

ENABLING THE CARRIER STRIKE GROUP:



The Role of the E-2 and C-2

Dr. Daniel Goure

Executive Summary

A U.S. aircraft carrier strike group (CSG) is the most powerful, mobile and flexible aggregation of military capability in the 21st Century. A CSG is fully capable of supporting operations across the entire spectrum of conflict and peacetime operations. It has the added advantage of being able to conduct such operations from the sanctuary of the open oceans. This freedom to maneuver is not only a strategic asset, allowing the CSG to go where and when needed and remain on station indefinitely, but also of great operational importance to its ability to act both offensively and defensively. Maneuverability is essential to the CSG's ability to secure sea lines of communications, opening them to friendly forces and closing them to adversaries.

The key to the effectiveness of the carrier strike group is its ability to persist in the right place at the right time. This requires that the CSG maintain operational maneuverability. Maneuverability allows for both tactical flexibility and stealthiness. The space needed to secure operational maneuverability can be envisioned as a "box" defined at one end by the distance to and from the objective and at the other end by the distance to and from resupply. When operating against hostile forces, the box also must encompass a sufficient area to allow the CSG to disappear from view or, as necessary, actively defend itself. The ability to defend at sea is closely tied to the capability for long-range, persistent and high quality detection and tracking. The ability to remain at sea in an operationally useful maneuver box depends on long-range, high volume, reliable logistics support. If the CSG can "see" and strike at great distance without being targeted in return and simultaneously remain within range of its logistics support base, it will be able to perform whatever mission is assigned it.

The ability of the carrier strike group to achieve operational maneuverability is challenged today perhaps as never before. According to Commander, U.S. Pacific Command, Admiral Robert Willard, China is now deploying a long-range, anti-ship ballistic missile with a maneuvering warhead. China and a number of prospective adversaries are acquiring aircraft carriers, advanced naval strike aircraft, long-range anti-shipping cruise missiles and modern, quiet diesel-electric submarines. Even as the CSG fights to maintain a position within striking range of its targets it will have to contend with the growing long-range threats to its survival.

The effectiveness of the carrier strike group is often associated with its ability to conduct airstrikes. While this is critical, equally important is the CSG's ability to use its maneuverability to deny targeting to an adversary. For this to happen, the battle group must see threats at sufficient distance to defeat them and remain sufficiently close to the target while being continuously available for resupply. This condition is dependent on the presence of two vital enablers, the E-2 Hawkeye surveillance aircraft and the C-2A Greyhound carrier onboard delivery aircraft. For a CSG to operate with maximum flexibility and freedom of maneuver, both offensively and defensively, it must have the long range detection, tracking and situational awareness provided by the new E-2D Advanced Hawkeye and the long-range, time-critical resupply provided by the C-2.

This report was written by Dr. Daniel Goure of the Lexington Institute.

The Power of the Carrier Strike Group

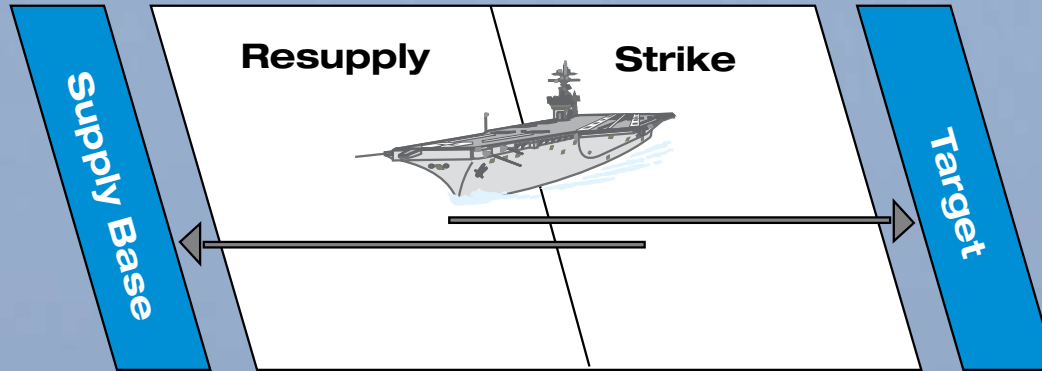
Of the world's great powers the United States is unique in having benefitted from the presence of two oceans between the homeland and foreign threats. Yet, this blessing also places the burden on this country to project its power overseas and to ensure freedom of passage in the global commons. U.S. naval forces are uniquely suited to projecting U.S. diplomatic strength and military power globally. Operating in the freedom of the world's oceans, naval forces can move where they are needed and remain on station nearly indefinitely. These same forces can project power and influence not only over the immediate sea area around them, but along the sea lines of communication that circle the globe, onshore and into the skies overhead.

