Aircraft Carriers

OFFENSIVE POWER AND DEFENSE IN DEPTH

Written by Dr. Rebecca Grant

TABLE OF CONTENTS

PUBLISHED JANUARY 2026

AIRCRAFT CARRIERS ARE BUILT FOR DANGER

Aircraft carriers are built for danger. No other nation in the world has mastered the delivery of immense striking power from the sea. From the fast carrier task forces of the Pacific in World War II, to the Ford-class carriers built for 21st-century warfare, the aircraft carrier delivers a combination of tactics, techniques, equipment, and raw courage only America can provide.

Aircraft carriers have spent much of the past thirty years providing global presence and conducting air campaigns in environments where the U.S. held air superiority. However, presence alone was never the primary design; carriers were built to fight in the midst of adversary threats. Today's carrier fleet is organized, trained and equipped to fight at extended ranges.

The aircraft carrier is a proven weapon equipped with an airwing that can reach a thousand miles or more in any direction to dominate sky and sea. Duty aboard an aircraft carrier in combat is not a back-row seat. Carriers are sent forward to fight. Sailors and naval aviators serve on carriers because they take the fight to the enemy. The agility and firepower of aircraft carriers are critical ingredients of America's deterrent power in the Indo-Pacific and around the world.

The USS *Gerald R. Ford* represents a new era of lethality. The Ford-class carriers with their updated armament, including lasers and drones, will enhance their defenses and their battle-tested ability to conduct 24/7 combat operations.

The aircraft carrier has faced formidable challenges for its entire combat lifespan. However, with the rise of China's military power and aggressive military activity, risks have increased. Part of China's strategy is to threaten aircraft carriers in the Western Pacific. China has built an arsenal of anti-ship missiles to attack from land or from the air and tries to convince the world that its military forces can take on American aircraft carriers. The threat has grown to the point where many are asking whether aircraft carriers can still fight and survive.

> *"China cannot sink U.S. aircraft carriers easily with a handful of missiles—or, in all probability, with multiple barrages. Most Chinese missiles fired at aircraft carriers will be destroyed or miss."*

Here is the stark answer.

China cannot sink U.S. aircraft carriers easily with a handful of missiles—or, in all probability, with multiple barrages. Most Chinese missiles fired at aircraft carriers will be destroyed or miss. Carriers move fast, covering miles of ocean during an enemy missile's time of flight. Sea-based missile defenses from the carrier's strike group escorts and the carrier's own air wing, tactics, and defenses are designed to keep the carrier in the fight, and hitting hard for the joint force—even while under attack. Space-based tracking of missiles with unusual flight patterns is now possible as advanced satellites link with missile defenses to reduce the threat from hypersonic missiles. Drone swarms are easy prey for the carrier strike group's defenses. On top of this, due to their construction, carriers are nearly impossible to sink, as World War II kamikaze attacks proved. The Ford-class and Nimitz-class carriers are the most survivable warship hulls ever built.

"In the 1980s, no one doubted that the nearly 600-ship U.S. Navy was bred and ready for war," wrote former Deputy Secretary of Defense Robert O. Work. "Its mission was not easy, but it was simple. Everyone, from senior admirals to junior sailors, knew, if push came to shove, their job was to put steel on target and the Soviet Navy on the bottom."[1]

China, Russia or any enemy will find the same resolve in the U.S. Navy today.

HITTING HARD: OFFENSIVE POWER OF THE CARRIER STRIKE GROUP IN ACTION

Aircraft carriers are first and foremost persistent weapons systems for striking enemy targets. Firepower is the mission of the carrier air wing and carrier air wings are armed to fight at vast distances.

Carrier air wings provide timely, high-quantity fires to strike sea, air, and land targets. Carriers bring more sustained, sovereign striking power to the joint force than any other naval asset. For example, one air wing of 44 strike fighters flying a conservative 1.25 sortie rate can deliver 55 sorties per day for a total of 220 weapons per day in a Pacific combat scenario. This assumes each plane carries four weapons per sortie. Some of these may be air-to-air and anti-ship weapons. Two carriers with a total of 88 strike fighters offer up to 440 weapons per day against targets. Over a 30-day period, two carriers working together on 24/7 operations can deliver over 13,000 weapons. Under surge conditions, carrier air wings can generate 70 or more sorties per day. While these numbers are planning factors, they illustrate why the aircraft carrier is so important to the combatant commander. The steady delivery of ordnance from the aircraft carriers provides the deepest reservoir of sovereign strike options for U.S. joint force commanders.

The air wing of the future will be able to push this strike envelope a thousand miles from the carrier. New platforms will augment the battle-tested F/A-18EF Super Hornets and F-35C Lightning IIs. The Navy plans for new aircraft, including the MQ-25 Stingray drone and the F/A-XX strike fighter, to increase both the range and lethality of the air wing.

