Naval Aviation Vision

January 2010

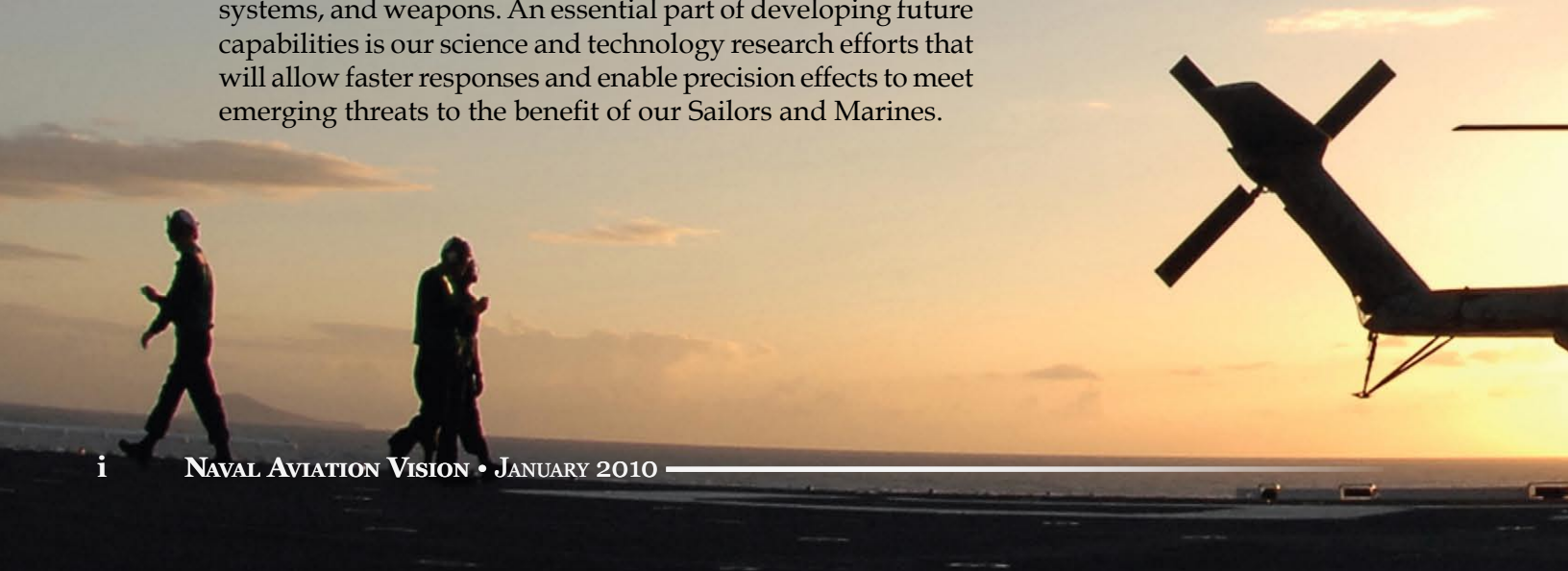
Letter from the Leadership of the Naval Aviation Enterprise

In the coming year, Naval Aviation will reach its centennial. In those 100 years, Naval Aviation has grown from a marginal force fulfilling a niche role in the nation's military strategy, to the centerpiece combat force that is powerfully and uniquely well-suited to conduct expeditionary operations and lethal sea-based power projection. This transformation resulted when visionary men and women looked beyond the obvious realm of the possible and into the promise of the future. That over-the-horizon focal point continues today, ensuring that Naval Aviation's support of our defense and naval strategies is significant, relevant, and uninterrupted.

The importance of Naval Aviation is founded on the Navy and Marine Corps partnership. From deployed Marine expeditionary units and aviation combat elements embarked aboard amphibious assault ships conducting expeditionary operations ashore, to Navy and Marine Corps fixed-wing and rotary-wing aircraft embarked aboard aircraft carriers streaming alongside surface combatants as part of carrier strike groups, Naval Aviation is ideally suited to carry out the national security strategy in any maritime conflict.

On 8 May 1911, Captain Washington Irving Chambers, the officer in charge of aviation, requisitioned the Navy's first aircraft—an A-1 *Triad*—from aviator and inventor Glenn H. Curtis. This aircraft first flew on 1 July 1911. The following year, the first Marine Corps aviator reported for duty, launching Marine Corps Aviation. Nearly a century later, the Navy's newest aircraft, the P-8A *Poseidon*, flew for the first time on 25 April 2009. This book shares the vision of today's Naval Aviation leaders, extending the earliest plans for Naval Aviation from 1911 into the year 2032 and beyond. It underscores our focus on current readiness, the future capabilities and readiness necessary for the fleet of the future, and the people who form the cornerstone of all our successes.

- Naval Aviation is engaged in operations worldwide. The aircraft, weapons, and systems we employ and the sustainment of that inventory are the focus of our current readiness efforts. Maintaining appropriate readiness levels creates the ability for Naval Aviation forces to respond to the full range of national tasking—whether as a part of Operation *Enduring Freedom* or a humanitarian assistance effort. Navy and Marine Corps units apply readiness improvement strategies that keep our aircraft mission-capable and effective within the constraints of funding realities.
- Future capabilities and readiness represent the roadmap that Naval Aviation will follow to remain capable of executing traditional Naval missions while also improving our ability to conduct non-traditional missions in any post-9/11 operating environment. This roadmap outlines the platform transformation for our aircraft carriers, amphibious assault ships, aircraft, unmanned systems, and weapons. An essential part of developing future capabilities is our science and technology research efforts that will allow faster responses and enable precision effects to meet emerging threats to the benefit of our Sailors and Marines.



- As elaborated in the *Marine Corps Commandant's Planning Guidance*, "our Marines and Sailors in combat are our number one priority in all that we do." The people who serve within Naval Aviation bring the skills, dedication, and motivation that will lead to successful execution of this vision. We are committed to recruiting, training, retaining, and improving the quality of life for this exceptional team of patriots. It should not be lost on anyone that the aircraft, weapons, and systems that we design and buy rely on our people to operate and fight them. This stellar collection of warfighters, civilian employees, and contractor personnel will ultimately define our success, and we will capitalize on their diverse talents to deter or defeat disruptive forces that threaten the security of our nation.

The threats to our country and allies are complex and unpredictable. This vision ensures Naval Aviation has the capability and flexibility to succeed in a challenging environment. It forms the basis for the strategic, operational, and fiscal decisions to be made today and in the future, and it supports Program Objective Memorandum (POM)-12 and its 20-year plan. It guides us to the year 2032 and beyond in our commitment, as codified in the Maritime Strategy, "to protecting our homeland and winning our Nation's wars [which is] matched by a corresponding commitment to preventing war." We share this vision to inform and guide the actions of those in Naval Aviation and those whose support is critical to our continued success.

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Letter from the Leadership of the Naval Aviation Enterprise i

Naval Aviation's Role 2

SEA CONTROL AND MARITIME SECURITY 7

The "Long Arm" of Naval Aviation Provides Persistent Presence 7

Manned and Unmanned Naval Aviation Assist with *Maersk Alabama* Rescue 9

U.S. and Australian Aviation Collaborate in *Talisman Saber* 2009 11

FORWARD PRESENCE, POWER PROJECTION, AND DETERRENCE 13

Naval Aviation Assists Marines in Operation *Khanjar* 13

Projecting Power from Several Acres of Sovereign Forward Presence 15

MV-22 Makes First Deployment to Iraq 17

HUMANITARIAN ASSISTANCE/DISASTER RELIEF 19

Lending a Helping Hand before Deployment 19

Typhoon Morakot 20

The Future of Naval Aviation 22

A CENTURY OF EXCELLENCE 23

TRANSFORMATION ROADMAPS 25

Aircraft Carriers 29

Future Carrier Air Wing 31

Amphibious Assault Ships 33

Future Aviation Combat Element 37

Navy Tactical Aircraft 39

Marine Corps Tactical Aircraft 43

Navy Helicopters 45

Marine Corps Assault Support Aircraft 49

Navy Maritime Patrol and Reconnaissance Aircraft 53

Navy and Marine Corps Training, Logistics, and Operational Support Aircraft 55

Other Naval Aircraft 63

Unmanned Aircraft Systems 67

Weapons 73

BEYOND 2032 85

FORCENET AND COLLABORATIVE WARFARE 87

SCIENCE AND TECHNOLOGY 89

TABLE OF CONTENTS

People....96

Naval Aviation Enterprise....106

Summary....117

Appendix A – Acronyms and Abbreviations....119

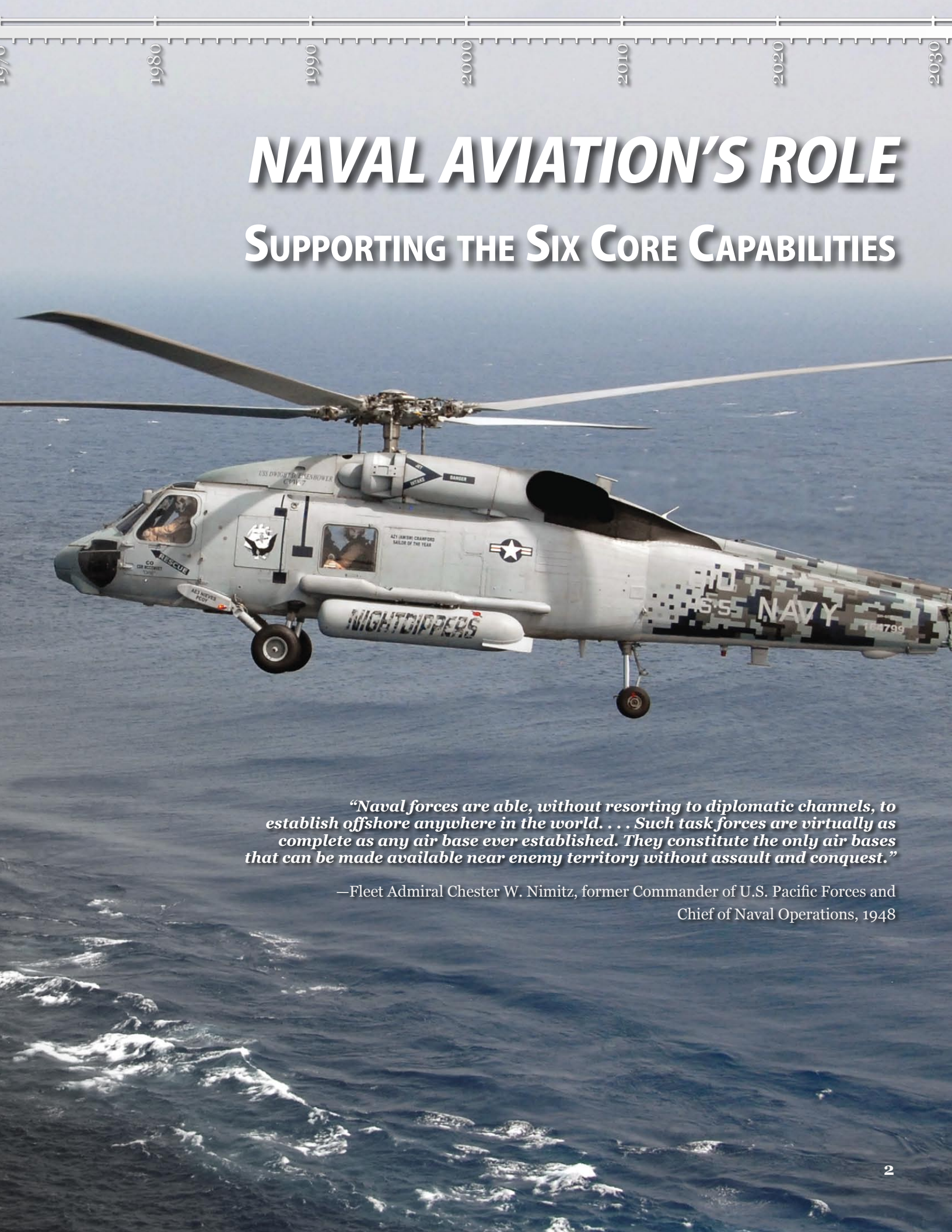
Appendix B – Image Credits....122

Acknowledgements....125

Curtiss SOC-1, 1939

NAVAL AVIATION'S ROLE

Supporting the Six Core Capabilities



"Naval forces are able, without resorting to diplomatic channels, to establish offshore anywhere in the world. . . . Such task forces are virtually as complete as any air base ever established. They constitute the only air bases that can be made available near enemy territory without assault and conquest."

—Fleet Admiral Chester W. Nimitz, former Commander of U.S. Pacific Forces and Chief of Naval Operations, 1948

Supporting the Six Core Capabilities

The Navy and Marine Corps are maritime forces. The planet is a maritime environment. Our military's ability to operate and execute in this environment is vital to our national interests, and it is the unique province of the Navy and Marine Corps. *A Cooperative Strategy for 21st Century Seapower* defines the Maritime Strategy for the Navy and Marine Corps in collaboration with the Coast Guard.

A Cooperative Strategy for 21st Century Seapower relies on global reach, persistent presence, and operational flexibility to accomplish strategic imperatives considered essential to influence local and global events at sea and ashore. Forward-deployed maritime forces with a regional focus will be in place to demonstrate a commitment to regional security and stability. Those forces will possess the combat power required to limit regional conflicts, deter major power wars, and, in the event that conflict cannot be avoided, convincingly win those wars. As a broad strategic imperative, mission-tailored maritime forces will be available to deploy beyond traditional areas and to execute missions as varied as humanitarian assistance or irregular warfare. These forces will contribute to homeland defense in depth, build and sustain cooperative relationships with international partners, and prevent or contain local disruptions and crises before they affect the global system. This strategy is implemented through expanded core capabilities in which Naval Aviation exercises prominent roles in achieving its strategic imperatives.

These six core capabilities are: forward presence; deterrence; sea control; power projection; maritime security; and humanitarian assistance/disaster relief. Individually and collectively, these capabilities are essential to ensuring the security, prosperity, and vital interests of the United States and its allies. They are at the heart of U.S. maritime power.

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U.S. seapower is inextricably linked to and dependent on Naval Aviation. Today, even as Naval Aviation contributes to each core capability, there is a need to develop even greater capability in future platforms to ensure the Maritime Strategy is fully supported. These core capabilities are exercised every day, and the resulting proficiency ensures that Naval Aviation successfully executes its missions and significantly contributes to the implementation of the Maritime Strategy.

- **Forward Presence** establishes maritime forces in regions throughout the world. Permanently or as part of a normal deployment cycle, a maritime presence operating in cooperation with allies or in proximity to areas of interest greatly contributes to the understanding of that environment. This familiarity builds partnerships while also better preparing the United States to deter and defeat threats should they arise. The deployability and expeditionary character of Naval Aviation distinguishes it as the centerpiece of this core capability.
- **Deterrence** is aligned to the national belief that preventing wars is as important as winning wars. Removing conditions for conflict, providing for the protection of forces deployed, and possessing superior military strength all serve to deter aggressors from acting. Naval Aviation forces alone can serve effectively as goodwill ambassadors and simultaneously anchor an aircraft carrier or amphibious ship just offshore to serve as a grim display of national determination and unquestioned lethal potential.
- **Sea Control** protects the ability to operate freely at sea and is an important enabler of joint and interagency operations. Piracy and the increasing number of nations possessing submarines (among other developments) threaten freedom of access for all nations. Establishing and maintaining sea control relies on numerous maritime capabilities, and Naval Aviation is a vital military arm critical to that effort. Surveillance, detection, and attack of coastal, surface, and subsurface platforms are missions readily executed by Naval Aviation assets in support of this capability.

- **Power Projection** from the sea is the essential combat element of the Maritime Strategy. This core capability is uniquely suited to the strengths of Naval Aviation. Operating from aircraft carriers, amphibious ships, or forward operating bases, Navy and Marine Corps forces develop an understanding of an adversary's capabilities, possess superior strategy, commit to disciplined training, and have technological advantages to defeat those who mean the United States and its allies harm.
- **Maritime Security** is the maintenance of security at sea and the mitigation of threats short of war. Combatting terrorism, piracy, drug trafficking, and other threats enhance global stability and protect U.S. shorelines. Naval Aviation assets cooperate with other services and agencies to keep watch, to disrupt, and, when necessary, to destroy those aggressors that seek to limit the sanctuary of the seas for others.
- **Humanitarian Assistance/Disaster Relief** is a human obligation and a foundation of the American character. The majority of the world's population lives within a few hundred miles of the ocean, meaning that access is best achieved by maritime forces. Bringing aid, offering relief and escape from disaster sites, or conducting non-combat evacuations from unsafe situations are results accomplished most effectively through the use of Naval Aviation assets.

U.S. Naval Aviation is an unrivaled maritime force. No other nation has the comparable aircraft, weapons, systems, or personnel to conduct operations as successfully using such a wide variety of capabilities. In uncertain times such as these, those capabilities are required to protect the interests of the United States at home and abroad. Naval Aviation stands ready as an integral part of U.S. seapower in the 21st century. The following section offers a snapshot of how our Marines, Sailors, and aircraft execute the strategy's core capabilities every day.

Sea Control and Maritime Security

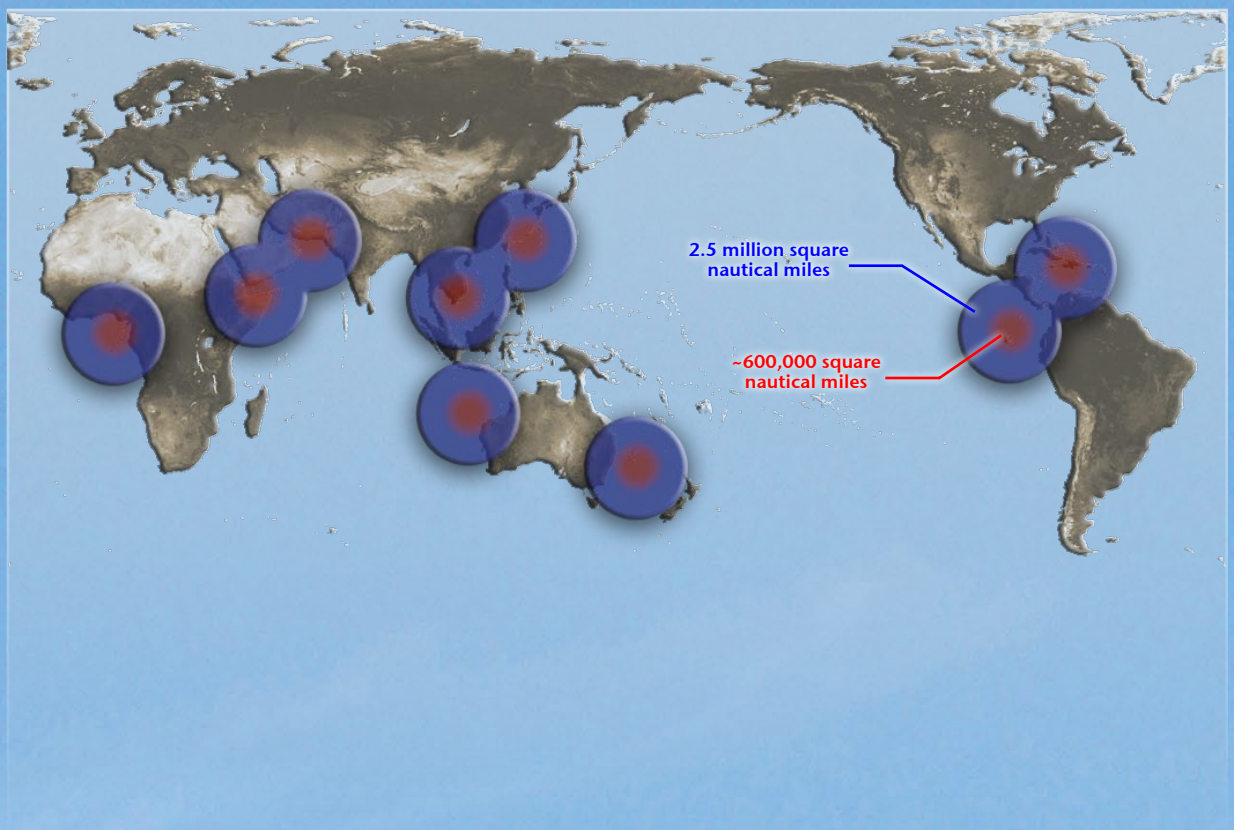
The "Long Arm" of Naval Aviation Provides Persistent Presence

Seas cover more than 70% of the Earth and serve as a vital medium for global trade, energy exploration and shipment, and communication. Naval Aviation is an essential military arm that effectively maintains sea control through persistent presence and long-distance reach. Navy and Marine Corps strike aircraft are capable of sustained reach out to approximately 430 nautical miles and provide operational reach out to 900 nautical miles. This capability allows the Navy to influence an area from 600,000 to 2.5 million square nautical miles of sustained or operational presence around a carrier strike group. In addition, helicopters provide reach out to 150 nautical miles and areas of influence of more than 70,000 square nautical miles around any helicopter-capable ship.

Originally developed as an anti-submarine platform, the P-3 *Orion* continues to prove its value as the silent sentry in the world of persistent maritime security and sea control. In particular, it is a vital part of international counter-drug operations and law enforcement.

On 7 July 2009, a U.S. Navy P-3 and a British warship, HMS *Cumberland*, located, tracked, and seized approximately 10 tons of narcotics with an estimated value of $70 million. The vessel was boarded by *Cumberland*'s crew approximately 150 miles southeast of Salalah, Oman, in the Gulf of Aden. This drug seizure was the largest by coalition naval forces in 2009.

"The seizure of these drugs takes money out of the hands of those financing terrorists in the region," said Commander, Combined Maritime Forces, Vice Admiral Bill Gortney. "The smugglers need to know that coalition forces are patrolling the seas and skies above. These efforts send a message to all would-be smugglers that we are here and we won't tolerate drug trafficking in international waters."

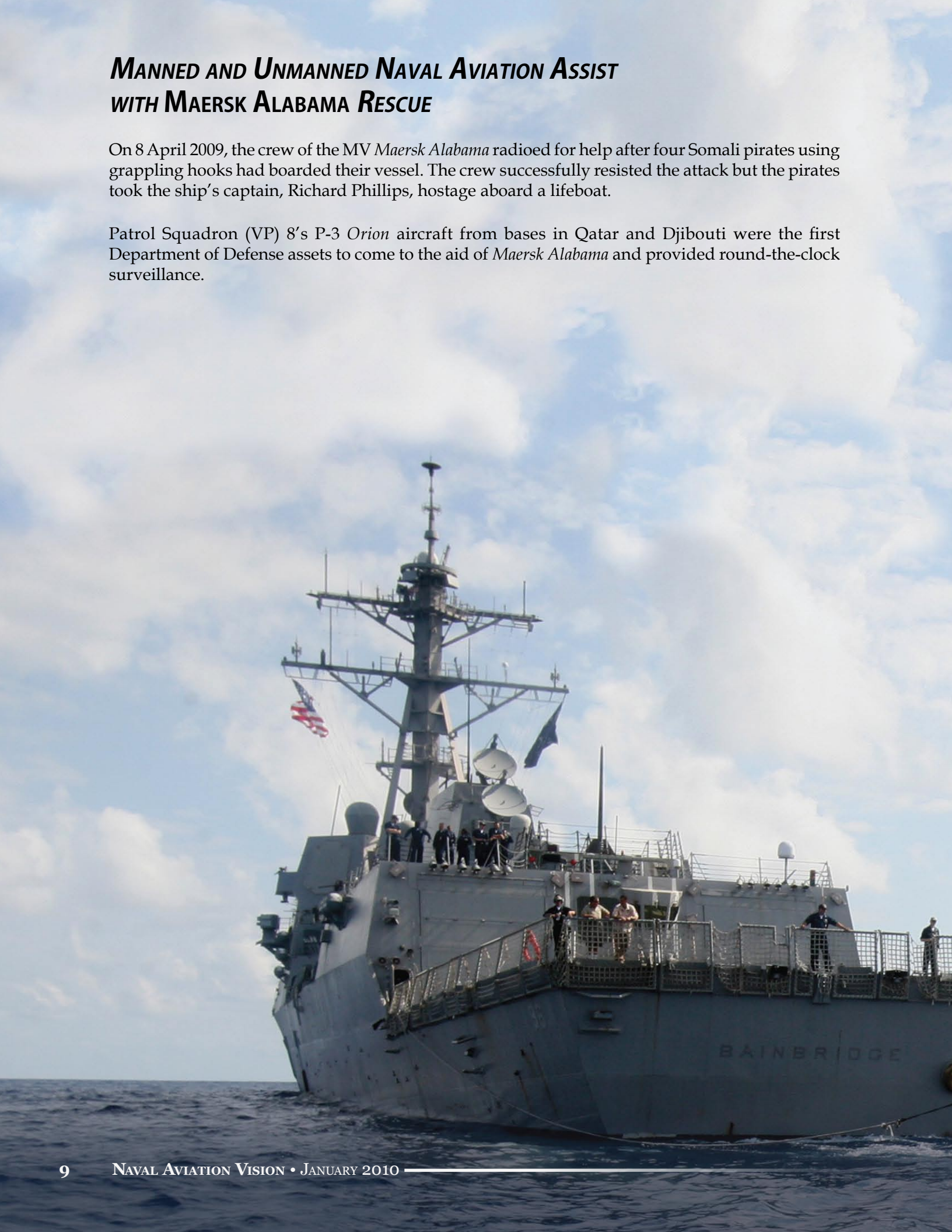

2.5 million square
nautical miles
~600,000 square
nautical miles

913
NAVY
NAVY

Manned and Unmanned Naval Aviation Assist with Maersk Alabama Rescue

On 8 April 2009, the crew of the MV *Maersk Alabama* radioed for help after four Somali pirates using grappling hooks had boarded their vessel. The crew successfully resisted the attack but the pirates took the ship's captain, Richard Phillips, hostage aboard a lifeboat.

Patrol Squadron (VP) 8's P-3 *Orion* aircraft from bases in Qatar and Djibouti were the first Department of Defense assets to come to the aid of *Maersk Alabama* and provided round-the-clock surveillance.



On 9 April, USS *Bainbridge* (DDG 96) and USS *Halyburton* (FFG 40) reached the *Maersk Alabama* to provide aid and begin negotiations for the release of Captain Phillips. *Scan Eagle*, a 40-pound unmanned aircraft system, was launched to provide real-time, continuous surveillance of the pirates and Captain Phillips' position on the lifeboat. This small aircraft provided a significant tactical advantage to the commander on the scene with persistent surveillance of the pirates' activities.

A still frame from video taken by a P-3C *Orion* aircraft, 9 April 2009.

As the pirates attempted to flee by heading for Somalian territorial waters, SH-60 *Seahawks* from Helicopter Anti-Submarine Squadron Light (HSL) 46 utilized the hurricane force winds generated by their rotors to disorient and demoralize the pirates. The pirates responded with AK-47 fire to no effect. The SH-60s and surface vessels successfully kept the lifeboat, with Captain Phillips still aboard, from reaching Somalian waters.

A still frame from video taken by *Scan Eagle* unmanned aerial vehicle.

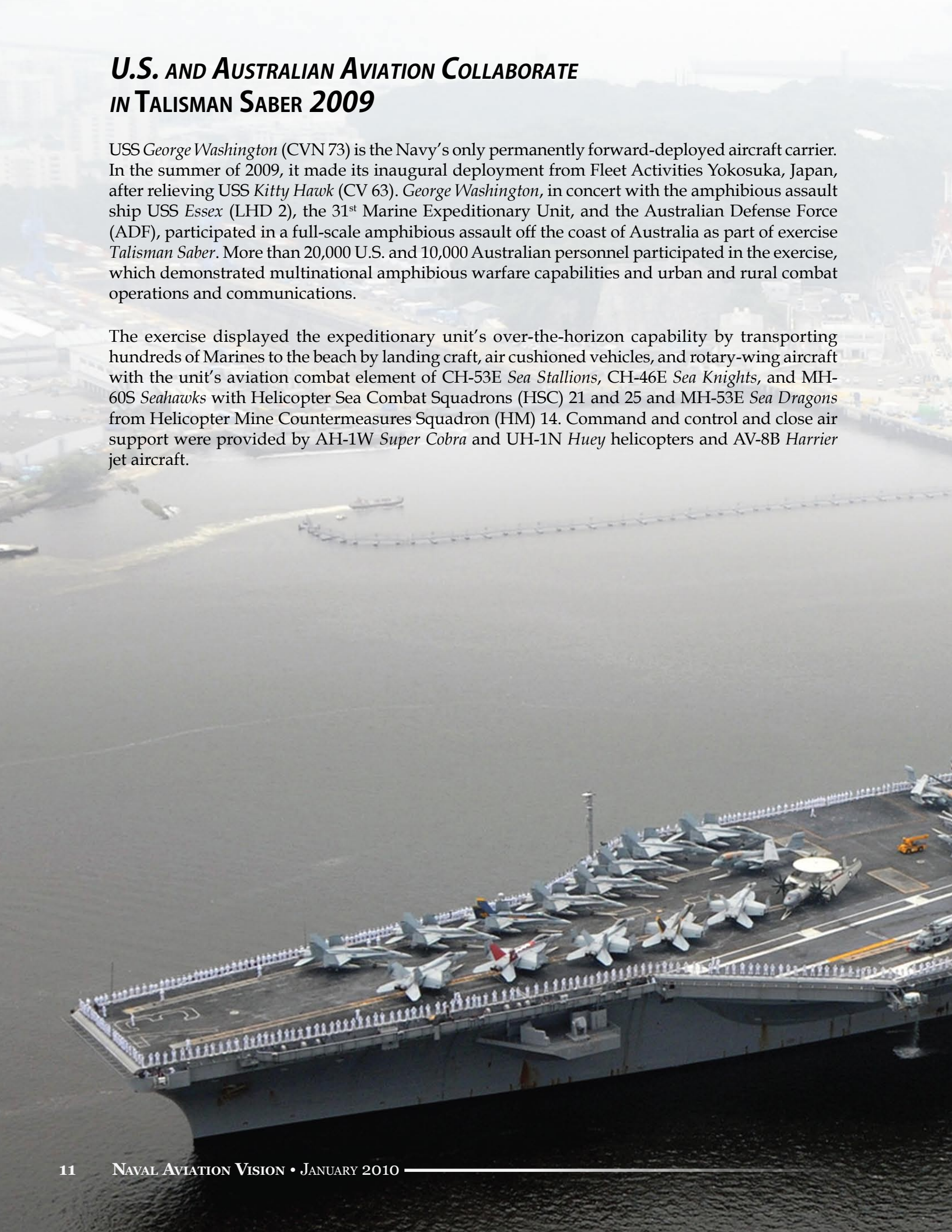
The commander on scene judged that, with an AK-47 at his back, Captain Phillips' life was in imminent danger and authorized a team of SEALs to eliminate the pirates. Captain Phillips was rescued unharmed and transferred to USS *Boxer* (LHD 4) for medical treatment and transport home.

The *Maersk Alabama* was one of about 140 ships attacked by pirates off the coast of Somalia in the first half of 2009.

U.S. and Australian Aviation Collaborate in Talisman Saber 2009

USS *George Washington* (CVN 73) is the Navy's only permanently forward-deployed aircraft carrier. In the summer of 2009, it made its inaugural deployment from Fleet Activities Yokosuka, Japan, after relieving USS *Kitty Hawk* (CV 63). *George Washington*, in concert with the amphibious assault ship USS *Essex* (LHD 2), the 31st Marine Expeditionary Unit, and the Australian Defense Force (ADF), participated in a full-scale amphibious assault off the coast of Australia as part of exercise *Talisman Saber*. More than 20,000 U.S. and 10,000 Australian personnel participated in the exercise, which demonstrated multinational amphibious warfare capabilities and urban and rural combat operations and communications.

