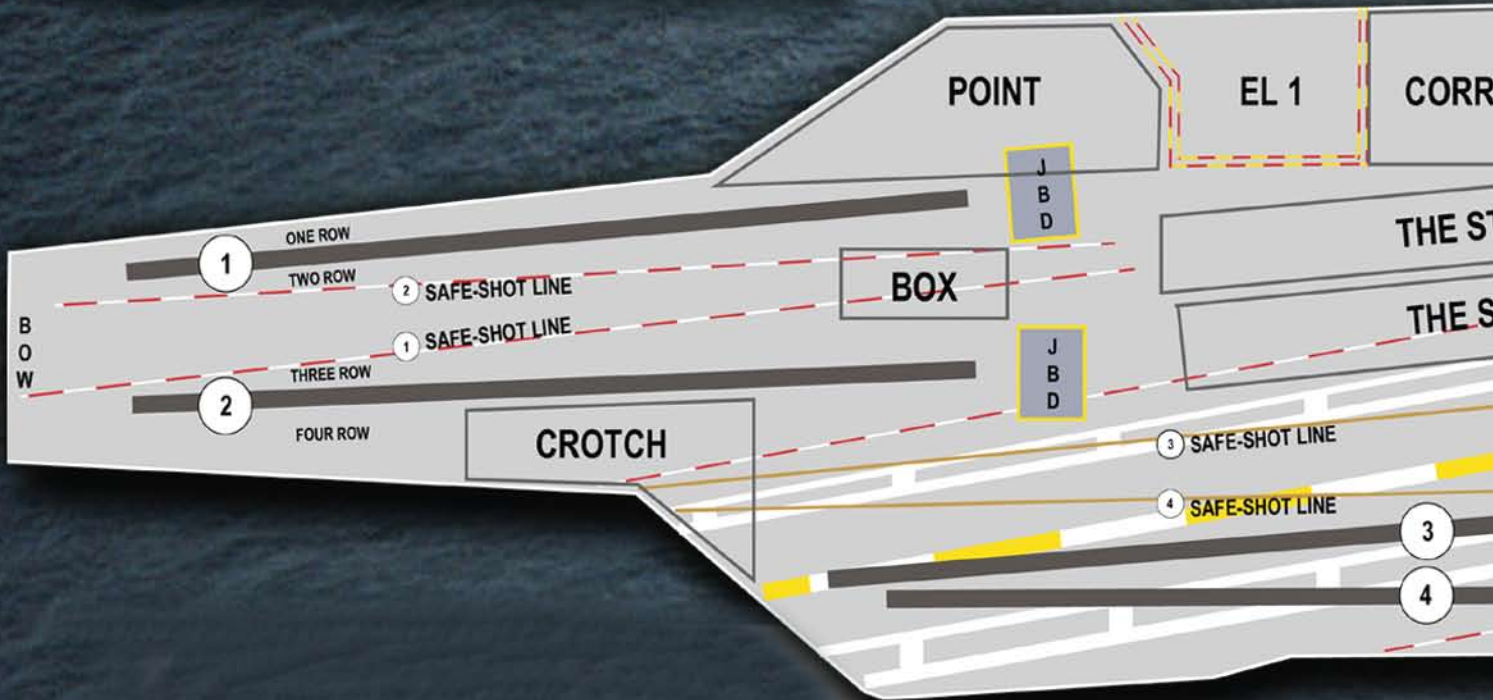
13. Notify flight-deck control immediately if you misplace a tool, wand or object.

14. Know the plan for the cycle. Know the flow of traffic by watching aircraft directors.



Navy photo by PH2 Christopher Stoltz Manipulated by Patricia Eaton

1. Don't walk onto the deck during flight operations without wearing proper flight-deck gear.
2. Don't wear jewelry such as neck chains or bracelets while on the flight deck or in the workcenter.
3. Don't have sleeves or goggles up during flight operations.
4. Don't walk close to aircraft with engines turning. Stay at least 25 feet away from all intakes and propellers. Avoid jet exhaust by at least 150 feet when possible.
5. Don't walk through propeller arcs even if the prop is not turning. Always walk around them.
6. Don't work on or pass beneath a moving aircraft. Do not pass beneath drop-tanks or air-refueling stores on parked aircraft.
7. Don't place yourself on the outboard side of a taxiing aircraft or one being towed to or from the bow.
8. Don't walk onto the flight deck via the bow catwalks during launches or via the port catwalk during recoveries.
9. Don't turn your back to the landing area during recovery.
10. Don't cross behind jet-blast deflectors while aircraft are at high-power settings and ready for catapult launch.
11. Don't sit on the flight deck.
12. Don't try to stand up if blown down by jet exhaust. Grab a pad eye or any immovable object, and hold on.
13. Don't place yourself near arresting-gear wires during aircraft recovery or when gear maintenance is being done.
14. Don't leave power cables lying on deck. Always stow them.
15. Don't stand in front of mobile firefighting equipment.
16. Don't cross elevator stanchions while they are raised.
17. Don't stand in front of a jet-starting unit's (huffer's) exhaust.
18. Don't loiter on the flight deck. If you do not have work to do, stay below.
19. Don't walk under tailhooks.