F/A-18EF and F-35. F/A-18EFs have added sensors, situation awareness and stealthier features along with expanded payload and range since they first engaged in combat[2] over Iraq in 2002. Although the production line is due to close soon, the Super Hornets will remain integral to carrier air wings until replaced by a future strike fighter in the 2030s. The "Murder Hornet" configuration quickly added carriage of more AIM-9X missiles for the USS *Dwight D. Eisenhower* strike group operating in the Red Sea in 2024. The F/A-18EF also deploys much longer-range, advanced missiles such as the AIM-174B Gunslinger long-range air-to-air missile, which gives the Super Hornet the ability to take on adversary fighters at longer ranges.[3] F-35Cs flown by both Navy and Marine Corps squadrons are part of several carrier air wings. F-35Cs are very low observable, supersonic stealth fighters with

5,000 lbs. of internal weapons carriage. Their sensor fusion represents a formidable edge in offense, defense and battle management. Israeli F-35s scrambled and shot down a long-range Houthi cruise missile in October 2023.[4]

The MQ-25 Stingray is the pathway to carrier-based unmanned aviation for the Navy. Scheduled to join the fleet in 2026, the MQ-25 combines air refueling capacity with sensors and communications relays. While the MQ-25 can be on station for recovery refueling near the ship, its main role is to increase the combat radius of the air wing. The MQ-25 can offload 15,000 lbs. of fuel at a 500 nm range from the carrier, enabling strike fighters to extend their mission radius and time on station. While land-based tankers play an important role, the MQ-25 Stingray frees up strike fighters that were formerly performing refueling roles and gives carrier aircraft of all types a guarantee of additional range. This also increases the number of fighters available for primary air superiority and power projection missions.

The future strike fighter will replace the F/A-18EF Super Hornet. The program designed under the moniker of F/A-XX is a stealthy, networked fighter that will add 6th-generation lethality, survivability, and capacity to keep the carrier air wing on the offensive. Over a decade ago, the Navy accurately read China's military development, and began preparing for an air battle at more extended ranges. The F/A-XX will be a larger, stealthier aircraft that will carry more payload than strike fighters in the current air wing, and provide a step-function increase in the range as well. Secretary of the Navy John Phelan testified that the F/A-XX will offer "significant advancements in operational reach and capacity within contested environments, intended to enable Carrier Strike Groups to outpace adversaries while maintaining naval air dominance."[5]

This new carrier plane will allow naval aviation to penetrate modern threats, attack at will, and use fewer aircraft for the same missions that currently require layered support. The capacity of the F/A-18EF, the sensing capability of the F-35, and the electronic warfare prowess of the F/A-18G will be consolidated into the F/A-XX. As a team, the future air wing will be postured to deliver longer-range, network-enabled munitions capable of generating a range of lethal effects.

Consider the estimate of a 600 nm combat radius for today's F-35C and F/A-18EF. An increase of 25% gives the F/A-XX an unrefueled combat radius greater than 750 nm. For the aircraft carrier, this is another 150 miles of maneuvering battlespace. Add in the reported 250 nm for the SM-6/AIM-174B[6] missile, which can be employed by the air wing's strike fighters and the tactical advantages grow. Combat radius depends on mission altitudes and profiles, weapons loadouts, aerial refueling, and much more. However, the carrier air wing can deliver effects 1,000 miles from the ship and beyond. The Ford-class aircraft carriers will be able to launch aircraft from a much wider swathe of the ocean, increasing the maneuver room for the carrier under combat conditions.

Carrier aircraft set up an air battle hundreds, even thousands of miles from the ship.

CARRIER DESIGN AND DEFENSES

The ability of the aircraft carrier to maneuver and launch strikes relies on a holistic concept. From the subtleties of the electromagnetic spectrum to robust sea-based missile defenses, aircraft carriers operate within layers of tactics honed by decades of experience and the latest advanced technology of the joint force. The fighting posture begins with the design of the carrier itself.

Hull design. Ford-class carriers are the most survivable carriers ever built. Armored flight decks and numerous compartments to seal off the interior of the ship section by section were designed with damage control in mind. The sheer size of the carrier—five times larger than World War II fleet carriers–improves survivability. In 2006, three years before the keel of the USS *Gerald R. Ford* was laid, the conventionally-powered USS *America* (in service since 1961) was sunk for "comprehensive tests above and below the waterline collecting data for use by naval architects and engineers in creating the nation's future carrier fleet."[7]

That design was validated when the USS *Gerald R. Ford* experienced three 40,000-lb. underwater blasts with live ordnance as part of Full-Ship Shock Trials in a simulated combat environment, with the final blast less than 75 yards from the carrier. "The Navy designed the Ford-class carrier using advanced computer modeling methods, testing, and analysis to ensure the ships are hardened to withstand harsh battle conditions," said Captain Brian Metcalf, manager for the Navy's future aircraft carrier program office, PMS 378. Just as important, "the tests demonstrated—and proved to the crew, fairly dramatically—that the ship will be able to withstand formidable shocks and continue to operate unde extreme conditions."[8] Note that 40,000 lbs. of ordnance is equal, by weight, to the warheads on 30 of China's DF-21 missiles.

Deck-launched defenses. The Ford-class carrier design also has the deck space and electrical power generation capacity to include a range of new and enhanced point defenses. Just as the Essex-class carriers that debuted in 1943 increased their guns mounts after sea battles around Guadalcanal, the next Ford-class carriers are incorporating modern lessons learned from the Red Sea and other encounters. The Essex-class bristled with as many as 8 Navy 5"/127 mm dual purpose guns, 32 of the 40 mm Bofors guns, and 46 Swiss 20 mm Oerlikon guns all busy with air defense. The Ford-class can beef up its air and missile defenses with additional deck-mounted guns and laser weapons.

Multiple adaptable deck launching systems can be placed at the edges of the flight deck. Carriers have long employed deck launch systems for the Sea Sparrow missile, for example. Adding more deck launching systems configured for the Evolved Sea Sparrow and other ordnance boosts the carrier's close-in, point defenses against drones, sea-skimming missiles, and enemy small craft.