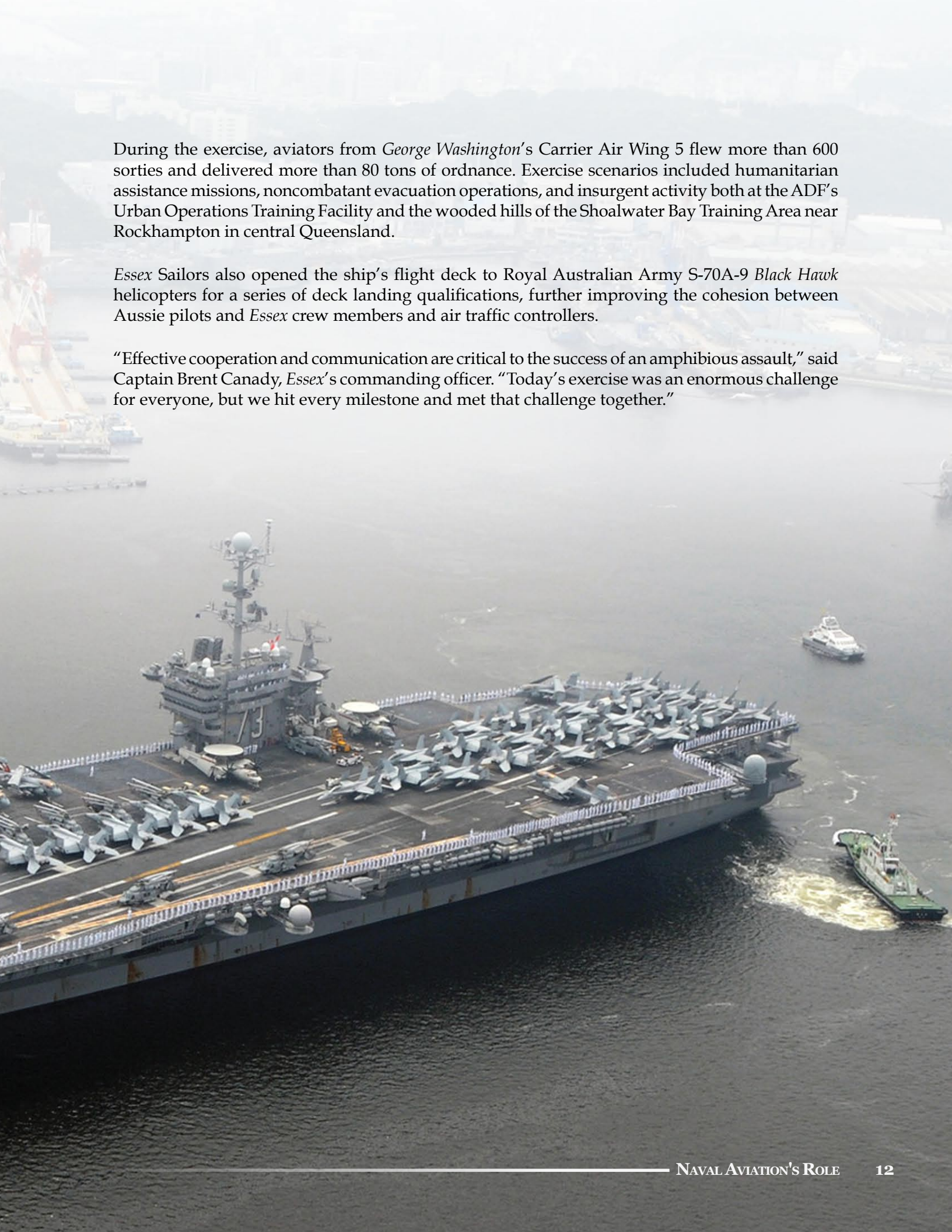
The exercise displayed the expeditionary unit's over-the-horizon capability by transporting hundreds of Marines to the beach by landing craft, air cushioned vehicles, and rotary-wing aircraft with the unit's aviation combat element of CH-53E *Sea Stallions*, CH-46E *Sea Knights*, and MH-60S *Seahawks* with Helicopter Sea Combat Squadrons (HSC) 21 and 25 and MH-53E *Sea Dragons* from Helicopter Mine Countermeasures Squadron (HM) 14. Command and control and close air support were provided by AH-1W *Super Cobra* and UH-1N *Huey* helicopters and AV-8B *Harrier* jet aircraft.



During the exercise, aviators from *George Washington*'s Carrier Air Wing 5 flew more than 600 sorties and delivered more than 80 tons of ordnance. Exercise scenarios included humanitarian assistance missions, noncombatant evacuation operations, and insurgent activity both at the ADF's Urban Operations Training Facility and the wooded hills of the Shoalwater Bay Training Area near Rockhampton in central Queensland.

Essex Sailors also opened the ship's flight deck to Royal Australian Army S-70A-9 *Black Hawk* helicopters for a series of deck landing qualifications, further improving the cohesion between Aussie pilots and *Essex* crew members and air traffic controllers.

"Effective cooperation and communication are critical to the success of an amphibious assault," said Captain Brent Canady, *Essex*'s commanding officer. "Today's exercise was an enormous challenge for everyone, but we hit every milestone and met that challenge together."



Forward Presence, Power Projection, and Deterrence

Naval Aviation Assists Marines in Operation Khanjar

The Helmand River Valley is a vast and lawless desert along Afghanistan's border with Iran and Pakistan, ideal for opium growing and smuggling, where the Taliban and the drug barons have thrived. In 2009, a combined U.S. and Afghan mission, Operation *Khanjar*, aimed to provide security for population centers along the Helmand River Valley and connect local citizens with their legitimate government. More than 4,000 Marines launched Operation *Khanjar* for one-year deployment rotations, the largest force for such an extended duration since the 2004 battles in Fallujah, Iraq.

Super Cobras from Marine Light Attack Helicopter Squadron (HMLA) 169 and F/A-18 *Super Hornets* from USS *Ronald Reagan*'s (CVN 76) Strike Fighter Squadron (VFA) 22, VFA-25, VFA-113, and VFA-115 provided close air support to the Marines on the ground.

In July 2009, F/A-18C *Hornets* and F/A-18E *Super Hornets* were in the vicinity of Now Zad and Musa Qaleh, when it was reported anti-Afghan forces were targeting coalition forces with small arms fire. "Shows of force" were requested to deter the enemy, and anti-Afghan forces were forced to retreat. This effective new method of close air support uses armed aircraft that drop ordnance sparingly and use physical presence and low-altitude flight to deter enemy forces. At Sangin and Lashkar Gah, Navy F/A-18F *Super Hornets* used similar tactics to provide cover for coalition forces taking small arms fire. And near Tarin Kowt, F/A-18C *Hornets* used shows of force during the day on anti-Afghan forces firing rockets on coalition forces. Enemy forces ceased fire after several flares were expended.

In mid-August 2009, Marines from Company E, 2nd Battalion, 8th Marine Regiment and Afghan National Army soldiers waged an intense six-hour battle with Taliban insurgents who opened fire on the patrol just after 0800. After moving only about one mile from their combat outpost, the Marines received a heavy volley of enemy gunfire from multiple directions. The Marines and Afghan National Army soldiers returned fire and called for fire support. Within minutes, an AH-1W *Super Cobra* and a UH-1N *Huey* were on station overhead to help suppress and engage enemy targets. The *Super Cobra* fired several five-inch *Zuni* rockets into one of the compounds from which the patrol was receiving sustained fire. The Marines and Afghan forces eventually maneuvered up to and cleared the insurgent positions initially used to launch the ambush.

"What makes Operation *Khanjar* different from those that have occurred before is the massive size of the force, the speed at which it will insert, and the fact that where we go we will stay, and where we stay, we will hold, build, and work toward transition of all security responsibilities to Afghan forces," said Brigadier General Larry Nicholson, commanding general of Marine Expeditionary Brigade Afghanistan.

Projecting Power from Several Acres of Sovereign Forward Presence

Carrier and amphibious strike groups continue to be the tip of Naval Aviation's spear, providing constant forward presence around the world and credible power projection to ongoing operations in southwest Asia and other regions of the world. From January 2008 to December 2009, eight carrier strike groups deployed or returned from deployment 12 times, and seven amphibious strike groups deployed overseas (in addition, one Marine expeditionary group deployed directly to Afghanistan). Their presence in any theater brings with it the sovereign territory and will of the United States.

For more than 210 days beginning in March 2008, the 24th Marine Expeditionary Unit's aviation combat element, Marine Medium Helicopter Squadron (HMM) 365, supported Marine and NATO forces on the ground conducting operations across Afghanistan—their focal point being the Garmsir District of Helmand Province. With more than 3,000 combat sorties, HMM-365 performed a multitude of tasks, including battlefield illumination, re-supply, insertion, extraction, casualty evacuation, close air support, and intelligence, surveillance, and reconnaissance. During its deployment, HMM-365 supported Operation *Azada Wosa*, conducting a battalion insertion during low-light level conditions into Garmsir District. This was the first night insert of this magnitude by the Marine Corps since Vietnam. Waves of Marines required insertion into predetermined landing zones by assault helicopters. C-130s provided aerial refueling and battlefield illumination for the Marines on the ground while AV-8 *Harriers* and attack helicopters provided close air support. At one point during the night at least one of every type of airframe in the squadron flew in support of the battalion insertion.

During its September 2008 to April 2009 deployment, crews aboard USS *Theodore Roosevelt* (CVN 71) flew 3,105 sorties in support of Operation *Enduring Freedom*, dropping more than 61,000 pounds of ordnance in support of coalition forces. Electronic Attack Squadron (VAQ) 141 executed 550

sorties, of which 220 (totaling 1,300 flight hours) were combat sorties in support of ground forces in Afghanistan. The squadron's four EA-6B *Prowler* aircraft and flight crews maintained a mission accomplishment rate of approximately 97 percent, and received the Admiral Arthur W. Radford Award for excellence in Naval Aviation and the Naval Air Forces Atlantic Battle "E" for 2008. This is particularly noteworthy since the *Prowler*, now in its fourth decade of service, is the sole U.S. aerial electronic warfare platform available until the EA-18 *Growler* comes on line.

Aboard USS *John C. Stennis* (CVN 74) crews flew more than 7,250 sorties, consisting of approximately 12,747 flight hours with a sortie completion rate of 97 percent, in support of a deployment to the Western Pacific region, which included an undersea warfare exercise with the Japan Maritime Self-Defense Force, exercise *Foal Eagle* with the Republic of Korea, and joint exercise *Northern Edge* 2009.

Aboard USS *Boxer* (LHD 4), the 13th Marine Expeditionary Unit's aviation combat element, HMM-163, flew more than 2,068 sorties during its seven-month deployment beginning January 2009. With them the UH-1Y *Venom* made its inaugural deployment. As U.S. Central Command's floating reserve, the squadron provided a detachment of CH-53E *Super Stallions* to Al Asad, Iraq, to support Operation *Iraqi Freedom*, and also conducted multinational training exercises in the Middle East and the Horn of Africa. The expeditionary unit also provided medical and dental outreach and executed a medical evacuation while in the Maldives. When *Boxer* became the flagship for Combined Task Force 151, they conducted counter-piracy operations in the Gulf of Aden and Indian Ocean, playing a supporting role in the rescue of the crew of the *Maersk Alabama* and rushed to the aid of the German Navy tanker *Spessart*.

MV-22 Makes First Deployment to Iraq

In April 2009, the MV-22 *Osprey*—the newest assault support transport aircraft in the Marine Corps inventory—completed an 18-month tour of duty at Al Asad Airbase, Iraq, in support of Operation *Iraqi Freedom*. During its continuous operation in theater, under three different units—Marine Medium Tilt-rotor Squadron (VMM) 263, VMM-162, and VMM-266—the *Osprey* contributed to a dramatic reduction in exposure of coalition forces to small-arms fire and road-side bombs. With its unique combination of rotary- and fixed-wing aircraft characteristics, the *Osprey* provided unprecedented operational flexibility to warfighters by transporting 45,000 passengers and more than 2.2 million pounds of cargo twice as fast and three times as far as the legacy assault support platforms it had replaced.

"The area of operations has, in a number of ways, highlighted the performance of the aircraft," said Lieutenant Colonel Paul Rock, commanding officer of VMM-263. "Our area of operations is large and the aircraft's speed and range has been much appreciated."

VMM-263 marked another milestone in *Osprey* history when, in spring 2008, the squadron embarked aboard USS *Bataan* (LHD 5) with the 22nd Marine Expeditionary Unit for the MV-22's first amphibious deployment. During the deployment, the *Osprey* had the opportunity to demonstrate its impact on the future of amphibious assault support by conducting its first ship-to-shore emergency medical

evacuation. Transporting a critically injured Sailor from *Bataan*, the aircraft traveled 147 nautical miles in 37 minutes, well within the "golden hour" of recovery, to a regional airport where an ambulance was used to transfer the Sailor to a hospital for further treatment—a feat that could not be replicated by a conventional helicopter.

With major combat operations shifting from Operation *Iraqi Freedom* to Operation *Enduring Freedom*, the MV-22s next milestone was to support ground forces in Afghanistan. MV-22s commenced combat operations in support of the Marine air-ground task force (MAGTF) in Operation *Enduring Freedom* in November 2009.

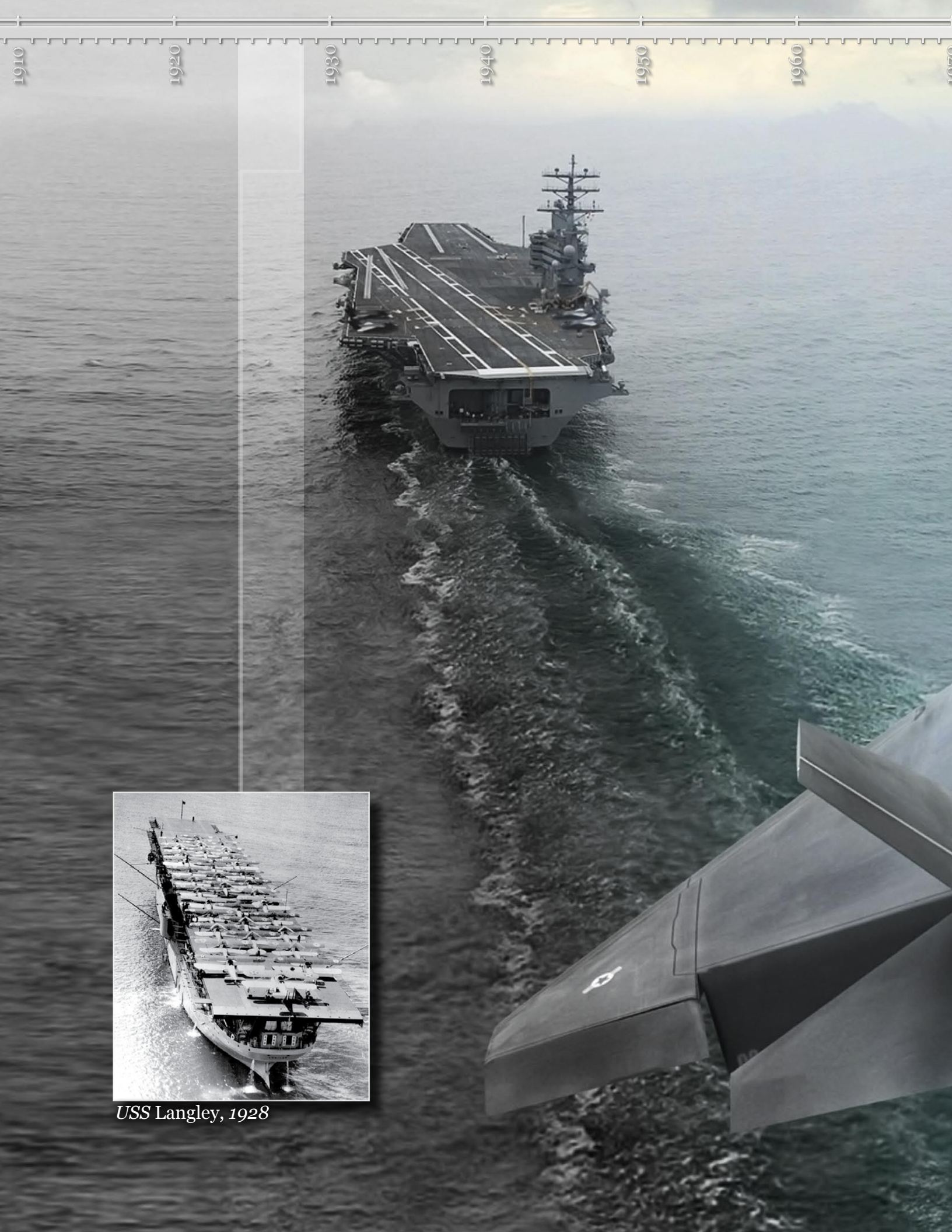
Humanitarian Assistance/Disaster Relief

Lending a Helping Hand Before *Deployment*

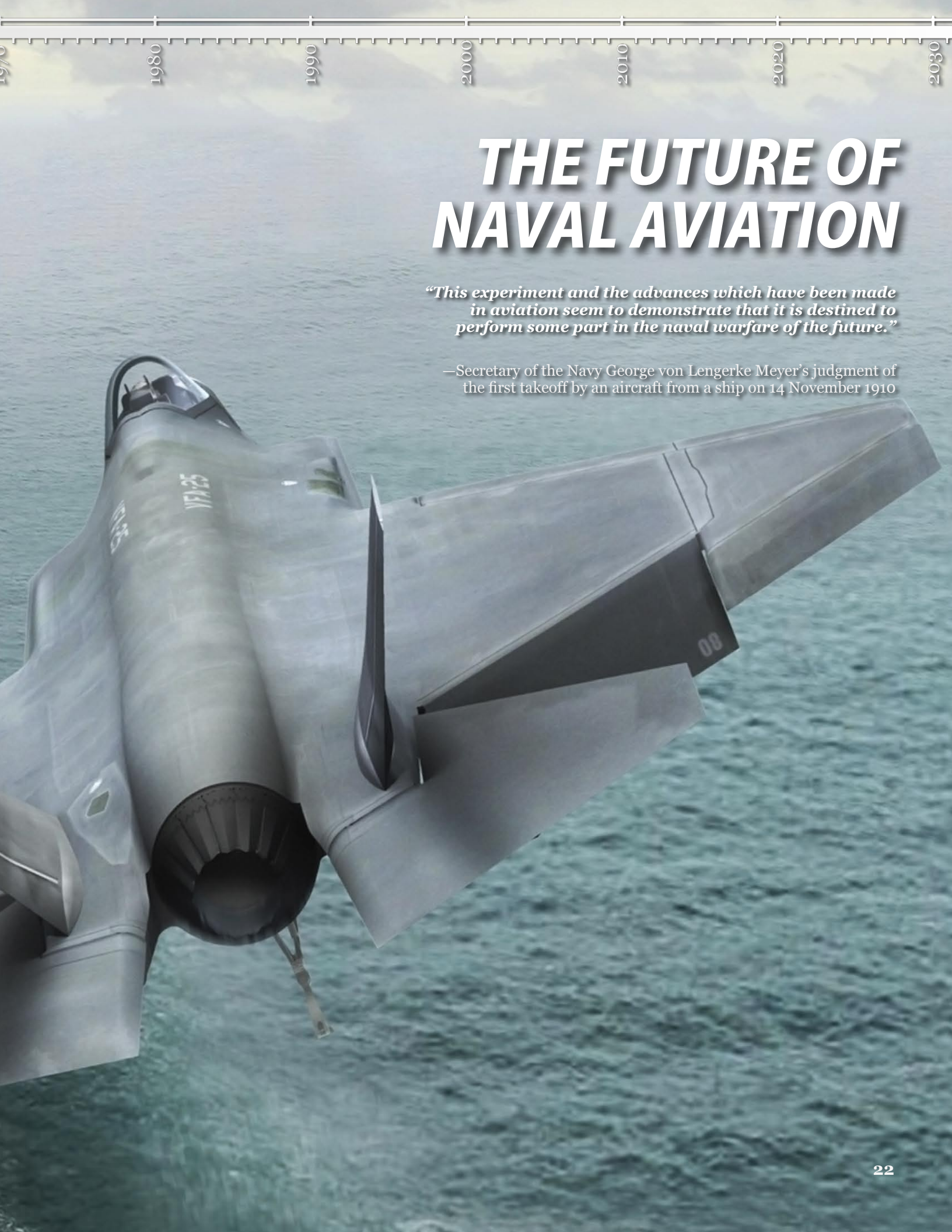
In June 2008, while conducting pre-deployment training in Indiana, the 26th Marine Expeditionary Unit's HMM-264 was called to action when a series of storms dumped more than 10 inches of rain on south-central Indiana in less than 24 hours, causing flooding. After receiving the word to mobilize, the Marines rushed to Elnora, Indiana, by way of CH-53E *Super Stallion* and CH-46E *Sea Knight* helicopters. Marines filled sandbags and worked to build and to reinforce levees for almost 14 hours until the effort was halted by approaching thunderstorms. The flood waters eventually reached 29.9 feet—the highest in that part of Indiana since 1913—but the levees held, protecting the homes of the 736 residents of Elnora. During the unit's subsequent August 2008 deployment aboard USS *Iwo Jima* (LHD 7), HMM-264 supported operations in Iraq and off the Horn of Africa and conducted numerous theater security cooperation exercises designed to bolster international relations and improve the military efficiency of regional allies.

Typhoon Morakot

Two Marine Corps C-130 *Hercules* cargo aircraft landed in Taiwan on 9 August 2009, and dropped off several pallets of supplies to help remote towns cut off by Typhoon Morakot. Two MH-53 *Sea Dragon* helicopters from HM-14, based at Pohang, South Korea, arrived early on 10 August aboard USS *Denver* (LPD 9). The *Sea Dragons* ferried relief supplies and brought heavy earth moving equipment to isolated mountainous areas cut off by mudslides. *Denver* also carried two SH-60 *Seahawk* helicopters from Helicopter Sea Combat HSC-25, based at Guam. Typhoon Morakot, which claimed hundreds of lives and was the worst typhoon to hit Taiwan in 50 years, dropped more than 100 inches of rain on the country, created massive landslides, and forced tens of thousands of people to evacuate their homes.



USS Langley, *1928*



THE FUTURE OF NAVAL AVIATION

"This experiment and the advances which have been made in aviation seem to demonstrate that it is destined to perform some part in the naval warfare of the future."

—Secretary of the Navy George von Lengerke Meyer's judgment of the first takeoff by an aircraft from a ship on 14 November 1910

A Century of Excellence

In 2011, the U.S. Navy will celebrate the 100th anniversary of Naval Aviation. The Navy officially dates the beginning of its aviation element to 8 May 1911, when the service's first aircraft were requisitioned. Marine Corps Aviation dates its birth to 22 May of the following year, when First Lieutenant Alfred A. Cunningham reported for duty as the first Marine Corps aviator. Even before these dates, however, the feasibility of launching and recovering aircraft at sea already had been proven, and the first naval aviators already were being trained. Although naval aircraft served faithfully in World War I, it would be a generation before U.S. Naval Aviation would truly prove itself in battle. When it did, it did so in spectacular fashion.

In one of history's most decisive engagements, the Battle of Midway, three squadrons of SBD *Dauntless* dive bombers led by Commander Max Leslie and Lieutenant Commander C. Wade McClusky mortally damaged or sank three Japanese fleet carriers in an attack lasting only a few minutes on the morning of 4 June 1942. A fourth carrier was sunk several hours later. Naval air power had, in one fell swoop, broken the back of a combatant's striking capacity and simultaneously captured the strategic initiative—and never relinquished it.

In the decades since World War II, Naval Aviation has been expanding its range to influence events, increasing its lethality, and diversifying the kinds of "battlefields" on which it can fight. In November 2001, in the aftermath of the attacks of 9/11, Marine helicopters from the 15th Marine Expeditionary Unit launched the longest "amphibious" assault in history, transporting ground units nearly 400 nautical miles from the Arabian Sea to southern Afghanistan. Today, from putting boots on the ground to placing precision munitions on target, there are few places on the planet beyond the reach of Naval Aviation.

A-1, 1912

Like so many technologies in history, the airplane—and its application at sea—was an invention waiting to happen. From Eugene Ely's first flight from the deck of USS *Birmingham* (CL 2), the machines of Naval Aviation have undergone tremendous change in a remarkably brief period. The very first aircraft purchased by the Navy, a Curtiss A-1 seaplane acquired in 1911, was powered by a 75-horsepower engine, allowing it to hurtle through the air at 60 miles per hour. Today, the Navy and Marine Corps' newest fighter aircraft, the F-35B/C *Lightning II*, is powered by an engine that generates up to 40,000 pounds of thrust and is capable of speeds in excess of 1,200 miles per hour. For more than two decades, naval aircraft were built primarily of wood and fabric before all-metal construction began in the 1930s. Today, aircraft are made from revolutionary composite materials that are lighter and stronger than steel. In the early years, aviators measured maximum altitude in a few thousand feet. Today, naval astronauts regularly pilot or crew spacecraft into orbit around the Earth—and beyond.

Over the course of the 20th century and into the 21st, the tactics and missions of Naval Aviation also have changed over time. Scouting for the battlefleet was the primary mission of the first naval aircraft, whether they were floatplanes such as the OS2U *Kingfisher* launched from battleships, or airships such as USS *Macon* (ZRS 5). Not until the completion of the first fleet carriers, USS *Lexington* (CV 2) and USS *Saratoga* (CV 3), in 1927 was it readily apparent that the employment of aircraft at sea would be focused on strike warfare. Torpedoes and dive bombing would be the primary weapons of the World War II era, used for attacking ships at sea and land targets near shore in support of Marine amphibious landings in the Pacific.

After 1945, Naval Aviation would influence battles ever farther afield and specialize in missions as diverse as search and rescue, anti-submarine warfare, and electronic warfare, and even would be asked, during the 1950s, to provide a nuclear strike capability. Since World War II, Navy and Marine aircraft have conducted countless peacetime patrols during the Cold War, supported troops on the ground in numerous conflicts, and participated in strategic air campaigns in five major wars from Korea to Iraq and Afghanistan. In all these endeavors and through all these changes, Navy and Marine Corps aviation personnel have excelled in everything that has been asked of them—and much more.

Like their counterparts in their parents' and grandparents' generations before them, young men and women continue to undergo rigorous training to become naval aviators and flight officers, to serve at sea and on land, at home and abroad, to support Navy and Marine Corps missions whenever and wherever they are needed. The Naval Aviation of the future, outlined in the following pages, will continue the same tradition of excellence into the next 100 years.

Transformation Roadmaps

Key to building the force of tomorrow is stabilizing Naval Aviation's investment strategy to acquire the level of warfighting capability and interoperability needed to be successful. This includes maximizing the return on our science and technology investments by transforming a high percentage of projects—with relevant and distinct capabilities—to actual fleet products that can be employed by our warfighters.

Ensuring that the right fleet products are available is the job of the Naval Aviation Enterprise Capabilities-Based Assessment Integrated Process (NCIP), which was developed to oversee the evolution of weapon systems. This process defines requirements and prioritizes capabilities by integrating the Naval Air Warfare Division's (N88) analysis tasks (e.g., the horizontal integration and capabilities assessment process, air campaign capabilities-based assessment, collaborative warfare process, Joint Capabilities and Integrated Development System capabilities-based assessment, and the Defense Acquisition System analysis of alternatives) so that resources are focused where they can generate the greatest warfighting effect. An NCIP steering group, composed principally of N88 section heads and other designated stakeholders, ensures that these capabilities-based analyses provide coherent support to investment decisions as part of the planning, programming, budgeting, and execution process and the development of the annual aviation plans.

NAVY
HSM-71

The ships, aircraft, systems, and weapons depicted on the following pages represent the heart of Naval Aviation's recapitalization and modernization plan. Their development, production, deployment, and sustainment are essential to delivering the effects mandated by various defense planning scenarios and the contingency and operational plans of the six combatant commanders. We believe this vision provides the pathway for the successful transition of current systems to future readiness, and sustains the measure of warfighting superiority needed to deter and defeat our adversaries. Under the guidance of the *Navy Aviation Plan 2031* and the *Marine Corps Aviation Plan*, these programs will endeavor to:

- Ensure Naval Aviation's relevance by presenting credible warfighting capabilities to deter or defeat any threat
- Provide aircraft, systems, and weapons that reach their initial operational capability and achieve the effects they were designed to produce, and sufficiently enhance their capabilities to keep pace with threats
- Optimize Navy and Marine Corps aircraft inventories so they have the ability to execute the most demanding wartime scenarios or meet surge force and reconstitution requirements
- Synchronize new procurements with the sunset of legacy aircraft
- Avoid concurrent capability enhancements and new procurement in order to reduce spikes in total costs
- Consider the operational risks associated with less-than-optimal procurement quantities and their affect on other missions
- Emphasize joint interoperability
- Reduce total life-cycle costs.

The aircraft transformation roadmaps are grouped into four broad categories:

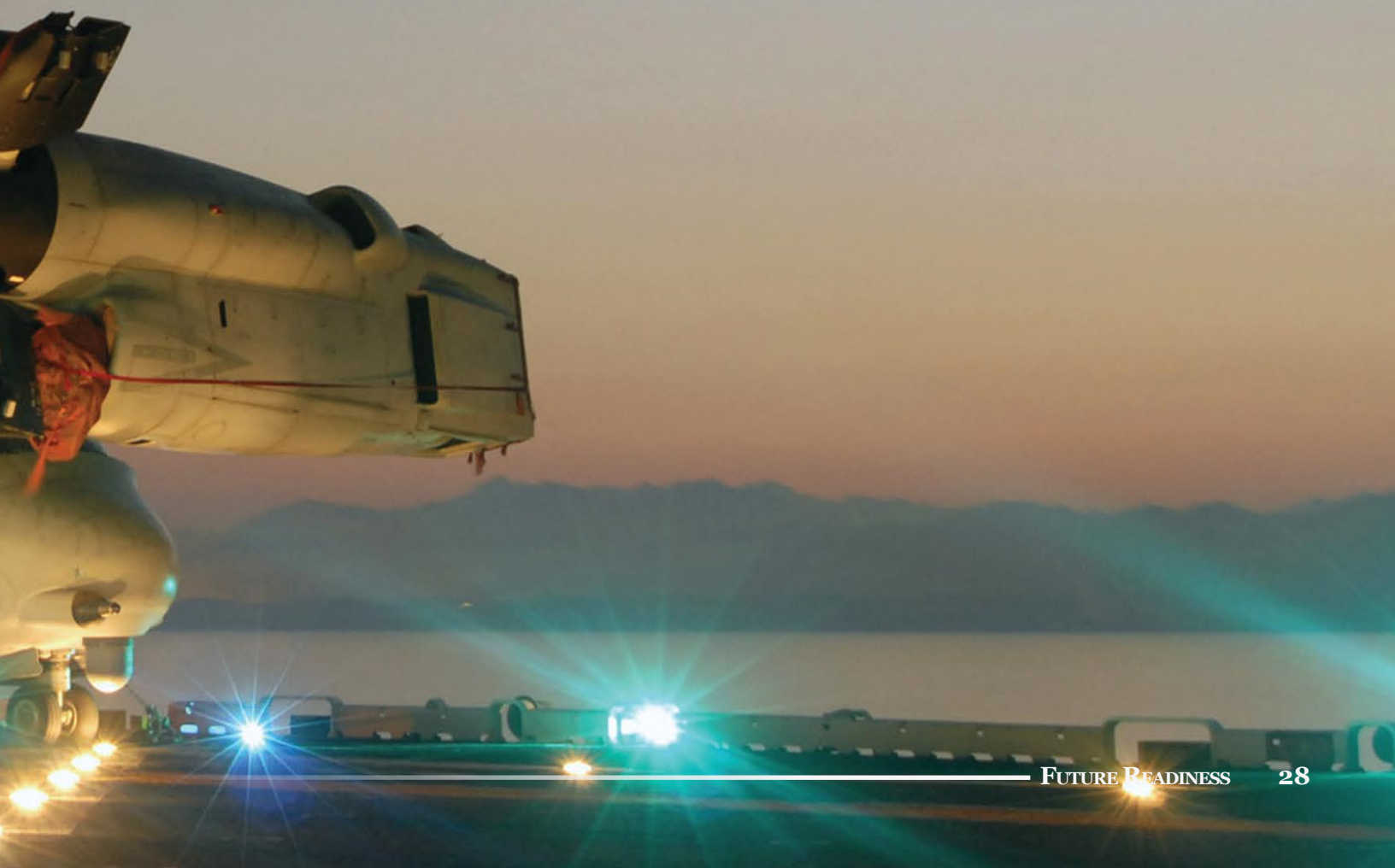
- Tactical Aircraft (Navy and Marine Corps)
- Helicopters (Navy) and Assault Support Aircraft (Marine Corps)
- Maritime Patrol and Reconnaissance Aircraft (Navy)
- Training, Logistics, and Other Aircraft (Navy and Marine Corps).

