NAVY AVIATION VISION 2030-2035

Introduction

The National Defense Strategy (NDS) identifies a complex global security environment characterized by overt challenges to the current international order and the resurgence of long-term, strategic competition among nations. It calls for a lethal, agile, resilient, and rapidly deployable force designed to compete against, deter, and win victories over all adversaries. Implementing CNO's guidance centered on our core principles of sea control and power projection, and the forward-looking Fleet Design concept, the Navy conducts Distributed Maritime Operations (DMO), providing the strong maritime component that the NDS requires. Integral to the NDS, Navy Aviation is strongly focused on updating current capabilities, bringing new and advanced platforms on line, and complementing today's warfighting competency with enhanced tactics and procedures for the high-end fight.

Today's Carrier Strike Groups (CSGs)—centered on large-deck, nuclear-powered aircraft carriers and their embarked carrier air wings (CVWs)—enable the implementation of this innovative Fleet Design by providing Fleet commanders with multi-domain military might. CSGs bring unmatched contributions of lethality, battle space awareness, and mobility to any maritime theater, ensuring the Navy's ability to establish and sustain sea control, achieve maritime superiority, and project power at great distances. The Navy's expeditionary fixed and rotary wing, manned and unmanned, aircraft constitute the most widely distributed aviation platforms in the world, operating in support of CSGs, Expeditionary Strike Groups (ESGs), and surface ships, providing a broad range of enabling missions.

The *Navy Aviation Vision 2030-2035* supersedes *The Vision for Naval Aviation 2025* and reflects key concepts to meet CNO's vision of a Navy that swarms the sea, delivering synchronized lethal and non-lethal efforts from near and far, on every axis and in every domain. As the Navy plans to build and sustain a lethal, resilient force, it is imperative to have a clear roadmap aligned with, and supporting, the overarching strategy.

The Air Boss's vision lays out three key elements—delivering capability and capacity to win in the Great Power Competition (GPC); generating future readiness across the force; and achieving revolutionary training—to form the framework of Navy Aviation's future. The fiscal environment is expected to remain constrained, placing wholeness at risk, so Navy Aviation's ability to responsibly manage its resources available to organize, man, train, and equip the aviation Fleet across its full range of missions will be central to ensuring maritime air superiority.

An expanded *Navy Aviation Vision 2030-2035* document will be made available at the secret classification level.

Strategic Environment

The character of maritime warfare is changing rapidly and despite efforts over the last few years, China and Russia continue to work to erode the U.S. Navy's warfighting advantages, putting national objectives in jeopardy. Technological advancements increase the potential for adversaries to track, target, and threaten our ships and aircraft. Our adversaries, both near-peer and regional threats, have demonstrated the ability to develop and employ an increasing number of high-end capabilities at a pace not seen since the height of the Cold War. Anticipated adversary threat capabilities will be more complex, more disruptive, and more lethal. In the early 2030s, Navy Aviation can expect to face:

- Increased People's Liberation Army Navy (PLAN) aircraft carrier inventory
- Improved People's Liberation Army Air Force (PLAAF) capabilities and capacity (to include fighters, bombers, and special interest aircraft)

- Advanced kill chains that extend over great distances
- Proliferation of complex threat emitters
- Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance, and Targeting (C4ISR&T) networks
- Information warfare attacks

In an environment of GPC, left unchecked, these symmetric and asymmetric threats can impose a high cost by exposing our forces to significant risk, particularly in areas long considered geographic strategic chokepoints. This could jeopardize the U.S. Navy's ability to project power and maintain maritime superiority. Anticipating and staying ahead of these advancements by developing and fielding capable and affordable platforms, weapons and sensors on a relevant timeline will continue to be at the forefront of Navy Aviation priorities.

Future Technologies

Given the rapidly advancing threat, Navy Aviation must invest in and pursue advanced technologies and operating concepts in order to succeed at the operational level of war. Secretary of Defense Austin correctly stated, "Despite force structure reductions over the past 30 years, the Joint Force has the necessary capacity and capability to implement National Defense Strategy (NDS) priorities and contend with today's threats. With congressional support, the Department of Defense will increase the Joint Forces' combat potential by continued investments in joint force readiness and force modernization, along with accelerated investments in artificial intelligence (AI), machine learning (ML), and other advanced technologies. These investments, combined with ally and partner cooperation, will enable optimizing our force structure to generate a combat credible Joint Force capable of deterring or defeating adversaries." Navy Aviation's advanced technologies include:

- Radio Frequency (RF) and Infrared (IR) signature reduction technologies
- Enhanced passive and active kill chains
- Manned/unmanned teaming (MUM-T)
    - » MUM-T reduces risk to the manned aircraft resident within the CVW, while simultaneously increasing capability, capacity, and survivability. Unmanned Air Systems (UAS) will fill diverse roles in the future air wing and the distributed surface Fleet in missions such as refueling, communications relay, logistics, airborne electronic attack, strike, and ISR&T.
    - » The MQ-25 will be the Navy's first aircraft carrier-based unmanned platform and will increase the lethality and reach of the CVW as a tanker with a secondary ISR role.
    - » The MQ-4C Triton achieved Early Operational Capability (EOC) in January 2020, delivering persistent maritime ISR&T through human-machine and autonomous teaming. It is on schedule to achieve Initial Operational Capability (IOC) in 2023. When paired with mission management tools, such as Minotaur with IFC 4 Multi-INT configuration, Triton will provide sensor agility to locate, track, classify, identify, and report on targets of interest.
    - » The MQ-8C Fire Scout unmanned aerial system will deploy for the first time in the near future with an advanced RADAR, Link 16, and the Minotaur mission system.
    - » Materiel and non-materiel solutions are being advanced to enhance interoperability between the MQ-8, MH-60, and Littoral Combat Ship. Incorporation of Link 16 messaging—as well as integration of Minotaur—will increase organic targeting capabilities for the distributed surface Fleet and improve battlespace awareness.
- Increased speed and range – Propulsion solutions that provide increased speed, range, and endurance while simultaneously providing power and cooling to advanced mission systems (i.e., variable cycle engines).
- Long-range, high-capacity, and hypersonic weapons – Next generation weapons must not only extend the air-to-air and surface-to-air reach, but also defeat both maneuvering air targets and surface-to-air defenses. This can be accomplished through increased kinematics (i.e., hypersonic) and/or other disruptive technologies such as directed energy weapons.

- Decreased decision-making timelines – Drive simplicity into tactics by incorporating automation, optimal crew vehicle interfaces, and teamed manned/unmanned forces that exploit Artificial Intelligence (AI) and Machine Learning (ML).
- Electromagnetic Maneuver Warfare (EMW) capabilities – The ability to counter enemy kill chains and air defense systems.
- Cyber capabilities – The ability to counter enemy cyber effects while enhancing cyber capabilities and platforms.
- Advanced networks – A Naval Tactical Grid (NTG) that is resilient with survivable waveforms.
- FORD Class aircraft carriers – Designed to support these and other technologies well into the future.

As Navy Aviation realizes these innovations in technology, it is critical that it be done in partnership with industry. The handshake with the commercial enterprise must include the stated need for open architecture, avoidance of unique and proprietary hardware and software, and development, testing and implementation that drives segmented rather than wholesale changes. This alliance and cooperation will accelerate the right change for the right reasons at the right time.

Delivering Capability and Capacity to Win the Great Power Competition

"Under any resourcing level, the Department must balance readiness, force structure, modernization, and competitive compensation levels while pursuing efficiencies and savings through organizational reform and critical reviews of ongoing missions and activities."
— Secretary of Defense Lloyd J. Austin III

Future platforms must be survivable; the aviation Fleet must be resilient with sufficient capability and redundancy to sustain the threat's effects; and the weapons load outs quickly reconstituted. The CSG is the weapon system that defines Navy power projection and will remain so for decades to come. The combined capability of the large-deck, nuclear-powered NIMITZ and FORD class aircraft carriers with their embarked air wing is unmatched by any other nation's Navy.

Nuclear-Powered Aircraft Carriers (CVN)

The potency of an air wing depends on the attributes of the airfield from which it operates (capacity, weapons magazines, sustainment capability, etc.). Additionally, airfields must be survivable yet operate close enough to the threat to enable effective weapons and sensor employment without imposing unreasonable logistical demands.

Large-deck CVNs are the most survivable, agile, resilient, and lethal airfields in today's security environment and will remain so for the future. Large size supports an air wing with enough aircraft to simultaneously conduct long-range power projection, sea control, and surveillance missions in nearly all environmental conditions and sea states. Similarly, nuclear power affords increased capacity for stores, weapons, and aviation fuel and survivability features—space that might otherwise be used for propulsion fuel in conventionally-powered vessels. Together, large size and nuclear power enable CVNs to conduct high-speed transits over great distances and then conduct military operations over more than 70% of the earth's surface for extended periods without need for replenishment.

Large-deck CVNs remain effective, relevant, and potent year after year, and decade after decade, because they are adaptable platforms in which evolving air wings deploy. To that end, the FORD Class CVN represents a revolutionary jump in carrier aviation and the future of large-deck, nuclear-powered aircraft carriers designed to fight and win over near-peer adversaries in GPC. With advanced warfighting capabilities and technologies—including cutting edge dual-band or Enterprise Air Search RADAR, advanced arresting gear, an electromagnetic aircraft launching system, an enhanced flight deck configuration, increased electrical generating capacity, and improved survivability features—FORD CVNs serve as the cornerstone of a lethal, agile, resilient, and readily adaptable distributed maritime force required by the NDS.

Carrier Air Wing (CVW)

The CVW remains the primary fighting element of the CSG. The Air Wing of the Future will be increasingly lethal, survivable, networked, sustainable, and unmanned with autonomous capabilities. Integrated passive and active sensors will provide battlespace awareness for the CSG and Fleet Commander. No weapon system on the planet matches the agility, flexibility, or volume of sea-space control enabled by the CVN/CVW team.

The future CVW will be composed of platforms able to deny and defeat air and surface-based threats by employing kinetic and non-kinetic effects. It will deliver precision effects on any target with next generation aircraft that will have greater range and speed. Integrated warfighting systems will operate in a coordinated multi-domain environment and be interoperable with the entire CSG. The CVW will coordinate maritime fires and provide persistence through endurance and tanking. It will complement the capabilities brought to bear by surface and sub-surface components to ensure the most efficient combined arms possible.