Lasers. High-energy lasers can disable drones and cruise missiles in flight. Two nuclear reactors on Ford-class carriers generate over 100 megawatts of power, or more than three times the electrical power available on the Nimitz-class carriers. In fact, *Ford* and ships of her class are among the few military systems ready to deploy current laser technology and upgrades.

The Navy began at-sea laser testing with a three-year series of trials of a 30-kilowatt solid-state laser conducted by the Afloat Staging Base USS *Ponce* from 2014 to 2017. That laser weapon destroyed ammunition on a target boat, and a small UAV in flight.[i] Maturing technology has increased laser power output so that efficient fiber optic lasers with beam control can take on more sophisticated threats at longer ranges. In December 2021, the USS *Portland* employed a 150-kw, second-generation laser weapon to shoot down both a drone and surface targets in the Gulf of Aden. Then in 2022, a Layered Laser Defense weapon shot down a cruise missile target during an Office of Naval Research test at White Sands missile range. "Innovative laser systems like the LLD have the potential to redefine the future

of naval combat operations," said Chief of Naval Research Rear Admiral Lorin C. Selby. "They present transformational capabilities to the fleet, address diverse threats, and provide precision engagements with a deep magazine to complement existing defensive systems and enhance sustained lethality in high-intensity conflict." Carriers will be able to make good use of lasers.

CHINA'S MISSILE ARSENAL

Targeting U.S. aircraft carriers has long been a quest for China's military. Among China's principal weapons are the missiles of the People's Liberation Army Rocket Force (PLARF). Years ago, China's missiles could not reach beyond Japan. With a major expansion in missile types and units, the PLARF has "evolved from a small, unsophisticated force of short-ranged and vulnerable ballistic missiles to an increasingly large and modern force with a wide array of both nuclear and conventional weapons platforms."[9]

The PLARF is now the largest ground-based missile force in the world, with about 2,500 ballistic missiles of all types, many of which are capable of reaching Guam and beyond. The PLARF became a separate branch of China's military in 2015, equivalent to the navy, army and air force. It owns and operates most of China's newer missiles and reports directly to the Central Military Commission in Beijing. Featured in its inventory are several types of missiles portrayed by China as "carrier killers."

- The DF-21D anti-ship missile variant was deployed in 2006 as a modification of the DF-21, in service with China since 1991. The DF-21D range is 2,150 km. A 2016 variant included a nuclear warhead.[10] However, the primary DF-21 payload is a 600-kg conventional warhead.[11]
- The DF-26 is a two-stage, solid-fueled intermediate-range ballistic missile with a range of 4,000 km and active seekers for terminal guidance. The PLARF fired an anti-ship DF-26B in the South China Sea in August 2020.[12] The range of the DF-26 extends Chinese precision strike closer to the Second Island Chain, reaching from Japan through the Marianas and Guam to wester New Guinea.
- The DF-17 is a solid-fueled missile that was deployed in 2019 after extensive testing. It has a range of up to 2,500 km, and is equipped with a hypersonic glide vehicle warhead designated the DF-ZF HGV.[13] U.S. officials have also said the DF-ZF HGV performed "extreme maneuvers" and "evasive actions" in previous test flights.[11]
- The DF-27 is an updated intermediate-range ballistic missile armed with a hypersonic glide vehicle with a range estimated at over 5,000 km. China apparently flight-tested the DF-27 in February 2023 and has fielded it in limited numbers.[14] Payload options include land attack, anti-ship warheads, or nuclear capabilities, as well as a hypersonic glide vehicle.

> *"Operational challenges and factors in the PLARF's own doctrine will affect the viability of the missile force."*

China has also increased its space-based surveillance. By July 2025, China had over 1,189 satellites on orbit, including "510+ ISR-capable satellites with optical, multispectral, radar, and radiofrequency sensors, increasing its ability to detect U.S. aircraft carriers, expeditionary forces, and air wings."[15]

This threat is serious. However, the PLARF has a wide mission brief, from nuclear deterrence through conventional precision strike to keep U.S. forces out. Operational challenges and factors in the PLARF's own doctrine will affect the viability of the missile force.


死
真
到
致
妥
可
靠

BREAKING THE KILL CHAIN: WHY MOST CHINESE MISSILES WILL MISS AIRCRAFT CARRIERS

Consider China's tactical problem set. Completing the long-range kill chain against a U.S. aircraft carrier is an exceptionally difficult targeting problem. Unlike fixed land bases, an aircraft carrier is a fleeting, moving target.

A notional "kill chain" in U.S. doctrine consists of six stages: Find. Fix. Track. Target. Engage. Assess. Turn it around and the kill chain concept shows how difficult it is to target aircraft carriers in the vast reaches of the ocean environment.