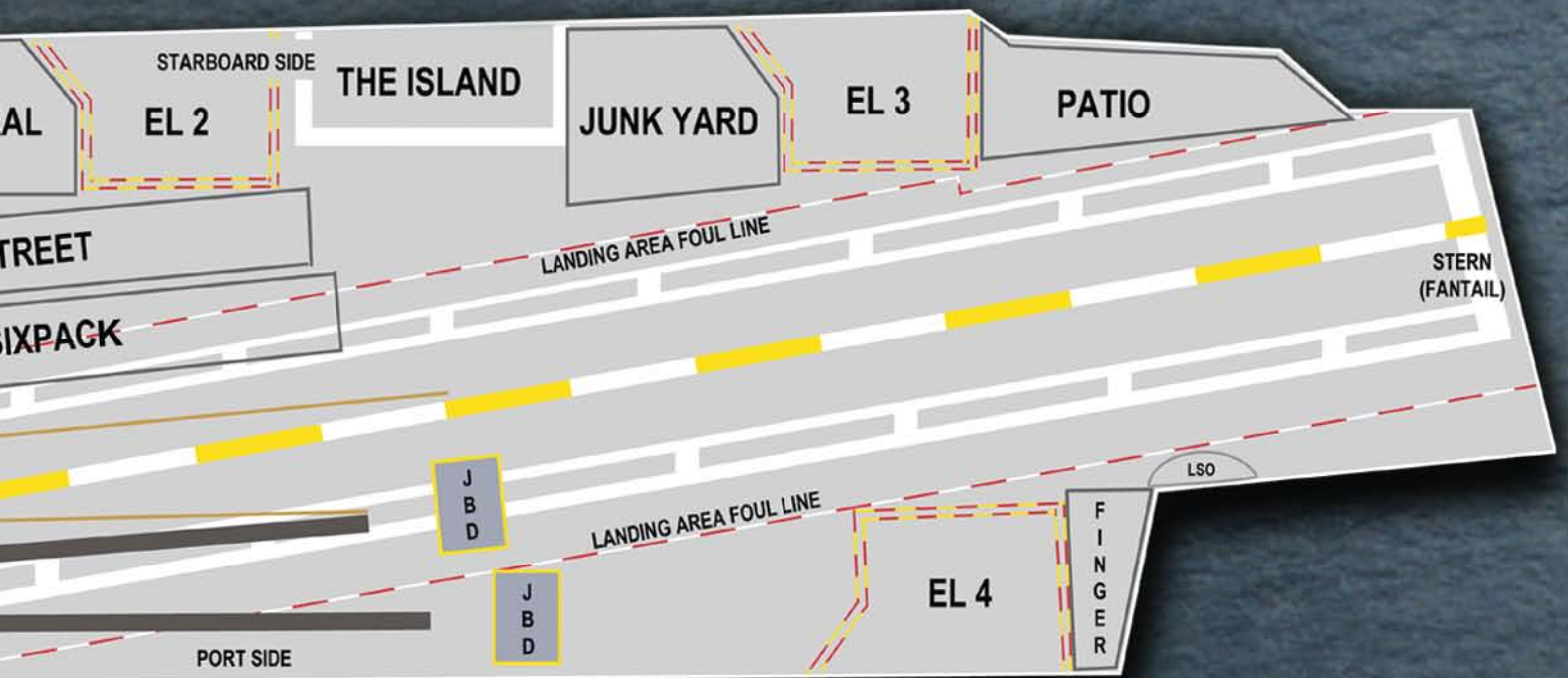


Illustration by Matthew J. Thomas



Real-Life, Flight-Deck Stories

Flight Deck Awareness describes an aircraft carrier's workplace, people and hazards. You know now that it can be a dangerous place for someone who loses situational awareness. This section will give you details of tragic incidents that hurt flight-deck personnel. The purpose is to show you how bad things can get for a clueless, careless or brazen Sailor.



I Walked Off the End of the Flight Deck...Into the Sea! (Mech, Winter 2005-06)



While on a deployment near the Great Barrier Reef of Australia, a young third class petty officer got the surprise of his life.

He was an experienced Sailor with four-and-a-half years in the Navy. The task was a night SCRUBEX, which he had volunteered for. The Sailor grabbed all his flight deck gear and mustered with the team near the island.

It was a very dark night, with clouds blocking out the moon and stars. Everyone was lining up along the forward edge of the landing area. He walked toward the very edge of the flight deck and was looking toward the stern. Not paying attention, he took one step too far

and found himself headed for the sea.

Fortunately, he was wearing all the right gear. He yelled all the way down to the water and all the way past the smoking sponson...all the time hoping someone heard him. They didn't initially, and the Sailor floated in the sea, watching the ship pass. He had the sense to turn on his strobe light and attach it to his cranial.

It seemed like an eternity, but a RHIB finally appeared, and the Sailors plucked him out of the water. The petty officer didn't suffer any injuries, and he got the lesson of a lifetime about paying attention...all the time...when on the flight deck.

Expect the Unexpected (*Mech*, Spring 2003)

A C-2 carrying passengers to an aircraft carrier veered out of the landing area and into the port catwalk. No one was hurt seriously, but the incident does show that anything can happen and usually when you least expect it.

The flight-deck crew sprang into action, making sure the engines were shut down, securing the aircraft with extra tie-down chains, and safely removing the passengers.

The aircraft then was removed from the catwalk. The actions of cool-headed flight-deck crew members kept the incident from becoming worse.



Tailhook vs. Finger (*Mech*, Summer 2006)

The painful injury you see in these photos could have been prevented. This story provides an important lesson about maintaining SA at all times on the flight deck.

The Marine was under an FA-18 doing final checks of the tailhook. As he crawled under the jet, he saw the hook begin to raise. Wanting to look at the hook, he signaled the yellowshirt to drop it, again. The yellow-shirt didn't see the signal, and the Marine stumbled a little, grabbing for the nearest object to stop his fall.

Unfortunately, he grabbed the hook as it slammed upward, hitting the stop pad. His finger now was locked into place, and the aircraft began to taxi forward, dragging him along.

The flight deck crew finally saw what was happening and stopped the aircraft, but the Marine has a permanent reminder of what can happen in a moments notice aboard a carrier.



These are just a few samples of what can go wrong on an otherwise perfect day. None of these Sailors ever thought they would make the type of mistakes that led to their problems. No one is infallible, of course, which is why working on the flight deck includes so many checks and backups.

Check out the maintenance and material division website at
www.safetycenter.navy.mil/aviation/maintenance/index.asp

and, while you're there, jump over to our air ops page,
www.safetycenter.navy.mil/aviation/operations/index.asp

ORM

for the

Flight and Hangar Deck

By Ted Wirginis and Denis Komornik

Did you ever notice how we almost seamlessly launch, recover and move aircraft and people all over the flight deck? Did you ever wonder how we do this? Simply put, because we have very dedicated professionals doing their job. However, whether we realize it or not, the success of those individuals who are just “doing their job” hinges upon thorough application of Operational Risk Management on three levels—in depth, when our leadership and acquisition folks provide the equipment, training and guidance for flight deck operations; deliberate, when we plan and brief for the events or operations of the day; and time critical, when we actually apply the risk controls or use the resources provided to us for getting the job done.

We depict the levels in a shaded gradient (Figure 1) because there are no definitive lines between the levels. Rather there is a flow from one level to the next dependent upon the time available, which obviously decreases as we get closer to the point of execution of an event. On the flight deck we spend most of the time doing the job—that means managing risk and resources at the time-critical level.