Investments in capability upgrades to the F/A-18E/F, EA-18G, F-35C, E-2D, and MH-60R/S will keep the CVW lethal through 2030 and provide risk reduction to future platforms. The complementary capabilities that the current aircraft bring—low-observable airframes, advanced tactical data links, passive targeting, long-range collaborative weapons, increased sensor detection range and identification, high-power, full-spectrum airborne electronic attack, and beyond line-of-sight (BLOS) communications—will form the building blocks of the integrated strike force of the future. To keep pace with peer threats, the future CVW will add updated passive detection systems, directed energy weapons for offensive and defensive measures, non-kinetic techniques to influence adversary decision-making, and hypersonic weapons capability to decrease time to kill.

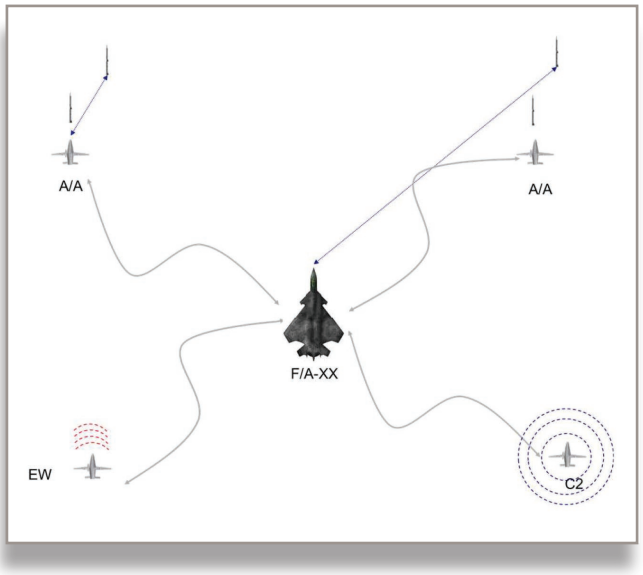
RF detection and electronic attack capability coupled with passive broad-spectrum advancements will be required to defeat the advanced Integrated Air Defense Systems (IADS) in the RF spectrum. Investments in IR and RF signature reduction technologies combined with standoff electronic attack assets will ensure platform survivability against adversaries that continue to make advancements in targeting technologies. Integrated and layered effects (non-kinetic and kinetic) will provide the tools required for operators to deliver precise lethal effects on the target in any environment.

The CVW of the 2030s achieves a complementary mix of F-35C Lightning II, F/A-18E/F Block III Super Hornet, and next generation strike fighter (F/A-XX), with the F/A-18E/F Block III providing the backbone of the CVW through 2035. F/A-18E/F Block III with reduced signature, Infrared Search and Track (IRST) Block II, and increased computing, working in tandem with the capabilities provided by the F-35C and E-2D, will make the entire CSG more lethal and survivable.

The F-35C of 2030 and beyond will serve as an invaluable force multiplier for the CSG. The F-35C's stealth and passive detection capabilities will allow the platform to gain critical intelligence and

share throughout the CSG, significantly aiding the kill chain. Additionally, in the maritime domain, the Block IV F-35C will be the Navy's strike platform of choice with Joint Standoff Weapon (JSOW) C1, Advanced Anti-Radiation Guided Missile Extended Range (AARGM ER) and Small Diameter Bomb (SDB) II incorporated. During Fighter Integration (FI) events with the F/A-18E/F Block III the F-35C will allow the F/A-18E/F Block III to be a more survivable and lethal platform leveraging the F-35C's stealth and passive detection abilities to shape the overall air picture.

The F/A-XX is the strike fighter component within the Next Generation Air Dominance (NGAD) Family of Systems (FoS). It is planned to replace the F/A-18E/F Super Hornet in the 2030s. Its specific capabilities and technologies are under development, however analysis shows it must have longer range and greater speed, incorporate passive and active sensor technology, and possess the capability to employ the longer-range weapons programmed for the future. As the Super Hornets are retired from service, a combination of F-35C and F/A-XX will provide Navy tactical fighter aircraft capability and capacity within the CVW. The advanced carrier-based power projection capabilities resident in F/A-XX will maintain CVN relevance in advanced threat environments.



The EA-18G Airborne Electronic Attack (AEA) will provide the bulk of the full-spectrum integrated non-kinetic effects for the air wing and joint expeditionary force. The EA-18G will employ Next Generation Jammer (NGJ) and other Non-Kinetic Effects (NKE). The F-35C and its emerging capabilities will complement and augment the EA-18G.

The E-2D will continue to be the quarterback of the Fleet and the linchpin for the CSG's self-defense throughout this decade. The E-2D's RADAR, additional active and passive sensors, and robust networks and communications capacities simultaneously provide real-time actionable data to platforms at the tactical leading edge and to the Composite Warfare Commanders (CWC) in order to enable power projection, Theater Air and Missile Defense (TAMD), and anti-ship missile defense (ASMD) in highly contested environments. Beyond 2035, the Navy's assured command and control platform will leverage manned and unmanned teaming; next-generation active, multi-spectral (RF/IR), and passive sensors; and enhanced Combat Identification (CID) to provide an enduring integrated fires capability across all domains.