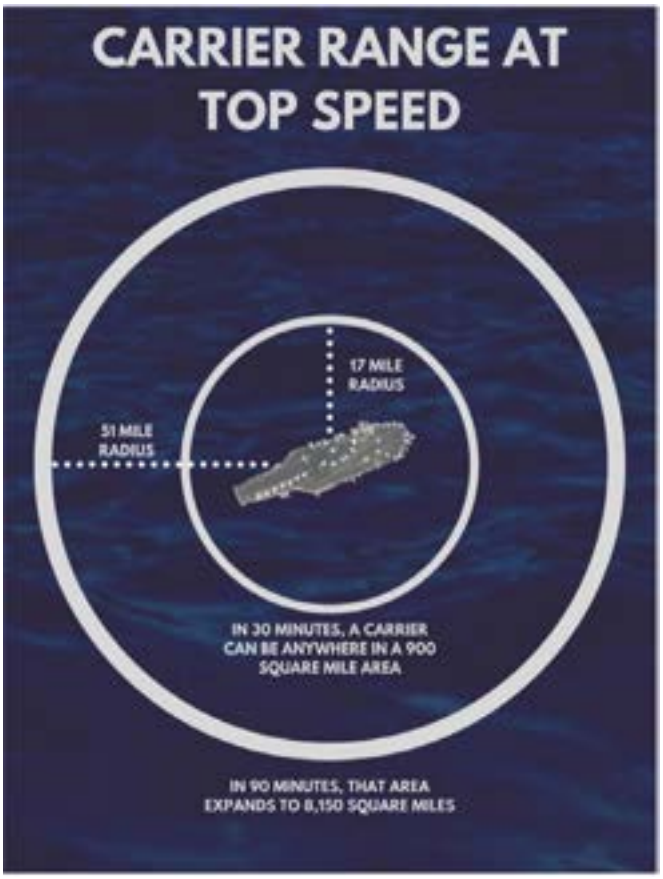
Find and Fix. The modern carrier air wing's combination of aircraft and missiles allows the carrier to fight from a distant position that expands the battle area well beyond the narrows and shoals of the Taiwan Strait. China will be searching for targets in the vast reaches of the Philippine Sea. China may be able to attempt the find and fix steps—although a 100,000-ton aircraft carrier can hide in plain sight by reducing its electronic emissions through a tactic called emissions control or EMCON.

Track. The track and target phases are where China's systems will begin to break down. As the Chinese track and target, the carrier counters first with mobility. Nuclear-powered carriers can steam at 35 knots per hour and do not need to refuel. They have unlimited battle range and endurance, enabling them to move 700 miles per day in any direction. Time spent in tracking by adversaries gives the aircraft carrier enough time to move many miles from the previously-spotted location. As the chart shows, a carrier can move anywhere in a 900-square mile area in approximately 30 minutes. In 90 minutes, the area expands to over 8,150 square miles. Targeting at long ranges in the maritime environment rapidly erodes effectiveness for China.

Target: The next dilemma is choosing how many missiles to expend against an uncertain probability of kill. As tracking takes place, enemy commanders are making overlapping decisions about missiles, aircraft, ships or other weapons systems available to strike the target, and achieve the desired weapons effects.

Accurate targeting of mobile targets represents one of the most difficult challenges in the kill chain. The first part of the problem revolves around the time of flight for the weapon, versus the movement radius of the target during that time period. Any mobile target is changing location constantly. A missile fly-out time of ten to twenty minutes allows significant escape time for the target.

To overcome this problem, active missile seekers attempt to track and confirm the target's position with updates during flight. But aircraft carriers employ a significant suite of tactical



deceptions when operating under wartime conditions. The primary aim is to inject electronic signatures of false targets into the battlespace. From the attacking missile's point of view, it may look like several "aircraft carriers" or other ships are emitting, while the real carrier is obscured.

Carrier skippers have long known that the real countermeasures stem from tactics.[16]

The weaponeering phase requires decisions on the blast effects, chances of hitting the target, and the probability of kill (the degree of damage to the target.)

Joint forces are also working to disrupt China's long-range kill chain. For example, Chinese space-based tracking can be disrupted by U.S. counter-communications systems. The Space Force deployed one such system in 2025. CCS Meadowlands is "a tactical electronic warfare system designed to detect, identify, and disrupt adversary communications systems, and is a key component of the U.S. military's electromagnetic warfare architecture."[17]

Engage: Next, Chinese missiles en route to targets enter the aircraft carrier strike group's enormous defensive zone where they encounter formidable sea-based missiles defenses that disrupt engagement. In the case of Iran, destroyers were on station in the Eastern Mediterranean, 1,500 miles from Tehran. Sea-based defenses in the Pacific are capable of targeting at even greater ranges. The U.S. Navy has developed and deployed outstanding missile defense capabilities across the carrier strike group. As discussed in the next section, few incoming missiles will survive to reach targets.

SEA-BASED MISSILE DEFENSES IN THE CARRIER STRIKE GROUP

Rapid progress in U.S. Navy sea-based missile defense systems over the past 20 years has greatly increased protection for aircraft carriers against ballistic missiles, cruise missiles and regional hypersonic threats, and drones. Missiles are observed from the moment of launch and ascent to the final, or terminal phase of flight. Carriers "sail every day inside a mini-Golden Dome," one naval aviator commented.

Aegis destroyers in the carrier strike group can target nearly every type of missile fielded by China.

The U.S. Navy proved the systems in combat with exo-atmospheric interceptions of ballistic missile launched by Iran towards Israel in April and October of 2024. On the night of April 13, 2024, Iran launched over 330 drones and missiles toward Israel. Again in June 2025, U.S. Navy destroyers on station in the Eastern Mediterranean intercepted multiple ballistic missiles fired by Iran.[18] The USS *Arleigh Burke* (DDG 51), USS *The Sullivans (*DDG 68), USS *Oscar Austin* (DDG 79) and USS *Paul Ignatius (*DDG 117) were equipped with the Aegis Weapon System to complete the intercepts.[19]

Meticulous development of hit-to-kill technologies has also improved both mid-course and terminal defenses. The Sea Based Terminal (SBT) program, with the Aegis Baseline 9 Weapon System and the SM-6 missile, is instrumental in Missile Defense Agency efforts to deliver a capability to the Navy to defend high value assets at sea and ashore against advanced threats in the terminal phase of flight. SBT is an incremental and evolving capability for ballistic and regional hypersonic defense capability.