The most powerful and capable expression of U.S. naval power is the carrier strike group (CSG). The CSG can project unequalled offensive and defensive power against a wide range of threats ashore, on the seas and in the air. The CSG is also able to exert influence and control over an enormous volume of sea and air space, ensuring the free flow of goods and people across the global commons. As has been demonstrated repeatedly from Haiti to Indonesia, the CSG is also a potent force in the execution of humanitarian assistance/disaster relief operations. A critical aspect of the CSG's ability to provide unparalleled support in humanitarian crises is its ability to deploy anywhere in the world and operate from international or territorial waters. Another feature of the CSG is its ability to use the broad ocean area to disappear from sight while still performing its assigned missions.

The carrier strike group is also possibly the most complex military organization ever to exist. There is the aircraft carrier (CVN) itself, a 90,000-plus ton nuclear powered goliath with 50 aircraft nominally and a crew of more than 4,000. The CVN is supported by its own fleet of escort ships and submarines able to conduct air, surface and subsurface warfare simultaneously. Of course there is the air wing that deploys with the CVN. The air wing consists of a combination of strike aircraft (currently F/A-18s but soon also F-35s), helicopters, airborne surveillance, and long-range resupply aircraft. Networked together, the combination of ships, submarines and aircraft/helicopters in the CSG can respond to the broadest possible spectrum of missions. The power of the CSG is scalable with the Navy able to deploy as many as nine CSG's in a single theater given sufficient warning.

The value to the United States of the Navy's ability to deploy CSGs anywhere in the world's oceans cannot be underestimated. During Operation Enduring Freedom, the USS Kitty Hawk (CV 63) was initially deployed to the North Arabian Sea to serve as a platform from which helicopters and Marine Corps units could be inserted into Afghanistan. Subsequently, the USS Enterprise (CVN 65) with an eight ship and submarine task group, followed by the USS Carl Vinson (CVN 70) with nine other ships and submarines deployed to support operations in Afghanistan. Naval strike aircraft provided near-continuous air support to deployed U.S. forces. No other Navy in the world could have undertaken this mission.

Maneuver Space



Maneuver space is the area in which the carrier can operate safely while still being within range of both its objective and critical resupply centers.



The Key to CSG Effectiveness: Operational Maneuverability

The carrier strike group provides an agile and maneuverable sanctuary for our nation to use in providing disaster relief, demonstrating resolve, providing deterrence through presence, and projecting military power in times of conflict. The CSG's operational agility and maneuver space is influenced by three factors. These are the distance to the objective, the distance from critical resupply nodes and the overall volume of air and sea over which the CSG can exercise defensive dominance.

There is an inherent tension between the first two of these factors. To efficiently and effectively project power, the CSG must operate as close as is operationally feasible to the shore. In addition, in order to project power over time, the CSG must be within range of its logistics support. As the CSG closes in on its target or destination it must necessarily move farther away from its sources of resupply. Should the range of the logistics supply line be reduced, the CSG would necessarily be forced to move closer to its "tail," increasing the distance aircraft would have to travel from the CVN to reach their objectives.

There is also the challenge posed by the third factor, CSG self-defense. To be secure against the range of potential threats, a CSG must be continually mobile and maneuverable. Simultaneously, the CSG must remain capable of projecting power and receiving resupply from optimal distances -- and do so autonomously, anywhere, at any time. It must also have the ability, despite its size, to "disappear and hide" into the vastness of the ocean, able to maneuver with absolute freedom, and approach objectives by the most advantageous routes.

