

The US Navy

Unit IV





Navy Ships

Key Terms

- strategy
- stability
- deterrence
- strategic
- tactical
- humanitarian
- displacement
- knot

What You Will Learn to Do

Identify the ships of the Navy and understand how they fulfill the Navy mission

Skills and Knowledge You Will Gain Along the Way

- ✓ Explain the mission of Navy ships
- ✓ Explain ship terminology
- ✓ List types of Navy ships
- ✓ Describe shipboard customs and courtesies

Above: Photo courtesy of US Navy/Mass Communication Specialist 2nd Class Shannon E. Renfroe

Previous page: Photo courtesy of US Navy/Mass Communication Specialist 3rd Class Douglas G. Morrison

The Mission of Navy Ships

The purpose of Navy ships is to carry out the military **strategy** of the United States.

That strategy includes three parts:

1. Peacetime engagement
2. Deterrence and conflict prevention
3. Fight and win.

The first element means that during peacetime the US has forces around the world to promote economic and political **stability**. This means the United States is paying attention to what's going on in the global neighborhood. The presence of American ships encourages free trade and peaceful connections among nations by ensuring the security of the seas.

Deterrence, the second element of the Navy's strategy, is derived from the adage, "If you seek peace, prepare for war." In other words, if a country places combat power where it cannot be ignored, a potential enemy is less likely to become hostile for fear of immediate reprisal.

The third element of the strategy—fight and win—means that US forces must be ready for combat at all times.

The Navy's Mission

The Navy's mission in carrying out the national strategy is to maintain, train, and equip combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas.

Over the years, the Navy has seen this mission as having four elements:

1. **Strategic** deterrence
2. Sea control
3. Projection of power ashore
4. Naval presence.

Strategic Deterrence

Strategic deterrence means convincing a potential enemy that an attack on the United States is not a good idea. The best example of this is the Navy's submarine force. These fast and maneuverable underwater ships are nuclear powered and can maintain secret operations for months. Add to this capability of the strategic missile submarine force, which can deliver nuclear weapons to targets across the globe, and strategic deterrence becomes a reality. Potential enemies who know that to attack the United States would be to risk devastation will be less inclined to attack.

Sea Control

Sea control refers to keeping the seas open to the United States, its allies, and other friendly nations. It also means being able to deny a potential enemy the use of the seas. Operation Anaconda during the Civil War was a good example of sea control: the Union fleet maintained control of the Confederate sea lanes by blockading Southern ports and preventing the Confederates from trading with Europe.

Key Terms

strategy—
a country's top-level political and military plan

stability—
steadiness or order in the international or political realm

deterrence—
prevention of war by instilling fear in potential enemies

Key Term

strategic—
referring to a country's long-range weapons or plans; the big picture

Key Terms

tactical—
referring to short-range
weapons, or to assets
used in support
of ground forces

humanitarian—
referring to help given
to individuals in need,
such as assistance to
disaster victims, without
regard to military
or political concerns

Projection of Power Ashore

Projection of power ashore refers to the use of the seas to carry a fight to a potential enemy beyond US borders and into its own. The United States is largely bound by water, with nearly 13,000 miles of coastline split between the Pacific, Atlantic, and Arctic Oceans. To defend its vast shoreline, the United States must be able to strike at any enemy before it reaches the shore. Over the past two centuries, the United States has refined the ways it accomplishes this mission. It has made strides such as the advancement from smooth-bore cannon mountings to Tomahawk cruise missiles, and from rowboats to **tactical** aircraft that allow troops to quickly land on enemy soil. Because of these and other advancements, a foreign enemy military force has landed on American soil only three times in more than 200 years.

Naval Presence

Naval presence is the ability to show the flag around the world—to be visible on the open seas anywhere on the globe. This presence can be a silent threat but it can also be quite visible—as when the Navy provides **humanitarian** assistance. Still, with a strong naval presence and the implied threat of action, the United States Navy helps keep the seas free and open to all and ensures compliance with the international law of the sea.

Ship Terminology

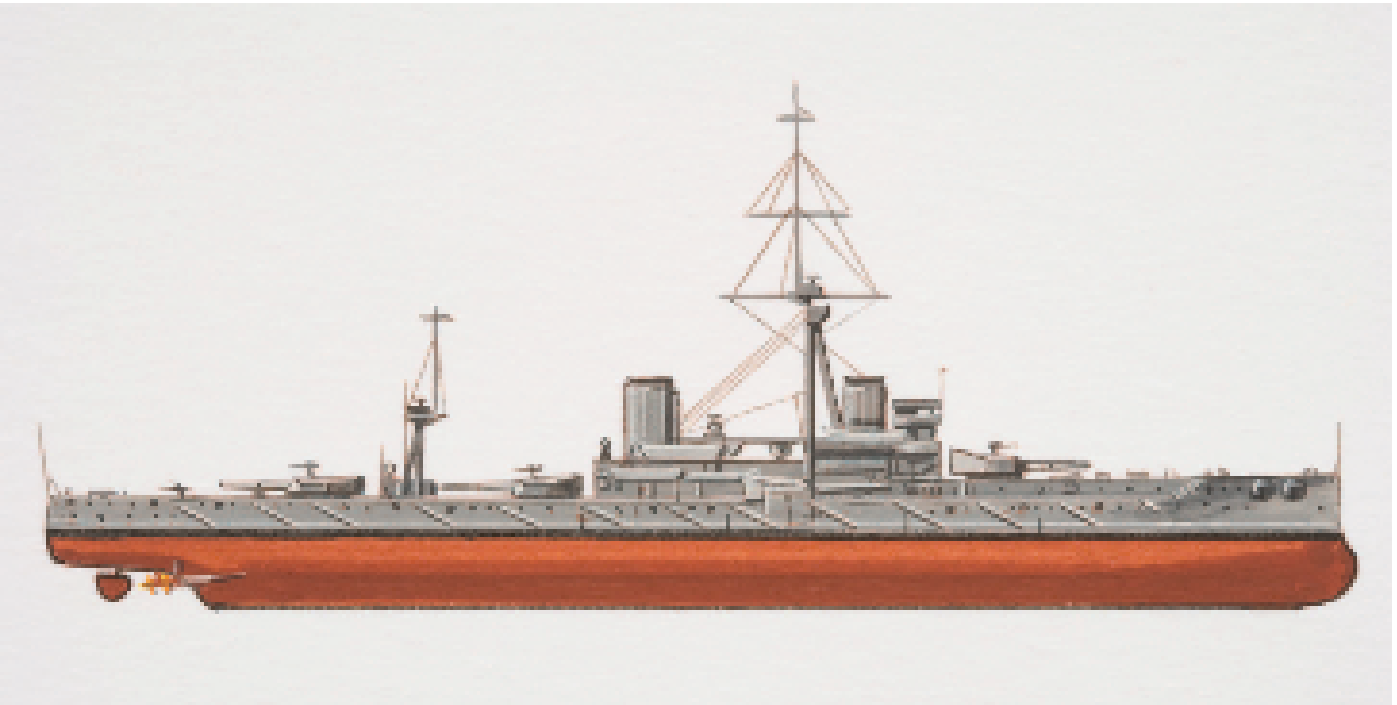
The Navy has a lot of specialized lingo. Some of these terms have to do with being a military organization while others have to do with being a nautical organization. In this section you will learn some of the basic terms.