Why is it important to understand the three levels of ORM? Because each level plays a role in improving our chance of completing the mission successfully. In particular, the controls developed at each level are resources we can tap into to accomplish our job or mission during its execution. These resources make it easier to do our job and help catch errors that might

Navy photo by MC2 Joseph Buliavac



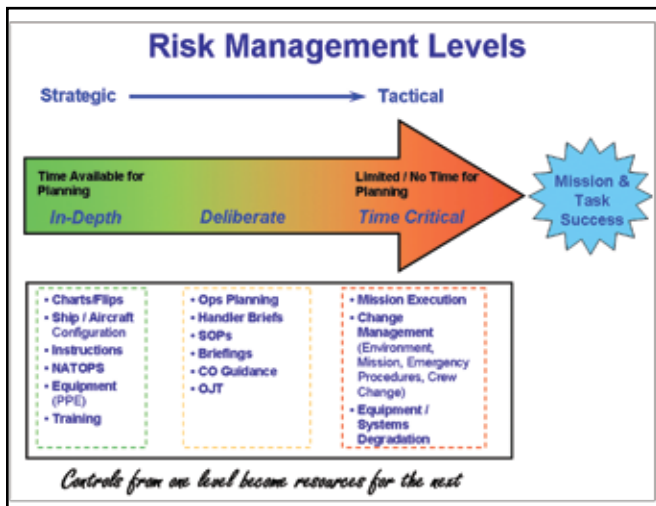


Figure 1

be detrimental to task or mission success. Beyond the equipment itself and our fellow shipmates, there are other resources we can tap to help mitigate the risks associated with the hazards of the flight deck. These can be broadly categorized into the following blocks:

- **Policies, procedures, and routines** such as general orders, SOPs and guides. These resources speed up decision making and increase predictability through standardized operations.
- **Checklists and job aids** such as instructions and MIMs. These resources decrease potential for error and improve coordination.
- **Automation** such as alarms, warning lights, auto door locks, autopilots and seat-belt warnings provide another opportunity to reduce risk by providing faster interpretation of information, process of information, provide warnings and distribute the workload.
- **Briefings and external resources** transfer situational awareness from a supervisor, shipmate, briefer or crew member. Briefs establish expectations and improve situational awareness.
- **Knowledge, skills and techniques** such as training, practice and drills. These resources are brought by the individual to the task or mission. In addition to helping us do a particular task, knowledge and skills improve situational awareness and ability to make informed decisions.

We can draw on the resources created as controls during the in-depth and deliberate levels of risk management to help us execute the task or mission at the time critical level. Those in a leadership position are responsible for making sure the resources are available to those who will be doing the tasks. Bottom-line, it is essential to continuously review available resources and make sure they are current, effective and relevant. This is a critical component of managing risk effectively.

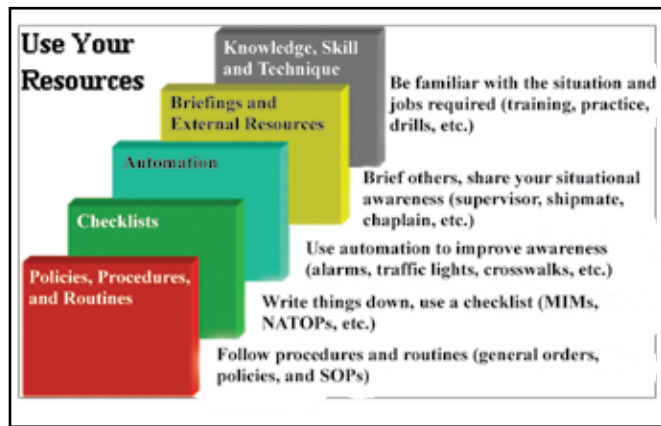


Figure 2

It is important to think of ORM not as an added program, but as an integral part of warfighting, of doing the job. To win or to succeed, we need to think, plan and perform better than our enemy. We need to understand the threats and hazards we face: the things that stand in the way of the successful accomplishment of our missions. We need to execute, sometimes under extreme stress, and we need to do it as a team. We prepare to go into battle by developing tactics and procedures to counter our adversaries, and then we hone the skill necessary to execute them.

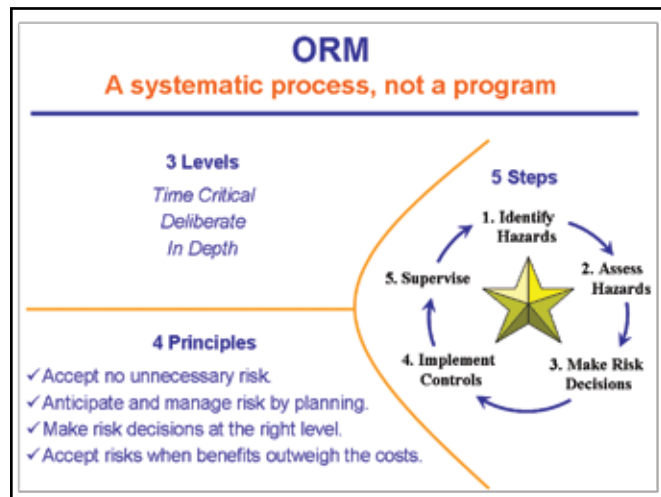


Figure 3

So, how does ORM fit into our daily lives when most of the time we're told what to do, when to do it, and that we better hurry up and do it? That's when time-critical risk management is applied.

Recall the 5-step process of ORM (Figure 3). This is the fundamental process used to anticipate hazards and develop controls to mitigate the associated risks prior to doing the job, when you have time to plan and find the right answers. Time and experience has shown that it works exceptionally well for the in-depth and deliberate levels, but was a challenge, at best, to apply

at the time-critical level. To help fill this time-critical gap, a new tool was developed—one that is easy to remember and use when we are doing our job—the mnemonic, A B C D.

- A – Assess the situation
- B – Balance your resources
- C – Communicate your intentions
- D – Do & Debrief

This is not a new ORM process, but a simple tool to help us manage the resources at our disposal in order to mitigate risks. Figure 4 illustrates the relationship between the 5-step ORM process and ABCD.