Navy Aviation is investing in increased capabilities, lethality, and safety for its MH-60R/S fleet. To improve the speed and accuracy of data transfer on MH-60R/S platforms, the Link 16 Multifunctional Information Distribution System (MIDS) will be upgraded to Concurrent Multi-Net 4 and paired with improved mission computers. Additionally, investments in the Minotaur mission system will improve the common operating picture while also increasing aircrew situational awareness by enabling robust, cross-platform, measurement-level data sharing. As well, the MH-60R will be provided downlink capability with an Integrated Broadcast Service (IBS) feed via an ENTR V4 Embedded National Tactical Receiver. Meanwhile, the MH-60S is gaining Knightlink, a common data link capability, which will enable an additional means of full motion video and data transfer.

As an organic aviation anti-submarine warfare (ASW) platform in the CSG, the MH-60R will gain added capability and lethality to protect the CVN against near-peer threat submarines. Digital Magnetic Anomaly Detection (DMAD) will provide a non-acoustic ASW capability and the fielding and incorporation Mk-54 Mod 2 advanced lightweight torpedo offers enhanced propulsion and an improved warhead. The MH-60S will gain operational flexibility with the incorporation of the external gun mount system, which will enable crew-served weapons to be employed from the gunner's window, freeing up valuable cabin space for other mission requirements.

Along with organic tanking, the MQ-25 will pave the way for unmanned air vehicles on the carrier and manned and unmanned teaming (MUM-T) to extend strike range and enhance maneuverability. As unmanned tanking capacity delivers, the manned tanker requirement decreases, making additional service life and capacity available for strike fighter missions. Continued development of MUM-T will enable information sharing across a distributed force, increasing survivability, reducing risk to manned aircraft, and ensuring weapons capacity. Future unmanned air vehicles with survivable planforms, sensors, and robust autonomy will find, fix, identify, track, engage, and assess land, sea, and air targets. The NGAD FoS will include unmanned platforms with F/A-XX as the quarterback. These manned and unmanned aircraft plus attritable assets will be employed across domains to enable integrated kinetic and non-kinetic fires at tactically relevant ranges. As autonomy and ML efforts mature, the appropriate mix of F/A-XX, manned and unmanned platforms will be evaluated to ensure the most lethal and affordable CVW possible.

Rotary Wing

The expected service life for both the MH-60R/S and MQ-8, coupled with a rapidly evolving threat, pose potential rotary wing capability and capacity gaps in the future. Mitigating these gaps will require the recapitalization of current capabilities as well as development of new capabilities as part of the Future Vertical Lift (Maritime Strike) family of systems (FVL (MS))—both manned and unmanned. This new FoS will be designed and built specifically to support DMO. The capabilities envisioned include increased survivability, long-range, persistent ISR-T, integrated air and missiles defense, long-range offensive anti-surface and anti-submarine warfare (ASW), communications and data relay, fleet logistics, and personnel recovery. The threat paradigm in the 2030-2035 timeframe—as well as the principles of DMO —dictate that FVL (MS) be able to conduct these tasks in a highly contested environment, at greater ranges, and with greater speed, endurance and precision. FVL (MS) will leverage advances in AI and ML sensor technology, AI and ML to fully integrate the manned and unmanned platforms to form highly effective teams, thereby reducing operator workload and increasing the speed and quality of aircrew decision-making.

MQ-8B Fire Scout will sundown in FY24 and be replaced with MQ-8C. MQ-8C is based on the larger Bell 407 airframe and offers increased range, payload, and endurance to support distributed maritime operations. Mission systems will be upgraded with the Active Electronically Scanned Array (AESA) ZPY-8 RADAR, addition of Link 16 and Minotaur, and future incorporation of a passive threat detection system.

The mine countermeasures (MCM) mission package (MP) employed from the Littoral Combat Ship (LCS) or vessels of opportunity will replace the MH-53 mission. The MCM MP is comprised of a family of air, surface, and subsurface platforms and systems, which Navy Aviation supports with the MH-60S Seahawk and MQ-8 Fire Scout. The MH-60S MCM systems include an Airborne Laser Mine Detection System (ALMDS) for imaging near-surface volumes of water to detect and localize mines; and Airborne Mine Neutralization System for neutralizing bottom and volume mines. The MQ-8 employs coastal battlefield reconnaissance and analysis (COBRA) Block 1 for detecting and localizing minefields and obstacles over a beach zone. Combined, these systems showcase Navy Aviation's commitment to ensuring continued access to littorals and ensuring freedom of navigation.