For terminal defense, in April 2023, the Missile Defense Agency announced the successful test of the Aegis sea-based terminal defense against a medium-range ballistic missile target. "This was an incredible accomplishment and key milestone for the Sea-based defense program," said MDA Director Vice Admiral Jon Hill. "This test proved our capabilities in an operationally realistic scenario, which is a critical step in increasing capability to outpace emerging threats."[20]

In May 2025, two destroyers intercepted medium-range ballistic missile targets using the SM-3 and SM-6 in At Sea Demonstration/Formidable Shield, a 6th Fleet exercise in European waters with a series of live-fire events against unmanned air and surface systems, subsonic, supersonic, and ballistic targets, incorporating multiple Allied ships, multi-nation/multi-service ground-based air defenses, and aviation forces.[21] The SM-6 Dual II SWUP missile is designed to defend against short-to-medium range ballistic missiles in the terminal phase of flight.

Beyond this, the U.S. is accelerating development of anti-hypersonic missile defenses all along the kill chain. "We will build everything from interceptors to capabilities that can confuse and blind the Chinese targeting sensors," said Sen. Roger Wicker, (R-Miss.).[22]

HYPERSONIC MISSILES

Hypersonic missiles may follow a ballistic trajectory as they are launched and boost up through the atmosphere. On re-entry, they carry out glide maneuvers, then settle to a fixed, final course in the terminal phase before impact. Chinese hypersonic weapons are designed to confound radar surveillance. In the Chinese concept, their hypersonic cruise missiles will "porpoise" with high-speed maneuvers that complicate radar tracking and shot engagement.

The maritime battle against a hypersonic missile salvo from China will not be easy. However, the U.S. already has considerable capability to track and intercept hypersonic missiles, and this capability is set to grow with new technology developments including more powerful radars and space-based tracking to neutralize many of the intended advantages.

The U.S. is deploying new systems to track hypersonic weapons. The space constellation overlay negates much of the advantage of speed and exotic maneuverability. The Hypersonic and Ballistic Track and Surveillance System centers on a new constellation of satellites in low earth orbit, cued to a medium field-of view, to track a hypersonic weapon even as it maneuvers. The Missile Defense Agency confirmed in April 2025 that the HTBSS on orbit was meeting expected performance in tests.

The United States Space Force has on orbit prototype satellites conducting air moving target indicator tracking. A full constellation will enable hand-off of a targeting track. Space tracking systems receive high priority as part of U.S.-based missile defenses and the planned Golden Dome defense of the U.S. homeland.

As a result, space-based tracking and upgraded Aegis systems paired with the SM-6 missile are establishing a baseline capability to defeat hypersonic missile attacks. In March 2025, the destroyer USS *Pinkney* demonstrated the ability to detect, track and perform a simulated engagement of an advanced maneuvering hypersonic target using the Sea Based Terminal (SBT) Increment 3 capability embedded in the latest Aegis software baseline. This "Stellar Banshee" test run by the Missile Defense Agency and the U.S. Navy placed a hypersonic test vehicle on a medium-range ballistic missile, achieving a significant step in advancing the Aegis Baseline 9's hypersonic defense capability.[23] Decoys and obstacles can also assist with slowing down hypersonic weapons, by forcing high-angle maneuvers that expend fuel and waste time and diminish speed.

CHINA'S WEAKNESS: LIMITED SHOT OPPORTUNITIES

Aircraft carriers operating in the Pacific will be just one target set—and a high-stakes target choice, at that, given the defenses around a mobile target. Chinese missile effectiveness against carriers will also be hampered by factors in their own doctrine. First, the Chinese rocket force does not have an unlimited supply of missiles. Overall, "although the PLARF is large, China does not possess vast stockpiles of missiles; in a protracted conflict, the utility of the PLARF will diminish rapidly," a U.S. Army study found.[24]

Many Chinese missiles have a considerable miss distance, known as Circular Error Probable, or CEP. One way to counter this is with multiple launches per target to compensate for CEP and achieve the designated probability of kill. For example, China tested a salvo of 10 DF-21Cs fired at once in late November 2016 in a show of force after the election of Donald Trump. Chinese state media said the missiles could "destroy U.S. Asia-Pacific bases at any time."[25]

However, barrage attacks are costly. No PLA Rocket Force commander can afford to expend too many missiles on a target where the probability of kill is not good. China's attack is likely to be intense but brief. As the U.S. Army has noted, "Finally, deception operations to fool the Chinese into striking false targets will yield immense benefits, because as noted above, the PLARF has a very limited reserve of missiles to draw from, and thus every wasted missile offers significant ability to degrade PLARF capabilities."[26]

In the event of war, the PLA Rocket Force will be tasked to do much more than target aircraft carriers. The PLARF "fulfills several missions for China, including strategic deterrence, suppression of enemy air defenses, and "not allowing any inimical force access to Chinese space: land, air, or sea, and deny the enemy any space to fight a battle near the Chinese territory, including Taiwan and the first chain of islands."

With so many tasks, China cannot expend its entire intermediate and medium-range missile inventory shooting at aircraft carriers. Allocation of missiles to maritime targets will be one "target set" among many. The PLA Rocket Force will have to assign missiles to numerous land-based targets for missions such as suppression of enemy air defenses, namely, targeting U.S. and allied SAM sites, which will require a lot of missiles. China will therefore have a challenge in prioritizing and allocating missiles to cover this growing set of land-based targets.