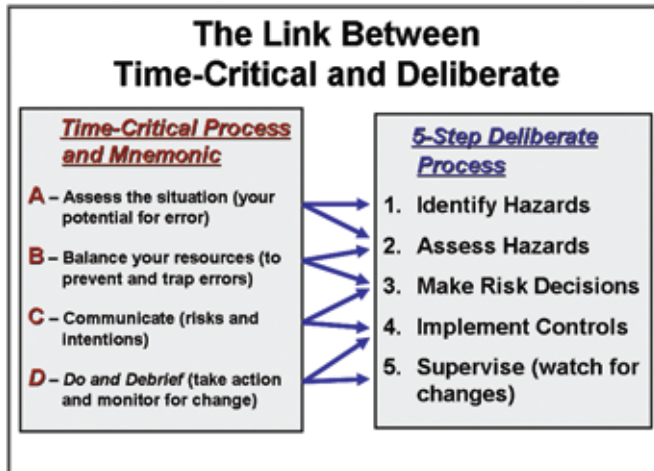


Figure 4

Time-Critical Risk Management (TCRM)

Let’s take a closer look at the ABCD’s and how it applies to our time on the flight or hangar deck.

As a yellow shirt, purple shirt, brown shirt, aviator or any other “shirt,” we use risk management, but maybe not all the time. Maybe we need to develop our skill sets to improve how we use risk management. What do we need to do our job better? How can the use of time-critical risk management help us and our team on the flight deck?

ASSESS the situation:

- What’s different today?
- What is going on?
- Where are you?
- What will impact your ability to complete the task?

Example: You’re headed to the flight deck to perform routine maintenance on your squadron’s aircraft. Before heading out, ASSESS the situation:

- Where on the flight deck will you come out?
- Are launch and recovery operations in progress?
- What are the current weather conditions (sea state,

rain, sun, day, night, fog, ice (you name it, we’ve seen it)? Are you prepared for it?

Are you fatigued (you know you’re tired; you’ve been working 12 hours, how attentive are you, will your reaction time be different)?



Navy photo by PHAN Ryan Restvedt

BALANCE your resources

What resources do you need to get the job done?
What resources do you need to work in today’s environment?

What resources are actually available?

What are your options?

How do you use them?

Example: You’re headed to the flight deck to perform routine maintenance on your squadron’s aircraft. What RESOURCES do I have available to me:

Do you have the proper PPE (cranial, hearing protection, flight deck boots)?

Do you have the tools required to perform the task at hand?

Do you have the correct publications, checklists, etc.?

Are you following proper procedures?

Do you have the necessary personnel to perform the task?

Navy photo by MC3 Kiona Mckissack





Navy photo by PHAN Joshua LeGrand

wrong...it is wrong—STOP! Communicate your concerns up the chain. Reassess the situation...don't take risks for which you're not prepared.



COMMUNICATE your intentions and risks

Who needs to know?

Who can help?

Who can provide back-up?

Revise if necessary.

Examples: You're headed to the flight deck to perform routine maintenance on your squadron's aircraft. To whom did you **COMMUNICATE** your intentions regarding getting the maintenance completed?

Does your supervisor or team know what you are doing?

If the job requires more personnel, do you press on or call for assistance?

Is it a new job? Are experienced personnel back at the work center? Do you ask for assistance or simply press on ... in a hurry?

Think about the job and your skill set...if it feels

DO and DEBRIEF

Carry out the plan.

Was mission successful?

Did actions produce mission success and reduce the risk?

Examples: You're headed to the flight deck to **DO** the routine maintenance on your squadron's aircraft (this task needs to be done...plenty of pressure from maintenance control).

The maintenance was performed as required, and you met the launch (mission success). But it's now time to ask some questions (**DEBRIEF**).

- Did you properly assess the situation? When coming up on deck, did you almost get blown down from jet exhaust? Did you cross foul-deck lines or safe-shot lines? Did you have all required PPE? Were you prepared for the weather? Why did the job take longer than expected?

- Did you balance your resources? Did you have the required tools and personnel? As you review the event, did you really use all the right resources to get the job done effectively and efficiently?

- Did you communicate what you were planning to do? Did you let the supervisor know about any issues or hazards that might impact job completion? Did communications cause delay? What could be done to achieve success in the future with fewer problems? As a leader, do you foster open communication to identify hazards?

We all have a responsibility to use risk management as a tool to improve our mission readiness and ensure mission successes, especially as we face daily changes in tasking, personnel, equipment or the operating environment. As a final thought, look back at Figure 3 and remember that regardless of the level at which you are applying risk management, the four principles are the essential underlying concepts.

Now, take a minute to review the scenarios below and facilitate discussion within your workcenter on how to improve your management of risk.



Navy photo by MC2 James Evans



Navy photo by MC3 Ryan O'Connor

Scenario 1



Navy photo by MCSN John Mike

During night CQ operations, the ship successfully recovered an EA-6B on the No.3 wire. Upon recovery, No. 3 wire was retracted, and the fast eddie (shuttle cover) was dislodged. This created a gap where the cross-deck pendant (CDP) 3 became wedged under fast eddie and lodged underneath catapult 3 spreader. A “foul deck” was announced by the Air Boss and other appropriate personnel. Because of miscommunication between personnel, flight-deck crewmembers removed CDP 4 vice CDP No. 3 in error. Below deck, arresting gear engine No. 3 was set to 10,000 lbs—the standard engine setting for out of service gear engines. However, the No. 3 engine still had the CDP attached. The next aircraft in the landing pattern was an FA-18F which required an arresting gear engine setting of 44,000 lbs. The Super Hornet engaged CDP 3, which partially slowed the aircraft until it failed. The aircraft departed the flight deck well below flying speed, and the aircrew ejected. Six flight-deck crewmembers were injured by the parted CDP and extended purchase cable. Two flight-deck crewmembers received permanent partial disabilities as a result of their injuries.

TCRM procedures that could have averted this mishap.

A – Assess the situation. Night CQ and a problem with the No. 3 CDP and aircraft to recover. Why is the flight-deck crew removing CDP No. 4 vice No. 3 and no one asking why they are performing this action? Who is directing No. 3 engine to be set at 10,000 lbs?

B – Balance your resources. Check the cable...is it good or does it need to be removed? What equipment is available? Personnel availability? Gages should be monitored and if they seem to be set wrong why isn't anyone stating so? Is there an established NATOPS procedure or SOP that should be followed?