In the Navy, a majority of a Sailor's time is spent on a ship, and several terms have been adapted to fit a Sailor's environment. Instead of saying, "upstairs," Sailors say *topside*, and they say *below* to mean "downstairs." Given the construction of the ship, terms like "floor" and "ceiling" are called *deck* and *overhead*, respectively, while walls have been labeled as *bulkheads* and hallways are *passageways*. These terms and others are as much a matter of tradition in today's Navy as they are of practicality. They are part of what distinguishes the Navy.

Directions

Navy language labels lengthwise direction on a ship as *fore* (toward the front) or *aft* (toward the rear). Crosswise is *athwartships*. The front of the ship is the *bow*. The rear is the *stern*. If you move toward the bow, you're *going forward*, in Navy talk. To *go aft* is to head toward the stern. An object closer to the bow than is another object is *forward* of that other object. If something is closer to the stern than is another object, Navy talk says it's *abaft* of the other object.

A ship's *centerline* divides it in half lengthwise. When you face forward along the centerline, everything on your right is to *starboard*, and everything to your left is to *port*. Fixtures and equipment are described in terms of the side of the ship they are on—such as the *port anchor* or the *starboard gangway*.



The exterior parts of a ship

Courtesy of Dorling Kindersley

Moving toward the centerline is going *inboard*. Moving away is going *outboard*. The section around the midpoint is called *amidships*. The widest part of the ship, usually in the midship area, is its *beam*.

Human beings live *in* a ship or *on board* a ship. Inanimate objects, stores, and equipment are *aboard* a ship. You *board* a ship or go *on board*. Supplies, on the other hand, are *taken aboard* and *struck below*. If you climb the mast, the rigging, or any other area above the highest solid structure, you go *aloft*.

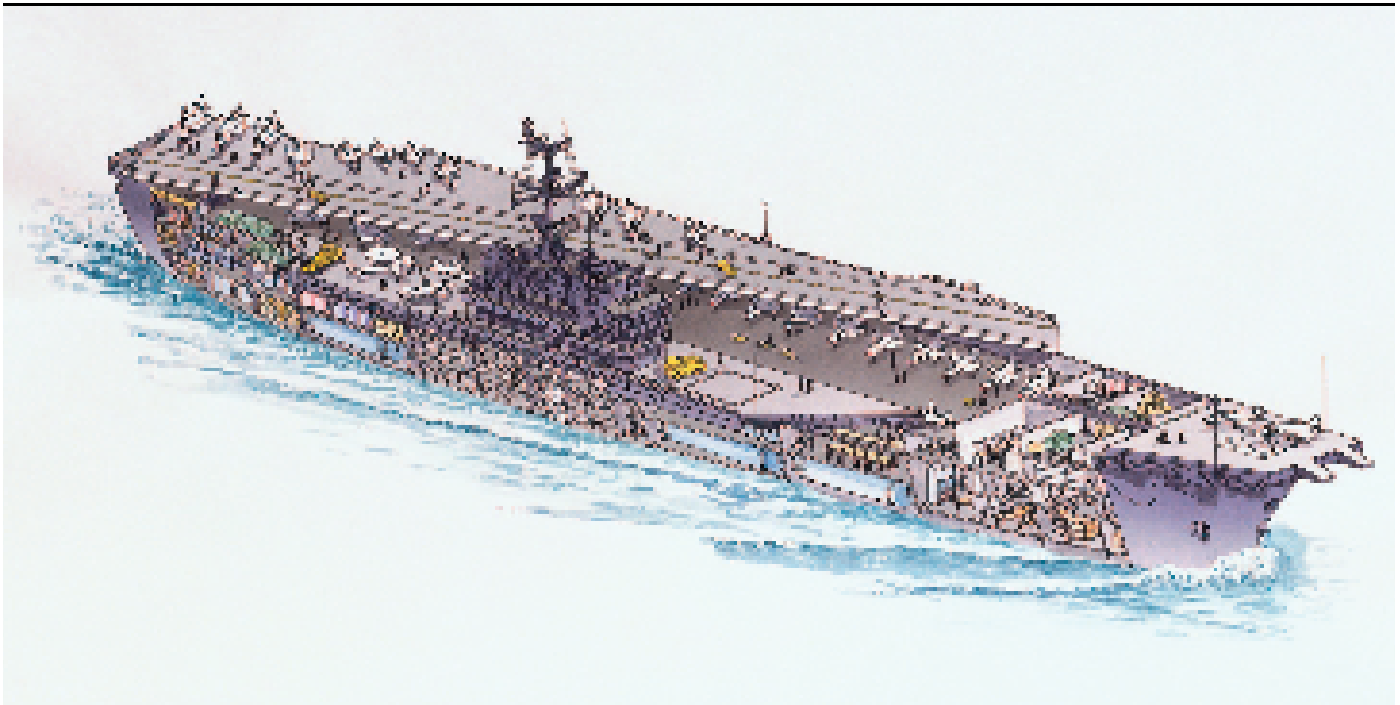
An object hanging against the side, bow, or stern is *over* the side, bow, or stern. An object in the water but not touching the ship is *outboard* of or *off* the ship (off the starboard side, off the port bow, and so on).

An object in front of a ship is *ahead* of it. An object to the rear is *astern*. Cooking is done in the *galley*, not in the kitchen.

Structural Terms

The *keel* is the backbone of the ship. Most steel ships have a keel that does not extend below the ship's bottom; such keels are known as *flat keels*.

The *hull* is the supporting body of a ship. It's like an envelope. Inside it are supports that prevent it from collapsing from the pressure of the water. Vertical walls called *bulkheads* divide the interior of a ship's hull into *compartments* for machinery, berthing, mess or dining, and other purposes.



The interior and exterior parts of an aircraft carrier

Courtesy of Dorling Kindersley

Bulkheads run both transversely and longitudinally—across the beam or along the length of the ship. Some bulkheads are just partitions, like room dividers in a house. Others form watertight compartments that are essential to the ship's structure.

Large ships have a series of longitudinal side bulkheads and tanks that provide protection against torpedoes. The outer tanks are usually filled with oil or water. The inner tanks, called *voids*, are empty. The innermost bulkhead is called the holding bulkhead. If a torpedo hit the ship, the outer tanks, even though ruptured, would absorb enough of the explosion that the holding bulkhead would stay intact. Vital spaces on the ship would stay dry.

A ship's *waterline* is the water level along the hull of a ship afloat. The vertical distance from the bottom of the keel to the waterline is the ship's *draft*. *Freeboard* is the distance from the waterline to the main deck.

Decks

The decks provide additional hull strength and protection for internal space. A ship does have some rooms that are actually called rooms—the wardroom, stateroom, and engine room, for example, but most “rooms” are called something else aboard a ship. The place where you sleep is called a *berthing*, and you eat on the *mess deck*.

A deck exposed to the weather is called a *weather deck*. A deck that extends from side to side and from bow to stern is a *complete deck*. On an aircraft carrier, the uppermost complete deck is called the *flight deck*. It's where the planes land and take off.

On every other kind of ship except an aircraft carrier, the uppermost complete deck is the *main deck*. On an aircraft carrier, however, the main deck is the *hangar deck*. This is where the aircraft are stowed and serviced when they're not on the flight deck.