The larger the maneuvering space, the larger the area a carrier strike group has to evade and "hide," the better. To optimize survivability, it is imperative the CSG have the ability to maneuver at will in the maximum area possible to prevent detection, localization and targeting by the enemy. In order to maximize the area of the "box" in which the CSG can safely maneuver, it must have the greatest possible reach from the CSG when it projects power, as well as to the CSG when it receives resupply.

In addition, the carrier strike group must be able to detect, track and, if necessary, engage threats over an extremely large area. In order for the CSG to maneuver to avoid being discovered and attacked, the distance at which the CSG needs to see potential threats should exceed its maneuvering box. Advanced airborne surveillance is critical to the ability of the CSG to see, maneuver against and successfully defeat current and projected anti-ship threats.

Balancing these tasks is a challenging endeavor. Clearly, preference must be given to ensuring that the CSG is able to achieve an optimal range to its objective and when in such a position that it is able to defend itself. Therefore, where possible, the reach of the logistics tail must be adjusted to support these two objectives.



The carrier strike group is composed of the aircraft carrier, a fleet of escort ships and submarines.

The Growing Threat to the CSG's Maneuverability

U.S. competitors and adversaries understand the importance of sea lines of communication and the role of U.S. naval power in securing the seaways, projecting influence and providing security around the world. That is why so many are seeking ways to limit that power. These states are quite aware that the key to contesting the presence of U.S. naval forces within range of their shores is by denying those forces access or otherwise limiting the areas in which U.S. forces can operate. To this end, they are acquiring capabilities intended to find, fix and destroy U.S. naval forces with a particular emphasis on that keystone of U.S. naval power, the aircraft carrier. Through a combination of anti-access threats and area denial capabilities, potential U.S. adversaries hope to be able to neutralize the Navy's ability to operate from the sanctuary of the open oceans.

Foremost among those developing the means to put the security of the aircraft carrier at risk is the People's Republic of China. China is seeking to develop a strategic approach to the problem of the U.S. carrier strike group. At a minimum, this means posing a sufficient threat to the aircraft carrier such that the CSG will be forced to operate in a box beyond the effective range of its F/A-18 and (soon) F-35 aircraft. An even better strategy would be to so restrict the size of the CSG's box that the CSG cannot hide. If the CSG can be localized with sufficient accuracy then it can be effectively engaged by the array of weapons systems China is deploying.

The Chinese strategy seeks a comprehensive solution to the carrier problem. This involves, first, using active and passive defenses to deny carrier strike aircraft the ability to reach their targets or to require that the carrier approach close to shore, away from its logistics support and within range of Chinese defenses. In addition, the growing Chinese ballistic missile force now poses a continuing threat to U.S. bases and shore facilities in the Western Pacific. Second, the Chinese are deploying an array of anti-carrier weapons systems. These include satellite and aerial surveillance to locate and target the CSG, air, sea and land-launched anti-shipping cruise missiles, quiet diesel-electric submarines with torpedoes and missiles and advanced strike aircraft. Finally, China is working on an innovative solution to the CSG problem. According to Admiral Robert Willard, Commander of U.S. Pacific Command, China has deployed a specially-designed ballistic missile for the purpose of deterring and attacking U.S. aircraft carriers in the Western Pacific.

Many other nations are seeking to acquire capabilities similar to those being deployed by China. The combination of advanced air defenses, long-range anti-shipping cruise missiles, modern strike aircraft and quiet submarines pose a growing threat to the secure operations of U.S. naval forces, in general, and the aircraft carrier, in particular. Iran has acquired the Kilo submarine from Russia and land based, anti-shipping cruise missiles from China. Even groups such as Hezbollah have demonstrated an ability to employ anti-ship cruise missiles.

In the face of these threats, it is all the more important for the U.S. Navy to maintain its ability to operate from a secure maneuvering box anywhere in the world's oceans.