Maritime Patrol and Reconnaissance

The Maritime Patrol and Reconnaissance Force (MPRF) will provide broad area ASW, anti-surface warfare (ASuW), and ISR-T capabilities with manned and unmanned platforms throughout the first half of this century. As near-peer adversaries, most notably Russia and the People's Republic of China (PRC), continue to expand and modernize their fleets, the U.S. Navy's MPRF continues to develop its FoS as fully integrated and netted nodes in the Navy's ASW network. Between now and 2035, the need exists for MPRF FoS sensor improvements to continually pace the threat posed by continued advancements in adversary propulsion-quieting and hull-quieting technologies in their submarine forces. The continuous investment in advanced ASW acoustic and non-acoustic sensors for the P-8A Poseidon and MQ-4C Triton Multi-INT Unmanned Aircraft System (UAS) enables the Navy to provide continuous coverage and expanded ASW search capability, covering larger areas in less time. Through robust combat system architecture, acoustic processing capability, advanced Signals Intelligence (SIGINT), and fully integrated satellite Command, Control, Communications, Computers, and Intelligence (C4I) suites, the MPRF community remains a critical node in the Navy's overall ASW, ISR, and ASuW kill chains. Beyond 2030, the P-8A will upgrade mission systems capabilities through Rapid Capability Insertion (RCI) upgrades. Continuous investments in ASW sensors, particularly acoustic search sensors, will enable the Fleet to search, locate, and track the most advanced submarines in the world. The use of autonomy and AI will be incorporated into advanced ASW systems and further enable aircrew to search larger areas in less time with better results. The threat paradigm in the 2025-2035 timeframe dictates that P-8A be able to operate in a highly contested environment. The P-8A survivability systems initially designed to defeat IR-based threats with Directional Infrared Countermeasures (DIRCM), flares, Onboard Inert Gas Generations System (OBIGGS), and dry-bay nitrogen fire-suppression systems will be expanded to include physical and electronic measures to defeat multi-spectral wideband IR and RF threats.

Weapons

Future kinetic weapons ranges and speeds must increase to ensure the ability to project meaningful power. Networked automation and AI will play a significant role in the future of power projection with kinetic weapons becoming smarter and more survivable with increased range, flexibility, and lethality. Collaborative weapon salvos of varying types will provide a high and low mix with speed, signature, and stand-in jamming providing increased lethality and decreasing salvo sizes. Development of more advanced non-kinetic weapons such as the electronic attack system will not only increase platform and weapons survivability with traditional electronic effects, but also enable more advanced capabilities to deny, degrade, and destroy threats.

Advancements in cognitive electronic warfare algorithms will ensure the survivability of our platforms in contested environments. Range and effectiveness of fires will be increased due to investments being made in engine and rocket technologies to achieve hypersonic kinematic solutions. Continued research and experimentation in hypersonic weapons is ongoing in order to transition this game-changing weapons technology to Navy Aviation platforms at the earliest possible opportunity.

Kinetic magazines are limited by capacity, so new and improved capabilities to counter emerging threats will be required. Integration of non-kinetic effects (e.g., expendable airborne electronic attack, cyber, high-power microwave, and directed energy) will ensure the survivability of Navy Aviation platforms and systems against any threat.

Networks

In order to support DMO, the Navy is developing adaptable, flexible communication networks capable of providing dynamic Battle Management Command and Control (BMC2), and supporting resilient integrated any-sensor/any-shooter kill chains enabling long-range fires. This modernized Naval Operational Architecture (NOA) will network existing and future platforms across the CVW and across domains, providing persistent multi-nodal sensing information to all participants. More specifically, Navy Aviation will enhance situational awareness and reduce aircrew workload with federated sensors and move toward aircraft displaying a true visualization of the battlefield via a common tactical picture. This common tactical picture will leverage AI/ML to provide decision aids to operators and aircrew, enabling them to identify and exploit first employment opportunities against adversaries by optimizing kinetic and non-kinetic effects.

The CSG requires resilient and low detectable/exploitable communication paths to ensure expedient and integrated information flow for decision making. A single network does not possess the capacity to transport an exponentially increasing flow of information. Therefore, multiple network paths are required to ensure adequate, resilient, reliable, redundant, and timely data flow. Additionally, common information and implementation of standards are required to ensure the data is usable by decision aids when it arrives. These standards will also ensure the interoperability across the Naval and Joint Force through ongoing efforts including: Project Overmatch—the CNO's initiative to "develop networks, infrastructure, data architecture, tools, and analytics that support the operational environment that will enable Navy's sustained maritime dominance"; the Navy Tactical Grid (NTG); Joint All Domain Command and Control (JADC2); and the Department of Defense's concept to connect sensors across all military services.

In the near term, Multifunction Advanced Data Link (MADL) for the high-end Lower Probability of Intercept/Lower Probability of Detection (LPI/LPD) and Tactical Targeting Network Technology (TTNT) for 4th-generation netted sensor integration, will serve as the Naval Aviation sensor network layer. As the Navy Surface Fleet integrates Link 16 and TTNT, CVW assets will be able to directly feed sensor data to every CSG asset.

Future developments of broad spectrum, LPI/LPD waveforms are required to maintain resiliency and survivability. Integration with multi-purpose apertures on platforms will enable this technology and improve mission success. Resilient BLOS communications are required for true power projection and the integration of BLOS on platforms and weapons will allow us to achieve long-range kinetic effects.

Continued development of MUM-T will enable sensor information sharing across a distributed force, further increasing survivability, reducing risk to manned aircraft and ensuring weapons capacity.