Ladders go from one deck level to another. They may or may not be covered by hatches. The *forecastle* (pronounced fohk-s'l), on most ships, is the forward portion of the weather deck. The *poop deck* is a partial deck above the main deck located all the way aft.

The *quarterdeck* is not an actual deck, but an area designated by the commanding officer for official functions. When the ship is in port, it's where the *officer of the deck* (officer in charge of the deck) has his or her station. Its location depends on how the ship is moored or which side is tied to the pier.

Doors and Hatches

Doors give access through bulkheads. *Hatches* give access through decks. *Watertight doors* form a watertight seal when properly closed. All doors leading to weather decks are watertight. The doors are held closed by fittings called *dogs*.

Ship Size

The size of a ship is given in terms of **displacement** in tons. The Navy uses full-load displacement, which describes the condition of the ship complete and ready to deploy.

Ship Identification

Each Navy ship is identified by name and designation. In the case of *USS Nimitz* (CVN 68), for instance, USS means *United States ship*. CVN is the designation for a nuclear-powered aircraft carrier. The ship's hull number (68) is a general indication of the number of ships of the same type that have been built. (Some gaps occur because of the cancellation of shipbuilding orders.) A ship's hull number never changes unless its designation also changes.

Armaments and Armor

Armament refers to a ship's offensive weapons—guns, rockets, and even aircraft. A ship's *armor* is the protective layers of steel lining the ship's hull for defense against attacks.

Ship Speed

The speeds of ships are given in **knots**. When a ship goes 20 nautical miles an hour, its speed is said to be 20 knots. Don't ever say 20 knots per hour!

Key Term

displacement—
the weight of the volume of water that a ship displaces when afloat; in other words, the weight of a ship by itself

Key Term

knot—
one nautical mile per hour, or about 1.15 statute (land) miles per hour

Types of Navy Ships

All Navy ships are either *combatant* ships or *auxiliary* ships. Combatant ships, in turn, fall into one of two categories: warships or other combatants.

Types of Warships

Aircraft Carriers

Aircraft carriers (CVNs) are all powered by nuclear reactors and are intended to carry, launch, retrieve, and handle combat aircraft quickly and effectively. A carrier can approach the enemy at high speed, launch planes for an attack, recover them, and retire before the enemy can even spot it. The aircraft carrier is a formidable long-range offensive weapon. It is at the center of the modern carrier battle group.

The *Nimitz*-class CVNs displace about 97,000 tons when heading into combat. Such a ship carries about 6,000 men and women, including the carrier air group. A carrier can operate between 85 to 90 aircraft on a deck about 1,090 feet long and 250 feet wide, maintaining flight operations for a near indefinite amount of time if need be. The *Nimitz*-class CVNs carry various defensive systems in addition to aircraft such as the 20-mm Phalanx Close-In Weapon System or CIWS.

Carriers have angled flight decks designed to launch and recover planes simultaneously. They have a special hangar deck that can be used to stow planes as well as hydraulic elevators that bring planes from the hangar to the flight deck. As a self-sustaining defense and attack platform, a carrier is also equipped with a large series of repair shops, parts and munitions compartments, and fast-fueling equipment. The power plant and engines of the modern carrier are able to propel these 97,000-ton behemoths, which can move at speeds in excess of 30 knots. Combine this with a carrier's sea-keeping ability and you have a platform that can rapidly move into an enemy position and carry out sustained flight operations despite storms and other environmental factors.



The CIWS is a self-guiding 20mm rotary barrel machine gun used as a last line of defense against incoming aircraft, missiles, or small attack ships. It fires a series of high-density rounds at a rate of more than 3,000 rounds per minute.

Courtesy of US Navy



IWO TO, Japan (Sept. 29, 2015)—The Nimitz-class aircraft carrier USS Ronald Reagan (CVN 76) pauses to honor fallen service members from the Battle of Iwo Jima while underway off the island of Iwo To, formerly known as Iwo Jima. This year marks the 70th anniversary of the end of World War II. Ronald Reagan's presence highlights how the relationship has grown between both countries who are committed to the peace, security, and stability of the Indo-Asia-Pacific region.

US Navy photo by Mass Communication Specialist 2nd Class Paolo Bayas/Released

In times of crisis, the question is always, “Where are the carriers?” The aircraft carrier is the centerpiece of naval operating forces. Carriers support and operate aircraft that can carry out attacks on air and surface targets, as well as targets ashore. Carriers can also engage in sustained operations in support of other forces, such as search-and-rescue operations or maintenance of air cover for amphibious assaults and troops already ashore.

Aircraft carriers are deployed worldwide. They can provide anything from peacetime presence to full-scale war. They have become the symbol of United States Naval supremacy around the world.



USS Gettysburg (CG 64) is a Ticonderoga-class cruiser based at Mayport, Fla.

Courtesy of US Navy

Cruisers

These ships, designated CGs, are the modern Navy’s primary surface warfare platform. They can carry out missions either within a carrier battle group or independently. Cruising at more than 30 knots, the guided-missile cruiser acts as both an escort for surface forces and as a fire-support platform for amphibious and land operations.

As the name implies, guided-missile cruisers are designed to carry the Tomahawk cruise missile in addition to the two five-inch gun mountings and dual-CIWS emplacements to provide a heavy and sustained course of fire in the event of attack. Cruisers displace about 10,000 tons and are about 567 feet long with a beam of 55 feet, making them the largest surface warfare ships in the fleet. The *Ticonderoga*-class cruisers can employ vertical launch missile tubes that, when coordinated with the shipboard anti-air warfare combat weapons system or Aegis, can deliver a payload to a surface location from more than 200 miles away.

Today’s guided-missile cruisers perform mainly in a battle-force role and can undertake a multitude of missions such as air warfare (AW), undersea warfare (USW) and surface warfare (SUW). In addition, they can conduct reconnaissance operations as well as act as flagships for surface-action groups.

Destroyers

Destroyers are known as “the greyhounds of the sea” for their speed. They evolved around the turn of the 20th century in response to a new threat at sea. This was the small torpedo boat that could dash in close to a larger ship, release torpedoes, and get away before an enemy’s defense could adjust. The world’s navies recognized the need to defend against these sorts of attacks, and so the torpedo boat destroyer—later just “destroyer”—came into being.

Today’s guided-missile destroyers (DDGs) are useful in almost any kind of naval operation. They are fast and carry a variety of armaments, but relatively little or no armor, making their displacement run from about 8,300 tons to 9,000 tons. Their real advantages are speed and mobility.

Both types of destroyers operate in support of carrier battle groups, surface-action groups, amphibious-support groups, and replenishment groups. DDs perform primarily undersea-warfare duty. But they can also engage in anti-air and anti-surface warfare with their guided-missile counterparts, which can act as a cruise missile platform for precision bombing ashore. Destroyers make up the Navy's largest group of similar types of ships and are the Navy's "workhorse."

Arleigh Burke-class destroyers

The *Arleigh Burke*, commissioned in 1991, was the most powerful surface combatant ever put to sea. *Arleigh Burke*-class destroyers are equipped with the Aegis Combat System, which integrates the ship's sensors and weapons systems to engage missile threats against the ship and tracks the movement of aircraft from hundreds of miles away. Destroyers of this type carry 56 Tomahawk cruise missiles, among other systems for power projection ashore.