C – Communicate risks and intentions. Notify appropriate personnel. All personnel need to continue to ask questions when an out of the norm event occurs until resolved.

D - Do and Debrief to improve. Execute mission and document lessons learned. This incident resulted in a class “A” mishap with loss of equipment and injury to crew. When completing operations, debrief as a team. What needs to change to prevent further occurrences?

ORM lessons learned:

- Lack of situational awareness resulted in mission degradation, failure and tragedy. Every person found to be at fault in this mishap missed the opportunity to act on one or more critical pieces of information that could have prevented this mishap. Those individual acts of omission resulted in the breakdown of communication. This sequence of events clearly illustrates how critically important every person involved in flight-deck operations is to mission success.

- Another common thread concerns complacency. Flight operations on an aircraft carrier are one of the most dynamic and challenging work environments. Yet, in spite of this, if we do the same thing over and over again, we can become complacent. Complacency can lead to overconfidence and a lack of attention to detail. At that point we are simply going through the motions instead of being actively engaged and focused in what we are doing.

- An experienced operator suspected the arresting gear was not configured correctly but did not stop flight operations to confirm the topside configuration matched the arresting-gear engine settings. This act of omission may imply something about the command climate with regards to complacency and understanding roles and responsibilities in mission execution. One person can make a difference.

the GSE was under the aircraft but erroneously determined that they had enough lateral clearance to move the jet without first moving the equipment. The stator was deflected (trailing edge down) before the aircraft was moved. The crew began the move, and the aircraft hit the GSE, causing damage to the underside of the starboard stator. The director failed to clear the immediate area of obstructions before allowing the aircraft to be moved. Also, the tail safety and the starboard chock walker did not notify the director of any unsafe condition.

TCRM procedures that could have averted this mishap.

A – Assess the situation. Aircraft move in hangar bay. GSE equipment in area. Crew with lack of situational awareness with no one focusing on the move in tight quarters. Crew was unaware of the impact the aircraft’s configuration would have on the move.

B – Balance Resources. SOPs for aircraft moves and required crew. Are we performing this move on the fly with inexperienced/unqualified personnel? Why not find someone to move GSE equipment?

C – Communicate risks and intentions. Did the Aircraft Director and crew brief before the move, to include utilization of established methods (voice, whistles, etc.)? Was the team aware of their responsibility to alert the director of any issues that would result in mission failure?

D – Do and Debrief to improve. Execute mission and document lessons learned. Document lessons learned for future reference to include space allowance, day/night, sea state, experience of personnel etc... remember you will transfer and someone behind you will perform the same evolutions...why let them make the same mistakes?

ORM lessons learned:

This is a perfect example of an age-old hazard with aircraft moves. Maintaining a strict adherence to safety precautions, shipboard SOPs and hangar-deck NATOPS procedures are part of the risk management process and, in this case, could have prevented this mishap. The bottom-line lesson learned is everyone must recognize the value and responsibility of providing input before, during and after aircraft spotting.

Mr. Wirginis is the ORM manager at the Naval Safety Center and had a tour with V-1/V-2 division. Mr. Komornik is a retired senior chief with CVN ships company experience.

Scenario 2



Navy photo by PH3 Danny Ewing Jr.

An aircraft being towed in the hangar bay of an aircraft carrier hit a piece of GSE that was under the starboard wing of the aircraft. The move crew knew



Assess

What is going on



Balance

Your options



Communicate

Risks and Intentions



Do

*and Debrief to
improve*



Time Critical Risk Management



Flight Deck References

Flight Deck Uniform Color Reference

PERSONNEL (NOTE 9)	HELMET	JERSEY/ FLOATATION VEST	SYMBOLS, FRONT AND BACK
Aircraft handling crew and chock men	Blue	Blue	Crew number
Aircraft handling officers and plane directors	Yellow (Notes 1-5 as needed)	Yellow	Billet title — crew number
Arresting gear crew	Green	Green	A
Aviation fuel crew	Purple	Purple	F
Cargo handling personnel	White	Green	"Supply"/"POSTAL" as appropriate
Catapult and arresting gear officers	Green	Yellow	Billet title
Catapult crew	Green	Green	C
Catapult/AG QA	Green	White	ALRE QA
Catapult safety observer (ICCS)	Green	(Note 6)	Billet title
Crash and salvage crews	Red	Red	Crash/Salvage
Elevator operators	White	Blue	E
Explosive ordnance disposal	Red	Red	"EOD" in black
GSE troubleshooter	Green	Green	"GSE"
Helicopter LSE	Red	Green	H
Helicopter plane captain	Red	Brown	H
Hook runner	Green	Green	A
JBD safety observer	Green	Green/White	JBD Safety
Landing signal officer	None	White	LSO
Leading petty officers:			
Line	Green	Brown	Squadron designator and "Line CPO"
Maintenance	Green	Green	Squadron designator plus "Maint. CPO"
Quality assurance	Brown	White	Squadron designator and "QA"
Squadron plane inspector	Green	White	Black and white checkerboard pattern and squadron designator
LOX crew	White	White	LOX
Maintenance crews	Green	Green	Black stripe and squadron designator
Medical	White	White	Red Cross
Messengers and telephone talkers	White	Blue	T
Ordnance	Red	Red	3-inch black stripe and squadron designator/ship's billet title
Ordnance QA	White	(Note 8)	Squadron designator and "ORDNANCE QA/SAFETY"

NAVAIR 00-80T-120

PERSONNEL	HELMET	JERSEY/ FLOATATION VEST	SYMBOLS, FRONT AND BACK
Photographers	Green	Green	P
Plane captains	Brown	Brown	Squadron designator
Safety	White	White	"SAFETY"
Supply VERTREP coordinator	White	Green	"SUPPLY COORDINATOR"
Tractor driver	Blue	Blue	Tractor
Tractor King	Blue	(Note 7)	TK
Transfer officer	White	White	"TRANSFER OFFICER"