Navy Integrated Fire Control (NIFC) will continue to integrate sensors and weapons in the CVW with naval surface platform sensors and weapons to enable robust extended-range kill chains in all domains. The interoperability of tactical datalinks within the CVW and surface ships will continue to enable integrated kinetic and non-kinetic Fires from the Air (FTA) and Fires from the Sea (FTS).

Future Readiness

The Air Boss's *Navy Aviation Vision 2030-2035* can only be achieved through the effective management and balance of resources and capability. Accordingly, Navy Aviation will continue to take an enterprise approach to the wholeness process by concentrating on improving future readiness and continuing to drive down Operating and Sustainment (O&S) costs.

Future readiness is an extension of current readiness and a bridge to future capabilities and capacity. The vision for Navy Aviation into 2035 includes sustaining/improving equipment and material readiness to meet future warfighting requirements across every Type/Model/Series (TMS). It focuses on improving each platform's lethality and combat survivability. This vision defines requirements and influences full resourcing with accurate data and facts. Future readiness postures Navy Aviation for the ever-evolving strategic landscape and associated threats. The Naval Aviation Enterprise (NAE) has pioneered cost reductions in operations and maintenance through enhanced readiness initiatives, some of which are detailed here.

The Lethality and Survivability Working Group (LSWG) brings together subject matter experts to review systems identified by Naval Aviation Warfighting Development Center (NAWDC) and Marine Aviation Weapons and Tactics Squadron (MAWTS)-1 that contribute to the lethality and survivability of each TMS. This in-depth review generated the first summary of the number of required systems needed for the high-end fight and it better describes Full Mission Capable (FMC) rates. The LSWG has defined the necessary quantity and readiness standards for the ATFLIR, LAU-127, ALQ-214, ALR-67, ALE-50/55, ARC-210, MIDS, and the Aerial Refueling Store (ARS) for the F/A-18E/F. Naval Sustainment System-Aviation (NSS-A) participants drive resourcing and process efficiencies to meet those goals. This process is also in place for the Hawkeye, Growler, and the Seahawk communities.

The Naval Aviation Analytics Consortium (NAAC) is chartered as an authoritative analytics governance organization to align the currently independent analytics efforts across the NAE and deliver data-driven information for readiness decisions. The NAAC provides accurate data and facts to inform decisions made today to support the future readiness needed across Naval Aviation.

The Future Readiness Team (FRT) is chartered to solicit and validate funding for readiness and cost reduction initiatives that leverage innovative thinking and are systemic enterprise-wide solutions. Since POM12, this effort has identified 51 projects, received over $870M in funding, and has a projected lifetime savings of $2.9B. Savings to date have outpaced projections $1,004.4M to $908.1M. POM23 includes 10 additional future readiness initiatives with $800M in projected savings with an almost 13:1 lifetime Return on Investment (ROI).

Integrated Supply Chain Management (ISCM) provides a new approach and tools to drive performance in supply chains throughout the NAE. This tool incorporates 150+ data sources and machine learning for advanced analytics to capture supply, maintenance, and readiness trends in near-real time to enable enhanced forecasting. This management approach has contributed to a 21% increase in ready for issue (RFI) inventory at the flight line and an 8% reduction in number of F/A-18 aircraft awaiting critical components since February 2020. This is matched by Material Availability (MA) for weapons systems (over 18,000 line items) consistently achieving 90% or better. The ISCM enables users to plan proactively to meet future readiness requirements.

Future readiness is dependent on finite resources and is therefore inextricably linked to cost. The NSS-A Cost Pillar's purpose is to identify the initial and recurring costs necessary to sustain an increased number of Mission Capable (MC) aircraft now and into the future. It has identified meaningful levers that influence cost, to include Foreign Object Debris (FOD) prevention, Maintenance Reset, a fully integrated supply chain management system, optimized commercial and organic maintenance, and improved pricing postures. This effort is on track to achieve a cost reduction of $300M annually.

Achieving Revolutionary Training

Without proper and sufficient training, the aforementioned future capabilities and efforts to ensure readiness will be less effective. As Navy Aviation's platforms, weapons, and sensors are modernized, so too, must training keep pace with the threat environment. Initiatives to ensure high-end training include: Chief of Naval Air Training (CNATRA) recapitalization; Naval Aviation Training Next (NATN); shifting Carrier Qualification (CQ) training to the Fleet Replacement Squadrons (FRS); Fleet Surrogate strategy; Live/Virtual/Constructive (LVC) training; distributed simulator training; and enhanced Air Wing Fallon facilities.

CNATRA

Naval Aviation Training Next (NATN) has a variety of programs under its umbrella, designed to bring CNATRA training from the industrial to the information age. The main focus is to provide a more competent aviator to the fleet by modernizing the training program. Current projects include:

- Project Avenger – The initial trial within the T-6B training wings. A tangible experiment in shifting to a competency-based approach and creating detachments within the squadron. This allows students to move at the pace of their individual capabilities vice the current approach that moves students along largely as a group as they meet minimum acceptable standards. Immersive student training starts day one, when students are issued electronic tablets that allow for constant access to curriculum resources. The curriculum also includes updated 2D computer-based training and 360-degree Virtual Reality instructional videos. The initial trial completed in March 2021 with reduced time-to-train, a small reduction in flight hours, above average performance, and attrition rates at or below historical norms.
- Project Hellcat – A T-6B Intermediate Syllabus for selected Strike students that will focus on angle-of-attack approaches, division formation, basic fighter maneuver set ups, and strike concepts.
- Project Corsair – A T-45C syllabus currently under development and planned for Winter 2021 at Training Air Wing TWO, then Training Air Wing ONE in the Spring of 2022.
- Advanced Rotary Training – The TH-73 Advanced Helicopter Training System syllabus is being developed with NATN concepts and will be introduced beginning in FY22 and full implementation by FY24.
- Advanced Maritime Training – The Multi-Engine Training System (METS) will be developed with NATN concepts and is scheduled for introduction in FY25.
- Unmanned Training – The first Air Vehicle Officers (AVO) will be trained at VT-4 in Pensacola in FY22. Upon winging, they will usher in a new era for Warrant Officers who will ultimately operate the MQ-25A starting in FY24.

All initiatives use a blend of immersive technologies, virtual reality, mixed reality, augmented reality, and artificial intelligence. With the potential of syllabi tailored to the individual student, the early achievement and demonstration of skills allow students the opportunity to progress at the pace that is best for the individual. Ultimately, this initiative will result in a better trained warfighter with reduced time-to-train and cost.

In 2035, Navy Aviation will be nearly complete with the recapitalization of three of the four training aircraft categories, with only the T-6 Primary training aircraft awaiting recapitalization. The TH-73A was recently recapitalized to train rotary and tilt-rotor students; the T-44C replacement—the Multi-Engine Training Systems (METS)—arrives in the mid-2020s for multi-engine aircraft training; and the T-45C replacement—the Undergraduate Jet Training System (UJTS)—arrives in the late 2020s for strike fighter tactics training.

The UJTS will introduce a paradigm shift for CNATRA training in that it will enable higher-end undergraduate training, such as synthetic air-to-air and sensor training, providing a better trained strike aviator to the Fleet Replacement Squadrons.

Fleet Surrogates and Adversaries

Fleet Surrogates – Acquisition costs and fully burdened cost-per-flight hour continue to grow for fleet aircraft. While simulators are an outstanding training aide, actual flight continues to be a requirement to develop and demonstrate skills. The concept of a Fleet Surrogate is to utilize the same UJTS being developed for CNATRA to train fleet aircrew in less demanding mission sets. Advanced trainer aircraft can come with large area displays that can use software loads to mimic fleet aircraft displays. The large-area displays are reconfigurable, allowing for the provision of a cockpit environment capable of simulating various fleet aircraft. The addition of fully developed LVC systems will allow the Fleet Surrogate to emulate blue systems such as RADAR/IRST. The greatest benefits to be realized from the Fleet Surrogate is the actual flight time and training that can be accomplished at a fraction of the cost—potentially for as little as 15% of the cost of fleet aircraft—while simultaneously reducing some of the flight burden on Fleet aircraft. Additional savings will be incurred by reduced acquisition, development, and O&S costs.

Adversaries – Similar to the Fleet Surrogates, UJTS can potentially be used to fulfill some of the adversary requirements of Naval Aviation. LVC capabilities coupled with podded or integrated emulation systems capable of providing appropriate waveforms will enable these aircraft to replicate 4th and 5th-generation threats. While not necessarily capable of the kinematics of those threats, the replication capabilities with the substantial O&S savings derived from replacing legacy F-5 adversary aircraft, make this adversary variant a win/win for Naval Aviation.

Live, Virtual, Constructive (LVC) Training

LVC training will consist of a network of aircrew-operated simulators (virtual) and computer-generated airborne and surface forces (constructive) to augment live events, establishing a modernized integrated training environment. At its full capability in 2035, LVC training will enable live units to detect, track, classify, and engage virtual/constructive entities—and vice versa—with both kinetic and non-kinetic effects.

Due to fiscal, range space, security, and other constraints, Navy Aviation's current training approach does not support training to the full spectrum of the current and emerging warfighting capabilities of our adversaries. LVC capabilities are critical as it facilitates the required number of training events (reps and sets) against a credible Opposing Force (OPFOR) while mitigating fiscal, geographic, and Operations Security (OPSEC) constraints.

The Navy will conduct integrated LVC training in the Basic, Integrated/Advanced, and Deployment/Sustainment Phases of the Optimized Fleet Response Plan (OFRP). During the Basic Phase, LVC can provide additional blue forces not normally available during early training. During the Integrated/Advanced Phases, LVC will enable more robust blue forces and OPFOR representations. The training audience will execute tactics, techniques, and procedures (TTPs) to engage and defeat the OPFOR while mitigating Non-Combat Expenditure Allocation (NCEA), as well as range and OPSEC concerns. Finally, during the Deployment and Sustainment Phases of the OFRP, integrated LVC training will provide unit Commanding Officers and CSG Commanders the capability to maintain force readiness, and eventually enable en route, full-spectrum mission rehearsal with the supporting Maritime Operations Center (MOC). Full-spectrum mission rehearsals synchronize efforts among the MOC staff, Combined Task Force (CTF) and CSG Commanders in order to rehearse the Operations Plan (OPLAN)/Concept Plan (CONPLAN) or contingency operations against live and synthetic OPFOR that accurately represents enemy capabilities, tactics, and capacity.