These ships displace 9,033 tons and are powered by four GE LM 2500 gas turbines, each rated at 33,600 horsepower with a power turbine speed of 3,600 revolutions per minute, driving two shafts, with controllable pitch propellers for increased maneuverability and control.

Zumwalt-class destroyers

The newly designed *Zumwalt*-class destroyers have a low radar profile and an integrated power system, which can send electricity to the electric drive motors and weapons. Despite being 40% larger than an *Arleigh Burke*-class destroyer, the radar signature is more like a fishing boat. They are designed for surface warfare, anti-aircraft warfare, and naval gunfire support.



Named for the Navy's most famous destroyer-squadron combat commander, Arleigh Burke was the most powerful surface combatant ever put to sea.

Courtesy of US Navy



USS Zumwalt

US Navy photo courtesy of General Dynamics Bath Iron Works/Released

Littoral Combat Ships

The littoral combat ship (LCS) is a class of small surface vessels intended for operations in the “littoral zone” (close to shore). LCS designs have been compared to corvettes of the wooden ship times of the US Navy.

Submarines

In the mid-1950s, nuclear-powered submarines began to replace diesel subs in the US Navy. These earlier subs, designated SS, had trouble staying at sea for very long and were prone to detection when forced to surface for oxygen and to recharge battery power. Today’s submarine fleet is entirely nuclear. Its attack submarines (SSNs) and ballistic missile submarines (SSBNs) operate a nuclear reactor and air-filtration system able to sustain ship power and life support for months without surfacing. These features make them the most sustainable submarine fleet in the world.

Attack Submarines

The mission of attack subs is to locate and destroy enemy ships and submarines. They act as scouts, deliver supplies and personnel to locations in enemy territory, perform rescue and reconnaissance missions, and are the primary defense against enemy submarine attack.

Nuclear power has made the submersible surface ship a true submarine. The modern submarine no longer needs frequent refueling or resupplying. The first SSN, *Nautilus*, steamed more than 62,000 miles without refueling. The *Triton*, another early nuclear sub (commissioned in 1956), traveled around the globe underwater, remaining submerged for 83 days.



Littoral combat ship

US Navy photo by Mass Communication Specialist 2nd Class Joe Bishop/Released

Today's submarines have special air-revitalization equipment to change the air every few minutes. Other equipment lets the submarine take oxygen from seawater to renew oxygen supplies, making the submarine truly self-sustaining.

The goal of technical superiority over numerical superiority is still the driving force in American submarine development. Many developing countries have state-of-the-art non-nuclear submarines able to slip past many surface defenses undetected. Countering their threat is the primary mission of US nuclear attack subs. While there are other methods to counter the threat of these silent predators, the saying, "The best way to find a sub is with another sub," still holds true.

In 1989 the Navy began construction of the *Seawolf*-class submarine, which was meant to be the premier anti-ballistic missile submarine defense platform. It is designed to be the fastest and quietest attack sub to date. With the fall of the Soviet Union and the end of the Cold War, the *Seawolf*-class's production level has dropped, but the mission hasn't changed. Armed with advanced sensors and an array of sound suppression and detection systems, the *Seawolf*-class is the premier attack sub to date with a capability to seek and destroy enemy submarines and surface ships and to fire cruise missiles in support of surface forces.

The Navy's newest attack submarines are the Virginia-class. Designed to be a lower cost alternative yet higher technological capability to the *Seawolf*-class, these submarines include several design improvements that enhance their ability to conduct littoral warfighting operations. Many of these improvements center around the ability to carry, support, deliver and recover special operations forces (SEALs) to their mission areas. There is a large lock-in/lock-out chamber for divers, and increased space to accommodate the additional weapons and equipment. The boat also has improved stealth capabilities, control systems, periscope optics and SONAR to aid in shallow water operations. It is equipped to deliver the Tomahawk cruise missile as well as traditional torpedo weapons.



USS Seawolf (SSN 21) is exceptionally quiet and fast.

Courtesy of US Navy

Fleet Ballistic Missile Submarines

Fleet Ballistic Missile Submarines (SSBNs) are nuclear-powered submarines armed with Trident II Ship Launched Ballistic Missiles, or SLBMs. The sole mission of the SSBN fleet, since its initial deployment in 1960, has been the strategic deterrence of any hostile nation, especially those with nuclear-launch capability. They represent the most survivable nuclear-strike platform in the US military. A single SSBN could deliver several nuclear payloads on an enemy, even if all other US airborne or land-based missiles had been destroyed.

The *Ohio*-class SSBN is roughly 560 feet in length and has a beam of 42 feet. It displaces 18,750 tons when completely submerged. Armed with four Mk-48 torpedo tubes, the *Ohio*-class can reach cruise speeds of more than 20 knots. It can carry up to 24 Trident I or Trident II SLBMs, each with multiple nuclear warheads able to independently target individual objectives on re-entry. They are the most destructive weapons platform in the US arsenal.

Guided Missile Submarines

In 1998, a contract was awarded for building the first of a new class of attack submarine called the guided-missile submarine, or SSGN. These vessels, to be referred to as *Virginia*-class, will support a new strategic concept as the first US submarine designed for dominance across a broad range of missions, including open-ocean, “blue water” missions. Built to act in the traditional role of the attack submarine, the *Virginia*-class will keep many of the *Seawolf*-class’s characteristics, such as the speed and maneuverability of an attack submarine. At the same time, it will incorporate a larger variety of weapons systems, such as 12 Tomahawk cruise missile launch tubes. The *Virginia*-class attack submarine is the first to be built to engage targets ashore, on the surface, and beneath the waves.

To accompany the construction of the *Virginia*-class and further the SSGN program, some *Ohio*-class submarines will be converted to carry the same Tomahawk cruise missile platforms, making them SSGNs. This means that for the first time in naval history, a submarine force can independently destroy targets ashore, on the surface, and beneath the waves without the use of surface ships or nuclear ordinance or the need to surface.



Submarines like USS Alaska have one mission: strategic deterrence.

Courtesy of US Navy

Other Combatant Ships

Mine-Warfare Ships

The Navy's Mine Countermeasures Ships (MCM) are designed to clear mines from vital waterways.

The MCM can find and destroy mines, whether they are moored or placed on the sea floor. Using sonar and video-imaging systems, the MCM locates the mine, cuts loose any mooring using an onboard cable cutter, and detonates the mine. In addition to these systems, the MCM carries two .50-caliber machine guns. It is 224 feet long with a beam of 39 feet and displaces 1,312 tons when fully loaded.

Amphibious Warfare

Amphibious warfare means an attack launched from the sea involving naval forces and ground combat troops, usually beginning with surface warships and airplanes bombing hostile shores. Later, amphibious ships bring in combat-ready ground forces—Marines, special operations forces, or other joint combat forces—while landing craft and helicopters move the ground troops from ship to shore. Amphibious assaults are intended to quickly capture enemy territory or to deny the enemy the use of that land.

Amphibious Command Ships

Amphibious command ships, designated LCCs, provide amphibious command and control for major amphibious operations. LCCs are more than 634 long and 108 feet in beam, displacing more than 18,500 tons. With their up-to-date command-and-control facilities, these ships have become the flagships of several Naval fleets. *USS Blue Ridge*, for example, is the command ship of the 7th Fleet in Yokosuka, Japan, while *USS Mount Whitney* is the command ship of the 6th Fleet in Gaeta, Italy.