Note

- Only personnel charged with the actual control or direction of aircraft movements on the flight or hangar decks shall wear yellow jerseys. Personnel in charge of a detail, such as aviation fuels, ordnance, and maintenance, shall wear a helmet and jersey corresponding in color to that of their respective detail and with their billet title on the jersey and flotation vest.
- Helmets for all personnel shall be marked with a 6-inch square (or equivalent) of white reflective tape on the back shell and a 3-inch by 6-inch (or equivalent) of white reflective tape on the front shell. Landing signal officers are not required to wear helmets or sound attenuators when engaged in aircraft control. Helmets shall have a 2-inch piece of velcro on the left side of the front shell and velcro on the survival light.
- Three reflective international orange stripes, 1-inch wide, evenly spaced, running fore and aft on top of the white reflective tape.
 - All air department officers
 - Air department chief petty officers and leading petty officers
 - EOD team members
 - All ordnance officers and gunners
 - Ordnance handling officer and gunner.
- Helmets for all personnel who have not completed flight deck observer qualification shall be marked (front and rear) with a "T" using 1-inch wide blue reflective tape over the existing reflective tape (front minimum 2-inch tall, rear minimum 3-inch tall lettering).
- Helmets for all aircraft directors under instruction shall be marked (front and rear) with a "U/I" using 1-inch wide blue reflective tape evenly spaced over the existing reflective tape (front minimum 2-inch tall, rear minimum 3-inch tall lettering).
- ICCS green jersey/yellow flotation vest.
- Yellow jersey/blue flotation vest.
- White jersey/red flotation vest.
- Only authorized, all leather, steel-toe boots shall be worn on the flight deck.

NAVAIR 00-80T-120

References for carrier flight-deck qualification:

- NA 00-80R-14, NATOPS, *U.S. Navy Aircraft Firefighting and Rescue Manual*
- NA 00-80R-19, NATOPS, *U.S. Navy Aircraft Crash and Salvage Operations Manual (Afloat)*
- NA 00-80T-113, NATOPS, *Aircraft Signals Manual*
- NA 00-80T-120, NATOPS, *CV Flight/Hangar Deck Manual*
- NA 17-1-537, *Aircraft Securing and Handling Procedures*
- NA 19-25-574, *Firefighting Vehicle A/S32P-25*
- NAWC Aircraft Division Lakehurst-4.8.10.3 (Rev. L), *Visual Landing Aids General Service Bulletin No. 8*
- NavEdTras for Damage Controlman 3 & 2, Airman, Basic Military Requirements, Interior Communication Electrician, Vol 1, Aviation Ordnancemen 3, 2 & 1, and Aviation Boatswain's Mate H 3 & 2
- NWP 3-04.1, *Helicopter Operating Procedures for Air-Capable Ships*
- NWP 3-50.1 (Rev. A), *Naval Search and Rescue (SAR) Manual Air-Capable Ship, Aviation-Facilities Bulletin No. 1H*
- OpNavInst 3500.39, *Operational Risk Management*
- OpNavInst 5100.19C, *Navy Occupational Safety and Health (NavOSH) Program Manual for Forces Afloat*
- Ship's Information Book

ORM 5-Step Process

- Identify Hazards
 - Look at the hazards on the flight deck (intakes, exhaust, "head knockers," open deckwells, etc.).
 - Look for what could cause a hazard (planes turning and taxiing, people too close to deck edge, sharp objects, trip hazards, etc.).
- Assess Hazards
 - What degree of risk exists: critical (death), serious (severe injury), moderate (minor injury), or minor (minimal impact)?
 - What probability exists: likely, probable, may occur, or unlikely?
- Make Risk Decisions
 - Develop controls to minimize risk (steps to take to avoid injury, death or damage to aircraft and equipment).
 - Determine residual risk (reassess risk with your controls).
 - Make risk decision.
- Implement Controls
 - Use established controls (follow your plan to reduce risk).
 - Communicate these controls to the lowest level: Who will do what, where and by when.
- Supervise
 - Enforce standards and controls
 - Remain alert for changes and the need to modify controls.
 - Take corrective action when necessary.



NEW HEARING PROTECTION

By Valerie Bjorn and Jim Wilt

After surveying more than 1,000 flight-deck personnel, NAVAIR took away some important lessons for developing new hearing protection.

The goals for new hearing protection are:

- Motivate (not just dictate) earplug use.
- Provide individual custom design, improved comfort.
- Ensure earplugs are worn correctly.
- Customize earplugs so they fit like puzzle pieces.
- Notify user if an acoustic leak is present and needs to be fixed.
- Track personal noise exposure more closely.
- Improve hearing-conservation training.
- Increase supervisor involvement and accountability through the chain of command.
- Provide hearing-protection alternatives that are logisti-

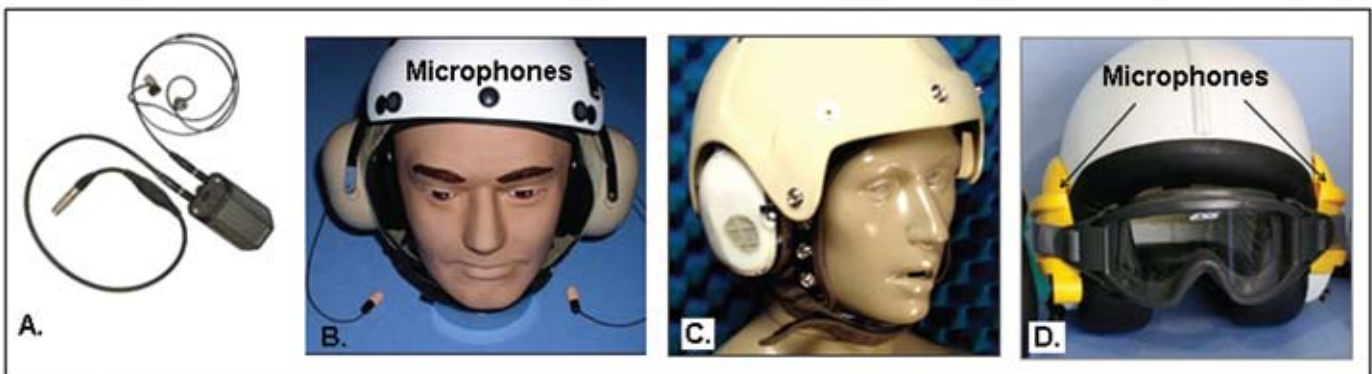
cally smart (a good value, easy to buy, use and maintain).
 -Not everyone works in the worst-case scenario (150 dB jet noise).

-Not everyone needs the most costly and capable hearing protection.