The weapon roadmaps are grouped into five categories:

- Long-Range Standoff Weapons
- Mid-Range Standoff Weapons
- Direct Attack Weapons
- Torpedoes
- Air-to-Air Weapons.

These roadmaps depict current aircraft in the 2010 column and the latest models planned to have reached initial operational capability in the 2032 column. In many cases the term "Replacement" is used to indicate that further analysis is required to define a future system.

Also discussed are the roadmaps for aircraft carriers, amphibious assault ships, and unmanned aircraft systems.



Aircraft Carriers

Our nation's aircraft carriers remain at the center of the most potent sea-going fighting force the world has ever seen. Together with their accompanying strike groups, the Navy's aircraft carriers provide exactly the right balance of forward presence and surge capability needed to conduct warfighting and peacetime operations around the globe in support of national priorities. Sailing the world's oceans, each carrier strike group possesses a versatile, independent, and deadly striking force capable of engaging targets located up to hundreds of miles inland. The mobility and operational independence of aircraft carriers provide a unique level of access that

USS Long Island, *1942*

does not require host-nation support. Nuclear-powered aircraft carriers can remain on-station for months at a time, replenishing ordnance, spare parts, food, consumables, and aircraft fuel while conducting air strikes and other critical missions. This capability demonstrates the remarkable operational flexibility and logistical self-reliance of the aircraft carrier so vital to conducting time-critical strike operations. Aircraft carriers and their strike groups are always within rapid reach of where they need to be and are ready on arrival.

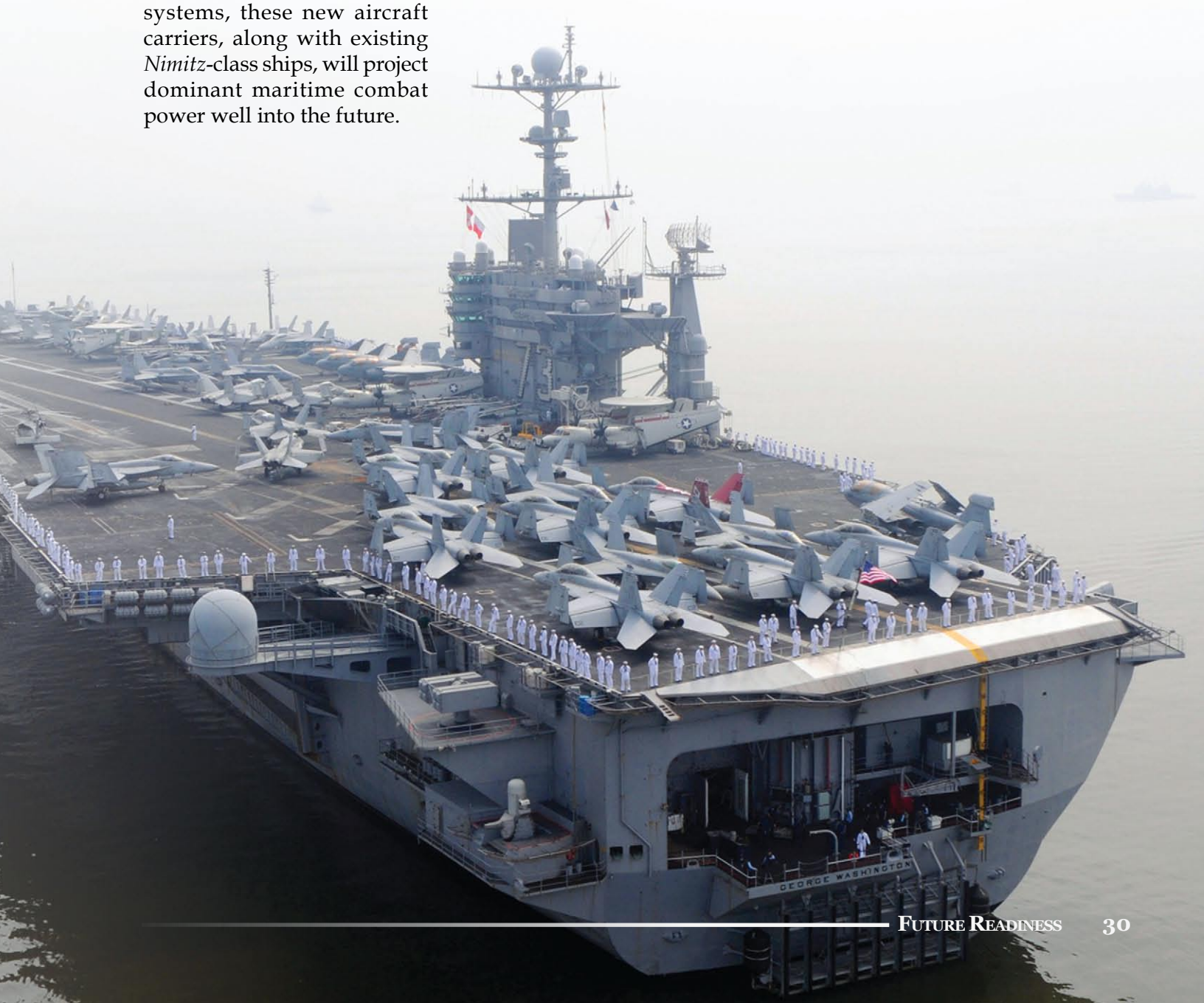
For the first time, the 11 aircraft carrier force is solely nuclear-powered, comprised of USS *Enterprise* (CVN 65) and 10 ships of the *Nimitz* class. USS *George H. W. Bush* (CVN 77), the last of the *Nimitz*-class carriers, was delivered to the Navy in May 2009. The day after that delivery, the commissioning pennant was lowered on the last fossil-fueled carrier, USS *Kitty Hawk* (CV 63), after completing more than 48 years of active service. Although *George H. W. Bush* will include many upgrades and improvements, service life allowances (such as weight and center of gravity, electrical load margin, material handling, and future weapon requirements) constrain the further growth of the *Nimitz*-class design. Consequently, a new design was approved to ensure the aircraft carrier's role as the centerpiece of the 21st-century carrier strike group.

Construction of *Gerald R. Ford* (CVN 78), the lead ship of the new class of aircraft carriers, began in 2008. The *Ford* class is the first major design upgrade in the more than 40 years since the *Nimitz* class was first designed. The *Ford* design boasts an improved reactor and electrifies all auxiliary systems outside the main propulsion plant, greatly reducing the requirement for costly steam, hydraulic, and pneumatic piping. The improved reactor and zonal electrical distribution system also will increase electrical power generation capacity by nearly 300 percent, enabling new technologies such as the electromagnetic aircraft launch system and advanced command-and-control systems. The new ship design, which is based on the current *Nimitz* hull, also includes an advanced arresting gear system as well as new flight and hangar decks. The redesigned flight deck will enable greater flexibility during aircraft turnaround and launch-and-recovery cycles, leading to a 25 percent increase in daily sortie generation rates. In addition, the *Ford* class will restore growth and electrical margins no longer available in *Nimitz*-class ships.

When compared to their *Nimitz*-class counterparts, manpower requirements for *Ford*-class ships and their embarked air wings will be reduced by as many as 1,200 Sailors. These manpower reductions, coupled with improved reliability and reduced maintenance requirements for the carrier, will enable the Navy to realize total operating cost savings of more than $5 billion during the life of each ship.

To meet the demands of 21st-century warfare, *Nimitz*- and *Ford*-class aircraft carriers will deploy long-range manned and unmanned strike aircraft. Advanced weapons and sensors, combined with high-speed sealift platforms, tilt-rotor aircraft, and advanced amphibious assault vehicles, will generate more flexible combat power. Joint concepts of operation, centered on the aircraft carrier, will leverage the military strengths of all the services, bringing cooperative muscle to the fight and a potent synergy across the warfare continuum.

The design approach and spiral development of the *Ford* class will reduce risk by introducing new technologies and capabilities at an affordable pace. Armed with advanced aircraft such as the F/A-18 E/F *Super Hornet*, F-35C *Lightning II*, EA-18G *Growler*, and unmanned combat air systems, these new aircraft carriers, along with existing *Nimitz*-class ships, will project dominant maritime combat power well into the future.



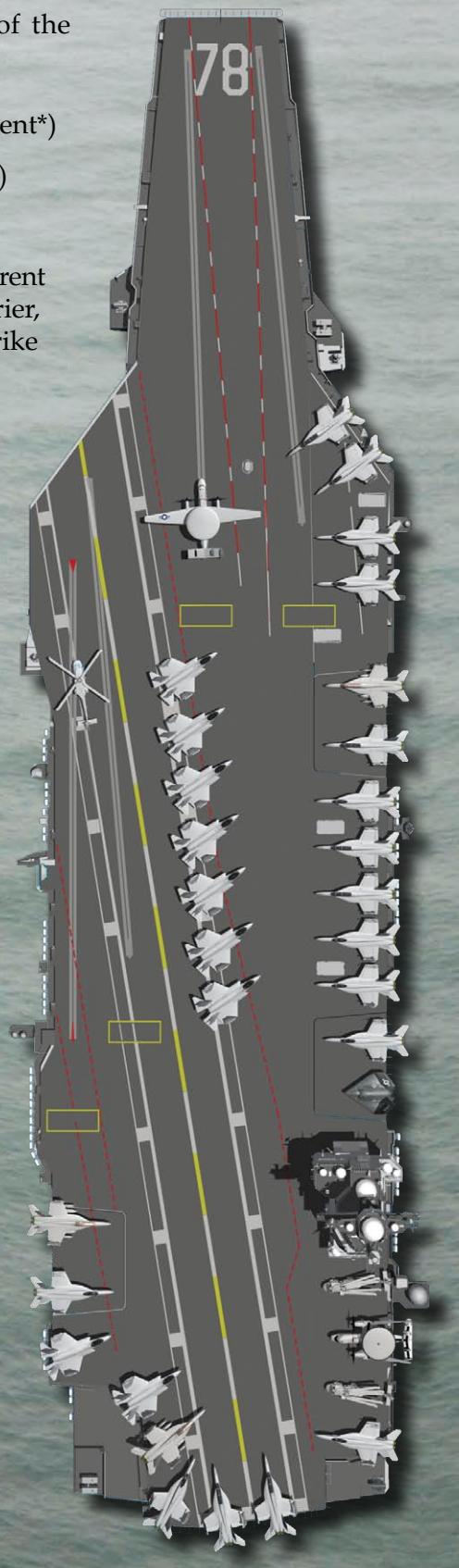
USS Yorktown, *1943*

2032

The notional carrier air wing of the future will consist of the following aircraft:

- 44 strike fighters (F/A-18E/F, F-35, F/A-18E/F Replacement*)
- 5 electronic attack aircraft (EA-18G, EA-18G Replacement)
- 5 airborne early warning aircraft (E-2D)
- 19 helicopters (MH-60R/S or MH-60R/S Replacement). Current projections include 11 helicopters deployed aboard the carrier, with the remaining 8 dispersed to other ships in the strike group
- In addition, 2 Future Carrier Onboard Delivery aircraft will normally be embarked to support the air wing and strike group.

* The F/A-18E/F Replacement may include a mix of manned, optionally manned, or unmanned platforms.



Amphibious Assault Ships

USS Valley Forge, *1963*

The Marine Corps is our nation's amphibious, expeditionary, air-ground team that has the flexibility to conduct military operations from the air, land, and sea. Relevant in conventional as well as irregular warfare, amphibious forces have provided and will continue to provide highly versatile options for any joint force commander tasked with conducting operations in the littoral regions of the world. Amphibious assault ships are the largest of all amphibious warfare ships, resembling small aircraft carriers. In addition to launching aircraft, they deliver Marine expeditionary forces and their equipment to the beach by way of small watercraft. Perhaps more than any other asset, these ships symbolize the warfighting relationship between the Navy and the Marine Corps, delivering the fight to the enemy in "every clime and place."

Large-deck amphibious assault ships were designed to embark, to deploy, and to land elements of Marine Corps and special operations forces by tilt-rotor and rotary-wing aircraft, landing craft, and amphibious vehicles while providing organic close air support with fixed-wing aviation. These very capable platforms are routinely deployed as the centerpieces of forward-deployed expeditionary strike groups, which also include *San Antonio*-class, *Whidbey Island*-class, and/or *Harpers Ferry*-class vessels with embarked MAGTFs. Expeditionary strike groups provide a unique tool capable of spporting the full range of military operations.

LHA: Amphibious Assault Ship – General Purpose

These vessels have been modified to accommodate fixed-wing and tilt-rotor aircraft. Each ship can carry a mix of 31 rotary-wing and fixed-wing vertical/short takeoff and landing (V/STOL) and vertical takeoff and landing (VTOL) aircraft, one air-cushioned landing craft (LCAC) or four utility landing craft (LCU), and more than 1,700 troops. They can also support sea-based command and control of waterborne and aerial ship-to-shore movements. With a fleet surgical team embarked, an LHA can function as a primary casualty receiving and treatment ship with 17 intensive care unit beds, four operating rooms, 300 hospital beds, a 1,000-unit blood bank, and dental and x-ray facilities. The two remaining *Tarawa*-class LHAs will reach the end of their extended service lives between 2011 and 2015.

LHD: Amphibious Assault Ship – Multipurpose

With improved flight deck and elevator schemes, *Wasp*-class LHDs can accommodate a mix of 31 rotary-wing and fixed-wing V/STOL and VTOL aircraft. LHDs were the first amphibious vessels designed to accommodate both the AV-8B *Harrier* aircraft and multiple LCACs. Their enhanced well decks are capable of carrying three LCACs or three LCUs and they can embark more than 1,680 troops. *Wasp*-class LHDs have the same Navy and Marine Corps command-and-control facilities as *Tarawa*-class LHAs and also have six operating rooms and 600 hospital beds. All LHDs are being modified to accommodate the MV-22 *Osprey* and the F-35B *Lightning II*. USS *Makin Island* (LHD 8), the last of the *Wasp*-class LHDs to be commissioned, has a gas-turbine propulsion system and an all-electric auxiliary system.

LHA (R): Amphibious Assault Ship – General Purpose (Replacement)

The *America*-class LHA will optimize the aviation performance capabilities of the LHD design and will enhance Marine Corps and special operations amphibious assault missions by enabling the deployment of combat forces at longer ranges and greater speeds. The enhanced capabilities of the future aviation combat element, coupled with the LHA (R)'s enlarged hangar deck, enhanced aviation maintenance facilities, increased aviation fuel capacity, and additional aviation storerooms, will add a warfighting dimension not previously available to the joint force. The contract for LHA 6, the first ship of the LHA (R) program, was awarded in June 2007 and delivery is scheduled for the end of fiscal year 2012. Delivery of LHA 7 is tentatively planned for fiscal year 2016.

LH (X): Amphibious Assault Ship – General/Multipurpose (Next)

The LH (X) will replace all LHD, LHA, and LHA (R) class ships and capitalize on lessons learned with the LHA (R) design. Some of the enhancements for LH (X) will include center-of-gravity/displacement growth margins and a surface interface point aimed at maximizing the combat power of MAGTFs. From a shipbuilding standpoint, the strategy is to consolidate amphibious ship designs into a single big-deck class and a single small-deck class (based on the LPD 17 hull form). This strategy will support economies across the doctrine, organization, training, equipment, and supplies spectra.

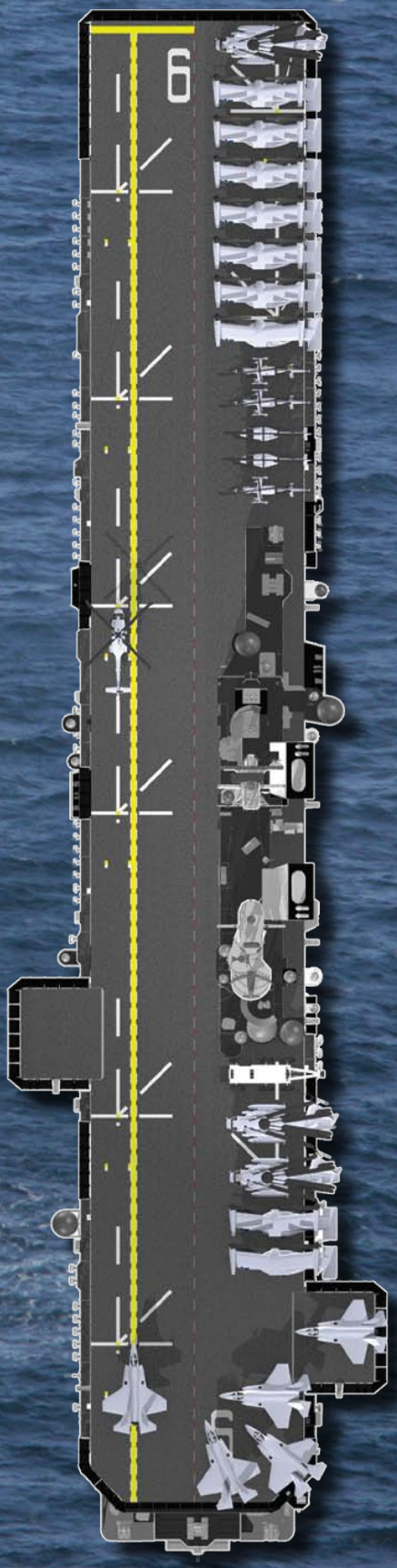
Korea, 1952

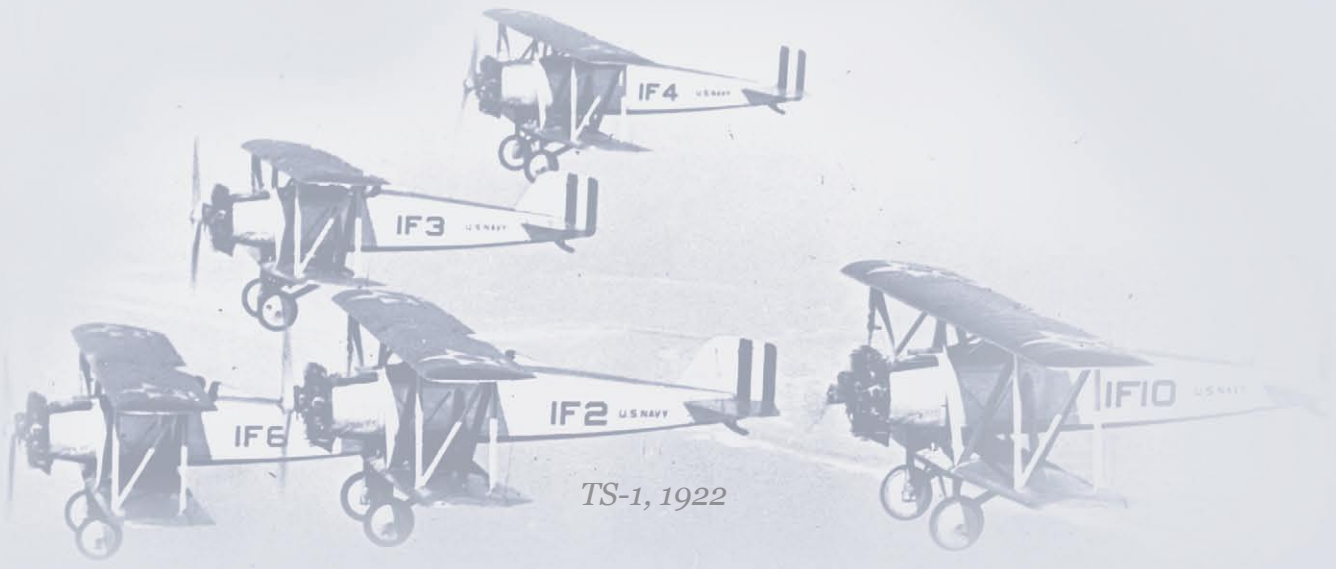
2032

The notional aviation combat element of the future will consist of the following aircraft:

- 6 short takeoff/vertical landing aircraft (F-35B with Next Generation Jammer [NGJ])
- 12 tilt-rotor aircraft (MV-22)
- 4 heavy-lift helicopters (CH-53K)
- 4 attack helicopters (AH-1Z)
- 3 utility helicopters (UH-1Y)

Aviation combat elements are task organized by MAGTF commanders. As such, the exact composition will vary depending on mission requirements.





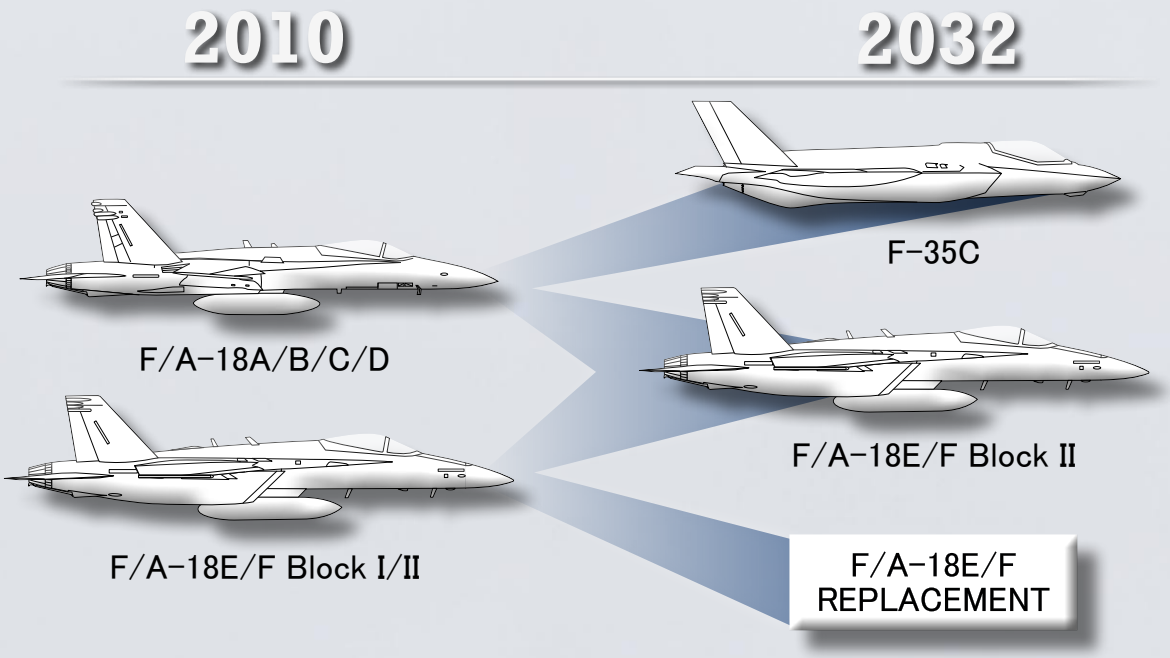
TS-1, 1922

F-35C *Lightning II* Joint Strike Fighter

The Joint Strike Fighter program is building a tri-service family of next-generation strike-fighter aircraft that is flexible and survivable. With its all-aspect stealth strike design, internal weapon carriage, fully fused mission systems, and unrefueled combat radius of approximately 650 nautical miles, the Navy's F-35C *Lightning II* will complement the capabilities of the F/A-18E/F *Super Hornet* now serving as the Navy's premier strike fighter. The F-35C will enhance the flexibility, power projection, and strike capabilities of carrier air wings and joint task forces. Initial operational capability for the F-35C *Lightning II* is late fiscal year 2014.

F/A-18E/F *Super Hornet* Strike Fighter

There are a number of enhancements to the F/A-18E/F *Super Hornet* that will sustain its lethality well into the 21st century. Upgrades include critical growth capability, enhanced survivability, and weapon bring-back improvement. Avionics upgrades for the F/A-18E/F



Block II include the APG-79 Active Electronically Scanned Array Radar System, the Infrared Search and Track System, and advanced sensor integration. Future avionics upgrades will enable network-centric operations, which will enhance situational awareness and the transfer of data to command-and-control nodes. With the recent retirement of the S-3B *Viking*, the *Super Hornet* is providing the organic tanking mission for carrier air wings.

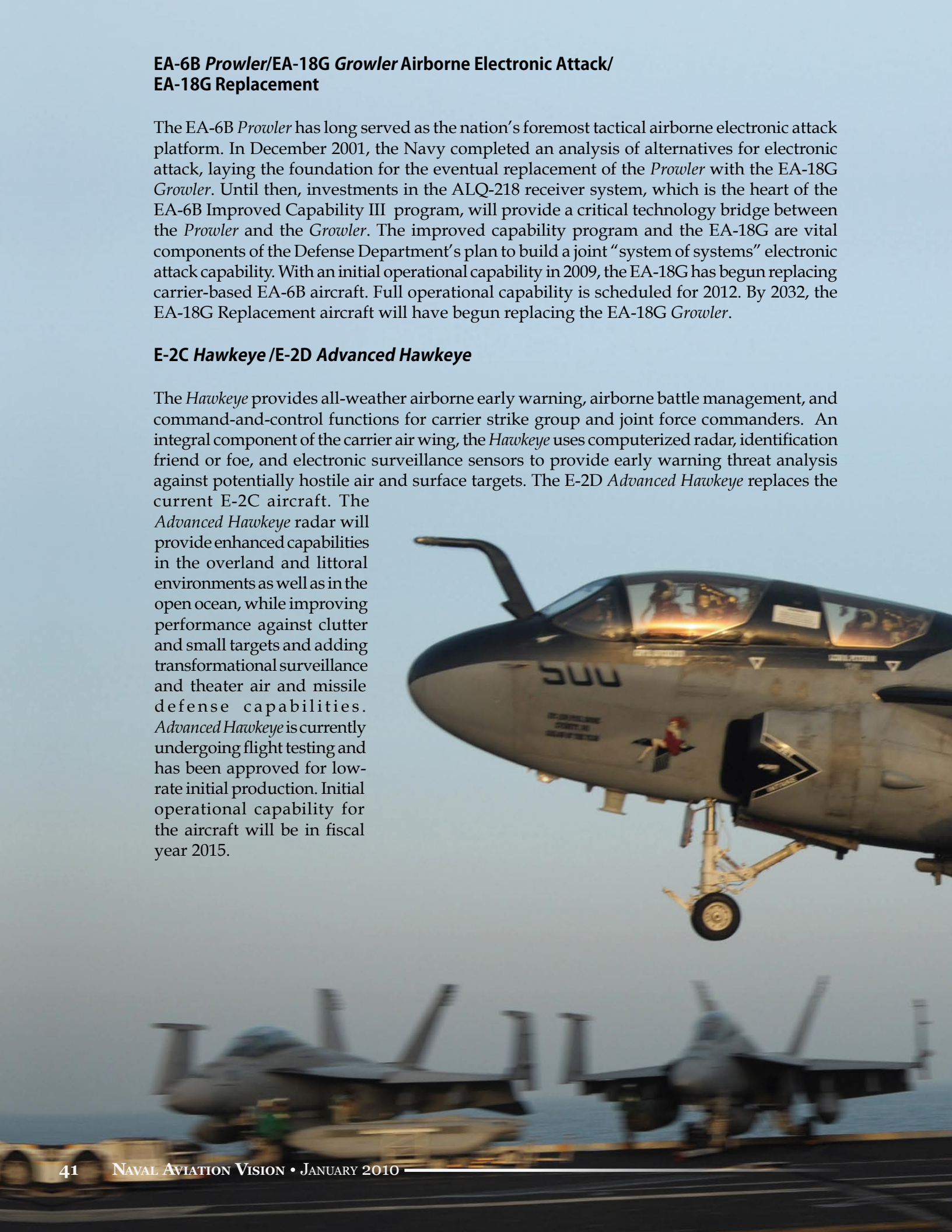
The Naval Aviation Enterprise (NAE) has initiated a study to assess the capabilities required when the F/A-18E/F reaches the limits of its service life beginning in 2025. This assessment is being led by the Director, Air Warfare (N88), with inputs from the other services and industry. The assessment is the initial stage of the requirements and acquisition process; it will evaluate a full range of considerations for addressing future Navy needs and recapitalization issues, including manned, unmanned, and system-of-systems options. The capabilities assessed during the study will be further developed and refined through operational analytical modeling and simulation, potentially leading to an analysis of alternatives and, eventually, a competitive fly-off between various industry proposals for the F/A-18E/F Replacement.

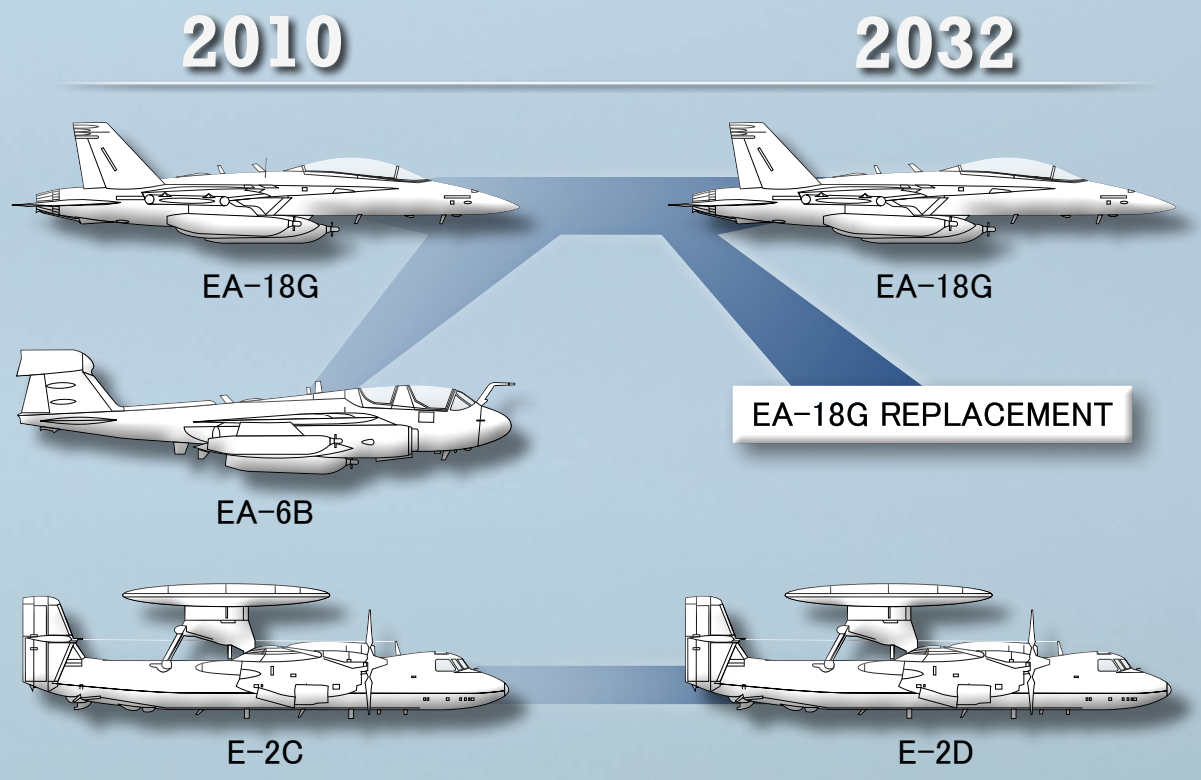
EA-6B *Prowler*/EA-18G *Growler* Airborne Electronic Attack/ EA-18G Replacement

The EA-6B *Prowler* has long served as the nation's foremost tactical airborne electronic attack platform. In December 2001, the Navy completed an analysis of alternatives for electronic attack, laying the foundation for the eventual replacement of the *Prowler* with the EA-18G *Growler*. Until then, investments in the ALQ-218 receiver system, which is the heart of the EA-6B Improved Capability III program, will provide a critical technology bridge between the *Prowler* and the *Growler*. The improved capability program and the EA-18G are vital components of the Defense Department's plan to build a joint "system of systems" electronic attack capability. With an initial operational capability in 2009, the EA-18G has begun replacing carrier-based EA-6B aircraft. Full operational capability is scheduled for 2012. By 2032, the EA-18G Replacement aircraft will have begun replacing the EA-18G *Growler*.