USS Mount Whitney is the command ship of the 6th Fleet, based in Norfolk, Va.

Courtesy of US Navy

Amphibious Assault Ships

A single amphibious assault ship, designated an LHA, can load up, rapidly deploy, and land a Marine battalion into enemy territory otherwise inaccessible by land, using a combination of helicopters, landing craft, and amphibious vehicles.

Another kind of amphibious assault ship (LHD) is designed to land 2,000 troops and their equipment, primarily using transport helicopters. The Navy calls this technique of using helicopters instead of landing vehicles to put troops on the beach *vertical envelopment*. Because it enables placement of troops and supplies in any position accessible by air, vertical envelopment is much more effective than the older methods. You may have seen the older system in movies about the D-Day landings on the Normandy beaches during World War II. While in the landing craft, troops are vulnerable to a number of attacks, such as mortar and artillery fire or fixed gun emplacements. Helicopters allow troops to avoid such fixed defensive positions. Combined with the relatively rapid speed of deployment, vertical envelopment allows the landing troops, and not the defenders, to choose the areas of engagement, simultaneously making amphibious assault easier and coastal defense significantly more difficult.

LHDs are more than 800 feet long with a beam of more than 100 feet and a displacement of about 40,000 tons. Carrying a crew of 1,108 sailors and able to transport 1,894 Marines or other landing forces, the LHD can travel at more than 20 knots, making the determination of a potential landing zone difficult for an enemy to determine.

Although they have a long history of distinguished service, beginning in 2007 both LHAs and LHDs will be replaced under the Sea Power 21 program by updated variants.



The amphibious assault ship USS America (LHA 6) is underway off the coast of San Diego preparing for final contract trials. America is the first ship of its class and is optimized for Marine Corps aviation.

US Navy photo by Mass Communication Specialist 2nd Class Jonathan A. Colon/
Released

Amphibious Transport Dock

The Amphibious Transport Dock (LPD) can carry about 700 Marines and their equipment. The LPD can launch its landing craft through an opening in the stern while the ship is underway or dead in the water. In addition, the deck over the well carrying the landing craft provides a platform for helicopters.

The LPD is 680 feet long with a beam of 105 feet and carries a crew of 400.

Dock Landing Ships

Dock landing ships, designated LSDs, were designed to transport amphibious craft and vehicles, along with crew and troops. These ships also have a helicopter platform over the well deck. They are more than 600 feet long and 84 feet in beam. Their crews total 419 officers and Sailors, and the ships can carry 504 Marines.



An amphibious transport dock like USS San Antonio can land troops by landing craft or helicopter.

Courtesy of US Navy



Dock landing ships such as USS Carter Hall carry and launch amphibious craft and vehicles as well as crew and troops.

Courtesy of US Navy

The Landing Craft, Air Cushioned

An air-cushioned landing craft (LCAC) travels over the water using a large pocket of air to ride over the waves while carrying troops and equipment from ship to shore and across the beach. With four gas turbine engines, it can transfer 60 to 75 tons of equipment more than 200 miles at 40 knots. It can transfer troops and equipment over 70 percent of the world's coastline.



The LCAC travels across the water on a cushion of air.
Courtesy of US Navy

Auxiliary Ships

Auxiliary ships are the lifeline of the Navy's combatant force. The auxiliaries bring fuel, supplies, and repair parties to the combat ships, wherever they are. There are several different kinds of auxiliary ships for several different purposes. Each has a designation beginning with the letter A. All of the Navy's auxiliary ships are operated under the Military Sealift Command (MSC). Most MSC ships are owned by the Navy and are civilian manned by civil service mariners. They carry blue and gold stack colors, are in service with the prefix USNS (United States Naval Ship), rather than in commission (a USS prefix), and have hull numbers as an equivalent commissioned ship would have with the prefix T-, for example: T-AOE.

Transferring fuel, munitions, supplies, and personnel from one ship to another while ships are under way is called *replenishment at sea*. Usually the replenishment ship maintains its course and speed, and the other ship (or ships) pulls into position alongside it.

Fast combat support ships (AOEs) carry not only fuel and ammunition (the "E" in their designation stands for "explosives") but can supply dry and refrigerated stores. AOEs move fast enough to keep up with a battle group for extended periods. They are the largest and most powerful auxiliary ships in the Navy.

AOEs can carry more than 177,000 barrels of oil, 2,150 tons of ammunition, 500 tons of dry stores, and 250 tons of refrigerated stores. An AOE receives oil and other supplies from shuttle ships and then distributes these items among carrier-battle-group ships. Ships are particularly vulnerable to attack while being supplied, so the AOEs move quickly to transfer supplies and reduce that vulnerability. Other auxiliary ships include *Dry Cargo/Ammunition Ships* (T-AKE) and *Fleet Replenishment Oilers* (T-AO).

Rescue and Salvage Vessels

Rescue and salvage ships have the designation ARS. Their mission is to provide fire-fighting, dewatering, battle-damage repair, and rescue towing assistance. They must often do their work in combat zones or areas of high threat. Their focus is to move damaged combat ships out of hostile areas and to tow them to repair ships or bases in safe areas.

The Navy is also responsible for salvaging ships owned by the federal government. Sometimes it salvages privately owned ships as well. This work is also part of the ARS vessels' mission.

Shipboard Customs and Courtesies

Over hundreds of years at sea, the British and American navies developed a great number of special customs and courtesies, some of which you may have already learned from your *Cadet Field Manual*. *Customs* are behaviors performed for so long that they have become common practice. *Courtesies* are expressions of consideration or respect for others. These may take the form of words or actions. In this section, you will read about customs and courtesies aboard US Navy ships.

Salutes

When aboard ship, Sailors salute the commanding officer every time they meet. That includes chance meetings as well as formal meetings. Sailors also salute any visiting officers senior to the commander on every meeting. They salute other officers only the first time they meet each day.

Side honors is a special ceremony for officials or officers boarding or leaving a ship. A group of four to eight sailors called *side boys* (whether they are men or women) line up along the gangway. Half are on one side and half on the other. The higher the officer's rank, the more side boys there are. The Boatswain's Mate of the Watch (BMOW) sounds a pipe. The side boys begin the salute at the first note of the pipe and finish together at the last note.

Another ceremony involving a salute is *passing honors*. When two naval vessels pass each other—within 600 yards for ships and 400 yards for boats—“Attention” is called. All sailors in view on the deck give a hand salute. Sailors render passing honors to US Navy vessels, US Coast Guard vessels, and those of most foreign navies.

Colors

The *colors ceremony* is the hoisting and lowering of the national flag. The national flag—the Stars and Stripes—flies on the *fantail* at the stern of a ship in port. A color detail, usually consisting of two junior personnel and a petty officer, performs the colors ceremony. The colors ceremony is performed twice a day when the ship is not underway. *Morning colors* is at 0800 hours and *evening colors* is at sunset.