The E-2 fleet is central to the carrier strike group's ability to see and respond to threats.

The Importance of Long-range, Accurate Airborne Surveillance

The operational maneuvering space in which the carrier strike group lives and functions must be a defensible space. This means the CSG must be able to see any threat approaching the box in time to respond effectively. The defense against aircraft is a challenge the Navy has long been working to meet. The combination of airborne surveillance, long-range fighter patrols and the Aegis radar/Standard Missile provides the Navy with a potent, multi-layer defense against traditional airborne threats.

Cruise and ballistic missiles are challenges the Navy is preparing to address. Its Naval Integrated Fire Control-Counter Air (NIFC-CA) system is a system-of-systems that will link sensors, aircraft, ships and even land-based air defense missiles into a capability that can neutralize large numbers of targets at long-ranges and all altitudes. When coupled to the Aegis Ballistic Missile Defense System, off board sensors and weapons systems such as Patriot and Terminal High Altitude Area Defense (THAAD), NIFC-CA has the capacity to provide area defense against both airborne and ballistic threats.

The cornerstone of the NIFC-CA capability will be the E-2D, an advanced version of the venerable E-2 Hawkeye family of carrier-capable, airborne sensor platforms. The E-2D will not only expand the Navy's surveillance capability, but also will enable naval and joint forces to conduct effective defenses against advanced cruise missile threats. The E-2D now in production with a 2015 initial operational capability will have a new solid-state, electronically steered ultra high frequency radar capable of conducting surface as well as airborne surveillance, integration of multiple sensors, an advanced tactical cockpit and software to support theater missile defense engagements. It will have better networking/processing power than earlier models and planning is ongoing to integrate the ability to do Internet-based networking. The E-2D plans to add in-flight refueling, enabling the Hawkeye to stay airborne twice as long as before. The E-2D can draw threat data from its own sensors and other surveillance and reconnaissance systems, establish engagement priorities and match available weapons to targets. Demonstrating this capability in the Arabian Gulf could be a significant deterrent to Iranian aggression.

The E-2 fleet is evolving from a primary Airborne Early Warning system to airborne command and control, providing information, connecting other platforms and making decisions. With their data links, they will be coordinating various assets from the tactical air controller on the ground while communicating with the Combined Air Operations Center and ships at sea and also reaching back to the United States with direct satellite feeds to the Pentagon.

The E-2D's central role in NIFC-CA should not obscure its potential contribution to offensive operations, as well. The ability to fuse data from many sources into a common operating picture and direct the fires of different systems against air and missile threats is the other side of the networked command and control coin.

As threats to the carrier strike group proliferate and increase in range, so too must the ability of the CSG to "see" them and respond in a timely manner. The E-2D will provide unparalleled ability to detect, track and target air-breathing threats to the CSG and to support ballistic missile defense operations.



The C-2 Greyhound has supported the carrier strike group for over 40 years.

The Value of Timely Aerial Resupply

In many ways, a carrier strike group is like a living organism. It is in constant motion. It must constantly be fed. When conducting operations, the aircraft carrier will require a steady stream of both consumables such as fuel and ammunition and critical spare parts for its aircraft and helicopters. If the CVN is to remain on-station, able to conduct operations for protracted periods, it must be able to receive timely resupply of mission critical material and even personnel. In order to avoid having to return to port for resupply, the Navy brings the supply to the CVN in its maneuver box. While some consumables can be resupplied by means of ship-to-ship transfers, critical supplies such as spare parts, munitions and replacement personnel must be flown to the CVN. It does so by relying on carrier onboard delivery. This mission is the singular responsibility of the C-2A Greyhound.