E-2C *Hawkeye* /E-2D *Advanced Hawkeye*

The *Hawkeye* provides all-weather airborne early warning, airborne battle management, and command-and-control functions for carrier strike group and joint force commanders. An integral component of the carrier air wing, the *Hawkeye* uses computerized radar, identification friend or foe, and electronic surveillance sensors to provide early warning threat analysis against potentially hostile air and surface targets. The E-2D *Advanced Hawkeye* replaces the current E-2C aircraft. The *Advanced Hawkeye* radar will provide enhanced capabilities in the overland and littoral environments as well as in the open ocean, while improving performance against clutter and small targets and adding transformational surveillance and theater air and missile defense capabilities. *Advanced Hawkeye* is currently undergoing flight testing and has been approved for low-rate initial production. Initial operational capability for the aircraft will be in fiscal year 2015.



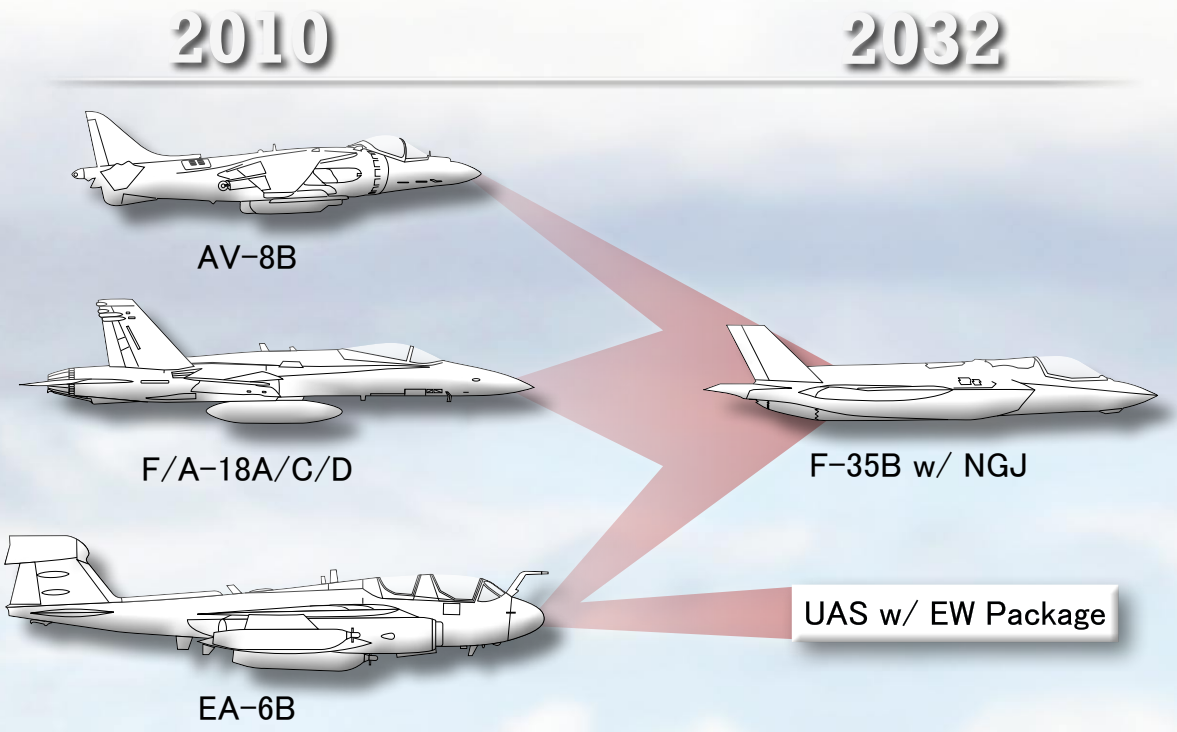

2010
2032
EA-18G
EA-18G
EA-18G REPLACEMENT
EA-6B
E-2C
E-2D

Marine Corps Tactical Aircraft

F-35B *Lightning II* Joint Strike Fighter

The Marine Corps' AV-8B *Harrier*, EA-6B *Prowler*, and F/A-18A/C/D *Hornet* aircraft will be replaced with the F-35B *Lightning II* short take-off and landing variant of the Joint Strike Fighter. This version of the *Lightning II* combines multi-role, low-observable, fifth-generation capabilities with the flexibility required for expeditionary basing. The F-35B will allow the Marine Corps to provide tactical air operational flexibility and tactical supremacy to Marine and joint task force commanders. Initial operational capability for the F-35B is fiscal year 2012.

F4F-3, 1942



EA-6B *Prowler* and Airborne Electronic Attack

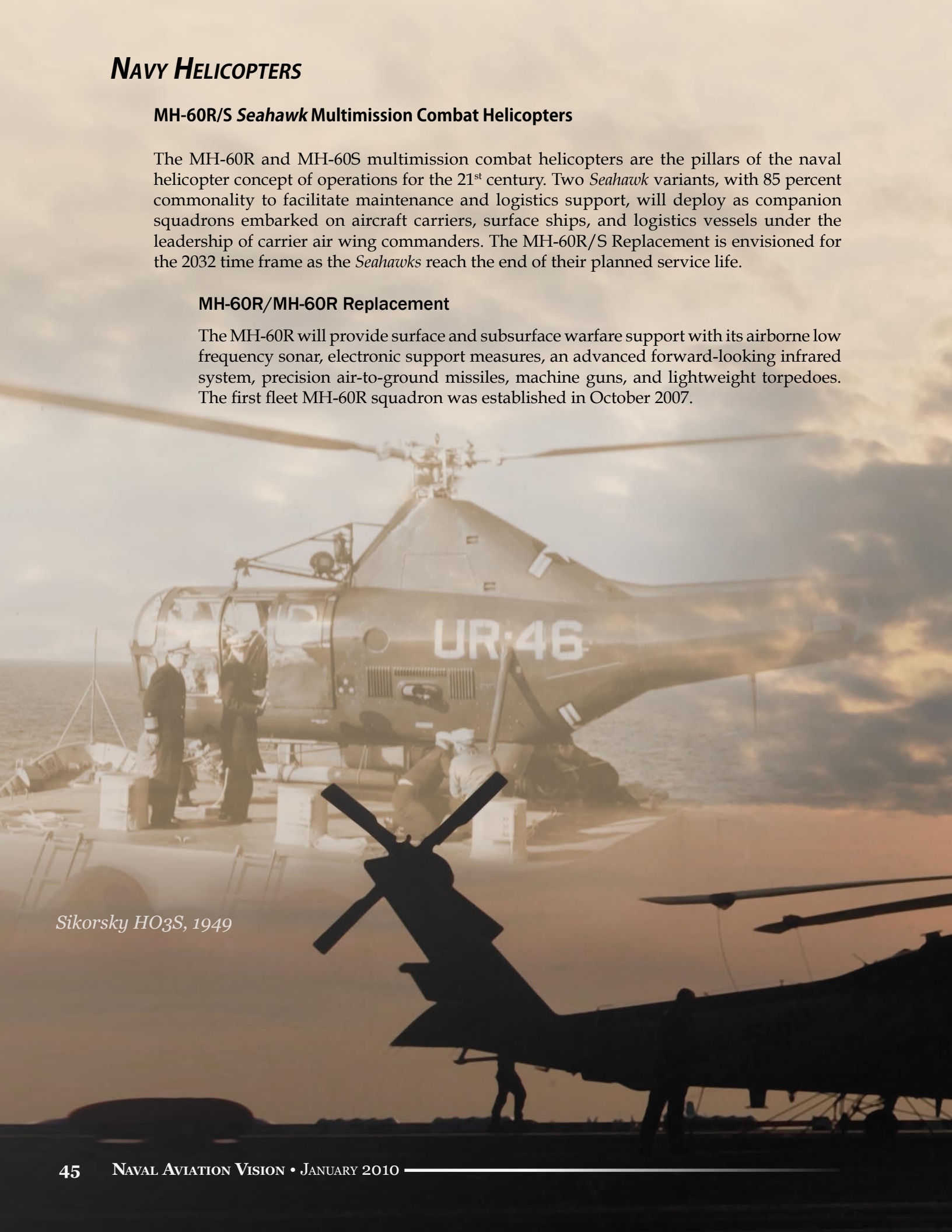
The Marine Corps will continue to fly the Improved Capability III EA-6B *Prowler* as a capability bridge to a MAGTF-scalable, system of systems able to support the needs of the joint force. In development are unmanned aircraft system (UAS) payloads, ground systems, and joint improvements to the all-service variant of the F-35B that will enable a distributed electronic warfare (EW) capability suitable for Marine operations.

MH-60R/S *Seahawk* Multimission Combat Helicopters

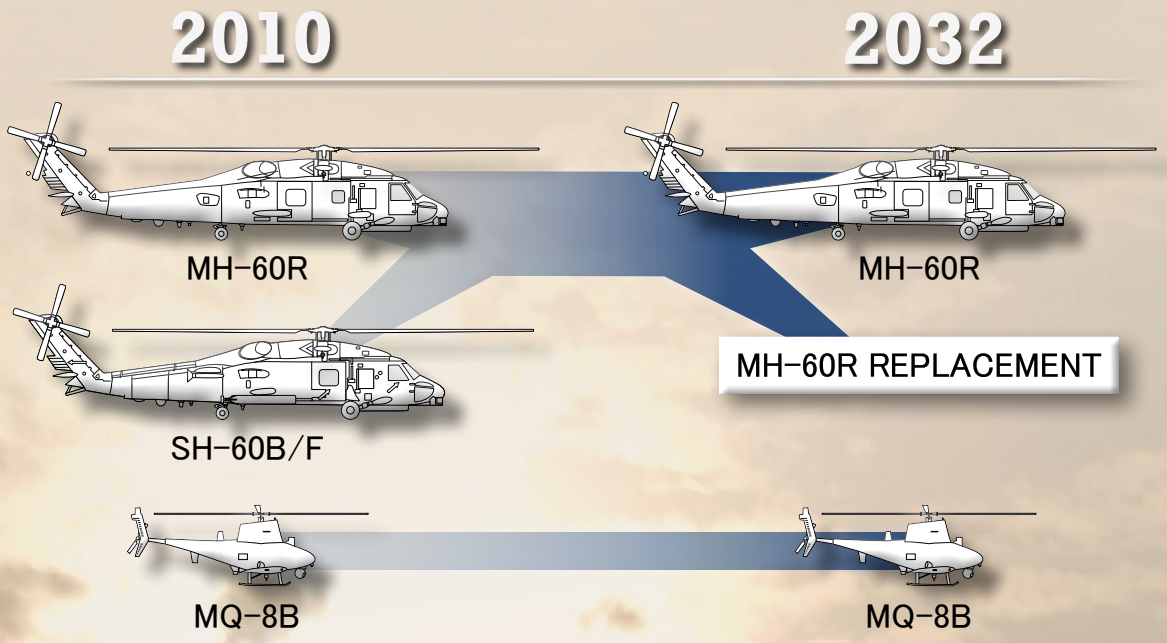
The MH-60R and MH-60S multimission combat helicopters are the pillars of the naval helicopter concept of operations for the 21st century. Two *Seahawk* variants, with 85 percent commonality to facilitate maintenance and logistics support, will deploy as companion squadrons embarked on aircraft carriers, surface ships, and logistics vessels under the leadership of carrier air wing commanders. The MH-60R/S Replacement is envisioned for the 2032 time frame as the *Seahawks* reach the end of their planned service life.

MH-60R/MH-60R Replacement

The MH-60R will provide surface and subsurface warfare support with its airborne low frequency sonar, electronic support measures, an advanced forward-looking infrared system, precision air-to-ground missiles, machine guns, and lightweight torpedoes. The first fleet MH-60R squadron was established in October 2007.



Sikorsky HO3S, 1949



MQ-8B *Fire Scout*

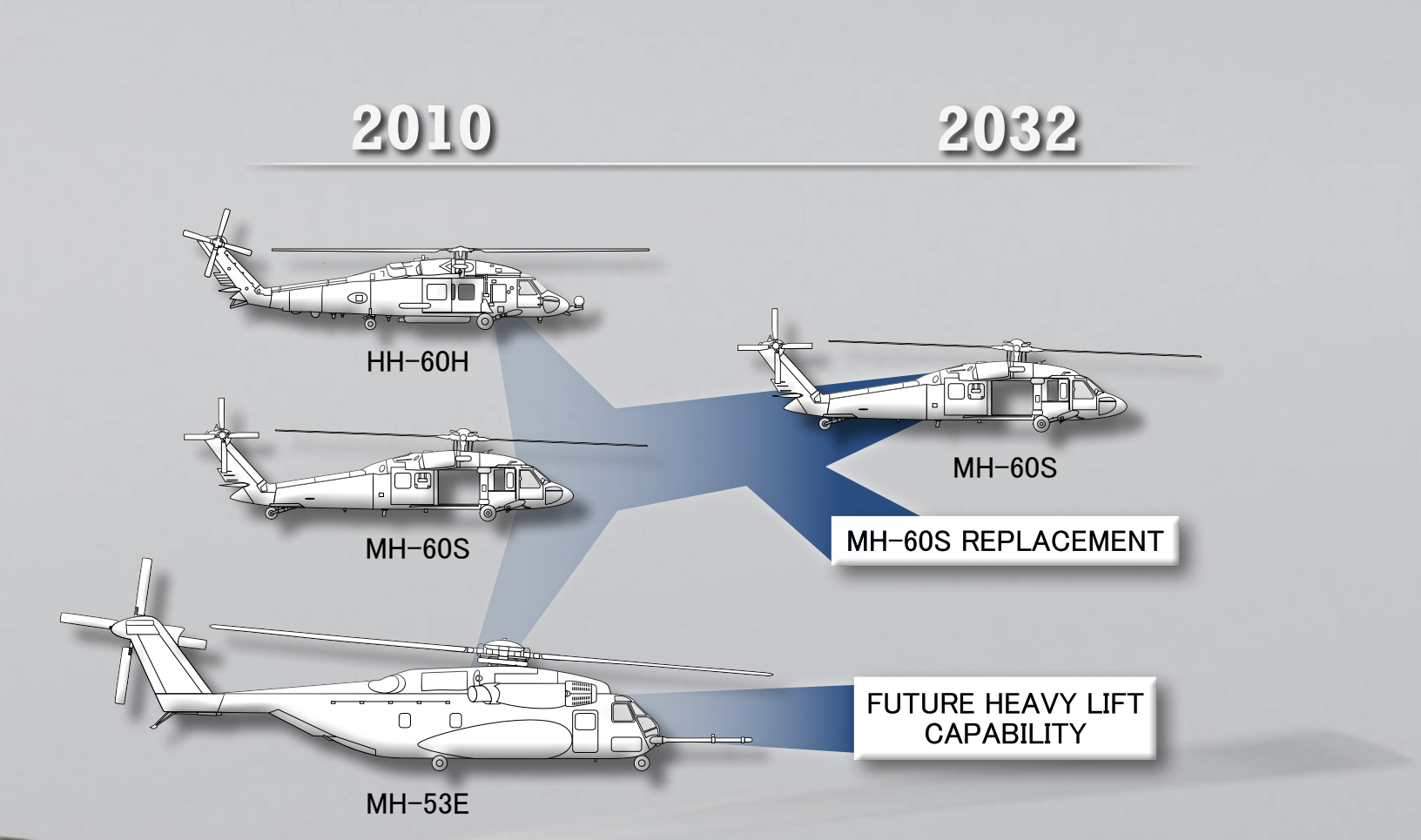
The MQ-8B *Fire Scout* VTOL UAS is designed to operate from all air-capable ships, to carry modular mission payloads, and to operate using the Tactical Control System and Tactical Common Data Link. *Fire Scout* is a medium- to large-size Group 4 UAS that will provide day and night real-time intelligence/surveillance/reconnaissance and targeting as well as communications relay and battlefield management capabilities to support anti-submarine, mine, and anti-surface warfare, the missions of the Littoral Combat Ship. *Fire Scout* conducted operational testing on USS *McInerney* (FFG 8) in fiscal year 2009 and deployed in fiscal year 2010 on *McInerney*.

MH-60S/MH-60S Replacement

The MH-60S will partner with the MH-60R for surface warfare missions, carrying the same forward-looking infrared and air-to-ground weaponry and machine guns. In addition, the MH-60S will have the capability to support combat search and rescue and naval special warfare joint theater operations. The platform will perform the airborne mine countermeasures mission (previously performed exclusively by the MH-53E) using any one of five advanced sensor and weapon packages to provide detection, localization, and neutralization of the anti-access mine threat. These five systems include the AQS-20A Mine-Hunting Sonar System, the Airborne Laser Mine Detection System, the Airborne Mine Neutralization System, the Rapid Airborne Mine Clearance System, and the Organic Airborne and Surface Influence System. Collectively, these systems will allow naval forces to operate and maneuver in littoral and blue-water environments. The MH-60S also will anchor the fleet logistics role in strike group operations.

MH-53E Replacement

The MH-53E *Sea Dragon* continues to conduct dedicated airborne mine countermeasures and vertical on-board-delivery heavy lift missions in the fleet. Future plans include transitioning the mine countermeasures capability from the *Sea Dragon* to the MH-60S and identification of an MH-53E Replacement for the Navy's future heavy lift capability. Initial operational capability will be required in the 2026 timeframe.


2010
2032
HH-60H
MH-60S
MH-53E
MH-60S
MH-60S REPLACEMENT
FUTURE HEAVY LIFT CAPABILITY

Marine Corps Assault Support Aircraft

AH-1Z *Viper* and UH-1Y *Venom*

The H-1 upgrade program is an integral part of the Marine Corps' end strength increase. As the number of Marine infantry battalions increases, so will the requirement for rotary-wing attack and utility support aircraft. To meet this demand, two Marine light attack helicopter squadrons will be added to the active component. H-1 upgrade aircraft are equipped with a four-bladed rotor system, 10,000-hour air frames, integrated avionics, glass cockpits, improved sensors and helmet-mounted displays. Approximately 84 percent of the two air frames are common, significantly benefiting deployability and maintainability and reducing the logistics footprint and associated training requirements. Initial operational capability was achieved for the UH-1Y in August 2008. The AH-1Z is scheduled for initial operational capability in fiscal year 2011.

UH-34D, 1966

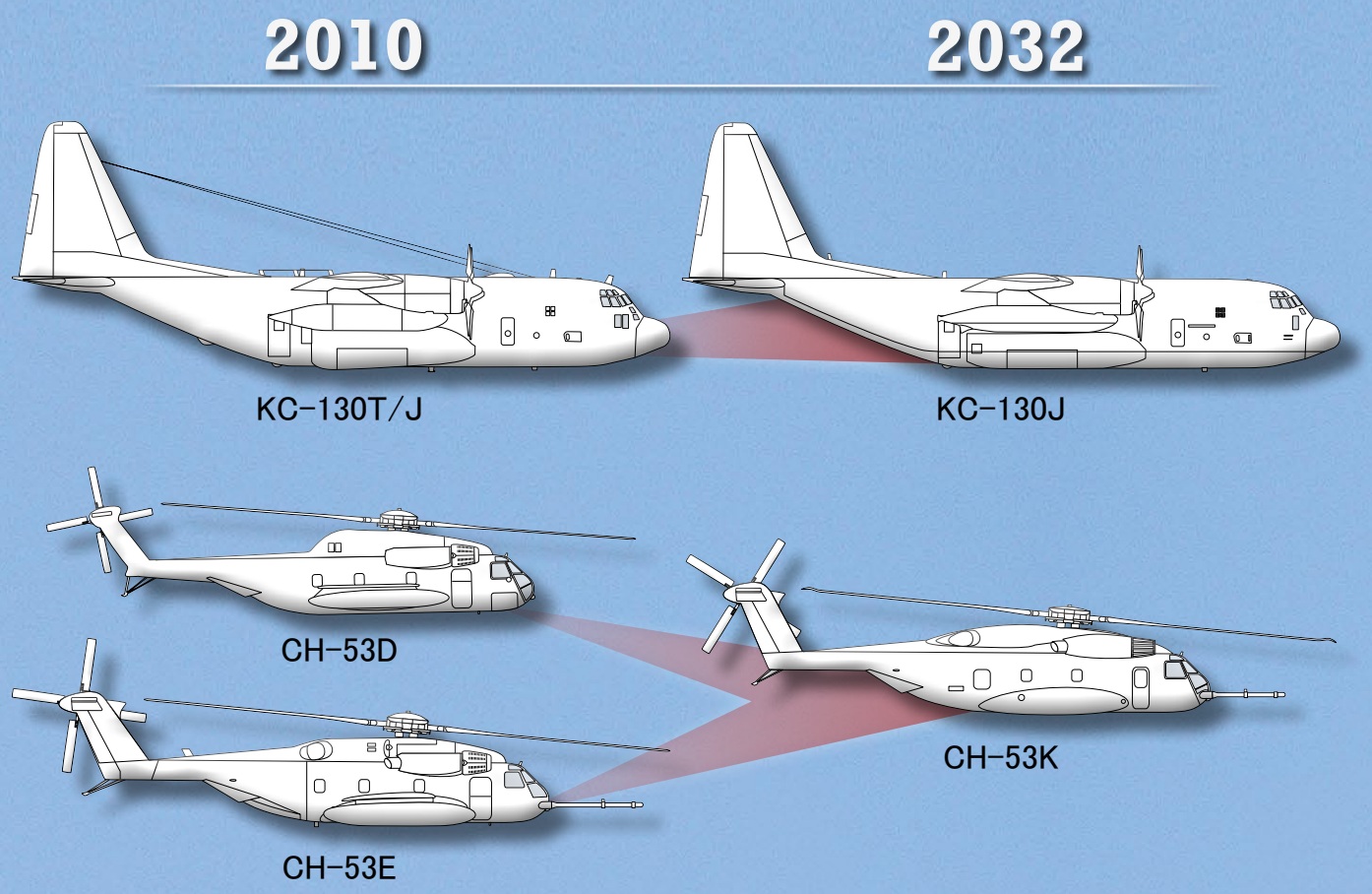
MV-22B *Osprey*

The MV-22B *Osprey* is a tilt-rotor V/STOL aircraft designed as the medium-lift replacement for the Vietnam-era CH-46E *Sea Knight* assault support helicopter. The *Osprey* can operate as a helicopter or as a turboprop aircraft and incorporates advances in composite materials, airfoil design, fly-by-wire controls, and digital avionics. It possesses twice the speed, six times the range, and three times the payload of the CH-46E. Initial operational capability for the MV-22B was in 2007 and it is now supporting combat operations in the Central Command area of responsibility.

2010
2032
AH-1W
AH-1Z
HH/UH-1N
UH-1Y
UH-1Y
CH-46E
MV-22B
MV-22B

KC-130J *Super Hercules*

The KC-130J *Super Hercules* is a multimission tactical tanker and assault support aircraft that is well suited to the mission needs of the forward-deployed MAGTF. As the replacement for the KC-130T model aircraft, the KC-130J provides increased speed and range, an improved refueling system, a digital cockpit, night vision imaging capabilities, and increased survivability as well as commonality and interoperability between the active and reserve components of the Marine Corps.



CH-53K Heavy Lift Helicopter

In operation since the early 1970s, the current CH-53 fleet is beginning to reach its airframe fatigue life service limits and does not have the lift capability necessary to support the future warfighting concepts of the Marine Corps. This aging but still very relevant helicopter is in high demand, making significant contributions to missions around the world. Expeditionary heavy-lift capabilities will continue to be critical to successful land- and sea-based operations in future anti-access operations, area-denial environments, sea basing, and the joint concepts of force application and focused logistics. The new CH-53K will fulfill land- and sea-based heavy-lift requirements not possessed by any of today's platforms, and will contribute directly to the increased agility, lethality, and persistence of Marine and joint task forces. The CH-53K will transport 27,000 pounds of external cargo to a range of 110 nautical miles, nearly tripling the CH-53E's lift capability under similar environmental conditions, while fitting within the same shipboard footprint. The CH-53K also will provide lift capability under high-altitude and hot-weather conditions, greatly expanding commanders' operational reach. Maintainability and reliability enhancements of the CH-53K will significantly decrease recurring operating costs, and will greatly improve aircraft efficiency and operational effectiveness in comparison with the current CH-53E. In addition, survivability and force protection enhancements will increase protection dramatically, for both aircrew personnel and passengers, thereby broadening the depth and breadth of heavy-lift operational support to task force commanders.

Navy Maritime Patrol and Reconnaissance Aircraft

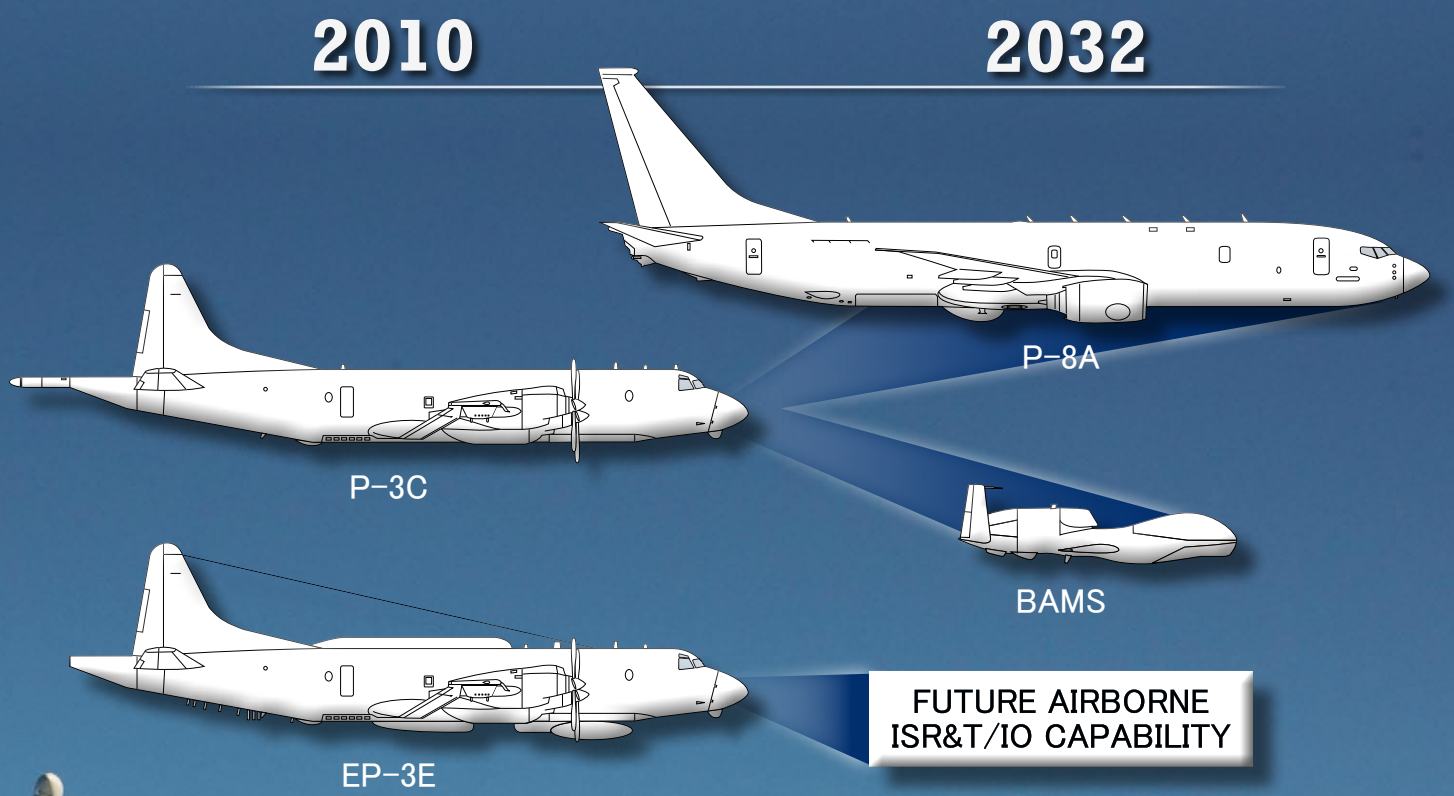
P-8A *Poseidon* Multimission Maritime Aircraft

The P-8A *Poseidon* will replace the P-3C *Orion*, which has reached the end of its service life. The *Poseidon* will provide broad area, maritime, and littoral anti-submarine and anti-surface warfare and reconnaissance capabilities to joint warfighters. To keep pace with emerging threats, the P-8A features a sensor and communications suite built within an open architecture to facilitate the insertion of state-of-the-art anti-submarine warfare sensors, net-ready technologies, and the latest joint weapons throughout its service life. The procurement plan for the *Poseidon* provides the lethality and capacity needed to support carrier and expeditionary strike groups and joint battle force access in any maritime environment. Initial operational capability for the P-8A *Poseidon* is 2013.

Broad Area Maritime Surveillance UAS

Integral to the Navy's airborne patrol and reconnaissance recapitalization strategy, the Broad Area Maritime Surveillance (BAMS) UAS will be a forward-deployed, land-based, autonomously operated system that will provide persistent maritime reconnaissance and basic communications relay capabilities from five operational sites (orbits) worldwide. BAMS will be an adjunct to the P-8A multimission aircraft, operated under the cognizance of the maritime patrol and reconnaissance force to leverage manpower, infrastructure, and expertise. As a FORCEnet enabler, it will serve as a distributed node in the maritime environment and help build and sustain the common operational picture for fleet commanders. The program entered system development and demonstration in fiscal year 2008 and conducted its first two major design reviews in January and June 2009. Initial operational capability for BAMS is scheduled for 2016.

Lockheed P2V-7, 1962



EP-3E *Aries*/Future Airborne ISR&T/IO Capability

The EP-3E *Aries* continues to provide the Navy's only manned airborne intelligence, surveillance, reconnaissance, and targeting and information operations (ISR&T/IO) capability to warfighters. EP-3Es incorporating multi-intelligence, data fusion, and cue-to-kill targeting capabilities are supporting current overseas contingency operations and will be sustained as a part of the force well into the 2020s. Naval Aviation is conducting an analysis of alternatives that will lay the foundation for replacing the *Aries* with a Future Airborne ISR&T/IO Capability that provides a single integrated solution for all of its mission areas in support of Maritime Strategy, FORCEnet, and Defense Department transformation objectives. In the 2020 timeframe, the Future Airborne ISR&T/IO Capability will begin replacing the aging EP-3E. Until then, investment in the EP-3E Joint Airborne Signals Intelligence Architecture Modification Common Configuration program will ensure the mission systems keep pace with current and emerging threats. This program provides a critical technology bridge between the *Aries* and the Future Airborne ISR&T/IO Capability.