Ships not underway also fly a flag known as the jack at the jackstaff at the ship's bow, any time that the national ensign is flown at the stern. The US, or Union Jack consists of 50 white stars on a dark blue field and resembles the upper-left corner of the Stars and Stripes. However, the Secretary of the Navy has ordered that since September 11, 2002 (the first anniversary of the 9-11 attacks), the Navy Jack be flown instead as a temporary substitution during the Global War on Terror. The Navy Jack replicates the traditional first jack of the Revolutionary War Navy and consists of thirteen horizontal red and white stripes with the design of a rattlesnake and the words: “DON'T TREAD ON ME” superimposed.



Signalman 3rd Class Sean Polidore from Franklin, La., raises the “Navy Jack” in lieu of the “Union Jack” aboard USS George Philip (FFG 12) during the ship’s morning flag raising ceremony.

Courtesy of US Navy

The national anthem is part of the colors ceremony whenever possible. If a band or an audiotape is available, Attention is sounded, and then “The Star-Spangled Banner” is played. At morning colors, hoisting of the ensign—the flag—starts with the music while at evening colors, the lowering of the flag starts with the music and ends at the last note. If no band or audiotape is available, a bugler plays. If no bugler is available, a whistle can signal the beginning and end of the ceremony.

When a ship is underway, it flies its ensign day and night. There is no ceremony for raising or lowering the flag.

How Cadets Render Honors During Colors

During the colors ceremony, cadets in ranks come to Attention. The person in charge of the formation salutes until “Carry on” is sounded. If not in ranks but in uniform, cadets face the colors and render a hand salute until they hear the order “Carry on.” If in civilian clothes or athletic attire, they face the colors standing at Attention and put their right hand or hat in hand over their heart until they hear “Carry on.” If no flag is in sight, they face the direction of the music and make the proper gesture until they hear “Carry on.”

Boarding, Leaving, and Crossing Naval Vessels

There are special courtesies you must practice when boarding or leaving a Navy ship.

Boarding Your Ship

If you are in uniform, when you come to the top of the brow, come to attention, face aft to the flag (if it's flying) and salute. Then face the Officer of the Desk (OOD) and salute. While holding the salute, show your identification card and say, "I request permission to come aboard, sir/ma'am." You must salute even if the OOD is enlisted and not an officer. When the OOD returns your salute and grants permission, you may go aboard.

If you are not in uniform, the procedure is the same, but no salute is required.

When you board a ship other than your own, or when you board your own ship for the first time, you follow the same procedures as above, but also state your purpose: "Reporting as ordered," for instance.

Leaving Your Ship

This is the same as boarding, only in reverse. You step onto the quarterdeck, face the OOD, present your identification card, and salute. Say, "I request permission to go ashore, sir/ma'am." When you receive permission, step onto the brow, face aft, and salute the ensign, if it is flying. Then go ashore.

If you are in civilian dress, follow the same practice, but no salute is required.

Crossing Another Ship

Smaller ships sometimes nest beside other ships. You may have to cross one or more ships side by side to get to your ship or to get ashore. The procedure is the same as for boarding or leaving a ship except that you must ask permission to cross over.

Military Etiquette Aboard Ship

The quarterdeck is a ceremonial area. You should always treat it with respect. You should always be in the uniform of the day when you appear there, unless you are returning from leave or liberty. Never smoke, eat, or drink on the quarterdeck. Do not lounge in or around the quarterdeck. Cross it only when necessary.

When you are moving through passageways, step aside to allow those senior to you in rank to pass first. If other juniors are present, call out "Gangway" so everyone can make way for the senior person in rank.

Always call the commanding officer of a ship "Captain," regardless of rank.

Conclusion

The National Military Strategy includes three concepts—peaceful engagement, deterrence and conflict prevention, and fight and win. The Navy seeks to fulfill its mission through four areas: strategic deterrence, sea control, projection of power ashore, and naval presence.

The Navy operates a wide range of types of ships—combatants and auxiliaries—to accomplish these goals. The aircraft carrier is the center of the modern carrier battle group. In times of peace or during building tension, it projects “forward presence.” In times of war, it can carry, launch, and retrieve combat aircraft quickly and efficiently, fulfilling the mission before the enemy even sees them. Under the sea, the fleet ballistic missile submarines make up the backbone of the Navy’s strategic deterrence.

Review Questions

- 1 What are the three elements of the National Military Strategy?
- 2 What are the four parts of the Navy mission?
- 3 What weapon is at the center of the modern carrier battle group?
- 4 What is the sole mission of the Fleet Ballistic Missile Submarines?
- 5 What is the procedure for boarding your ship while in uniform? While out of uniform?



Naval Aviation

Key Terms

- pontoon
- man of war
- drone
- modification
- surveillance
- logistics
- VTOL
- rotor
- nacelle

What You Will Learn to Do

Understand the background of US Navy aviation and learn about Navy aircraft in use today

Skills and Knowledge You Will Gain Along the Way

- ✓ Explain the background of naval aviation
- ✓ Describe naval aviation and missions

Above: Photo courtesy of US Navy/Lt. Peter Scheu

Background of Naval Aviation

Naval aviation goes back to two achievements by a flyer named Eugene Ely.

On 14 November 1910 he became the first pilot to complete a takeoff from a ship.

On 18 January 1911 he made the first successful aircraft landing on the deck of a ship.

In the years after that, the Navy tried four ways to combine aircraft with the fleet:

- aircraft carriers
- flying boats
- lighter-than-air craft
- **pontoon** aircraft operating from ships other than carriers.

During the first era of naval aviation, propeller-driven combat planes took off from small early aircraft carriers. Pontoon planes—with floats that let them land on or take off from water—operated from **men of war**. Flying boats flew antisubmarine-warfare (ASW) patrols. And huge dirigibles—similar to blimps—roamed the skies.

The second era of naval aviation involved jet aircraft, giant aircraft carriers, helicopters, and large, long-range patrol planes.

The Navy's first aircraft carrier was *USS Langley* (CV 1). It was originally a coal ship but was converted to a new purpose. Its commission date was 20 March 1922. In July of that year, Congress approved changing over two ships being built as battle cruisers to aircraft carriers. They were commissioned as *USS Lexington* (CV 2) and *USS Saratoga* (CV 3) in 1927.

Air power came into its own during World War II. The Japanese attack on Pearl Harbor on 7 December 1941 showed the effectiveness of long-range carrier-based air strikes. Not long after came another military first: the Battle of the Coral Sea in May 1942. This was a battle of aircraft launched from carriers. The Japanese and American fleets engaged in the battle never saw each other.

Several important developments in Aircraft Carriers came only after the war, mostly as a result of design improvements initiated by the Royal (British) Navy. All of the following except nuclear power were incorporated into carrier upgrades between 1954 and 1959

1. *The angled flight deck.* This allows a carrier to both launch and recover aircraft at the same time. In 1952, a mockup of an angled flight deck on the *USS Midway* showed how this concept could work. The following January, test operations began on the *USS Antietam*, the first ship actually built as an angled deck carrier.
2. *The steam catapult.* Introduced in 1954, it can propel a 60,000 pound aircraft to a speed of 150 miles per hour in two seconds.
3. *The hurricane bow.* World War II carriers had open bows on their hanger decks, allowing storm waves, wind and rain to enter the hanger-bay and potentially damage the aircraft being stored and worked on there. The so-called hurricane bow enclosed the hanger-bay and helped protect aircraft and maintenance personnel.
4. *Deck-edge elevators.* Originally the elevators to move aircraft, bombs and parts from the hanger-bay to the flight deck and back were located on the centerline in the middle of the landing area. By moving them to the edge of the deck, it allowed the movement of aircraft without disturbing flight operations
5. *Armored decks.* One of the lessons learned by the Navy's experience with the Kamikaze, particularly at the battle of Okinawa, was that the old wooden decks

Key Terms

pontoon—
a floating structure,
such as the float
on a seaplane

man of war—
a general term for
an armed naval vessel

could not stand up to such an assault and would burn if subjected to burning aircraft fuel. The decks were replaced with thick steel covered with a non-skid coating.