- Offer hearing protection alternatives.
- No single product is good for everyone.
- These alternatives and any related advancements should be plug-and-play compatible.
- Provide non-radio deck crew the ability to speak to each other while protecting their hearing level and allowing them to maintain situational awareness.

Through the small-business innovation-research (SBIR) program, NAVAIR is working with four companies to develop a suite of hearing protection and communication

Flight Deck Talk-Through Technologies in Development



NAVAIR Small Business Innovator / Manufacturing Partners
 (A) Adaptive Technologies, Inc. (ATI) / Aegisound, (B) Communications & Ear Protection, Inc. (CEP) / Westone, (C) Red Tail Hawk Corporation / 3M, and (D) Create, Inc. / OTTO and CMR&D

New Flight Deck Hearing Protection & Comm Technologies



technologies to meet these goals. Hearing protection and communication options will allow users to tailor their selection to their work-noise environment. As shown in the figure, there is a progression of capability, starting from what has been used on the flight deck for decades up through active noise reduction (ANR), deep-insert, custom communication earplugs worn under improved earmuffs and used with a digital noise-canceling microphone.

By using deep-insert custom earplugs, the user can achieve a more assured earplug fit, compared to foam and flanged earplugs, and thereby achieve a good, consistent hearing-protection level. It is this assured fit by deep-insert custom earplugs that allows ANR to cancel noise in the small trapped space between the earplug inner tip and the eardrum. By canceling noise here, instead of in a headset for example, the ANR electronics benefit from all the combined passive attenuation of the earmuff and custom earplugs, which leaves a much lower noise level for the ANR to reduce.

Future endeavors funded by the Office of Naval Research and the SBIR program include two new NAVAIR projects. One is developing a way to improve how ear-canal shape is captured to make custom earplugs. Another effort is to develop in-ear noise measuring for flight-deck use. This dosimetry capability will allow users the ability to ensure their hearing protection is worn correctly by detecting and notifying them of acoustic leaks, and it will track their daily noise exposures more accurately—a critical element to NMCPHC and BUMED’s hearing-conservation program. Another NAVAIR SBIR effort is developing the capability for flight-deck crews in non-radio jobs to talk to each other through their hearing protection, while also receiving safe levels of sound cueing.

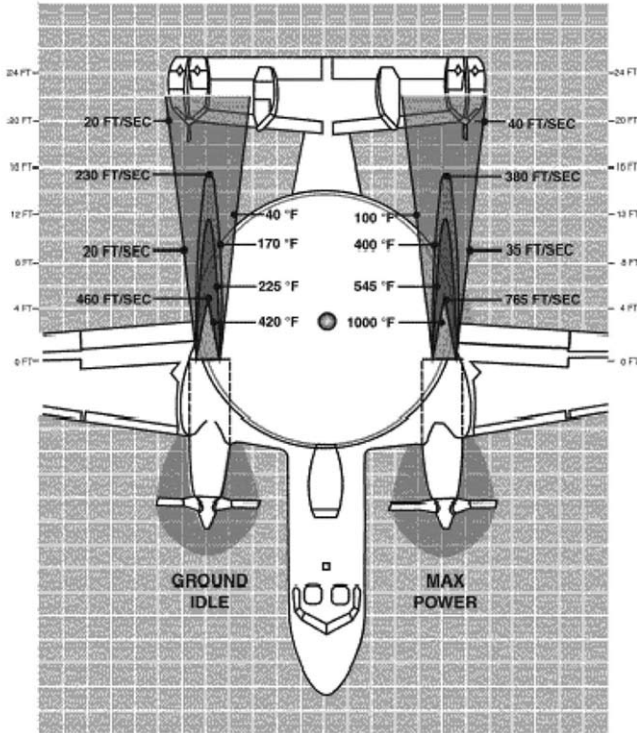
All of these hearing-protection and communication technologies are being designed to integrate with both the legacy and the new flight-deck cranial.

Ms. Bjorn works at NAVAIR with Human Systems, Code 4.6, and Mr. Wilt is with the Personal Protection Branch, Code 4.6.7.3

Exhaust and Noise Danger Areas

AIRCRAFT: E-2C 2000

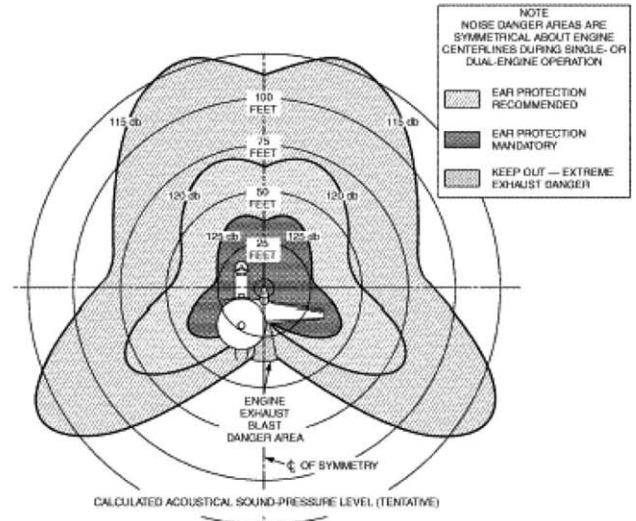
PERSONNEL DANGER AREAS (1 of 2)



AIRCRAFT: E-2C 2000

PERSONNEL DANGER AREAS (2 of 2)

ENGINE OPERATION – MAX POWER (SUBTRACT 10db FOR GROUND IDLE VALUES)