The C-2A can deliver up to 10,000 pounds of cargo, passengers or both out to distances of over 1,000 nautical miles. It can also carry litter patients in medical evacuation missions. It possesses a specially-designed cage system or transport stand that restrains cargo during carrier launch and landing. It also is equipped with a large aft cargo ramp and door and a powered winch to permit rapid rear cargo loading and unloading. The C-2A also has a unique quadruple-rudder structure, folding wings and self-contained power generation capability for engine starting to allow self deployment to/from remote sites. The C-2A's pressurized fuselage allows it to attain altitudes above most severe weather with passengers and it is compatible with the rest of the air wing's air traffic control and landing systems, catapult and arresting gear, Wind Over Deck parameters and cyclic operations.

The C-2A's unique features that support dedicated carrier operations plus the aircraft's rugged design allow it to operate from primitive and expeditionary airfields in support of deployed U.S. forces or to assist in humanitarian operations. The C-2 was one of the first military aircraft to provide relief supplies to the earthquake victims in Haiti. C-2 and E-2 aircraft operated from the USS Carl Vinson and C-2s also transited through the U.S. base at Guantanamo, Cuba. The capability to operate from short or even damaged landing fields also allows the C-2 to expand the number of potential supply points available to the Navy. This not only has advantages when performing humanitarian missions but reduces the potential significance of main operating bases as targets of hostile missile strikes.

First flown in the mid-1960s, the C-2A Greyhound, a derivative of the E-2 Hawkeye, with which it shares wings and power plants, has a widened fuselage with a rear loading ramp. The current inventory of C-2A aircraft is approaching its projected end of useful service life. In considering potential replacement candidates, the U.S. Navy needs to take into consideration the unique attributes of the C-2 configuration: speed, range, altitude, carrying capacity and pressurized cabin. One option available to the Navy is to exploit the commonalities between the E-2 and C-2 by remanufacturing the latter's airframe while upgrading it with new avionics and the same engines, wings, and cockpit as the E-2D.



The E-2 and C-2 planes share many components, including wings and power plants.

Operational Maneuver for CSG's in the 21st Century

If the force can see and strike at great distance and simultaneously remain within range of its logistics support base, it will be afforded greater maneuvering room to fight, hide and defend itself. The carrier strike group must be able to close the contested area on the optimum track and maximize its maneuver space while executing its missions and receiving time-critical resupply at any location within the maneuver space.

Prospective adversaries are pursuing what has been characterized as an anti-access/area denial strategy. The primary goals of this strategy are, first, to make it difficult for U.S. forces to operate within effective range of their objective and, second, to increase the risk posed to U.S. forces when they are within range. The CSG is being challenged by the combination of networked sensors and long-range cruise and ballistic missiles.

Defeating the anti-access/area denial threat requires, inter alia, improving the ability of the CSG to detect, track and defeat these new threats. The Navy's NIFC-CA architecture is central to countering the emerging airbreathing threat, and key to its effectiveness is the deployment of the E-2D Advanced Hawkeye. The Hawkeye will also support the Navy's growing ballistic missile defense capability which is centered on the Aegis combat system and the Standard Missile 3.

It is critical to the survival and operational effectiveness of the CSG to reduce constraints introduced by the range, speed, and/or cargo capacity of the air and surface logistics platforms supporting it. A supply line that limits the CSG's ability to maneuver or requires it to increase range from its targets negatively impacts survivability and capability to project power. The goal of the CSG is to avoid having logistics matters be the determining constraint in operations.

The C-2 Greyhound has provided unparalleled service in support of worldwide CSG operations for over 40 years. Its range, payload, compatibility with carrier deck operations and pressurized cabin make it particularly effective in meeting the needs of the CSG for logistics support without compromising maneuverability. The C-2 balances "tooth and tail" better than any other asset available to resupply the CSG.



E-2C Hawkeyes and C-2A Greyhounds prepare to launch from the carrier flight deck.

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Glossary Of Terms

- CSG - Carrier Strike Group
- CVN - Nuclear Powered Aircraft Carrier
- NIFC-CA - Naval Integrated Fire Control – Counter Air
- THAAD - Terminal High Altitude Area Defense



1600 Wilson Boulevard • Suite 900 • Arlington, VA 22209
Tel: 703.522.5828 • Fax: 703.522.5837
www.lexingtoninstitute.org • mail@lexingtoninstitute.org