Navy and Marine Corps Training, Logistics, and Operational Support Aircraft

TRAINING AIRCRAFT

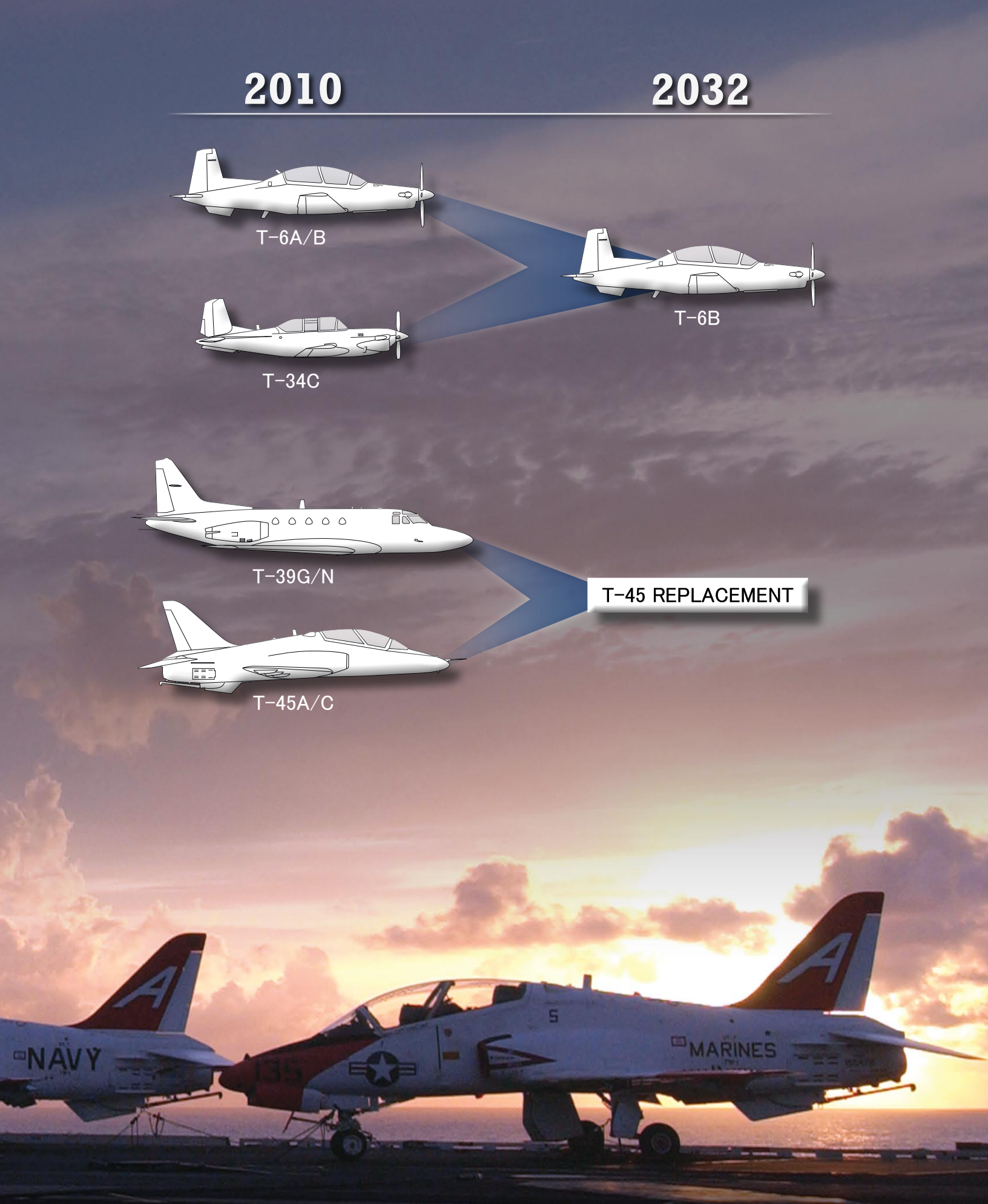
T-6B *Texan II* Joint Primary Trainer

Navy and Marine Corps primary pilot and flight officer training will transition to the T-6B *Texan II* as the T-34C *TurboMentor* is retired after more than 30 years of service. The T-6A, currently used for naval flight officer and Air Force combat systems officer training, will be retrofitted to the T-6B configuration so that there will be a single primary training aircraft for Naval Aviation.

T-45 Replacement

The T-45C *Goshawk* will be the single advanced strike trainer for tailhook pilots and naval flight officers as the T-39G/N *Sabreliner* is retired and the T-45A aircraft is retrofitted to the T-45C configuration. The required avionics modernization program will digitize all T-45A cockpits. The virtual mission training system program will integrate a virtual multimode radar capability into the T-45C to enable basic tactical skills training that will provide a new capability to prepare students for the advanced tactical jet aircraft of the future. By 2032, the T-45 Replacement will replace the T-45 *Goshawk*.

XN3N Yellow Peril, *1936*


2010
2032
T-6A/B
T-34C
T-6B
T-39G/N
T-45A/C
T-45 REPLACEMENT
NAVY
MARINES

T-44 Replacement Aircraft

The T-44A *Pegasus* and the TC-12B *Huron* are both pressurized, twin-engine, fixed-wing aircraft used to conduct multiengine aircraft training for Navy, Marine Corps, Air Force, and Coast Guard pilots. Training in the TC-12B will be discontinued in 2012. The T-44C, which upgrades the T-44A with a digital cockpit, will become the single multiengine training platform for Naval Aviation. By 2032, the T-44 Replacement will replace the T-44C.

TH-57D *Sea Ranger* Rotary and Tilt-Rotor Trainer

The TH-57D *Sea Ranger* will replace the TH-57B/C as Naval Aviation's single rotary-wing and tilt-rotor aircraft training platform. Future upgrades will include a digital cockpit and passenger protection to enhance training and safety to match more closely the capabilities of Navy and Marine Corps fleet helicopter and tilt-rotor platforms.

2010
2032
T-44 REPLACEMENT
T-44A/C
TC-12B
TH-57B/C
TH-57D

LOGISTICS AIRCRAFT

Navy-Unique Fleet-Essential Aircraft

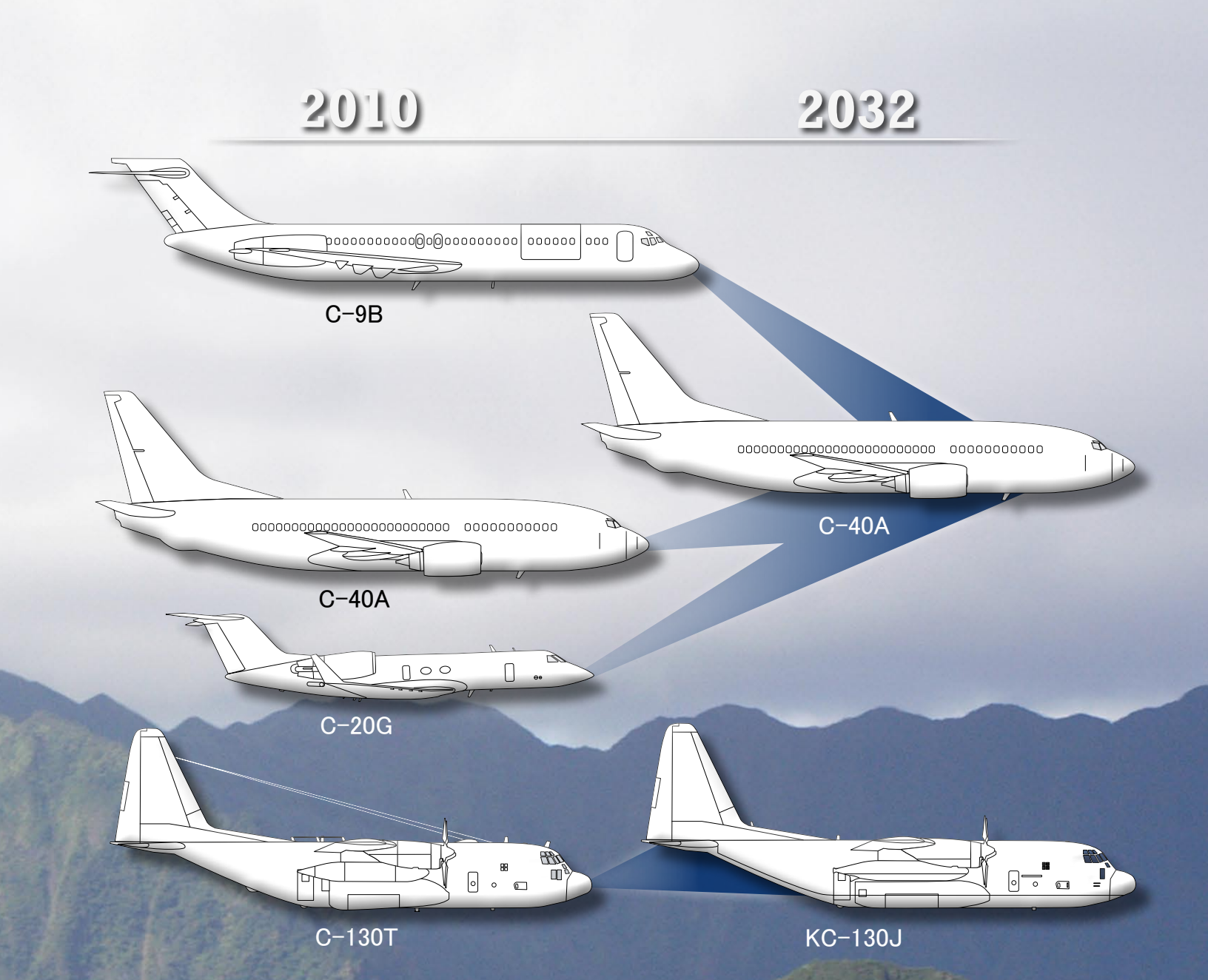
Navy-unique fleet-essential aircraft provide Navy combatant commanders with short-notice, fast-response, intra-theater logistics support when and where it is needed. Comprised of several aircraft platforms, these assets deliver medium- and heavy-lift capabilities in direct support of the fleet worldwide. Designed primarily to provide a reliable and highly flexible airborne logistics capability for the wartime movement of personnel and heavy cargo, they respond to immediate demands for the movement of essential fleet personnel and cargo to mobile sea-based naval force elements.

C-40A *Clipper*

The C-40A *Clipper* is a Boeing 737-700 next generation aircraft equipped with an oversized cargo door that offers multiple passenger and cargo configurations and combinations. It is replacing the aging C-9 *Skytrain* and C-20G *Gulfstream* fleet. The venerable C-9 has served the fleet exceptionally well for years, but with an average aircraft age of 36 years, its maintenance costs are steadily rising. The C-40A has increased range, capacity, and fuel efficiencies to support sea-based logistics.

KC-130J *Hercules*

The KC-130J is the follow-on aircraft that will replace the C-130T. With increased performance, fuel efficiency, and maintenance reliability, the KC-130J is fully compliant with the Communications Navigation Surveillance/Air Traffic Management System and comes equipped with an electronic flight deck. Scheduled for delivery in fiscal year 2017 (to the Navy), this aircraft can transport up to 35,000 pounds of cargo (or 75 passengers) 1,800 nautical miles at 350 knots.



Marine Corps Medium Lift Operational Support Airlift

The Marine Corps uses the medium-lift C-9B aircraft for operational support airlift missions. Marine Aviation will replace the C-9 with the more capable C-40A aircraft. The Marine Corps C-20G will be replaced by a super mid-sized UC-35 Extended Range (ER) Replacement.

OPERATIONAL SUPPORT AIRCRAFT

Operational support aircraft are used to transport high-priority passengers and cargo when requirements are time-, place-, or mission-sensitive. They are stationed worldwide and perform critical airlift missions for the geographic combatant commanders to and from remote locations where commercial sources are not available or viable.

UC-12W *Hawker Beechcraft King Air* 350

The UC-12W is replacing the Marine Corps UC-12B/F *Huron* and will provide light-lift capability through 2032. With a crew of three and a maximum range of 1,900 nautical miles, the *King Air* 350 can transport up to eight passengers while flying at a speed of 290 knots at an altitude of 35,000 feet.

UC-35 Extended Range Replacement *Cessna Sovereign*

The UC-35C/D and C-20G aircraft continue to provide high-speed transport for time-sensitive passengers and cargo. These aircraft have performed admirably, but operating forces need a jet transport with increased range and improved passenger and cargo capabilities. The replacement aircraft will be the UC-35 Extended Range Replacement aircraft.

C-12 Replacement

A C-12 Replacement aircraft will be identified to replace the Navy's current fleet of UC-12B/F/M *Huron* and C-26D *Metroliner* aircraft to provide light-lift capability through 2032.

Executive Transport Aircraft

C-37A/B *Gulfstream* G550

The C-37A/B *Gulfstream* executive transport aircraft replaces the aging C-20A/D to provide senior Navy Department personnel with high-speed, long-range transportation with a secure communications capability. Flying at speeds up to 585 knots, the G550 can travel 6,750 nautical miles at 45,000 feet and transport 12 or 14 passengers depending on configuration.

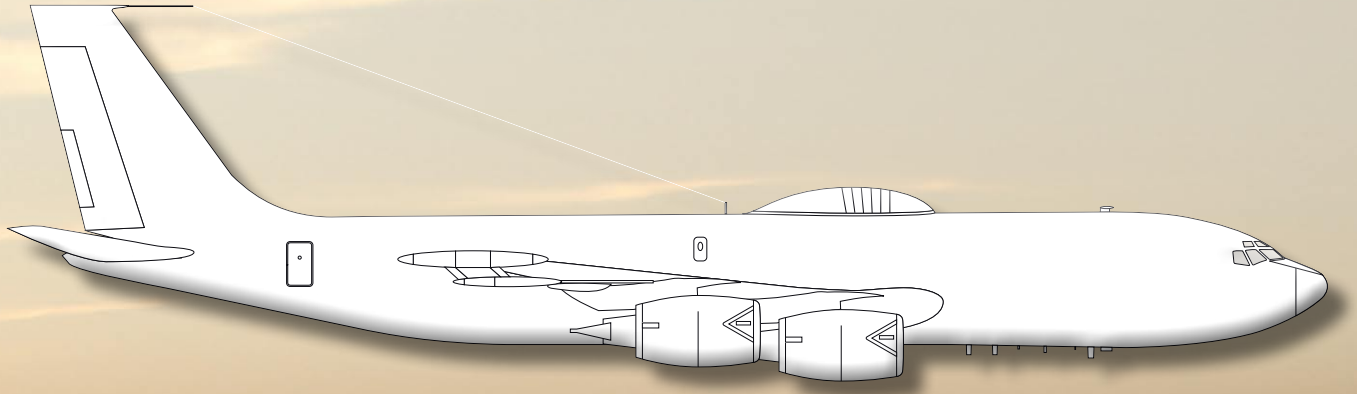
2010
2032
UC-12B/F
UC-12W
UC-35C/D
UC-35ER
C-20G
UC-12B/F/M
C-12 REPLACEMENT
C-26D
C-20A/D
C-37A/B
C-37A/B
474

OTHER NAVAL AIRCRAFT

E-6B *Mercury* Airborne Command Post

Derived from Boeing's 707 aircraft, the E-6B supports Commander, U.S. Strategic Command, with the command, control, and communications capabilities needed to direct and employ strategic forces. Designed to support a flexible nuclear deterrent posture, the E-6B performs very-low-frequency emergency communications, U.S. Strategic Command airborne command post missions, and airborne launch control of ground-based intercontinental ballistic missiles. The Block I program, (initial operational capability in 2013), is designed to improve the mission communication systems of the aircraft and increase efficiencies between airborne command post and Navy communications personnel. The internet protocol/bandwidth expansion program (2013) and the Block II program (2015) both provide increases in line-of-sight and satellite-based data links to allow for greater data throughput supporting high-capacity communications. The service life extension program (2011) ensures continued airframe viability well into the 21st century.

2010 2032



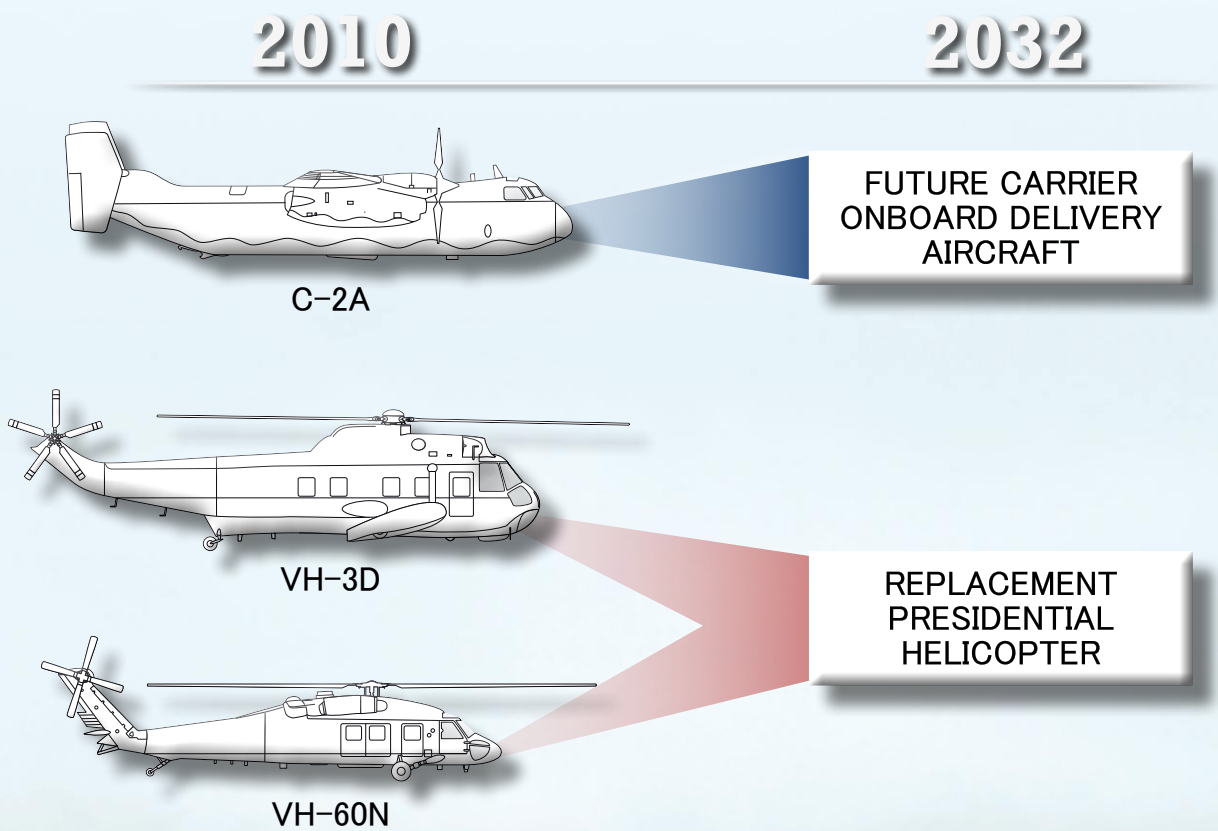
E-6B

C-2A *Greyhound*/Future Carrier Onboard Delivery Aircraft

The C-2A *Greyhound* transports high-priority cargo, mail, and passengers between carriers and shore bases. It can deliver a combined payload of 10,000 pounds a distance of 1,000 nautical miles, and its interior cabin can be rearranged easily to accommodate passengers, litter patients, or jet engines. The large cargo ramp at the rear of the aircraft and a powered winch allow straight-in rear loading and unloading for fast turnaround and can be operated in flight to air drop supplies and personnel. Equipped with an auxiliary power unit used for unassisted engine starts, the *Greyhound* can operate independently from remote locations, adding to its operational versatility. The aircraft is currently undergoing several modifications and a service life extension program, which include structural enhancements, improvements to the avionics system, rewiring, and a new propeller system that will extend the *Greyhound*'s service life until a Future Carrier Onboard Delivery Aircraft can be fielded.

VXX Replacement Presidential Helicopter

A replacement is under development for the 30-year-old VH-3D and 20-year-old VH-60N helicopters, currently providing transportation for the President of the United States, foreign heads of state, and other dignitaries as directed by the White House Military Office. The Replacement Presidential Helicopter (VXX) will provide a hardened, mobile command-and-control transportation capability and a system of integrated systems necessary to meet current and future presidential transport mission requirements.

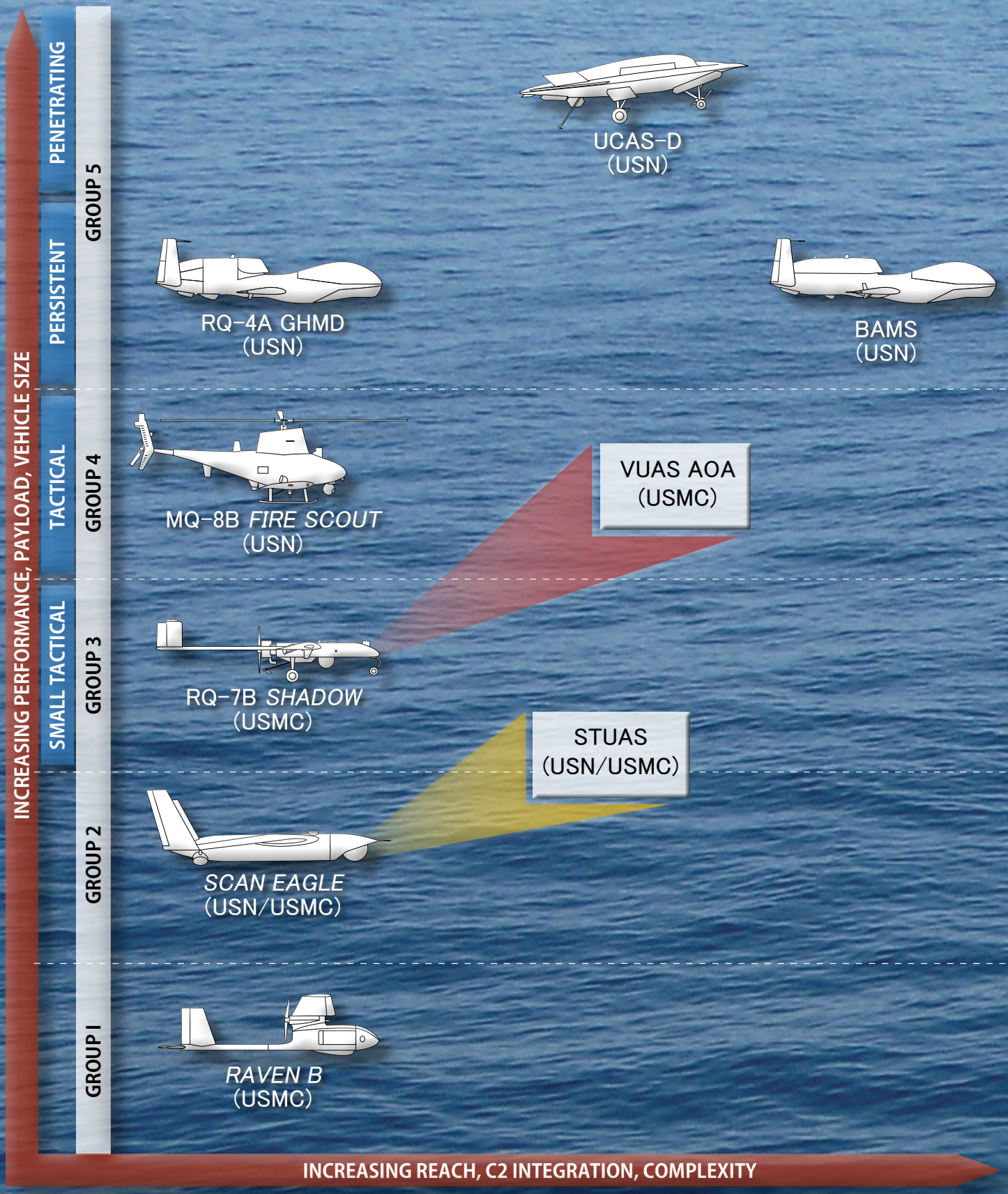

2010
2032
C-2A
FUTURE CARRIER ONBOARD DELIVERY AIRCRAFT
VH-3D
VH-60N
REPLACEMENT PRESIDENTIAL HELICOPTER

37
37

Unmanned Aircraft Systems

The Naval UAS family of systems is composed of five groups aligned by increasing performance and payload and vehicle size. It provides the Navy and Marine Corps with a diverse UAS portfolio and an architecture for the battlespace awareness, maritime domain awareness, force protection, and force application required by commanders. Driven by Navy and Marine Corps concepts of operation, the UAS groups are tailored to support specific force levels, from carrier and expeditionary strike groups to Marine expeditionary units, regiments, and battalions.

F6F-5K Hellcat *drone, 1952*


PENETRATING
PERSISTENT
TACTICAL
SMALL TACTICAL
GROUP 5
GROUP 4
GROUP 3
GROUP 2
GROUP I
INCREASING PERFORMANCE, PAYLOAD, VEHICLE SIZE
UCAS-D
(USN)
RQ-4A GHMD
(USN)
BAMS
(USN)
MQ-8B FIRE SCOUT
(USN)
VUAS AOA
(USMC)
RQ-7B SHADOW
(USMC)
STUAS
(USN/USMC)
SCAN EAGLE
(USN/USMC)
RAVEN B
(USMC)
INCREASING REACH, C2 INTEGRATION, COMPLEXITY

GROUP 1

Dragon Eye and *Raven B*

The *Dragon Eye* and *Raven B* are man-packable, hand-launched, autonomous systems designed to provide Marine Corps small-unit commanders with a reconnaissance and surveillance capability to see over the next hill in the field or around the next building in an urban environment. *Dragon Eye* began operations in 2004 and is now being replaced by the *Raven B*, a joint asset used by the Army and U.S. Special Operations Command.

GROUP 2

Scan Eagle

Scan Eagle is a 40-pound vehicle with a cruising speed of 50 knots and a ceiling of 15,000 feet. Designed to fly missions of 15 hours or more, it is used for both land- and ship-based operations. The *Scan Eagle* system includes the Sky Wedge hydraulic launcher, the Sky Hook retrieving system, and a mobile ground-control element. The vehicle is equipped with a nose-mounted inertial-stabilized camera turret that carries either a zoom charge-coupled device or infrared sensor. Leased by the Navy and Marine Corps, the *Scan Eagle* system is being used to fill a capability gap on an interim basis. It will be replaced by the Small Tactical UAS in fiscal year 2012.

GROUP 2-3

Small Tactical UAS

The Small Tactical UAS will be an expeditionary long-endurance system capable of multiple missions. It will have advanced target acquisition, fire support capability, and will be employed from both land and sea. The competitively selected system began development and demonstration in 2009 and it will reach initial operational capability in fiscal year 2012.

GROUP 3

RQ-7B *Shadow*

The RQ-7B *Shadow* is a transportable surveillance asset capable of providing Marine Corps tactical commanders with day and night battlefield reconnaissance, target acquisition and designation, and communication relay in support of joint or expeditionary force commanders. *Shadow* is operated by Marine Corps unmanned aerial vehicle squadrons that are reorganized as detachments to allow greater operational flexibility than was possible with the prior RQ-2B *Pioneer* system.

GROUP 4

MQ-8B *Fire Scout*

The MQ-8B *Fire Scout* VTOL UAS is designed to operate from all air-capable ships, carry modular mission payloads, and operate using the Tactical Control System and Tactical Common Data Link. *Fire Scout* is a medium- to large-size Group 4 UAS that will provide day and night real-time intelligence/surveillance/reconnaissance and targeting as well as communications relay and battlefield management capabilities to support anti-submarine, mine, and anti-surface warfare, the missions of the Littoral Combat Ship. *Fire Scout* conducted operational testing on USS *McInerney* (FFG 8) in fiscal year 2009 and deployed in early fiscal year 2010 on *McInerney*. The MQ-8B *Fire Scout* is a part of the transformation roadmap for the SH-60B/F and the MH-60R (see pg. 46).

Vertical UAS

Vertical UAS is envisioned as the replacement for the RQ-7B *Shadow* after 2015. An analysis of alternatives has been completed, but program funding has not yet been established. Vertical UAS will be a versatile, persistent, medium-range platform that supports joint forcible-entry operations delivered from sea bases. It will provide a real-time reconnaissance, surveillance, targeting, and weapon employment capability. Vertical UAS will have the speed to complement expeditionary maneuver warfare, the range to meet the needs of Marine Corps and joint task force commanders, the survivability to operate in denied environments, the endurance to permit continuous coverage, and the agility to execute preplanned and in-flight multimission tasking.

GROUP 5

Persistent

Global Hawk Maritime Demonstration

In fiscal year 2003, two Air Force *Global Hawk* unmanned aircraft and associated ground control equipment were acquired by the Navy for demonstration purposes and to conduct risk reduction activities for the BAMS program. In fiscal year 2009, in response to theater surveillance and reconnaissance demands, the *Global Hawk* Maritime Demonstration (GHMD) transitioned to a 5th Fleet operational deployment, providing near-real-time, high-resolution tactical imagery in support of combat operations. In addition, GHMD is facilitating the cultural and tactical integration of unmanned aircraft systems into fleet operations with concept of operations validation; tactics, techniques, and procedures development; and training and proficiency flights. Lessons learned are being used in the development of maritime patrol and reconnaissance capabilities.

Broad Area Maritime Surveillance UAS

Integral to the Navy's airborne patrol and reconnaissance recapitalization strategy, the BAMS UAS will be a forward-deployed, land-based, autonomously operated system that will provide persistent maritime reconnaissance and basic communications relay capabilities from five operational sites (orbits) worldwide. BAMS will be an adjunct to the P-8A multimission aircraft, operated under the cognizance of the maritime patrol and reconnaissance force to leverage manpower, infrastructure, and expertise. As a FORCEnet enabler, it will serve as a distributed node in the maritime environment and help build and sustain the common operational picture for fleet commanders. The program entered system development and

demonstration in fiscal year 2008 and conducted its first two major design reviews in January and June 2009. Initial operational capability for BAMS is scheduled for 2016. BAMS is a part of the transformation roadmap for the P-3C *Orion* (see pp. 54).

Penetrating

Navy Unmanned Combat Aircraft System-Demonstration

Naval Aviation is conducting the Navy Unmanned Combat Air System aircraft carrier demonstration (UCAS-D) to develop technologies for a carrier-capable, low-observable UAS that will contribute to a potential follow-on acquisition program that could reach initial operational capability by about 2025. By September 2013, the Navy plans to complete a UCAS carrier demonstration and demonstrate probe and drogue (Navy style) and boom and receptacle (Air Force style) autonomous aerial refueling with an unmanned platform, and evaluate and identify technologies supporting future intelligence, surveillance, reconnaissance, and strike capabilities requirements.

The UCAS-D contract was competitively awarded in August 2007. The first X-47B aircraft is undergoing integration and checkout activities in preparation for its first flight in late 2010. Aircraft carrier integration activities are underway and surrogate aircraft testing is in progress to validate the various interfaces required to control the UCAS-D aircraft. The first aircraft carrier landing is scheduled for the first quarter of fiscal year 2012.

LONG-RANGE STANDOFF WEAPONS

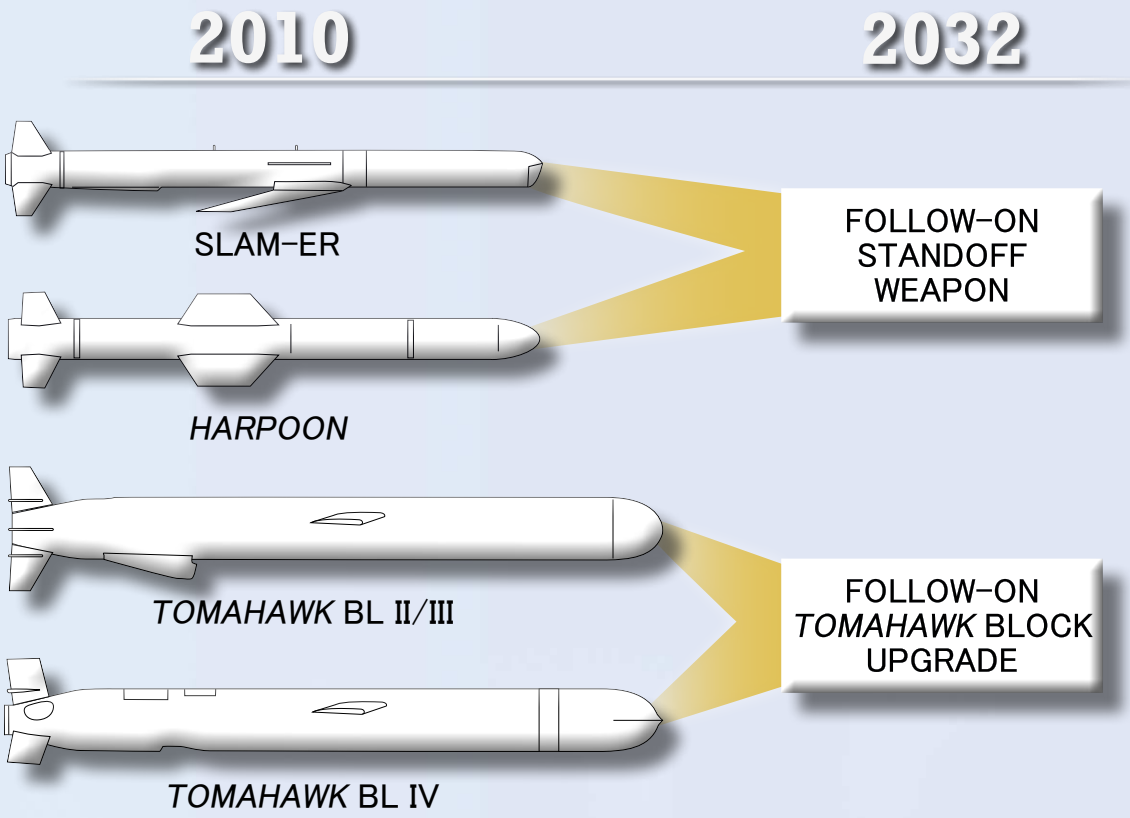
AGM-84H/K Standoff Land Attack Missile – Expanded Response

The Standoff Land Attack Missile – Expanded Response (SLAM-ER) is a long-range, highly precise, air-launched strike missile capable of attacking high-value fixed and mobile land targets as well as surface ships that are under way or in port. Terminal control of the weapon is accomplished when the pilot designates the impact point on the imaging infrared scene transmitted by the weapon to the cockpit display. Man-in-the-loop commands are sent to the SLAM-ER by way of a data-link pod carried by the launching (or secondary control) aircraft.