6. *Mirror landing systems.* To assist pilots landing aboard a carrier, particularly at night, a device using mirrors and a light with a Fresnel lens to give pilots automatic feedback on their lineup and altitude was added to the left of the landing area.
7. *Nuclear power.* Introduced in 1961, it allowed carriers to accommodate more planes and larger crews. It also let them stay at sea longer and steam at 30 knots for great stretches of time.

Aircraft

In addition to aircraft launched from carriers, the Navy has relied on a variety of planes and helicopters to carry out fleet-support missions. In today's Navy, helicopters do many things that pontoon planes and dirigibles used to do: scouting, rescue, and patrol missions.

Modern naval aircraft fall into two categories—fixed-wing (airplanes) and rotary-wing (helicopters). Fighter and attack jet planes can strike at an enemy as well as protect the fleet from enemy aircraft and surface ships. The Navy uses patrol aircraft and long-range multi-engine aircraft in undersea-warfare missions. These aircraft also perform photographic and escort missions. Carrier-based aircraft also make reconnaissance flights. They provide the fleet with early warnings of potential trouble.

Helicopters came into their own during the Korean War. They were used in amphibious operations in support of the Marines. They also helped deliver supplies, equipment, and personnel to ships at sea. This is “vertical replenishment,” as you learned in the last chapter.

- A** — Attack
- B** — Bomber
- C** — Cargo/transport
- E** — Special electronic installation
- F** — Fighter
- H** — Helicopter
- K** — Tanker
- O** — Observation
- R** — Reconnaissance
- S** — Antisubmarine
- T** — Trainer
- U** — Utility
- V** — VTOL or STOL (vertical or short takeoff and landing)
- X** — Research

figure 2.1 Aircraft Designations

- A** — Attack
- C** — Cargo/transport
- D** — Director (for control of drones)
- E** — Special electronic installation
- H** — Search and rescue
- K** — Tanker
- L** — Cold weather
- M** — Missile carrier
- Q** — Drone
- R** — Reconnaissance
- S** — Antisubmarine
- T** — Trainer
- U** — Utility
- V** — Staff
- W** — Weather

- G** — Permanently grounded (for ground training)
- J** — Special test, temporary (when tests are complete, the craft will get its original design back)
- N** — Special test, permanent
- X** — Experimental stage of development
- Y** — Prototype (for design testing)
- Z** — Early stages of planning or development

Figure 2.2 Mission-Modification Designations

Figure 2.3 Special-Use Designations

Aircraft Model Designations

All aircraft in the US armed forces have “tri-service designations.” That means a given model of plane has the same designation code, whether it’s used in the Navy, the Army, or the Air Force.

Each basic designator has a letter and a number. The letter signals the basic mission of the aircraft, as shown in Figure 2.1.

The number (one, two, or three digits) shows the design number of the type of aircraft. Thus an F-14 is the 14th fighter design. If a design is modified, another letter (A, B, C, etc.) follows the design number. The B in S-3B tells us that this antisubmarine plane is a modification of the original design.

When the mission of an aircraft changes, another letter goes in front of the basic mission symbol, as shown in Figure 2.2.

Some of these mission-modification letters are, as you see, the same as the basic mission letters.

Here’s how the system works: If the Navy modifies an A-6 for use as an electronic-warfare aircraft, it becomes an EA-6.

Other letters put at the very front of an aircraft’s designator are called “special use” symbols. They signal that an aircraft has some special status. Six letters are currently in use this way (see Figure 2.3).

Key Terms

drone—
an unmanned aircraft or ship guided by remote control

modification—
an alteration or adjustment, as of an aircraft or other vehicle

Naval Aircraft and Missions

The Navy groups aircraft of the same type into *squadrons* for training, maintenance, and administration. Aircraft of various squadrons combine and deploy as *operational air groups* aboard ships. The battle group's mission determines the types and numbers of squadrons.

Fighter/Attack Aircraft

The single-seat F/A-18 Hornet is the nation's first carrier-launched strike-fighter. It was built with the ability to drop bombs or deny access to sea lanes. But it was also designed as a fighter plane, too—able to engage enemy pilots in the sky. The F/A-18 replaced the F-14 Tomcat, which was the Navy's primary air-to-air superiority fighter for 36 years, until 2006.

The F/A-18 Hornet operates in 37 tactical squadrons from air stations worldwide, and from 10 aircraft carriers. The US Navy's Blue Angels Flight Demonstration Squadron proudly flies the Hornet in air shows across America.

The newest model, the Super Hornet, carries out an even wider variety of missions. It can act as an air-superiority fighter, fighter escort, and reconnaissance plane. It can provide close air support, air-defense suppression, and precision strikes during day or night operations. The Super Hornet has a longer range than earlier models and is even tougher than the Tomcat. It also costs 40 percent less to operate and requires 75 percent fewer hours of labor per hour of flight than the F-14.

The Hornet proved itself during Operation Desert Storm in 1991. Hornets took direct hits from surface-to-air missiles, recovered successfully, underwent rapid repairs, and resumed missions the next day.

The newest models, the E and F, rolled out at McDonnell Douglas (now part of the Boeing Company) 17 September 1995. The E is a single seat aircraft while the F is a two-seater. Both can fly almost twice the speed of sound, at altitudes up to 50,000 feet, and for ranges greater than 1,300 miles. Also being deployed is the F/A-18 G or Growler, which is meant to replace the EA-6B Prowler as the Navy's primary electronic-warfare aircraft by 2010. Carrying some of the most advanced electronic surveillance and jamming equipment in the world, this new version of the Hornet will revolutionize the battlefield. It will introduce an electronic-warfare aircraft that will outmaneuver many of the world's fighters and take the fight to enemies both on the ground and in the skies.



The F/A-18 Hornet proved itself during Operation Desert Storm in 1991.

Courtesy of US Navy

Electronic Warfare

The EA-18G Growler is the fourth major variant of the F/A-18 family of aircraft that combines the proven F/A-18F Super Hornet platform with a sophisticated electronic warfare suite. Built to replace the EA-6B Prowler, the Growler is the first newly-designed electronic warfare aircraft produced in more than 35 years. The aircraft also retains all of the F/A-18E/Fs multi-mission capabilities with its validated design and the capability to perform a wide range of enemy defense suppression missions.



The EA-18G Growler

Courtesy of US Navy

Airborne Early Warning

The E-2C Hawkeye is the Navy's all-weather, carrier-based tactical-warning and control-system aircraft. It provides airborne early warning and command-and-control function for the entire battle group. Other missions for the E-2C include surface **surveillance** coordination, strike-and-interceptor control, search-and-rescue guidance, and communications relay.