LVC training will be conducted at the fully informed level to allow aircrew to train to the full capabilities of their aircraft, utilizing cross-domain solutions and multi-level security enclaves that have been incorporated into the network design.

Distributed Training

Navy LVC training will be achieved through the integration of existing and planned live and synthetic training systems, capabilities, ranges, and infrastructure via the Navy Continuous Training Environment (NCTE). In 2035, at-sea and in-sustainment training will be conducted via NCTE by injecting constructive opposing force tracks and signals into ships' combat systems, sensor processors, and command and control systems. The tactical training range networks will be consolidated into the NCTE, integrating live training systems, establishing LVC exercise control centers on each coast, and encompassing training at all classification levels for Navy strike groups and their staffs. Aircraft systems have been modified to enable aircrew interactions in the LVC training scenario through the Tactical Combat Training System Increment II (TCTS II) and its integration into the NCTE.

By 2035, all series simulators for the F/A-18, EA-18, E-2, F-35, P-8, MH-60, and MQ-25 will be integrated into the NCTE to allow for distributed training from the unit level up to the strike group level. A balance of tactical operational flight trainers and low-cost trainers will be utilized to increase capacity as well as shorten the concurrency window between an aircraft and its associated trainer's software loads.

Air Wing Fallon Training

The Naval Aviation Warfighting Development Center (NAWDC) is the center of excellence for Naval Aviation air combat training and tactics development. Its primary mission is integrated training, both live and virtual, of air wings in the final phase of the OFRP. The focus is on TTPs tailored to fight and win the high-end fight against peer competitors. To properly prepare aircrew for the anticipated threat, NAWDC continually updates the Naval Air Station (NAS) Fallon Range Training Complex (FRTC) threat emulators, Air Wing Fallon (AWF) syllabi, and its training systems and facilities. NAWDC is exploring options to expand the FRTC airspace south and east to create a specific area while investigating additional options to include periodic altitude reservations between FRTC, Utah Test and Training Range (UTTR), and Nevada Test and Training Range (NTTR), while using technologies (LVC training) to complement the smaller airspace structure.

Following IOC in 2022, NAWDC's state-of-the-art Integrated Training Facility (ITF) will provide the ability to conduct the full scope of AWF integrated training at the security levels required to employ the full capabilities of the CVW and train for the high-end fight. The ITF will integrate with other Navy sites through the NCTE as well as the U.S. Air Force via appropriate networks to allow full joint mission rehearsal, integrated strike group air defense training, AWF mission rehearsal, weapons and tactics instructor support, TTP development, Combatant Commander (CCDR) mission rehearsal, and unit-level training.

Navy Aviation invests in a career-long learning continuum that develops individuals with the advanced, integrated warfighting expertise foundational to the greatest strategic advantage. Anchored by a cadre of highly trained Weapons and Tactics Instructors (WTI) who have been developed through one of the pinnacle NAWDC Weapons Schools—including TOPGUN, HAVOC, CAEWWS, SEAWOLF, and MISR—the Air Combat Training Continuum (ACTC) provides a cost-wise and standardized training curriculum that ensures Fleet aviators develop and demonstrate the tactical proficiency required to support CCDR intent for the full spectrum of operations. NAWDC continues to work closely with the entirety of the warfighting development center constellation to implement this proven program for advanced warfighting education across the Fleet.

Navy Aviation 2030-2035 Vision

"Our armed forces are manned, trained, equipped, and ready to answer the nation's call, as the most capable military in the history of the world."
—Secretary of Defense Lloyd J. Austin III

As Navy Aviation looks to the future, it is evident we are facing a rapidly evolving threat requiring substantial force modernization. Leadership must take bold action and make difficult choices to generate the change required to win across the spectrum of conflict. This will require a renewed focus on the capabilities, capacity, readiness, and training the Navy needs to improve and sustain our warfighting advantage.

Navy Aviation will embrace affordability. Through the judicious application of resources and an evolutionary investment strategy, *Navy Aviation Vision 2030-2035* outlines an approach to deliver complete kill chains across all warfare domains that contribute to assured access, power projection, and sea control in the out-years. The aviation fleet being developed and procured today for 2035 is a mix of: complementary 4th and 5th-generation aircraft; NGAD FOS; manned and unmanned platforms; and netted sensors and weapons to ensure the Navy is able to decisively defeat increasingly advanced near-peer threats. Navy Aviation must be able to deliver precision effects on any target with next-generation aircraft at longer ranges and with greater speed.

If we maintain this vision, Navy Aviation will be able to integrate sea-based and land-based aircraft— manned and unmanned—to provide a persistent, agile, tailorable force with the flexibility and responsiveness to provide a stabilizing presence, de-escalate regional tensions, or use force to impose cost on our adversaries.

Throughout its history, Navy Aviation has been on the cutting edge of tactical, operational, and strategic innovation in naval warfare. The Air Boss's vision continues that tradition and preserves the warfighting advantages that Navy Aviation brings to our nation.

NAVAL AVIATION ENTERPRISE
NAVAL AIR STATION NORTH ISLAND
SAN DIEGO, CALIFORNIA