AGM/RGM-84D *Harpoon* Block 1C

The *Harpoon* Block 1C is an air- or surface-launched, anti-ship, all-weather cruise missile that employs an autonomous active radar seeker to attack a wide variety of surface ship targets from standoff ranges. The *Harpoon*, which entered service in 1977, is currently carried by F/A-18 and P-3C aircraft as well as a portion of the Navy's DDG-51 and CG-47 surface ship classes. Numerous air, surface, and submarine platforms currently deploy *Harpoon* for 27 international customers. An analysis of alternatives will be conducted to scope and define a follow-on weapon solution to meet the standoff strike mission areas currently addressed by SLAM-ER and *Harpoon* Block 1C.

Five-inch rockets, 1945



Tomahawk Land Attack Missile

The *Tomahawk* Land Attack Missile (TLAM) is a long-range, subsonic cruise missile used for deep land attack warfare that is launched from U. S. Navy surface ships and U.S. Navy and United Kingdom Royal Navy submarines. There are currently three main versions: the Block II nuclear variant, which contains the W80 warhead; the Block III conventional variant, which can carry either a 1000-pound unitary warhead or a submunition-dispensing warhead; and the Block IV, or Tactical *Tomahawk*, which is network-enabled and capable of changing targets while in flight. *Tomahawk* provides on-scene commanders with the flexibility to attack long-range fixed targets or to support special operations forces with a lethal, responsive, precise weapon system. Future capabilities for the *Tomahawk* Block IV include improvements to the warhead (the Joint Multiple Effects Warhead System [JMEWS]) and a maritime interdiction multimission capability (Multimission *Tomahawk* [MMT]). JMEWS will demonstrate the military utility of a programmable warhead with increased effects of penetration and blast against the full range of targets, from area to hardened targets. MMT adds a moving target seeker and upgraded data link to the existing Tactical *Tomahawk* missile. The *Tomahawk* program office is currently investigating industry seeker technologies for maritime interdiction that could potentially be integrated into the existing Block IV weapon system. Additional studies have been initiated to develop a next-generation supersonic cruise missile capability for *Tomahawk* that will increase responsiveness against time-critical targets.

MID-RANGE STANDOFF WEAPONS

AGM-88E Advanced Anti-Radiation Guided Missile

The Advanced Anti-Radiation Guided Missile (AARGM) upgrade program transforms a portion of the existing AGM-88 High-Speed Anti-Radiation Missile (HARM) inventory into lethal strike weapons with enhanced time-critical strike and precision attack capabilities. The AARGM upgrade includes: an advanced digital anti-radiation homing receiver for greater sensitivity and advanced air defense system capabilities; an active millimeter wave terminal radar to increase lethality against modern air defense units, such as surface-to-air missile radars that use radar shutdown and countermeasures designed to defeat anti-radiation missiles; an inertial navigation system (INS)/Global Positioning System (GPS) capability; a weapon impact assessment transmitter to aid and cue the battle damage assessment process; and an integrated broadcast service receiver for network-centric connectivity reception of off-board targeting information. AARGM correlates multiple sensors and geo-specific capabilities to locate and attack both stationary and fixed targets with precision while countering enemy tactics designed to defeat anti-radiation missiles. Initial operational capability for AARGM is the beginning of fiscal year 2011.

AGM-154 Joint Standoff Weapon

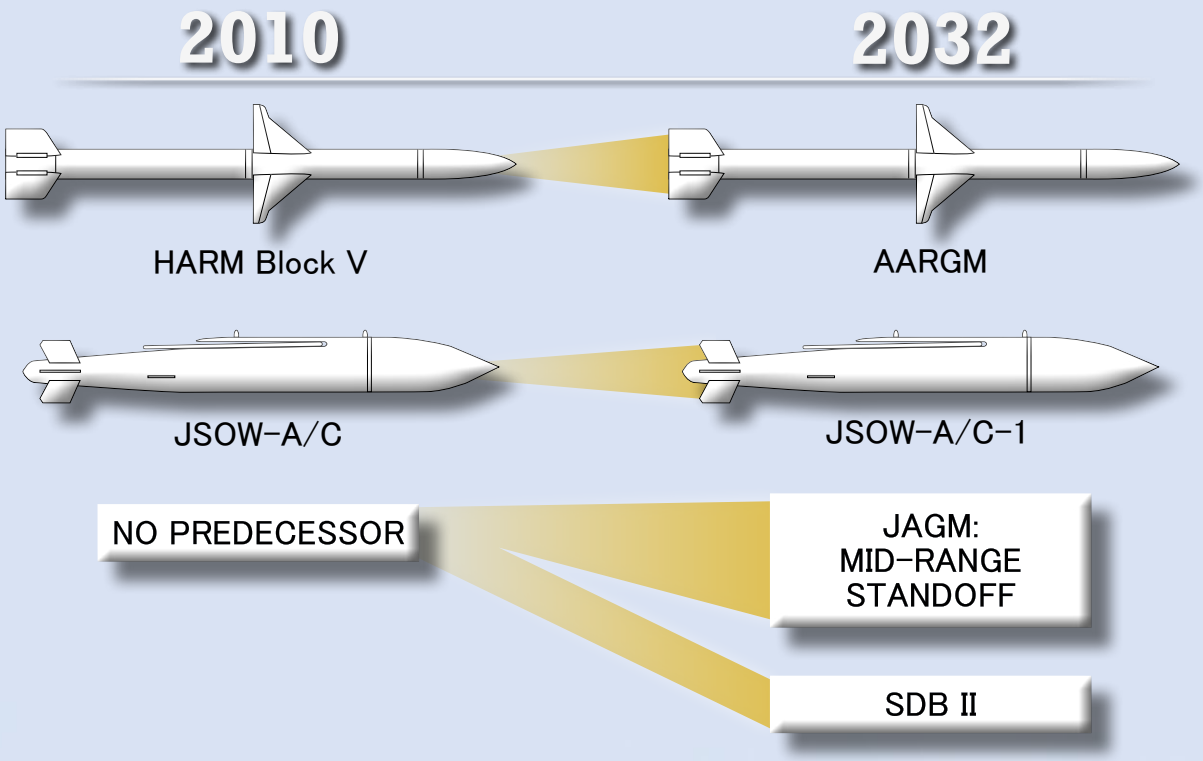
The Joint Standoff Weapon (JSOW) is a joint family of armaments that permits Navy and Air Force aircraft to attack targets at increased standoff distances. The weapons use INS and GPS for guidance. All JSOW variants share a common body but can be configured for use against area targets or bunker penetration. The JSOW-C unitary variant adds an imaging infrared seeker and an autonomous target acquisition capability to attack point targets with precision accuracy. The JSOW-C-1 will incorporate new target tracking algorithms into the seeker for moving targets, giving joint force commanders an affordable, air-delivered, standoff weapon that is effective against fixed and mobile land targets in addition to maritime targets. The JSOW-C-1 system will maintain legacy JSOW-C functionality to be effective against point targets in or through adverse weather conditions on both day and night missions. JSOW-C-1 will provide low- and high-altitude launch capabilities to enable launch platforms to remain outside the range of target point defenses, enhancing aircraft survivability. Used in conjunction with accurate targeting information and anti-radiation weapons, JSOW-C-1 will destroy enemy air defenses.

Joint Air-to-Ground Missile (Mid-Range Standoff)

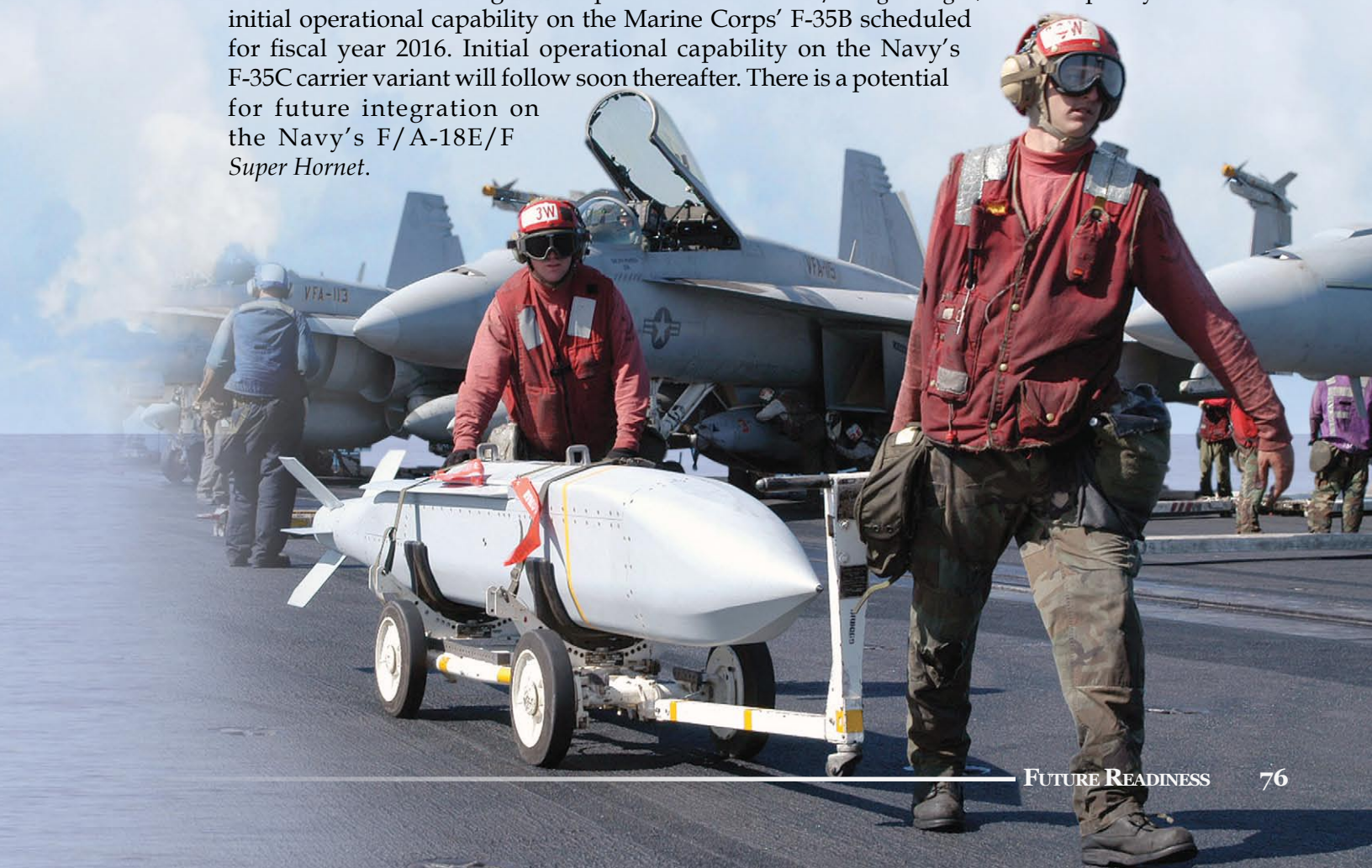
The Joint Air-to-Ground Missile (JAGM) is a joint Army-Navy initiative with the Army designated as the lead service. It is an all-weather, extended range, 100-pound-class weapon system that will use a tri-mode seeker (semi-active laser, millimeter wave radar, and imaging infrared), multipurpose warhead, and single configuration rocket motor to destroy high-value hardened and non-armored stationary and moving targets. Threshold platforms for JAGM as a mid-range standoff capability include the F/A-18E/F *Super Hornet* and other joint service manned and unmanned aircraft. It is expected to reach initial operational capability in fiscal year 2015.

Small-Diameter Bomb Increment II

The Small-Diameter Bomb Increment II (SDB II) is a joint program that provides warfighters with the capability to attack mobile targets at standoff ranges in all types of weather. This 250-pound-class weapon addresses the following additional requirements: multiple ordnance



carriage; all-weather operations; precision munitions capability; reduced munitions footprint; increased weapon effectiveness; minimized potential for collateral damage; reduced susceptibility of munitions to countermeasures; and a migration path to a network-centric operations capability. Incremental development to pursue network-centric interoperability will continue. SDB II integration is planned for the F-35B/C *Lightning II*, with weapon system initial operational capability on the Marine Corps' F-35B scheduled for fiscal year 2016. Initial operational capability on the Navy's F-35C carrier variant will follow soon thereafter. There is a potential for future integration on the Navy's F/A-18E/F *Super Hornet*.



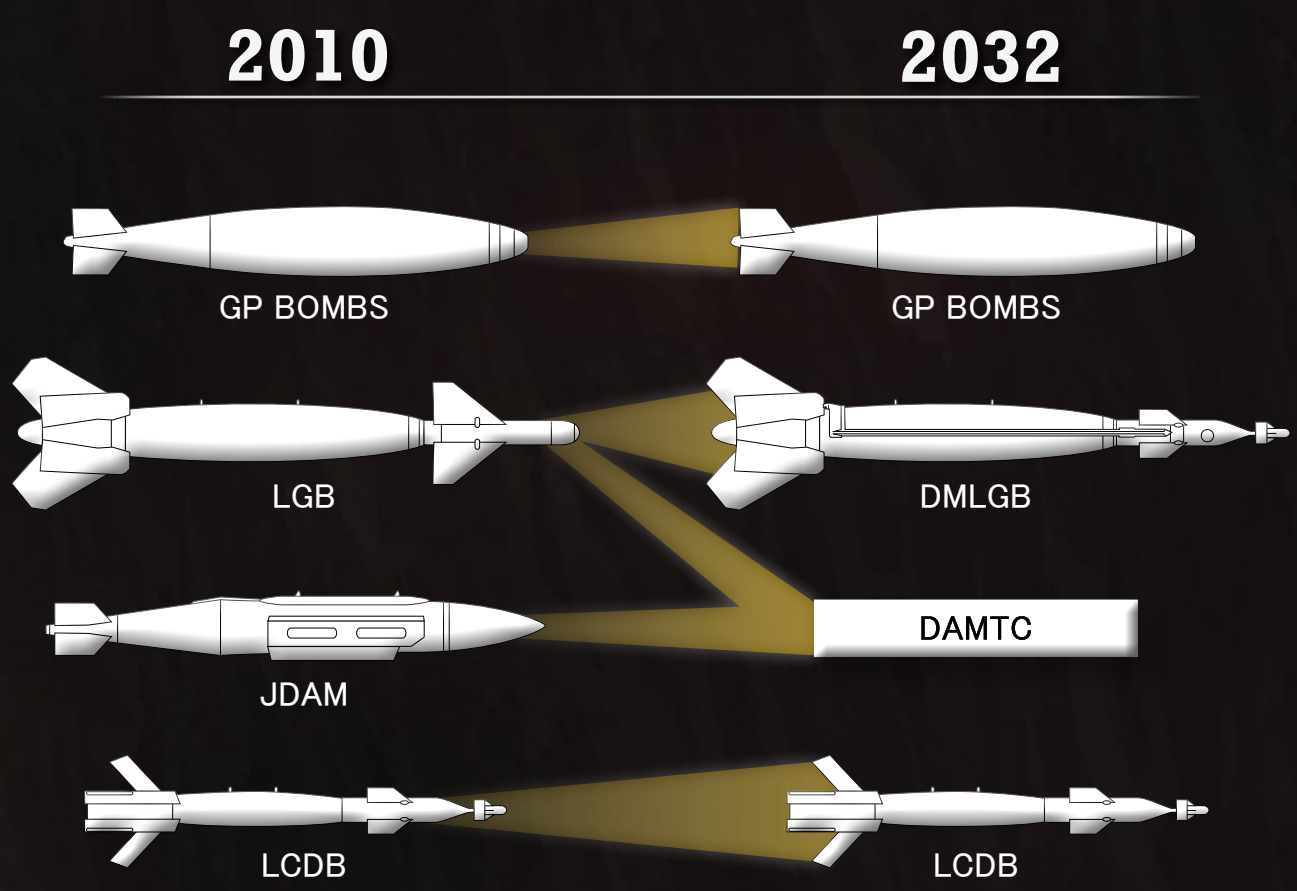
DIRECT ATTACK WEAPONS

General Purpose Bombs

Mark 80/BLU series General Purpose 500-, 1,000-, and 2,000-pound bombs provide blast and fragmentation effects against a variety of non-hardened targets and are used extensively for direct attack, close air support, and suppression missions. The thermally protected warhead is used for Joint Direct Attack Munitions (JDAM), Laser JDAM, Dual Mode Laser-Guided Bombs (DMLGB), and Low Collateral Damage Bombs (LCDB). General Purpose bombs are expected to remain in the inventory through 2032.

Dual Mode Laser-Guided Bomb

The Dual Mode Laser-Guided Bomb (DMLGB) is a retrofit that converts Laser-Guided Bombs currently in the inventory to a dual mode configuration using common components. The retrofit replaces the existing computer control group with an INS and GPS that provides fire-and-forget, all-weather terminal guidance. The retrofit strategy streamlines qualification timelines, putting a new weapon in the hands of warfighters that much faster. Initial operational capability took place in October 2008 for both the AV-8B *Harrier* and F/A-18 *Hornet* aircraft. Future integration on the F-35 *Lightning II* is also planned.



Direct Attack Moving Target Capability

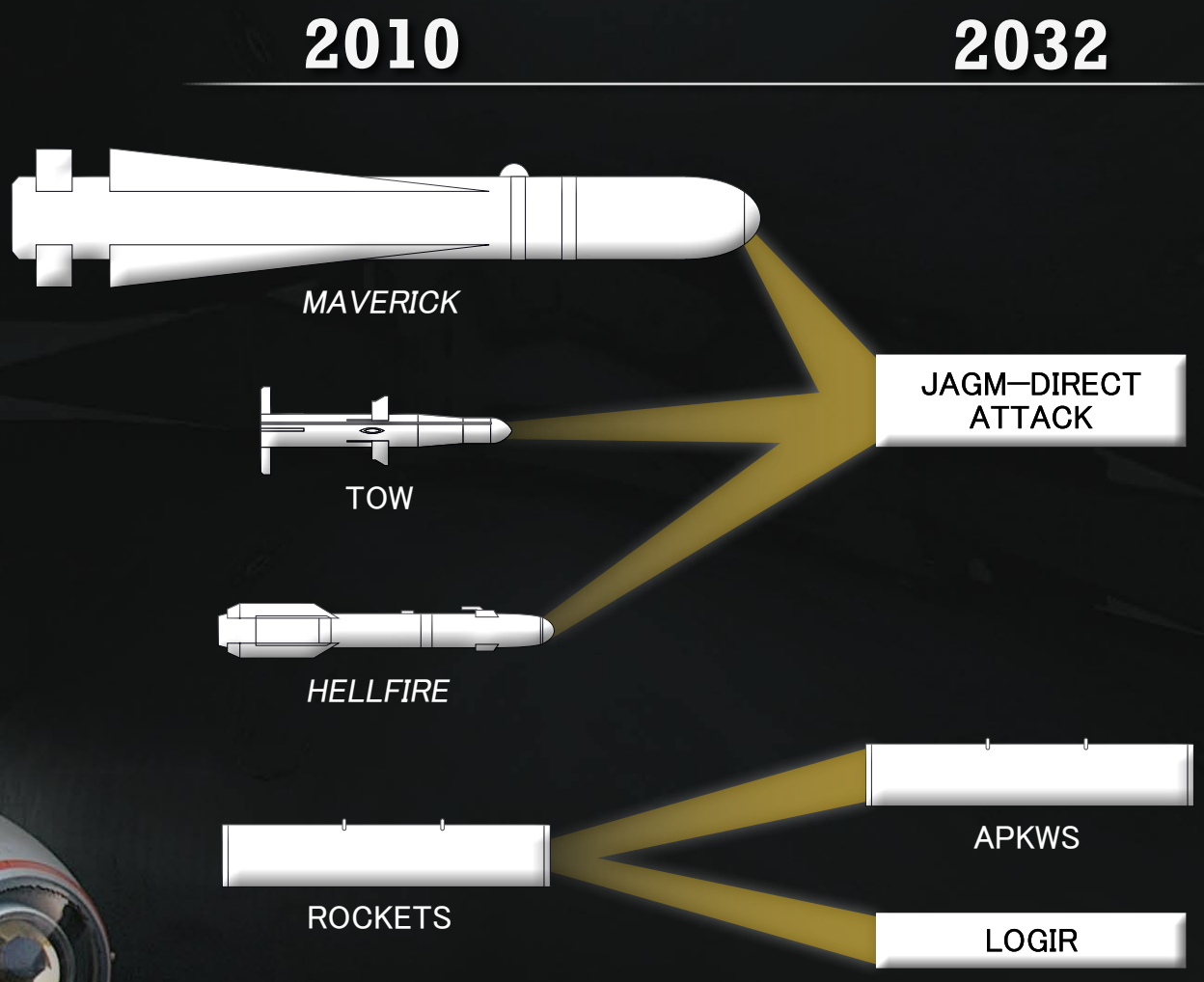
Threat targets are becoming more mobile and more capable, and the ability to neutralize them with legacy aircraft is critical. The Direct Attack Moving Target Capability (DAMTC) will be a level-of-effort weapon that is intended to provide naval and joint warfighters with a lethal, interoperable, and cost-effective precision strike weapon system that can engage moving, semi-mobile, and stationary targets. It is anticipated that DAMTC will be a retrofit kit for existing JDAM and/or LGB level-of-effort weapons, making it available to the fleet in the near future.

Low Collateral Damage Bomb

The Low Collateral Damage Bomb (LCDB), is a weapon that is combat-effective and adheres to the collateral damage rules of engagement dictated by U.S. Central Command. A precision strike weapon, LCDB is ideal for modern urban warfare, where target discrimination between friendly, neutral, and enemy forces requires exceptional blast control. LCDB can be used with the same guidance kits as those used for LGBs, DMLGBs, JDAM, and Laser JDAM. The modification of an existing weapon system reduced the design, production, and sustainment costs of the LCDB.

Joint Air-to-Ground Missile (Direct Attack)

The Joint Air-to-Ground Missile (JAGM) is a joint Army-Navy initiative with the Army designated as the lead service. It is an all-weather, direct attack, 100-pound class weapon system that will use a tri-mode seeker (semi-active laser, millimeter wave radar, and imaging infrared), multipurpose warhead, and single configuration rocket motor to destroy high-value hardened and non-armored stationary and moving targets. JAGM as a direct attack capability is envisioned as the eventual replacement for the AGM-114 *Hellfire*, AGM-65 *Maverick*, and tube-launched, optically tracked, wire-guided missile systems. Threshold platforms include the AH-1Z *Viper*, the MH-60R *Seahawk*, and other joint service manned and unmanned aircraft. It is expected to reach initial operational capability in fiscal 2015 for the AH-1Z and fiscal year 2016 for the MH-60R.

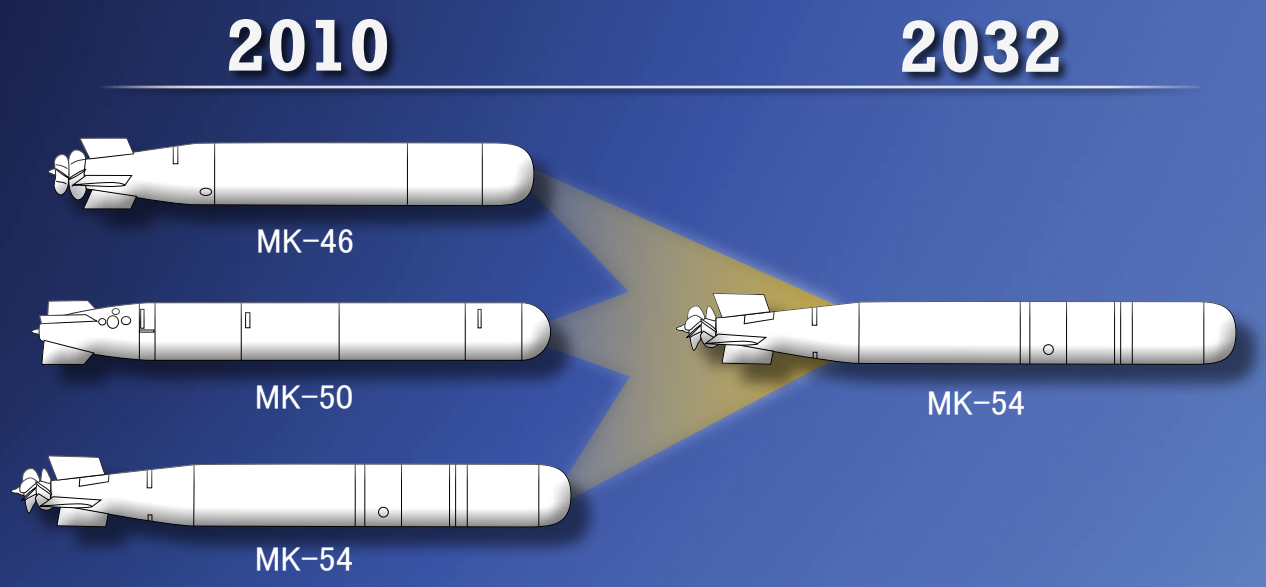


Advanced Precision Kill Weapon System

The Advanced Precision Kill Weapon System (APKWS) provides precision guidance to the existing *Hydra* 70, 2.75-inch rocket system (scalable to 5-inch) by placing a laser-guided seeker on existing rocket motors and warheads, providing an excellent low-cost, mid-range weapon that is well suited to the urban environment. Accurate to within 2 meters of the aim point, the weapon will destroy target sets consisting of personnel, unarmored vehicles, lightly-armored vehicles, armored personnel carriers, structures, and man-portable air defense systems at ranges from 1.5 to 5 kilometers. Initial operational capability is expected in fiscal year 2010.

Low-Cost Guided Imaging Rocket

The Low-Cost Guided Imaging Rocket (LOGIR) is a *Hydra* 70, 2.75-inch rocket with a front-end inertial/infrared guidance kit. LOGIR technology is applicable to 5-inch rockets (such as *Zunis)* and bombs (such as JDAM). In 2006, the LOGIR team from the weapons division of the Naval Air Warfare Center completed final deployment testing and the results showed excellent functionality. In addition, researchers have made significant theoretical advances that will lead to the elimination of nearly all image processing thresholds, technologies that are now being incorporated into LOGIR.

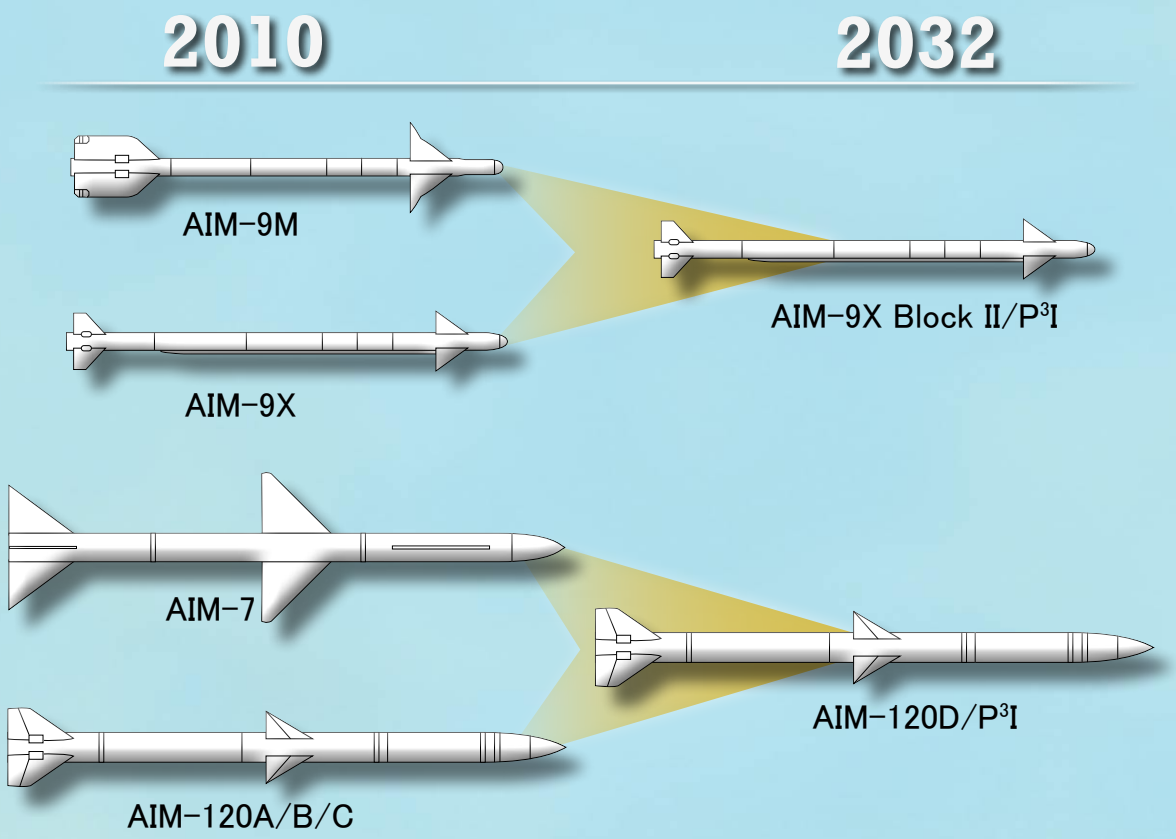


By 2032, the MK-54 will have replaced the current inventory of MK-46 and MK-50 lightweight torpedoes. The MK-54 was created by combining the homing section of the MK-50 and the propulsion unit and warhead of the MK-46, improved for better performance in shallow water, and with the addition of commercial off-the-shelf technology. The MK-54 has both analog and digital fire control capabilities in addition to a software upgrade capability. Aircraft capable of employing the MK-54 are the SH-60F, MH-60R, P-3C, and P-8A (in 2013). Still in the design phase, a special variant of the MK-54—the High-Altitude Anti-Submarine Warfare Weapon—is an air-launch accessory that allows fixed-wing aircraft to employ the torpedo outside the current air-launch envelope. This variant will provide the P-8A *Poseidon* (starting in 2016) with the ability to engage undersea targets with precision at high altitude and long range without the need for dedicated attack runs. Future developments may include a data link allowing in-flight control and mid-course guidance to the weapon by 2018.

AIR-TO-AIR WEAPONS

AIM-9X Block II/P^{3}I *Sidewinder*

The AIM-9X *Sidewinder* is a major modification to the AIM-9M short-range, air-to-air missile and will provide U.S. fighters with the ability to defeat tomorrow's advanced threats. The AIM-9X is upgraded with a focal-plane-array guidance-control section, a highly maneuverable airframe, and signal processors that enhance kinematics and infrared countermeasure capabilities. The AIM-9X Block II/Pre-Planned Product Improvement (P^{3}I) program will provide warfighters with increased lethality, high off-boresight capability, and a data link to take full advantage of increased kinematics and range. The Joint Helmet-Mounted Cueing System provides a "first-look, first-shoot" capability to naval aviators.



AIM-120D/P³I Advanced Medium-Range Air-to-Air Missile

The Advanced Medium-Range Air-to-Air Missile (AMRAAM) is deployed on the F/A-18A/B/C/D *Hornet* and the F/A-18E/F *Super Hornet* and will be deployed on the EA-18G, AV-8B, and F-35 aircraft. Joint Navy and Air Force procurement of the AMRAAM AIM-120C7 was completed in late 2008. The AIM-120D/P³I program modernizes this missile to maintain medium-range air superiority. This modernization plan includes an enhanced data link, a GPS system, improved high off-boresight capability, a program to enhance kinematics, and improved electronic counter-countermeasures capabilities through software upgrades. Initial acceptance of AIM-120Ds began in 2009. Ultimately, the AMRAAM will be the Department of the Navy's sole medium-range missile.