Nor is the U.S. the only adversary. The PLA Rocket Force also allocates missiles for nuclear and conventional deterrence against nuclear-armed India. China and India fought in 1962, and India lost 20 soldiers to a Chinese attack on the Himalayan border in 2020.[27] At least some of the PLARF's arsenal will be marked for deterrence and coercion against this powerful neighbor.

CARRIERS VS. CHINESE BOMBERS

An attack by Chinese bombers against a carrier using stand-off missiles is also a possibility. China has a fleet of as many as 231 H-6 bombers capable of carrying anti-ship and cruise missiles.[28]

Chinese bombers have been conducting long-range flights in the Pacific with its upgraded H-6K "Badger" bombers for over a decade. A pair of Chinese H-6Ks together with two Russian Tu-95 "Bear" bombers flew into the U.S. air defense identification zone (ADIZ) near Alaska in July 2024.[29] The H-6K bomber carrying the KD-21 has been photographed often and is reported to be similar in design to Russia's Kinzhal missile. Chinese state media claims the H-6Ks carry four YJ-21-type missiles, two under each wing.[30]

Enemy bombers aiming to spar with carriers is nothing new. At the height of the Cold War in the 1980s, the Soviet Union built a fleet of Backfire bombers armed with AS-4 "Kitchen" anti-ship missile which could be launched from 200 miles out from the aircraft carriers. Naval aviation developed the tactics for a concept known as the Outer Air Battle to kill Soviet bombers before they could launch their missiles. F-14 Tomcats armed with Phoenix missiles patrolled over 200 miles from the carrier, supported by S-3 tankers, the airborne radar of the E-2C, and support in the electronic jamming environment. These were the secret "Chainsaw" tactics practiced meticulously at TOPGUN and their aim was to break up any Soviet air attacks on carriers at long range.[31]

Chinese fighters and bombers are also working to master surface warfare attack. Of course, to do so, they would have to fight through the Navy's carrier-based planes augmented by U.S. Air Force land-based fighters accompanied by Collaborative Combat Aircraft (CCA) drones tracking Chinese aircraft, adding in electronic warfare and weapons.

For carrier air wings in the Indo-Pacific today, the principles are the same: strike fighters combine range with advanced, networked situation awareness to catch Chinese bombers prior to missile launch. Extending the reach of the carrier air wing with the MQ-25 Stingray's unmanned air refueling and with new platforms like F/A-XX ensures carriers are not clustered close to China.

Beyond this, the Russian Kinzhal and Chinese KD-21 classes of air-delivered weapons have distinct drawbacks versus a true hypersonic weapon. A Chinese analysis criticized the Russian air-launched hypersonic missiles as over-reliant on satellite links to the missile guidance system for correcting route errors, especially given the severely insufficient number of satellites in orbit, making Kinzhal's accuracy "unsatisfactory." China's critique of Russia's Kinzhal missile illuminates many of the challenges also faced by China in closing the long-range kill chain. The Chinese will struggle to target and strike, let alone disable, a U.S. aircraft carrier using air-launched missiles. In May 2023, a U.S.-made Patriot missile battery shot down six Kinzhal missiles in one attack. "The United States appears to be well ahead of Russia and China in its ability to defend against hypersonics," a Brookings Institution report concluded.[32] Finally, the stockpile of these missiles is limited.

CARRIERS IN THE GRAY ZONE

While the bluewater fight with China is the most stressing scenario, carriers will also be active in "gray zone" operations in the littorals all over the globe to include the Western Hemisphere. China has invested in coercive naval forces as well as missiles. China's "gray-zone harassment of Taiwan" and similar operations near Japan, the South China Sea, and the Philippines have increased along with Beijing's taste for riskier, more aggressive military operations.[33] Here, recent experience in the Red Sea provided numerous lessons learned. After Hamas attacked Israel on October 7, 2023, the U.S. kept one or two aircraft carriers on station continuously for two years with only a single 30-day gap in late November 2024.[34] The carriers countered threats from Iran and Iran-backed proxies and added defensive and strike options for U.S. joint forces across the Central Command region. A total of five carrier strike groups rotated through the region. Aircraft carriers dealt with continuous, cyclical operations, and conducted major strikes. In Operation Rough Rider. U.S. Central Command forces, including the USS *Harry S. Truman* and USS *Carl Vinson* aircraft carrier strike groups, struck over 1,000 Houthi targets.[35] The combat lessons were immediately applied to future naval tactics. "The geography, the way the Houthis have evolved, is giving us some great insight, and it directly translates into us getting ready for that high-end fight against China," one naval officer commented.[36] Operating in the Red Sea also gave sailors and aviators combat experience—something China lacks.

FIGHT AND SURVIVE

Projecting power, breaking the kill chain, and foiling air-launched attacks are top tactics. Based on careful lessons and design, the Ford-class carriers are built to withstand damage and fire.

Aircraft carriers have proven over the decades that they can withstand gruesome damage. Achieving a "kill" of a carrier is extremely difficult. The discussion of survivability must not overlook another factor: the historical record of the carrier itself. The data on carrier battle damage illustrates that aircraft carriers are remarkable in their ability to survive.

Even in World War II, sinkings of U.S. fleet carriers typically occurred only after they could no longer maneuver. The most famous aircraft carrier battle in history was the Battle of Midway from June 4-7, 1942. Four Japanese carriers were lost, and so was the USS *Yorktown* (CV-5.) Yet the final sinking of three of the Japanese vessels occurred due to scuttling after devastating U.S. air attacks put them out of action. *Yorktown,* hit by Japanese planes, was afloat 36 hours after the battle, and was taken under tow as damage control parties worked to restart engine power. *Yorktown* was nearly saved until stalked and torpedoed by a Japanese submarine.