The Hawkeye provides its early warning by flying in front of the battle group to look for enemy surface ships and aircraft. The newest variant of this aircraft, the Hawkeye 2000, has a new mission computer, improved radar displays, and "cooperative engagement capability." This last element helps bring streams of data from several different sources to give commanders one big picture of a battle, whether at sea or on land.

The Hawkeye carries a crew of five—two pilots and three mission system operators. It can exceed 300 knots and has a range of 1,500 miles.

Key Term

surveillance—
close observation
of the enemy



An E-2C Hawkeye launches forth from USS Kitty Hawk (CV 63).

Courtesy of US Navy



The E-6B Mercury airborne command post
Courtesy of US Navy

The E-6B Mercury is the Navy's strategic airborne command post. It also relays communications for fleet ballistic missile submarines. It can launch land-based intercontinental ballistic missiles.

The E-6B can fly above 40,000 feet. It has a range of more than 7,500 miles and can travel at 600 miles per hour.

Undersea Warfare

The P-3C Orion is the Navy's sole land-based antisubmarine-warfare aircraft. The Navy took delivery of its first Orion in July 1962.

It has gone through a designation change from P3V to P-3 and three major models: P-3A, P-3B, and P-3C. The Navy has kept repairing and refurbishing the airframes of these planes. It's upgraded the weapons, electronics, and other systems, too. The Navy is cutting back the Orion's numbers, however—down to 130 by 2010 from an original 227. Current plans call for the P-8 Multi-mission Maritime Aircraft (MMA) to start replacing the P-3 beginning in 2013.

The P-8A Poseidon is a modified Boeing 737-800ERX, bringing together a highly reliable airframe and high-bypass turbo fan jet engine with a fully connected, state-of-the-art open architecture mission system. This combination, coupled with next-generation sensors, will dramatically improve anti-submarine warfare (ASW), and anti-surface warfare (ASuW) capabilities.



A P-3C Orion assigned to the "Golden Eagles" of Patrol Squadron Nine (VP-9) circles Mt. Fuji in Japan.

Courtesy of US Navy



A P-8A plane over the Pax River.

Courtesy of CDR Eric Humphreys

Logistics Aircraft

The C-2A Greyhound is a twin-engine cargo-passenger aircraft. Its primary mission is carrier on-board delivery. The C-2A can deliver up to 10,000 pounds of cargo. The cabin can carry cargo or passengers or both. The Navy is overhauling this plane to extend its service life from 15,020 landings and 10,000 flight hours to 36,000 landings and 15,000 flight hours. The C-2As are getting structural enhancements, rewiring, avionics-systems improvements, and new propeller systems. Congress and the Chief of Naval Operation have required two passenger safety improvements to be part of the program, too. One is a system to avoid midair collisions; the other warns pilots when they are flying too close to the ground (“terrain”).

Some other Navy **logistics** aircraft are:

- the C-12F Huron. A twin-engine turboprop aircraft, it transports equipment and passengers between naval air stations
- the C-130 Hercules. A four-engine turboprop aircraft, it can take off from and land on short runways. It hauls cargo and people.
- the C-40 Clipper. A twin jet version of the civilian Boeing 737, it provides primarily fleet logistical support.



The primary mission of the C-2A Greyhound is carrier on-board delivery.

Courtesy of US Navy

Key Term

logistics—
the aspect of military or naval operations that deals with the procurement, distribution, maintenance, and replacement of materiel and personnel



The C-40 Clipper.

Courtesy of CDR Eric Humphreys

Trainers

The T-45A Goshawk is a two-seat jet trainer, used for intermediate and advanced pilot training. The T-6A Texan II is another single-engine turbo prop and represents the next generation of primary basic trainers.

Unmanned Aerial Vehicles (UAV)

The RQ-2A Pioneer is an unmanned aerial vehicle. It can perform a wide variety of missions: reconnaissance, surveillance, target acquisition, and battle-damage assessment. It can provide tactical commanders with real-time images of a battlefield or target.

The Navy introduced the Pioneer as a land-based system in 1986 but now uses it at sea as well. The Pioneer can travel at speeds higher than 100 miles per hour. Its ceiling is 15,000 feet and its range more than 115 miles.



The T-6A Texan II
Courtesy of US Navy



The T-45A Goshawk
Courtesy of US Navy



The RQ-2A Pioneer
Courtesy of US Navy

Rotary-Wing Aircraft

The helicopter has been an important part of naval operations since World War II. Helicopters play a role in the transfer of supplies and in search-and-rescue operations, as well as undersea warfare (USW), mine warfare, and special warfare.

Undersea Warfare

The SH-60 is a twin-engine helicopter. Its primary mission is to detect and destroy enemy submarines. The Navy also uses it for search and rescue, advanced scouting, special operations, cargo lift, and intercepting drug smugglers. It can be deployed on cruisers, destroyers, and frigates as well as aircraft carriers.

Mine Warfare

The MH-53E Sea Dragon operates from carriers and other warships. Its primary mission is airborne mine countermeasures. It seeks out and destroys enemy minefields. It can also deliver troops or cargo to a ship.



The SH-60 Seahawk
Courtesy of US Navy



The MH-53E Sea Dragon operates from carriers and other warships.

Courtesy of US Navy

Key Terms

VTOL—
vertical takeoff or landing; refers to either the capability or to the aircraft that has it

rotor—
an assembly of rotating horizontal airfoils (wings), such as on a helicopter

nacelle—
a separate, streamlined enclosure on an aircraft for sheltering the crew or cargo or housing an engine

Training

The TH-57 Sea Ranger is the primary training helicopter for those preparing to become naval aviators. It can also perform some photo, chase, and utility missions.



The TH-57 Sea Ranger

Courtesy of US Navy

VTOL

The V-22 Osprey is a helicopter that can turn into a propeller airplane once it takes off. The Osprey is a *tiltrotor* aircraft with a 38-foot rotor system and engine/transmission nacelle mounted on each wing tip. It can operate as a helicopter when taking off and landing vertically. Once airborne, the nacelles rotate forward 90 degrees for horizontal flight, converting the V-22 to a high-speed, fuel-efficient turboprop airplane. The wing rotates for compact storage aboard ship. The Osprey's ceiling is up to 25,000 feet and it can cruise at more than 272 knots.

The plane's first flight occurred in March 1989. The V-22 is the world's first production tiltrotor aircraft. Planned purchases include 360 for the Marine Corps, 48 for the Navy, and 50 for the Air Force.

The Osprey pushes the limits of VTOL (vertical takeoff or landing) technology, and as a result some people have called into question its safety record. The Marine Corps, however, is committed to it to provide its heavy lift capability for years to come.



The V-22A Osprey is a helicopter that turns into a turboprop plane.

Courtesy of US Navy

Conclusion

Naval aviation goes back to the first years of flight. The first aircraft carriers were introduced in the 1920s. Not until World War II, though, did naval air power truly come into its own. The challenge of naval aviation is to integrate aircraft with the fleet. Today the Navy relies on a combination of jet aircraft, giant nuclear-powered aircraft carriers, helicopters, and large, long-range patrol planes.

Review Questions

- 1 What were two achievements of Eugene Ely?
- 2 What were two turning points in naval aviation during World War II?
- 3 What were three important developments in aircraft carriers after World War II?
- 4 What does the combination of letters and number in the C-12F Huron signify?
- 5 What is the Navy's primary fighter aircraft?