Beyond 2032

U.S. naval strategy in 2032 and beyond will adapt to the challenges of a changing world environment to operate jointly and with partners at sea, on land, and in the air, space, and cyberspace. As an extension of naval power, Naval Aviation will develop new platforms, sensors, and weapons to meet future threats with novel capabilities that will replace aging systems. Emphasis will be placed on reducing costs, manpower, and development time. Technological advances will increase automation and decrease manpower requirements in maintenance, fueling, arming, and logistics. Naval Aviation platforms and sensors, along with space-based systems and joint assets, will provide nearly omniscient intelligence. Sensor technology advances will result in increased performance with reduced size, weight, and power. Information from intelligence and surveillance resources will be seamlessly integrated to build an overall picture of the strategic and tactical situation, and directed energy weapons will revolutionize our ability to address hostile threats.

Naval Aviation beyond 2032 will consist of carriers and air wings equipped to deter and to defeat future threats to our national security. Enhanced levels of cooperation with allies will be required to execute the core capabilities of the Navy and Marine Corps. Warfare beyond 2032 will require the use of cyber technology to combat hostile forces successfully and to survive unconventional attacks on our platforms and infrastructure. On carriers, manned strike fighters will be complemented by unmanned tactical aircraft. These advanced aircraft will refuel other aircraft; deliver cargo to carriers; gather intelligence, surveillance, and reconnaissance data; and carry out air-to-air, air-to-surface, and electronic attack missions. The rotary-wing force will perform critical anti-surface and anti-submarine warfare, mine countermeasures, and humanitarian missions.

In the next 20 years, new aircraft in many Navy and Marine Corps mission areas will commence development to replace their aging counterparts and provide the bridge to the future. It is paramount that Naval Aviation's resources be marshaled wisely to acquire the optimum mix of aircraft and weapon systems to meet the nation's security needs.

FORCEnet and Collaborative Warfare

Throughout history, military leaders have faced the challenges of understanding the battlefield, exploiting information, and how best to achieve victory. The key is to obtain an optimum vantage point and quickly employ and maneuver forces to achieve desired effects. Modern Naval Aviation's desired effects can be realized through a number of enhancements, including compressing timelines, reducing or eliminating fratricide and collateral damage, increasing survivability, and enhancing lethality. A key enabler to these enhancements is the tactical network that can accelerate the rate at which information is collected, processed, comprehended, and translated into action—enabling friendly forces to collaborate and act more quickly than the enemy. This concept is the essence of collaborative warfare—the operational application of networks to optimize transactions between platforms to achieve desired effects during military operations.

The Naval Aviation Collaborative Warfare Process

Collaborative warfare is the Naval Aviation component of FORCEnet, which is a Navy and Marine Corps operational construct and architectural framework for network-centric warfare. To leverage warfighting capability in a time of decreasing resources, it is paramount that platforms and their requisite weapon systems collaborate to the greatest extent possible. The Naval Aviation collaborative warfare process aligns requirements, resources, and acquisition strategies with a myriad of capability enablers, such as platforms, weapons, sensors, communications systems, waveforms, and computing systems to deliver coherent and relevant warfighting capability. Essential to the success of this process is prototyping an "environment," or network, that must be integrated into Naval Aviation platforms. This collaborative warfare environment consists of the necessary platforms, weapons, and avionics that enhance mission performance and, ultimately, warfighting capability. Rapid prototyping offers cost savings benefits, allowing the NAE to refine the functionality of an advanced small combat network prior to making multibillion-dollar investment decisions.

Naval Aviation Collaborative Warfare Vision 2032: Dynamic Mission Execution

The Naval Aviation collaborative warfare vision is divided into two primary "increments." The first of these is the integration of sensor fusion, electronic warfare, fire control, and netted weapons throughout carrier air wings. This first increment quantifies: the advanced functionality and mission applications required for fiscal year 2012; full integration and fielding in 2014; and a potential initial operational capability in 2016. The second increment is dynamic mission execution, which is the ability of numerous survivable small combat networks simultaneously and dynamically to execute multiple missions, culminating in a campaign or set of military operations. This increment will also provide the overarching capability that an advanced tactical network enterprise provides to joint task force commanders or combatant commanders. Making dynamic mission execution a reality, with 2032 as the target for increment II, will involve the creation of a family of mission applications for multiple Naval Aviation platforms.

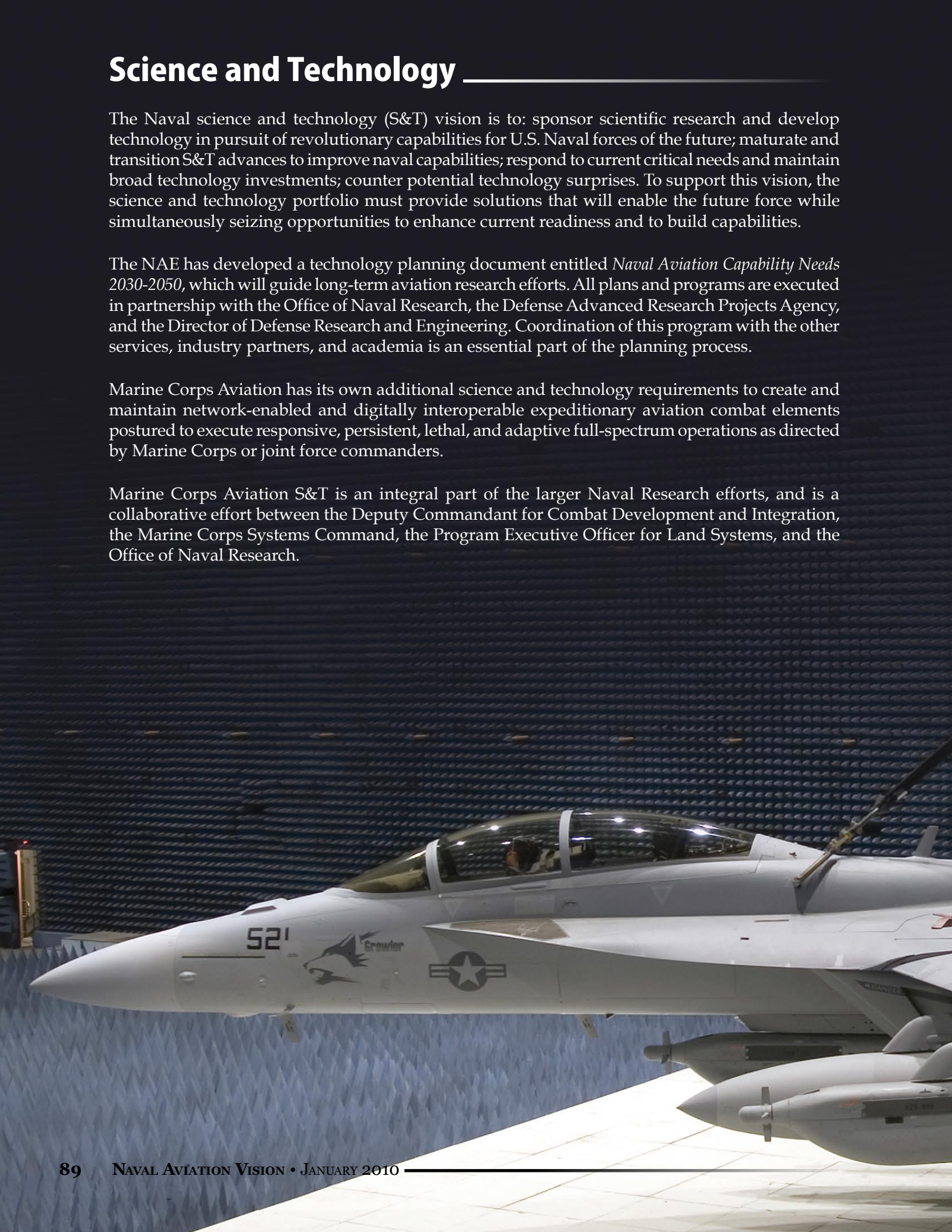
Science and Technology

The Naval science and technology (S&T) vision is to: sponsor scientific research and develop technology in pursuit of revolutionary capabilities for U.S. Naval forces of the future; maturate and transition S&T advances to improve naval capabilities; respond to current critical needs and maintain broad technology investments; counter potential technology surprises. To support this vision, the science and technology portfolio must provide solutions that will enable the future force while simultaneously seizing opportunities to enhance current readiness and to build capabilities.

The NAE has developed a technology planning document entitled *Naval Aviation Capability Needs 2030-2050*, which will guide long-term aviation research efforts. All plans and programs are executed in partnership with the Office of Naval Research, the Defense Advanced Research Projects Agency, and the Director of Defense Research and Engineering. Coordination of this program with the other services, industry partners, and academia is an essential part of the planning process.

Marine Corps Aviation has its own additional science and technology requirements to create and maintain network-enabled and digitally interoperable expeditionary aviation combat elements postured to execute responsive, persistent, lethal, and adaptive full-spectrum operations as directed by Marine Corps or joint force commanders.

Marine Corps Aviation S&T is an integral part of the larger Naval Research efforts, and is a collaborative effort between the Deputy Commandant for Combat Development and Integration, the Marine Corps Systems Command, the Program Executive Officer for Land Systems, and the Office of Naval Research.

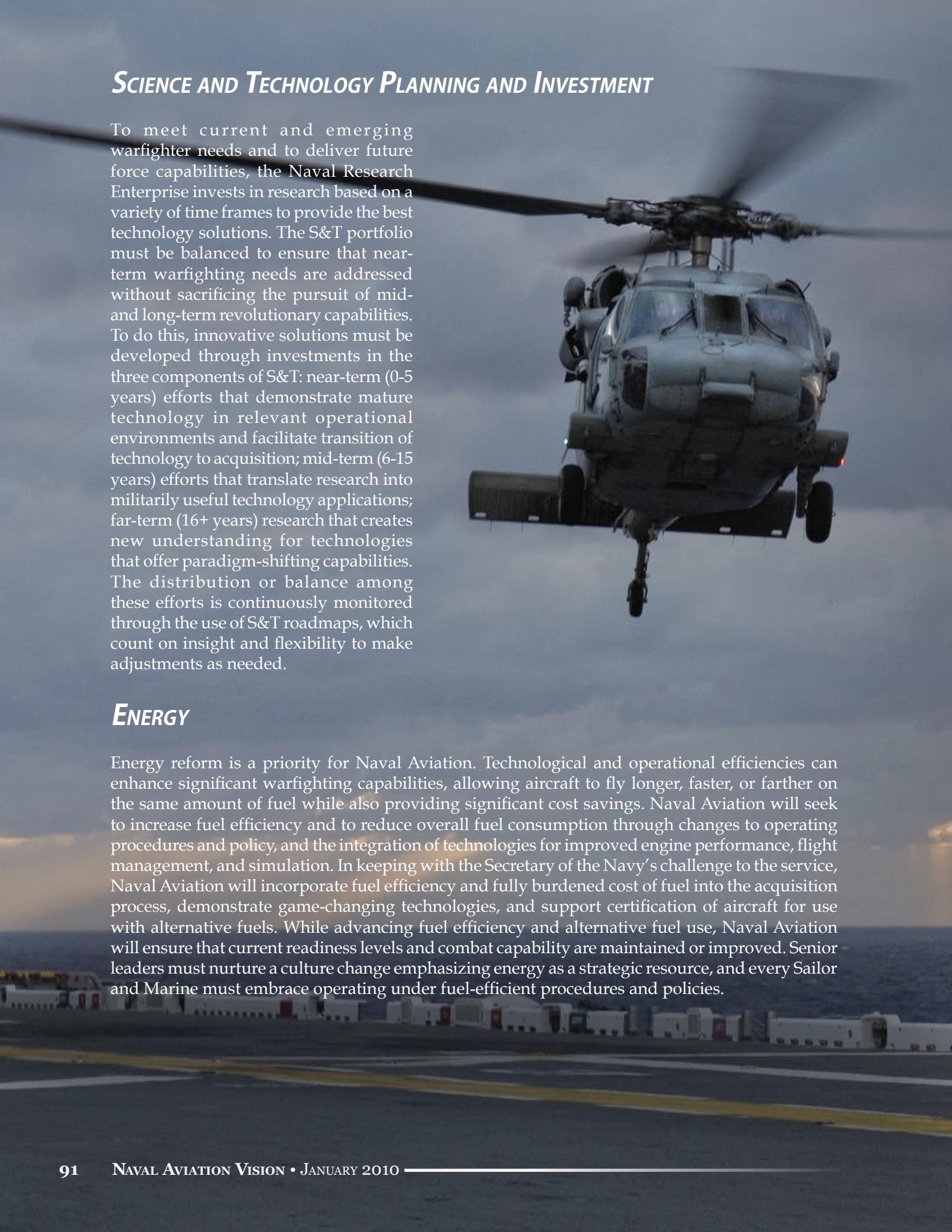


Future Warfighting Capabilities

Naval Aviation is a critical element of a mobile and flexible fighting force capable of rapid response with minimal host-nation support. To deter adversaries and reassure allies, Navy and Marine Corps Aviation provide long-term, persistent functions that move forcibly when required. These capabilities will be provided through increased use of unmanned aerial systems in a broad range of missions. Automated systems will decrease the number of personnel required ashore and afloat. Combatant commanders will expect systems to work in concert with space-based systems and joint assets to provide nearly omniscient intelligence. Systems will decrease in size and increase in performance. Communication throughout the battle space will be secure and reliable and provide information in real time. The seamless integration of information from intelligence and surveillance resources will help build a common operational picture. New weapon technologies will allow faster responses and enable precision advanced lethal and non-lethal effects to meet emerging threats. Timely support and lift from sea bases also will be provided.

Science and Technology Planning and Investment

To meet current and emerging warfighter needs and to deliver future force capabilities, the Naval Research Enterprise invests in research based on a variety of time frames to provide the best technology solutions. The S&T portfolio must be balanced to ensure that near-term warfighting needs are addressed without sacrificing the pursuit of mid- and long-term revolutionary capabilities. To do this, innovative solutions must be developed through investments in the three components of S&T: near-term (0-5 years) efforts that demonstrate mature technology in relevant operational environments and facilitate transition of technology to acquisition; mid-term (6-15 years) efforts that translate research into militarily useful technology applications; far-term (16+ years) research that creates new understanding for technologies that offer paradigm-shifting capabilities. The distribution or balance among these efforts is continuously monitored through the use of S&T roadmaps, which count on insight and flexibility to make adjustments as needed.



Energy

Energy reform is a priority for Naval Aviation. Technological and operational efficiencies can enhance significant warfighting capabilities, allowing aircraft to fly longer, faster, or farther on the same amount of fuel while also providing significant cost savings. Naval Aviation will seek to increase fuel efficiency and to reduce overall fuel consumption through changes to operating procedures and policy, and the integration of technologies for improved engine performance, flight management, and simulation. In keeping with the Secretary of the Navy's challenge to the service, Naval Aviation will incorporate fuel efficiency and fully burdened cost of fuel into the acquisition process, demonstrate game-changing technologies, and support certification of aircraft for use with alternative fuels. While advancing fuel efficiency and alternative fuel use, Naval Aviation will ensure that current readiness levels and combat capability are maintained or improved. Senior leaders must nurture a culture change emphasizing energy as a strategic resource, and every Sailor and Marine must embrace operating under fuel-efficient procedures and policies.

Navy and Marine Corps Aviation Science and Technology Objectives

The Navy and Marine Corps Aviation science and technology objectives represent the goals of the S&T program, and are used as the baseline for identifying, aligning, and synchronizing investment efforts throughout the enterprise. These objectives represent a broad strategy that provides strong direction for the future, but that also retains sufficient flexibility to allow the S&T community to meet emerging challenges. They were developed in concert with warfighters and technologists and are in alignment with national, defense, and Naval strategies and visions.

REPRESENTATIVE NAVY AVIATION OBJECTIVES

- Anti-Air Warfare Performance: Develop targeting and engagement systems and weapon technologies to detect, track, identify, and engage advanced air threats outside of enemies' projected sensor ranges and the kinematic range of emerging missiles in an electronic-attack environment.
- Wide Area Search and Detection: Develop technologies to enable automatic detection and discrimination of small targets from all altitudes and/or ranges, and improve active/passive/multistatic identification algorithms to minimize false detections.
- Persistent Capability to Engage Time-Critical Targets: Develop technologies that enable all-weather endurance over a large area of responsibility and neutralization of a range of time-critical targets in multiple locations, including ballistic missile launchers, surface-to-air missile systems, small buildings, light bunkers, lines of communication, and vehicles in the most challenging of scenarios, with little collateral damage.
- Improved Vertical Delivery Air Vehicle: Develop technologies for air vehicle enhancements that improve durability, speed, range, payload, and take-off/landing performance capabilities required to increase tactical effectiveness and survivability in all weather.
- Enterprise Platform Enablers: Develop new technologies to enable legacy and future systems to provide long-range, persistent, flexible, and responsive capabilities that assist and strengthen our forces and those of our allies and partners. Research areas such as advanced propulsion and power (including hypersonic capability), energy efficiency, advanced material development, omniscient intelligence, and systems integration are considered key elements of this objective.
- Tactical Decision Support: Develop technologies to enable rapid and accurate decision making. Technologies can include intelligent agents or decision aids for rapid and reliable threat/intent determination, distributed weapon/sensor coordination, real-time operations, and improved mission planning.
- System Affordability: Develop and implement methods and technologies that predict and identify performance problems and reduce the development, support, maintenance, and acquisition costs of Naval systems, including air platforms, weapons, training systems, and aircraft carriers.
- Improved Warrior Performance: Develop technologies to reduce operator workload, mitigate stress (both physiological and psychological) and improve warfighter performance and effectiveness.

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REPRESENTATIVE MARINE CORPS AVIATION OBJECTIVES

- Collaborative Networking: Develop technologies that facilitate and provide for network-enabled and digitally interoperable expeditionary aviation combat elements postured to execute responsive, persistent, lethal, and adaptive full-spectrum operations.
- Advanced Electronic Warfare Systems: Develop technologies that are compatible with Marine Corps follow-on electronic attack platforms as platform requirements are refined. Develop multifunction transceiver arrays that enable future electronic warfare and provide adequate bandwidth, signals intelligence, surveillance, reconnaissance, and NGJ technologies.
- Sand- and Dust-penetrating Radar: Develop technologies that enable passive obstacle detection at range and precision support of distributed operations in unprepared landing zones for current rotary-wing and tilt-rotor aircraft, and that could be incorporated into future unmanned systems. Develop complementary technologies to precision quality navigation in brown-outs that enable precise non-visual air- and ground-speed reference.
- Command and Control Data Fusion and Networking: Develop technologies to support data fusion, in order to improve sensor tracking of tactical aircraft and unmanned aircraft systems and to collect data from the various ground and intelligence systems employed by MAGTFs.
- Standardized Force Tracking System: Develop technologies that provide 100-percent-assured covert, real-time identification of friendly forces for fratricide avoidance as well as battlefield coordination, maneuver deconfliction, command situational awareness, and resupply during future distributed operations.
- Group 4 Unmanned Aircraft Systems: Develop an expeditionary, all-weather, high-endurance, multimission UAS capable of operating from austere locations and providing networked, interoperable systems to enhance MAGTF and joint commanders' battle-space awareness.
- Advanced Multi-function Electronic Warfare Transceiver: Leverage NGJ technologies to develop capabilities compatible with Marine Corps follow-on electronic warfare concepts (i.e., system-of-systems distributed electronic warfare, including low-observable systems) as the system requirements are refined.
- Ground-Based Command and Control and Surveillance Systems: Develop technologies that support the calibration of an ambient air-cooled active electronically scanned array. Develop manufacturing techniques that can produce high-quality, micro-miniature radio frequency circuits that are not susceptible to stress and cracking during production.

USS Ranger, *1943*

PEOPLE

"War is force - force to the utmost - force to make the enemy yield to our own will - to yield because they see their comrades killed or wounded - to yield because their own will is broke. War is men against men - mechanized war is still men against men. Machines are mere masses of inert metal without the men who man them."

-- Admiral Ernest J. King, Chief of Naval Operations, 1942

The primary goal of the NAE's total force strategy is to provide combat-ready Naval Aviation forces to execute the Maritime Strategy. To accomplish this goal, the NAE will continue to adopt innovative ways to attract, train, and employ its dedicated and superbly talented workforce, which is composed of active and reserve military members as well as government civilian and contract-support personnel.

The total force strategy relies on readiness and capability demand signals from the fleet to define work requirements clearly, to shape the workforce correctly, and to affect budgeting and programming decisions positively. It is a living management tool—one that is continually assessed, improved, and refined to maintain relevance and effectiveness.

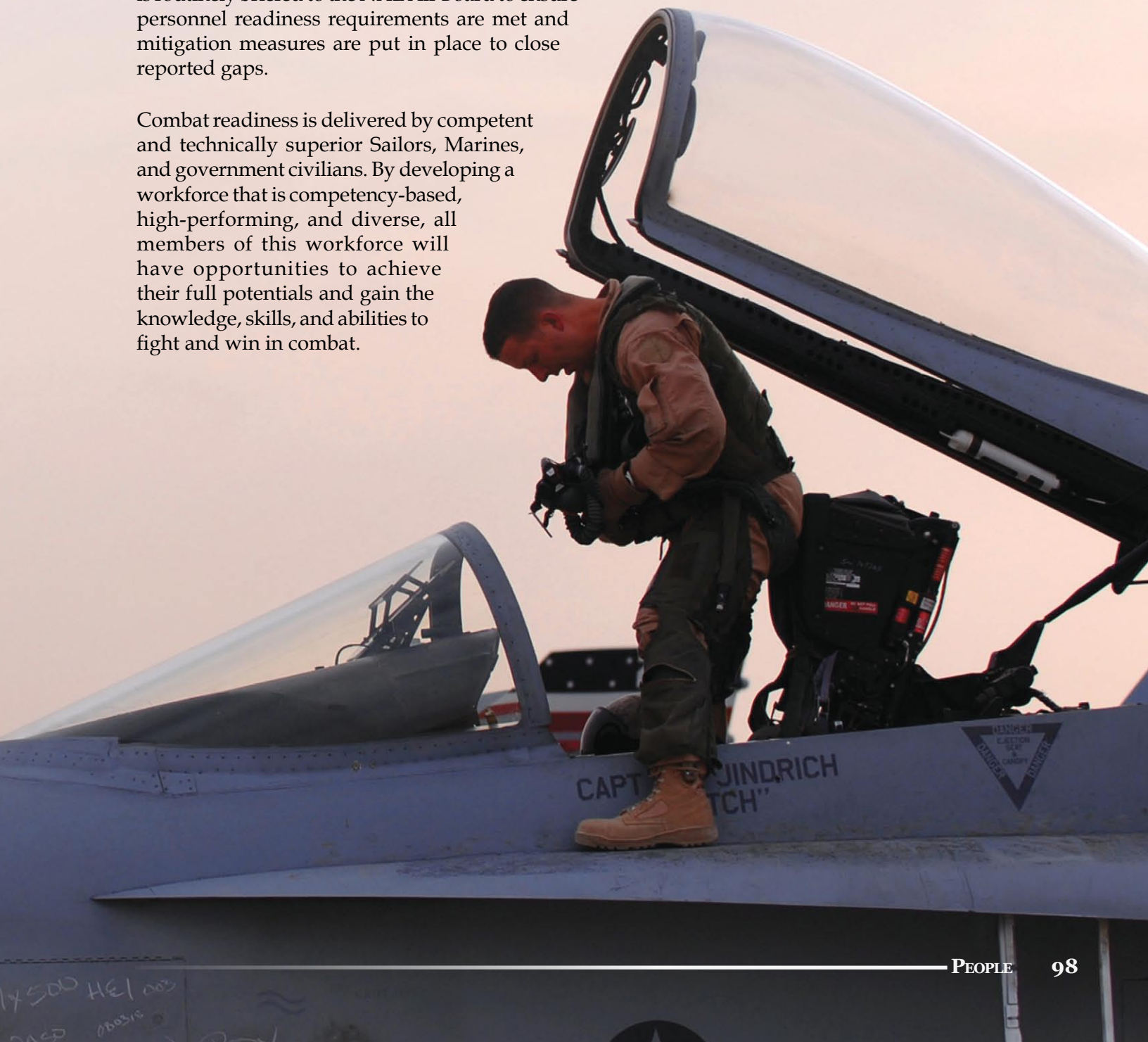
The business of the Navy and Marine Corps always will be combat—and warfighter readiness is the NAE's highest priority. The total force strategy reflects the belief that Naval Aviation's competitive advantage is, and always will be, dedicated and highly talented people. The strategy creates and sustains a culture that values and recognizes each member's contributions to warfighting readiness. It provides the framework to create a productive and motivated total force that meets current readiness goals while building future capability, and its most important product, the warfighter.

Producing and Delivering Personnel Readiness

Naval Aviation engages with the Navy Total Force, Marine Corps Manpower and Reserve Affairs, and Office of Civilian Human Resources to respond to demand signals by recruiting, training, educating, and assigning officers, Sailors, Marines, and civilians and delivering the right personnel with the right skills at the right time and in the right place. This process is aligned with the *Naval Aviation Plan* and the *Marine Corps Aviation Plan*.

Production is monitored and managed by using hierarchical metrics and production alignment conferences. These tools track student aircrewmen, officers, and enlisted aviation technicians throughout the entire training process, and facilitate the adjustment of production plans to mitigate any gaps. Aircrew and enlisted technical production is routinely briefed to the NAE Air Board to ensure personnel readiness requirements are met and mitigation measures are put in place to close reported gaps.

Combat readiness is delivered by competent and technically superior Sailors, Marines, and government civilians. By developing a workforce that is competency-based, high-performing, and diverse, all members of this workforce will have opportunities to achieve their full potentials and gain the knowledge, skills, and abilities to fight and win in combat.



Tools to Measure Personnel Readiness

The Fleet Readiness Enterprise and the Navy Total Force have created a Sailor-oriented "gap analysis" program to provide metrics designed to give a more detailed look at enlisted manning. The NAE is participating in this collaborative effort with all the warfare enterprises to automate metric execution for every unit. The goal is to employ a single fleet-driven personnel readiness metric. The gap analysis program, commonly referred to as "Fit," is the metric for determining the quality of the skill plus experience levels assigned at fleet units. It will be reported in parallel to the Defense Readiness Report System's personnel figure of merit system.

The type/model/series teams also use qualified proficient technician (QPT) metrics in order to identify experience gaps at the detachment level. The QPT program is an effort to quantify experience levels and the value of an effective in-service training and qualifications process. The QPT program builds on formal pipeline training and provides a structured process for all Sailors to enhance their levels of qualification and proficiency expected for their career levels. Through monitored completion of structured personnel qualification standards, the production capacity of the workforce can be increased. As the program maturates, qualified apprentice, journeyman, and master maintainers will be readily available to deliver required readiness.

Future Personnel Readiness

Over the next decades, new type/model/series aircraft, UASs, and a new class of aircraft carrier will enter widespread use in the Navy and provide new capabilities to warfighters. The NAE total force strategy will employ innovative manpower solutions and field new ship layouts to streamline operations that size and optimize manpower requirements to deliver the mission capabilities required in the future.

As aircraft and combat systems are becoming increasingly sophisticated and technology is redefining the work that the NAE does, that work is moving ashore and providing opportunities to leverage the civilian component of the work force. Civilians currently operate UASs on board ships, repair aircraft in hangars, and perform other functions once exclusively performed by military personnel. It is anticipated that this trend will continue and that the NAE will emphasize training, educating and assigning Sailors, Marines, and civilians to deliver the readiness required in the future.

Developing and Keeping the Best

The NAE total force strategy is dedicated to delivering diverse, high-performing, and mission-focused Sailors, Marines, and government civilians by institutionalizing and sustaining a culture that fully leverages and values the warfighting contributions made by every member of the workforce. The NAE will ensure all personnel have the opportunity to achieve their full potentials and to gain the knowledge, skills, and abilities to fight and win in combat.

Retention continues to be one of Naval Aviation's most significant total force challenges. When retention levels fall, costs rise through loss of experience and technical knowledge, additional recruiting requirements, and increased training demands. The focus on retention begins with sustaining a culture that values and recognizes everyone's contribution to warfighting readiness. Both the Navy and Marine Corps will work to create an environment that is conducive to retaining a productive and motivated total force by providing challenging and rewarding career choices and recognizing the contributions and sacrifices of their people and their families.

Navy Reserve Aviation

The total force strategy fully integrates active and reserve components. Units with Commander, Naval Air Forces Reserve, serve multiple roles as fleet readiness enablers, deployed forces for combatant commander operations, and Naval Aviation's strategic reserve. Reserve units provide a trained, experienced, cost-effective, and responsive wartime capacity that can be reconstituted as needed to meet the specific demands of the active-duty fleet. When not engaged in wartime operations these forces offer a full-time operational support capability. Active-reserve integration optimizes the employment of current and future aircraft, weapons, and systems delineated in *Naval Aviation Plan 2031*.

Reserve naval aviators are an integral part of every element of Naval Aviation. Significant milestones already achieved or presently under way include: all Naval Air Reserve helicopter and maritime patrol squadrons now report directly to their active-duty type wing commanders; reserve crews provide 100 percent of the Navy's transport and heavy-lift capability; reserve *Hawkeye* crews fly 100 percent of the Navy's E-2 counter-narcotics deployments; reserve squadrons belonging to the tactical support wing provide 75 percent of the tactical adversary aircraft support required by active-duty squadrons; reserve *Prowler* crews deploy regularly to Afghanistan and Iraq; reserve helicopter squadrons provide a range of operational support capabilities to the fleet, from counter-narcotics operations to flying combat missions; and approximately 20 percent of all Training Command and fleet replacement squadron sorties are flown with reserve instructors.

The Naval Air Reserve offers resources and support at reduced cost, delivers readiness capability to the fleet, provides surge capabilities for wartime and contingency operations, and eases the strain on active-duty personnel engaged in high-tempo operations. The advantages of a well-supported and capable Navy Reserve force are numerous, offering the operational and organizational flexibility required to support fleet requirements.

Marine Reserve Aviation

The 4th Marine Aircraft Wing augments active operating forces with aviation capabilities required to conduct the six functions of Marine Corps Aviation: air reconnaissance, anti-air warfare, assault support, control of aircraft and missiles, electronic warfare, and offensive air support. In this capacity, the 4th Maine Aircraft Wing augments fixed- and rotary-wing platforms as well as ground support and aviation command and control tactical agencies.

Active-component support from the 4th Marine Aircraft Wing is far reaching. In support of Operation *Iraqi Freedom*, 90 percent of the wing's total assets were integrated with active forces during various rotations. In addition, the wing's rotary-wing assets augmented the Fleet Marine Force with assault support capabilities during Operation *Enduring Freedom*. All of the wing's rotary-wing and refueling squadrons have been mobilized for at least two years, and seven of eight squadrons have participated in at least two deployments. One of three strike-fighter squadrons has been mobilized for one year and participated in one deployment.

Resources and real-world flight experience from the 4th Marine Aircraft Wing also are being dedicated to the future of Naval Aviation. Marine Reserve pilots are assigned to the Chief of Naval Air Training as flight instructors under the Marine Corps Reserve flight instructor program. Units of the wing also provide seasoned aviators in direct support of fleet replacement squadron training. The 4th Marine Aircraft Wing is a valuable component of the Marine Corps Total Force and provides selected Marine Corps Reserve aviation units or individual augmentees to active Marine operating forces.