During the Battle of Leyte Gulf in October 1944, it took four U.S. Navy cruisers to sink Japan's light carrier *Chiyoda* after the ship was disabled by planes from the USS *Franklin* and USS *Lexington*. The cruisers fired shells and torpedoes to sink the 11,000-ton *Chiyoda* after a Japanese battleship tried to tow her.

The Essex-class carriers in action after 1943 were vulnerable to kamikaze attacks which escalated as the U.S. Navy closed in on Japan in 1945. "Armored flight decks were not enjoyed by Mitscher's ships, which reeled under the attacks," a historian wrote of the actions off Okinawa in May 1945.[37] *Intrepid, Bunker Hill, Enterprise, Franklin* and others endured appalling damage and casualties yet none of the four were sunk and all returned to fleet service.

The USS *Franklin* herself provided an example of how difficult it is to sink a carrier. On the morning of March 19, 1945, the carrier was 100 miles off the coast of Japan when a single plane released two 500-lb. bombs at low altitude onto the flight deck at 0708, killing over 800 of the crew and setting *Franklin* ablaze. However, the damage control parties of every new World War II ship were trained by the New York City Fire Department. Carriers were equipped with fog nozzles to quench fires. There were foamite stations every 100 feet on the flight deck plus portable pumps, rescue breathing apparatus and oxyacetylene steel-cutting torches. Dead in the water, the crew fought the fires and the task force provided air cover and antisubmarine protection.[38] "Big Ben" returned to the Brooklyn Navy yard for repair. [39]

Three serious fires aboard aircraft carriers USS *Oriskany,* USS *Forrestal* and USS *Enterprise* in the 1960s contributed greatly to carrier design and emergency procedures. The 1967 disaster on *Forrestal* in particular resulted in subsequent carrier modifications, including a flight deck washdown system to spread foam or water. Each ship was repaired and returned to duty.[40]

CONCLUSION

China has evolved from a posture that could only target U.S. forces in Korea and Japan, to a demonstrated ability to attack Guam, and project credible threats against Hawaii and Alaska. At least since the 1996 transit of the USS *Nimitz* through the Taiwan Strait, China has been gearing up to target American aircraft carriers and forces deployed to the Pacific.

The U.S. Navy also made good use of those years with the debut of the Ford-class carriers and many new aircraft including the F/A-18EF, the F/A-18G, the F-35C, the CMV-22, the MQ-25 and soon the next strike fighter F/A-XX. The U.S. Navy is well-prepared to meet challenges with the warfighting capabilities of its aircraft carriers and air wings. In a duel with Chinese missiles, battle will be joined, but the advantages rest with the U.S. Navy. Remember, too, that U.S. Navy carriers fight with the incalculable advantages of combat-hardened sister services, well-trained to work as a joint team. From geosynchronous orbit to the sea floor, the advantage rests with the U.S.

The emergence of a Chinese aircraft carrier force—now consisting of three vessels, growing to six by the 2030s—suggests the potential for carrier duels as seen during World War II.[41] In those duels, too, the U.S. Navy will prevail.

Understanding the role of the aircraft carrier in warfighting requires constant attention to new tactical problems and advocacy of the unique, ever-evolving role of aircraft carriers. "They had no appreciation of the tremendous advantages of carrier mobility to destroy enemy air and sea forces at their bases," wrote Admiral J.J. "Jocko" Clark of an October 1943 Navy strategy session convened by Admiral Chester Nimitz after the massed strike by three large and three light carriers on occupied Wake Island.[42] To Clark, the raid had "demonstrated the value of the fast carriers on the offensive" in hazardous waters. Others had to be convinced, and they were, but the point remains valid. It is part of the job of naval aviation to make others aware of the aircraft carrier's unsurpassed value to America.

"Warfighting always has been and always will be a risky endeavor, but it is our job to outthink adversaries and create the conditions to fight and win," wrote Vice Admiral Daniel Cheever. "Naval aviation will never rest, never quit, and never allow new threats to keep us from operating where and when the nation needs."[43]

1 The Honorable Robert O. Work, "A Slavish Devotion to Presence Has Nearly Broken the U.S. Navy," USNI *Proceedings,* December 2021.

2 Dario Leone, "Naval Aviator Who Took Part in First F/A-18E Combat Mission Tells Story of Super Hornet Combat Debut," The *Aviation Geek Club*, December 20, 2022.

3 Vice Admiral Daniel Cheever, "Naval Aviation: Preparing for the Next 50 Years," USNI *Proceedings*, July 2025.

4 Seth J. Frantzman, "Israel Uses F-35I to Shoot Down Cruise Missile, A First for Joint Strike Fighter," *Breaking Defense*, November 2, 2023.

5 John A. Tirpak, Navy Secretary Nominee Touts Service's NGAD With Improved Range and Capacity," *Air and Space Forces Magazine*, February 28, 2025.

6 Sydney Friedberg, Jr., "Army Picks Tomahawk and SM-6 for Mid-Range Missiles," Breaking Defense, November 6, 2020.

7 Lauren Frias, "How the U.S. Navy Tried and Failed to Sink Carrier USS *America* for Weeks," *Business Insider*, June 29, 2024.

8 PEO Carriers Public Affairs, "USS *Gerald R. Ford* Conducts Final Explosive Event, Completing Full Ship Shock Trials," August 8, 2021.

9 Ma Xiu, "PLA Rocket Force Organization," *China Aerospace Studies Institute*, Air University, 2022.

10 "DF-21," CSIS Missile Defense Project, April 23, 2024.