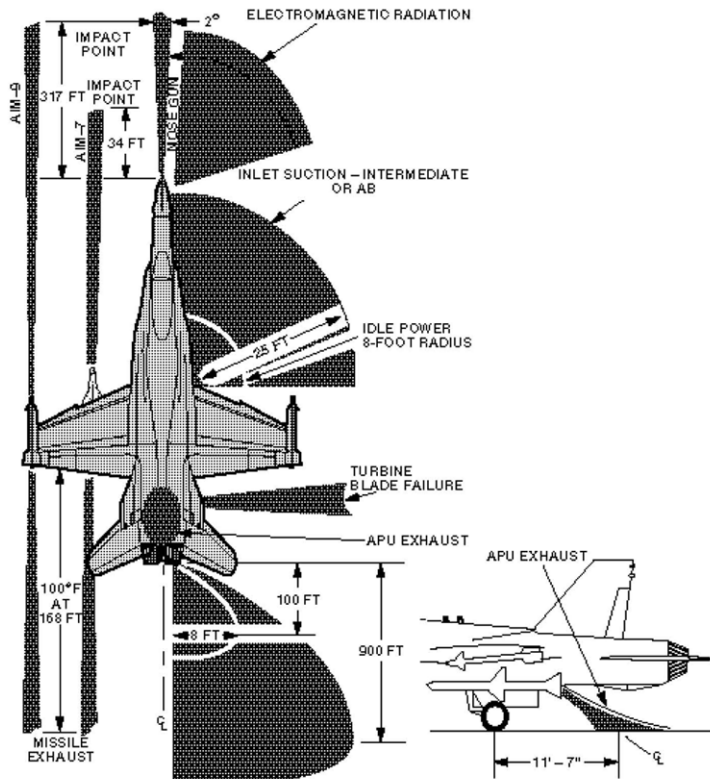


			DAMAGE RISK CRITERIA					
			EXPOSURE TIME DURATION PER DAY					
			5 MINUTES	15 MINUTES	30 MINUTES	1 HOUR	2 HOURS	
			NO PROTECTION	99 db	95 db	92 db	89 db	86 db
STANDARD EARPLUG (V-51F)	WILSON MUFF NO. 200	NAVY EARMUFF (STRAIGHTWAY 400-9)	EARPLUGS	129 db	124 db	121 db	118 db	115 db
			EARPLUGS AND EARMUFFS	138 db	134 db	131 db	128 db	125 db

REF: WADC TN 55-355 TO DAMAGE RISK CRITERIA

AIRCRAFT: F/A-18A/B/C/D

PERSONNEL DANGER ZONE

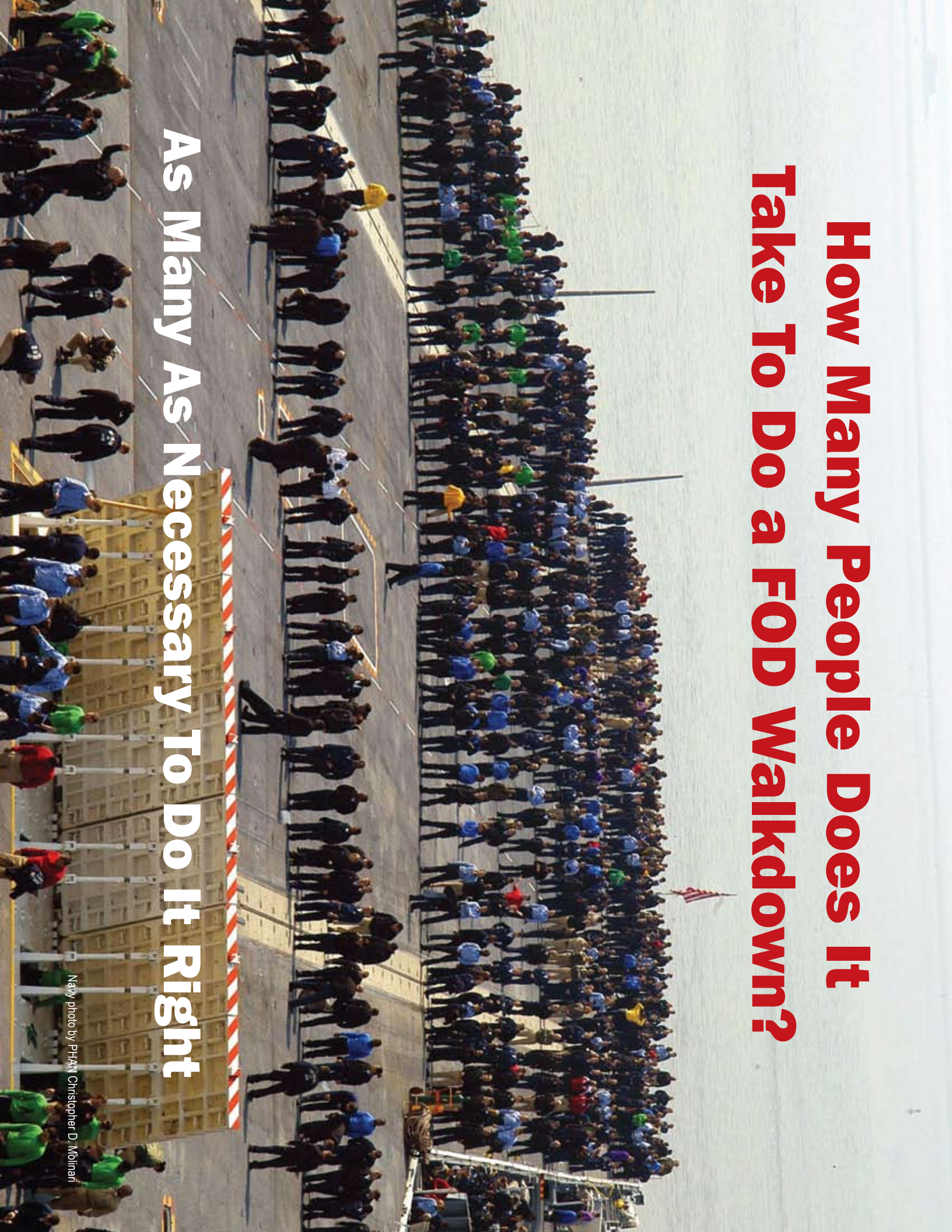


The MIL-HDBK-844A provides information on the fueling of aircraft and, more importantly, a set of diagrams for aircraft that show jet exhaust and noise danger areas. Not every aircraft has both charts listed, but the general NATOPS and specific NATOPS for individual aircraft provide similar charts. The E-2 and FA-18 represented here are examples of the information available that will keep you away from exhausts, intakes, and noise danger areas.

Too many Sailors and Marines are injured each year when blown down on the flight deck. Many others suffer permanent hearing loss from working in high-decibel noise areas without the proper hearing protection. Claims for hearing damage are filed and paid each year, but money isn't a good replacement for the ability to hear. Use your head and PPE... wear it and maintain your hearing for the future.

How Many People Does It Take To Do a FOD Walkdown?

As Many As Necessary To Do It Right



Keep Your Head on a Swivel



www.safetycenter.navy.mil