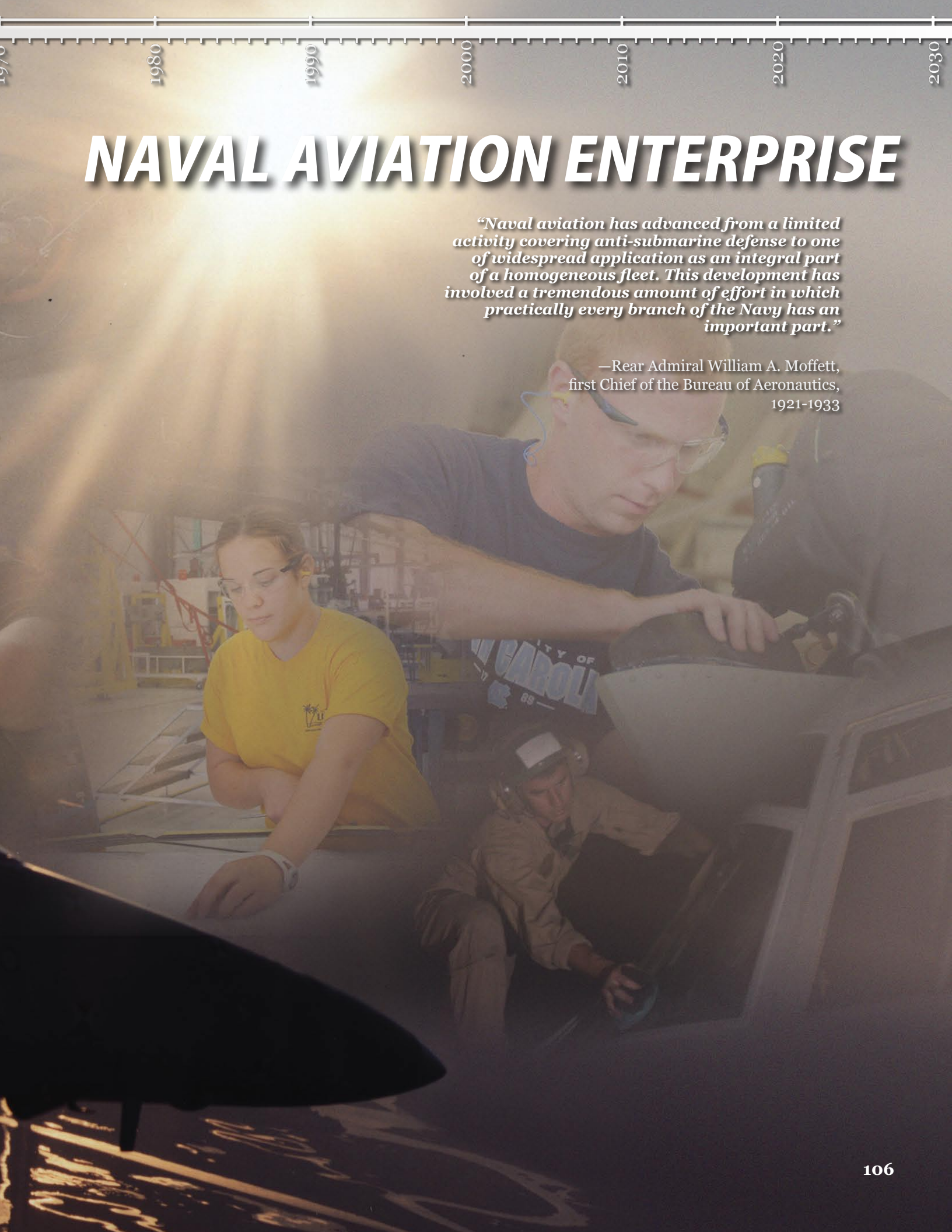
Right-Sizing the Marine Corps

The Marine Corps must continue to plan for a wide range of contingencies. Updated guidance on force development directs the Defense Department to prepare to support operations in multiple theaters, during overlapping time frames, and for the full range of missions. This means the demand for MAGTF capabilities will probably remain at or about current levels in the near- to mid-term. Key planning factors are: achieving an active component deployment-to-dwell ratio of at least one-to-two for sustained combat operations and at least one-to-three during "normal" operations; and developing three balanced Marine expeditionary forces.

It will be necessary to expand support capacity in several areas, such as helping force commanders to accelerate the establishment of and increase the effectiveness of their headquarters, as well as improving the ability to control the integrated employment of air, land, maritime, and information capabilities in pursuit of campaign objectives. These capabilities are necessary for security force assistance, counterinsurgency, and stability operations. In addition, rapid growth in our intelligence-collection assets requires an increase in the intelligence support necessary for processing, exploitation, and dissemination. Also, the increasing importance of controlling the electromagnetic and information spectra requires that the Marine Corps expand its capabilities to dominate cyberspace.

WARNING!
AUTOMATIC INFLATION
ASSEMBLY INSTALLED.
DO NOT USE
ABOARD AIRCRAFT

HUP2, 1957



NAVAL AVIATION ENTERPRISE

"Naval aviation has advanced from a limited activity covering anti-submarine defense to one of widespread application as an integral part of a homogeneous fleet. This development has involved a tremendous amount of effort in which practically every branch of the Navy has an important part."

—Rear Admiral William A. Moffett,
first Chief of the Bureau of Aeronautics,
1921-1933

The NAE is a valuable and established construct that supports the readiness requirements of Naval Aviation by enhancing communication, fostering organizational alignment, encouraging inter-service integration, stimulating a culture of productivity, and facilitating change when change is needed to advance and improve. The NAE's single fleet-driven metric is: *Naval Aviation forces efficiently delivered for tasking*. While older and more mature than all other Navy enterprises, the NAE continues to evolve, and in 2009 it published a new strategic plan that changes both the vision and mission statements to define better and to describe more accurately the role and value of the NAE.

The vision of the NAE is *to be the preeminent partnership of operators, sponsors, and providers who champion the efficient delivery of the right force with the right readiness at the right time . . . today and in the future*. This vision captures what the NAE is and will continue to be in the future. To endeavor to be the standard bearer for partnering with fellow stakeholders and other enterprises is new, lofty, and appropriate.

The mission of any organization is essentially what it does and, in its absence, what would not get done. The NAE does not deliver readiness; readiness was delivered before the NAE. The NAE's mission, then, is to *support Naval Aviation readiness requirements with transparent, cross-functional processes that facilitate risk-balanced decisions*. As a result of the NAE, decision-making organizations (Title 10 authorities) are better informed to make decisions that benefit all of Naval Aviation, improve warfighting readiness and effectiveness, and generate the greatest possible efficiencies. This mission statement is a new paradigm and is far more precise than the previous mission statement in describing the Enterprise's role.

The NAE leadership also realized that there was a focus gap between current readiness and developing future capabilities, with future readiness being the bridge between the two. Thus, in 2009, the NAE ended the Future Capabilities Cross-Functional Team, and established the Future Readiness Cross-Functional Team, recognizing a more immediate and appropriate need for the focus to be on future readiness. This change in focus drove the first major structural change to the cross-functional teams in almost four years.

NAE membership also has changed. The new Commander, Naval Air Forces, Executive Director position has been added as an Executive Committee member and currently leads the Integrated Resource Management Team. And, as part of the reorganization of the Director of Naval Intelligence (N2) and Deputy Chief of Naval Operations for Communications Networks (N6) into the Deputy Chief of Naval Operations for Information Dominance (N2/N6), N2/N6 Concepts, Strategies, and Integration has been added as an Executive Committee member. Seeking further alignment between the Navy and Marine Corps, the Marine Aviation Executive Review Board Lead has been added to the Current Readiness Cross Functional Team as the Co-Lead and to the Air Board as a member. In addition, the Commanding General, Marine Training and Education Command, was added as an Extended Air Board member.

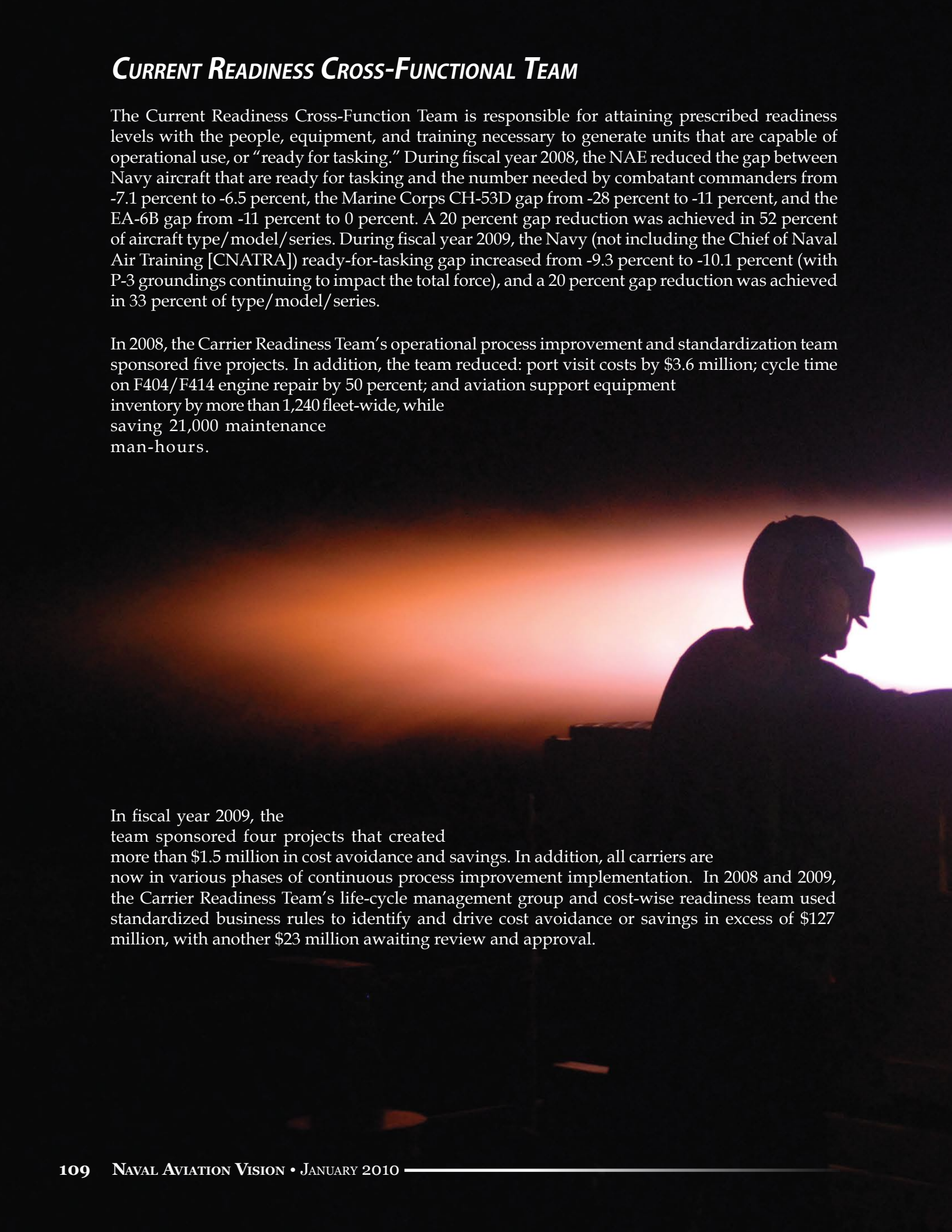
Also in 2009, the NAE published its first organizational structure and governance document, which codifies the NAE vision, mission, membership, roles, and responsibilities for each member. This document serves as the authoritative source for how the NAE functions.

The NAE is an acknowledged success, but it is still relatively new. Its leadership is committed to ensuring that the NAE continues to benefit Naval Aviation, to be relevant to current challenges, and to evolve to stay on the leading edge. It is important work, and, given the complex and unpredictable time in which we live, it is essential work as well.

Current Readiness Cross-Functional Team

The Current Readiness Cross-Function Team is responsible for attaining prescribed readiness levels with the people, equipment, and training necessary to generate units that are capable of operational use, or "ready for tasking." During fiscal year 2008, the NAE reduced the gap between Navy aircraft that are ready for tasking and the number needed by combatant commanders from -7.1 percent to -6.5 percent, the Marine Corps CH-53D gap from -28 percent to -11 percent, and the EA-6B gap from -11 percent to 0 percent. A 20 percent gap reduction was achieved in 52 percent of aircraft type/model/series. During fiscal year 2009, the Navy (not including the Chief of Naval Air Training [CNATRA]) ready-for-tasking gap increased from -9.3 percent to -10.1 percent (with P-3 groundings continuing to impact the total force), and a 20 percent gap reduction was achieved in 33 percent of type/model/series.

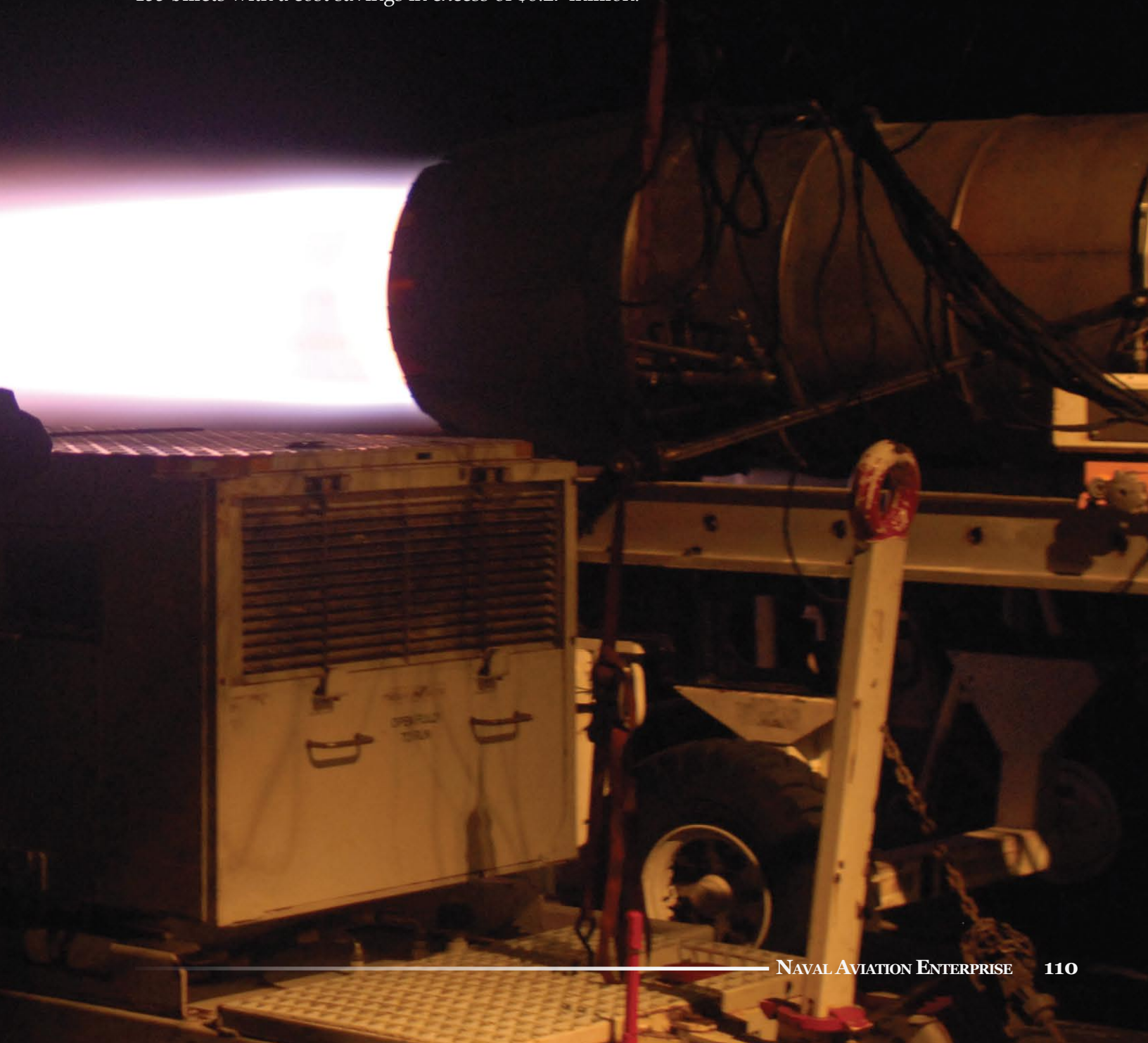
In 2008, the Carrier Readiness Team's operational process improvement and standardization team sponsored five projects. In addition, the team reduced: port visit costs by $3.6 million; cycle time on F404/F414 engine repair by 50 percent; and aviation support equipment inventory by more than 1,240 fleet-wide, while saving 21,000 maintenance man-hours.



In fiscal year 2009, the team sponsored four projects that created more than $1.5 million in cost avoidance and savings. In addition, all carriers are now in various phases of continuous process improvement implementation. In 2008 and 2009, the Carrier Readiness Team's life-cycle management group and cost-wise readiness team used standardized business rules to identify and drive cost avoidance or savings in excess of $127 million, with another $23 million awaiting review and approval.

Continuing implementation of the Carrier Sierra-Hotel Aircraft Readiness Program (CV-SHARP) is creating a standard training and readiness reporting process for all Navy aircraft carriers using metrics that measure the individual training and readiness levels of recurring onboard watch teams to populate the training pillar within the Defense Readiness Reporting System-Navy. Ultimately, CV-SHARP will enable fleet forces or type commanders to get up-to-date reports of carrier fleet readiness at the touch of a button, with data less than 72 hours old.

The Naval enlisted aircrew production gap was reduced from -26 percent to -7 percent—a 73 percent improvement. Carrier Navy enlisted classification rating Fit improved from 84 percent (with four carriers below the standard) to 93 percent (with all carriers within the standard). During fiscal year 2008, the Carrier Readiness Team's manpower initiative team successfully completed six projects that targeted work, billets, and costs in support of budget submissions, resulting in a reduction of 155 billets with a cost savings in excess of $8.27 million.



Total Force Cross-Functional Team

The Total Force Cross-Functional Team remains the single process owner for all NAE personnel, including active and reserve military members, government civilians, and contractor support personnel. The team's mission remains unchanged: to develop and execute a comprehensive strategy for managing the "people element" of the NAE and balancing the impacts—financial and otherwise—of recruiting, training, and sustaining a force focused on warfighting readiness. To achieve this goal, the team has established the following:

- Rigorous metrics to measure personnel readiness throughout the NAE
- Barrier-removal and training teams that have closed enlisted classification Fit gaps
- Integrated NAE personnel budget submissions
- Innovative manning strategies for transitioning weapon systems
- Center for Naval Aviation Technical Training integrated production plans for initial "A" and "C" schools, career "C" school, and function and technical school for intermediate- and organization-level aviation technical training
- An enlisted classification challenge process.

Future Readiness Cross-Functional Team

Over the past two years, the NAE's Future Capabilities Cross-Functional Team undertook several initiatives that brought improvements to the requirements, acquisition, and budget processes. Noteworthy among these were initiatives that addressed the quality of program funding requests, restoration of program funding following funding decreases, requirements officers' training, implementation of system engineering processes, open architecture, and improvements to program performance using Lean and Six Sigma.

Recent acquisition reform initiatives are incorporating many of the improvement initiatives originally undertaken by the Future Capabilities Cross-Functional Team. As a result, the team has been reconstituted as the Future Readiness Cross-Functional Team and will focus on improving the reliability, maintainability, and availability of those systems that are currently in the fleet. The team will examine aviation degraders that contribute to ever increasing operations and support costs and will provide solutions for the most troublesome. The team also will examine the necessary requirements to ensure that reliability, maintainability, availability, and affordability are considered early during program initiation.

Integrated Resource Management Team

The Integrated Resource Management Team (IRMT) was established in May 2008. Its origin can be traced to a corporate-like chief financial officer organization that served as the chief communicator of current-year financial performance information for the NAE. While retaining some of the same functions as these previous efforts, the IRMT shifted to a future-year focus. Just as important, the IRMT is responsible for developing and implementing an integrated planning process to assess and to manage a balanced risk approach to Naval Aviation resource and investment decision making. The team concentrates on planning, programming, budgeting, and execution support to Office of the Chief of Naval Operations resource sponsors for program objective memoranda and program reviews development. The team emphasizes seams identification and resource sponsor financial conflict resolution with the goal of providing an integrated view of the Naval Aviation portfolio to the leadership of the NAE. The team will continue to provide financial analysis and recommendations to the NAE leadership in order to help achieve a balanced NAE portfolio.

AIRSpeed

The NAE's primary enabler for continuous process improvement is called AIR*Speed*. This term encompasses all improvement tools and methodologies that produce readiness, improve quality of life for Sailors, Marines, and civilians, and assist with meeting cost constraints. The industry-proven tools provided to our workforce include Theory of Constraints, Lean, Six Sigma, barrier removal teams, and Kaizen initiatives. Their application to the processes associated with Naval Aviation maintenance, supply, and administration is driving the development of improved operating practices that consistently deliver greater readiness with greater efficiency. Because of its scope and flexibility, AIR*Speed* can be tailored to the unique needs of multiple areas within the NAE. AIR*Speed* enables readiness production by increasing the speed, reliability, and predictability of the processes associated with integrated maintenance and supply replenishment. It has contributed to reductions in the cycle time of aircraft, engine, and component repair and overhaul, leading to fewer items in the repair pipeline and more of them available for fleet use. Within the systems commands, AIR*Speed* and similar continuous process improvement tool sets reduce the response times and costs of processes employed in the course of acquiring, testing, and sustaining new aircraft, weapons, and their related systems.

Marine Corps Reset

The Marine Corps Reset strategy applies a holistic, integrated maintenance process to groom, sustain, and reconstitute Marine Corps aircraft involved in overseas contingency operations, while increasing cooperation among type/model/series program managers, team leads, and team members. The Marine Corps Reset strategy focuses on maximizing flight line availability and reliability of aircraft, reducing depot backlog and out-of-reporting status time, enhancing the visibility of aircraft material condition, and reducing the burden on organization-level Marines. The strategy also focuses on repairing all depot noted-but-not-corrected discrepancies from scheduled depot events, reducing the number of backlogged engineering investigations to ensure safely flyable, high ready-for-tasking aircraft are available for overseas contingency operations, and measuring the effectiveness of process improvements and aircraft material condition and their contribution to the Marine Corps Aviation Executive Readiness Board and current readiness type/model/series teams' goals. In addition, the strategy optimizes maintenance plans to ensure the right things are being done at the right times and in the right ways to reduce man-hour requirements for deployed units.

Marine Aviation Command and Control Transformation

One of Marine Corps Aviation's highest priorities is to ensure that the Marine Air Command and Control System (MACCS) is prepared for emerging operational environments while it continues to support current operations. This system enhances capability by improving deployability, flexibility, adaptability, MAGTF integration, data fusion, and training.

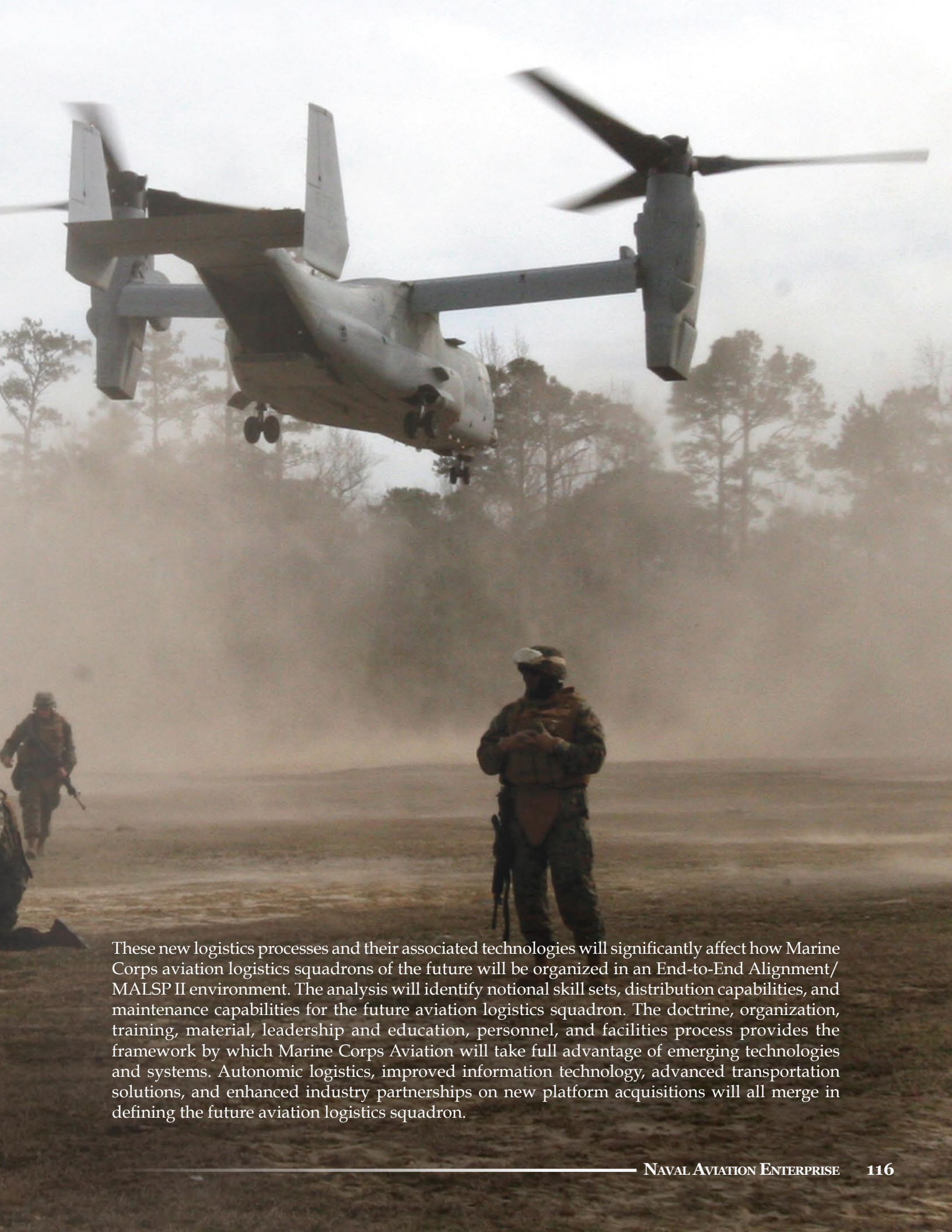
All future enhancements to MACCS will focus on the "command" aspect of aviation command and control. By leveraging technological advancements and innovation to increase capability, MACCS will ensure that tactical air commanders can execute effectively their battle command and management functions in support of Marine air-ground task force commanders.

Marine Corps Aviation Logistics Transformation

Marine Corps Aviation is transforming to meet the uncertain operational environment of the future and to move toward current readiness. Marine Corps Aviation logistics provides organizational and intermediate levels of maintenance, tactical supply, ordnance, and avionics in support of aviation combat elements, which are key components of MAGTFs. Satisfying this requirement, as it evolves to meet new challenges, involves a new way of doing business—End-to-End Alignment.

This new business process is being implemented using a carefully developed blueprint based on the Theory of Constraints, demand-pull logistics, and buffer management principles. It is a focused and aggressive continuous process improvement program that seeks to identify and eliminate waste, variation, and redundancy throughout the logistics chain. Implementing End-to-End Alignment in Marine Corps aviation logistics squadrons is only the first step. End-to-End Alignment is evolving to take a complete view of the entire Marine Aviation logistics supply chain, and will synchronize all supporting activities toward a common goal to provide Marine aviators with exceptional support.

Marine Aviation Logistics Support Program (MALSP) II is a logistics solution that is critical to maintaining Marine Aviation's capabilities. MALSP II will transform the Marine Corps logistics chain from a "push" system using historical data to provide a fixed allowance to a "pull" system in which supply buffers are determined by current demand. MALSP II will provide support to deployed and non-deployed core capable units at higher levels of performance, while decreasing infrastructure and resource inventory to support all forms of conflict. To ensure MALSP II's successful deployment, key stakeholders such as Marine forces and air wings were engaged to develop the mission-essential tasks required for the program's development and implementation. MALSP II is currently scheduled for an initial operational capability in fiscal year 2014.



These new logistics processes and their associated technologies will significantly affect how Marine Corps aviation logistics squadrons of the future will be organized in an End-to-End Alignment/ MALSP II environment. The analysis will identify notional skill sets, distribution capabilities, and maintenance capabilities for the future aviation logistics squadron. The doctrine, organization, training, material, leadership and education, personnel, and facilities process provides the framework by which Marine Corps Aviation will take full advantage of emerging technologies and systems. Autonomic logistics, improved information technology, advanced transportation solutions, and enhanced industry partnerships on new platform acquisitions will all merge in defining the future aviation logistics squadron.

Naval Aviation is a warfighting force that is an integral part of the ability of the Navy, Marine Corps, and joint forces to deter or win regional conflicts and major power wars. Our aircraft carriers, amphibious assault ships, carrier air wings, aviation combat elements, and maritime patrol and reconnaissance forces maintain a combat-ready posture that is deployed forward as an instrument of our national power. We understand the importance of cooperative multinational relationships because no one nation has the resources required to guarantee the complete safety of the world's oceans and the airspace above them. Although our foremost responsibility is the projection of sea-based combat power, we also embrace the responsibility to provide humanitarian assistance and disaster relief throughout the world.

Naval Aviation is a warfighting enterprise that will continue to develop, deliver, and sustain the aircraft, weapons, and systems our Sailors and Marines need to serve America in defense of freedom. We embrace the privilege of this awesome responsibility with pride, determination, and enthusiasm.

SUMMARY

AARGM	Advanced Anti-Radiation Guided Missile
ADF	Australian Defence Force
AMRAAM	Advanced Medium-Range Air-to-Air Missile
APKWS	Advanced Precision Kill Weapon System
AWAC	Airborne Warning and Control System
BAMS	Broad Area Maritime Surveillance
CL	Hull designation for U.S. Navy light cruiser
CNATRA	Chief of Naval Air Training
CV	Hull designation for U.S. Navy conventionally powered aircraft carrier
CVN	Hull designation for U.S. Navy nuclear-powered aircraft carrier
CV-SHARP	Carrier Aircraft Readiness Program
DAMTC	Direct Attack Moving Target Capability
DDG	Hull designation for U.S. Navy guided-missile destroyer
DMLGB	Dual Mode Laser-Guided Bomb
ER	Extended Range
EW	Electronic warfare
FFG	Hull designation for U.S. Navy guided-missile frigate
GHMD	*Global Hawk* Maritime Demonstration
GPS	Global Positioning System
HARM	High-Speed Anti-Radiation Missile
HM	Helicopter mine countermeasures squadron
HMLA	Marine light attack helicopter squadron
HMM	Marine medium helicopter squadron
HSC	Helicopter sea combat squadron
HSL	Helicopter anti-submarine squadron light
INS	Inertial navigation system
ISR&T/IO	Intelligence, surveillance, reconnaissance, and targeting and information operations
JAGM	Joint Air-to-Ground Missile
JDAM	Joint Direct Attack Munitions
JMEWS	Joint Multiple Effects Warhead System
JSOW	Joint Standoff Weapon
LCDB	Low Collateral Damage Bomb
LCAC	Air-cushioned landing craft
LCU	Utility landing craft

APPENDIX A

Acronyms and Abbreviations

LHA	Hull designation for U.S. Navy amphibious assault ship general purpose
LHD	Hull designation for U.S. Navy amphibious assault ship multipurpose
LOGIR	Low-Cost Guided Imaging Rocket
LPH	Hull designation for U.S. Navy amphibious assault ship helicopter
MACC	Marine Air Command and Control System
MAGTF	Marine air-ground task force
MALSP	Marine Aviation Logistics Support Program
MMT	Multimission *Tomahawk*
MV	Motor vessel
NAE	Naval Aviation Enterprise
NCIP	Naval Aviation Enterprise capabilities-based assessment integrated process
NGJ	Next Generation Jammer
P3I	Pre-planned product improvement
POM	Program objective memorandum
QPT	Qualified proficient technician
S&T	Science and technology
SDB	Small-Diameter Bomb
SEAL	Sea-air-land
SLAM-ER	Standoff Land Attack Missile – Expanded Response
T-HA	Hull designation for U.S. Navy hospital ship
UAS	Unmanned aircraft system
UCAS	Unmanned Combat Air System
UCAS-D	Unmanned Combat Air System – Demonstration
VAQ	Electronic attack squadron
VFA	Strike-fighter squadron
VMM	Marine medium tilt-rotor squadron
VP	Patrol squadron
VTOL	Vertical takeoff and landing
V/STOL	Vertical/short takeoff and landing

2P

APPENDIX B

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