11 Maya Carlin, "DF-21D: China Built This Missile to Sink U.S. Navy Aircraft Carriers," Center for Security Policy, April 24, 2024.

12 "DF-26," CSIS Missile Defense Project, April 23, 2024.

13 "DF-17," CSIS Missile Defense Project, April 23, 2024.

14 Zuzanna Gwadera, "Intelligence Leak Reveals China's Successful Test of a New Hypersonic Missile," *IISS Online Analysis*, May 18, 2023.

15 United States Space Force, "Space Threat Fact Sheet," September 2025.

16 Clark G. Reynolds, *Fast Carriers: The Forging of an Air Navy* (New York: McGraw-Hill, 1968), p. 350.

17 Space Operations Command Public Affairs, "Field Approval for U.S. Space Force Space Electromagnetic Warfare System Upgrade Expands Warfighting Capabilities," May 21, 2025.

18 Jake Epstein, "U.S. Navy Warships Picked Up Multiple New Iranian Ballistic Missile Kills in Latest Defense of Israel," *Business Insider,* June 30, 2025.

19 U.S. Naval Forces Europe Public Affairs, "Senior Military Leaders Praise Destroyer Sailors During Souda Bay Visit," June 29, 2025.

20 Mark Wright, Missile Defense Agency Test Successfully Intercepts Ballistic Missile Target," *USINDOPACOM Stories*, April 3, 2023.

21 Seapower Staff, "Navy DDGs Successfully Engage SRBM and MRBM During Exercise Formidable Shield 25," *Seapower Magazine*, May 22, 2025.

22 Jeff Schogol, "How Much of a Threat Are Chinese Hypersonic Missiles to U.S. Navy Ships and Sailors?" *Task and Purpose,* April 18, 2025.

23 Lockheed Martin, "Aegis Combat System Demonstrates Systems Capability to Counter Hypersonic Threats," News Release, March 25, 2025.

[24] Maj. Christopher P. Minhal, "Understanding the People's Liberation Army Rocket Force: Strategy, Armament and Disposition," *Military Review, China Reader Special Edition,* September 2021.

[25] Bill Gertz, "China Flight Tests 10 DF-21 Missiles," *Washington Free Beacon,* December 2, 2016.

[26] Maj. Christopher P. Minhal, Understanding the People's Liberation Army Rocket Force: Strategy, Armament and Disposition," *Military Review, China Reader Special Edition,* September 2021.

[27] "India-China Clash: 20 Indian Troops Killed in Ladakh Fighting," BBC, June 16, 2020.

[28] Peter Suciu, "H-6: The Old Chinese Bomber That Has Transformed Into a Missile Truck," *National Interest*, November 22, 2023.

[29] Sebastien Roblien, "How China's H-6 Badger Bomber Came Knocking at Alaska's Door," *Popular Mechanics,* August 20, 2024.

[30] Liu Xuanzun, "China's H-6 Bomber Displays High Ballistic Missile-Carrying Capacity," *Global Times,* July 1, 2024.

[31] See for example Captain Matt Wright and Lieutenant Josh Hano, U.S. Navy, "Defending the Fleet: Carrier Defense and the Relentless Fight for Range, *USNI Naval History*, June 2024.

[32] Alexander H. Montgomery and Amy J. Nelson, "Ukraine and the Kinzhal: Don't Believe the Hypersonic Hype," Brookings Institution, May 23, 2023.

[33] See Bradley Martin, *United States Navy Force Structure: The Challenge of Global Crisis Response,* RAND, RR-A3294-1, July 2025, p. 9.

[34] Heather Mongilio, "Top Stories 2024: The Battle Between the Houthis and Commercial Shipping," *USNI News,* January 2, 2025.

[35] Heather Mongilio, "Operation Rough Rider: 45 Days, 1,000 Targets, No End in Sight," *USNI News*, April 29, 2025.

[36] Geoff Ziezulewicz, "What Red Sea Battles Have Taught the Navy About a Future China Fight," *The War Zone*, January 28, 2025.

[37] Clark G. Reynolds, *Fast Carriers: The Forging of an Air Navy* (New York: McGraw-Hill, 1968), p. 345.

[38] David Davidson and Leslie E. Gehres, "Leslie Gehres: Captain of the 'Ship that Wouldn't Die,'" *American Heritage*, Volume 20, Issue 3, April 1969.

[39] Samuel Eliot Morison, *Two-Ocean War,* (Boston, MA: Atlantic Monthly Press with Little, Brown, 1963), pp. 528-529 and Naval History and Heritage Command, "Exhibit: *USS Franklin* (CV-13, later CVA/CVS-13, then AVT-8)."

[40] Samuel J. Cox, "H-Gram 008 USS *Forrestal Disaster,*" U.S. Naval History and Heritage Command, July 2017.

[41] John F. Lehman and Steven Wills, "Aircraft Carriers: Missions, Survivability, Size, Cost, Numbers," *Naval War College Review*, Vol. 74 : No. 4, 2021.

[42] Admiral J. J. "Jocko" Clark, USN, Ret. *Carrier Admiral*, (New York: David Mackay Company, 1967), p. 129.

[43] Vice Admiral Daniel Cheever, "Naval Aviation: Preparing for the Next 50 Years," USNI *Proceedings*, July 2025.

Lexington Institute

LEXINGTONINSTITUTE.ORG | 703.522.5828

1600 Wilson Boulevard, Suite 203, Arlington, Virginia 22209