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MASTER OF MILITARY STUDIES

**PERSISTENT AND CONTINUOUS?
U.S. CARRIER AVIATION IN IRREGULAR WARFARE**

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EXECUTIVE SUMMARY

Title: Persistent and Continuous? Naval Carrier Aviation in Irregular Warfare

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Thesis: U.S. carrier aviation must make significant changes in methods of operation in order to remain relevant to twenty-first-century conflicts.

Discussion: The limited, remote, and protracted nature of IW requires continuous and persistent reconnaissance, mobility, and fire support for dispersed ground forces. The methods in which aircraft carriers operate restrict the Navy's ability to provide such support. During operations that last longer than a week, the aircraft carrier can only conduct flight operations for a limited number of hours in a given day and a limited number days in a given month. Shore-basing has become the obvious and expedient answer. Although an adequate solution in the context of OEF and OIF, land-based airfields have limitations of their own. Airfields ashore take time to build, are subject to tenuous agreements with host nations, and provide large and vulnerable targets for insurgent forces. IW environments must be considered in which our presence on the ground is limited or non-existent, therefore the necessity exists for U.S. aircraft carriers to conduct around-the-clock flight operations for extended periods. A second flight deck shift requires manpower increases made possible through the CVN-78 design: modernized systems that require less maintenance and upkeep, improvements in weapons/material movement processes, and flight deck configuration changes.

Conclusion: In the short term, the U.S. Navy must embrace shore-basing aviation assets. All carrier squadrons should be properly trained and equipped for potential expeditionary operations on every deployment. In the long term, the Navy should examine methods to provide for around-the-clock carrier operations in order to better support IW operations.

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PREFACE

The genesis of this research project came in July 2004, as I served in Iraq as an Air Planner for the Naval Special Warfare Task Group- Arabian Peninsula. As I went about integrating sea-based aircraft into air support plans for ground operations, it quickly became apparent that a single carrier in theater could not provide consistent coverage. Fourteen-hour fly days, underway replenishments, and port calls all served to limit the availability of critical naval aviation assets. A subsequent deployment flying missions over Afghanistan while aboard USS *Stennis* (CVN-74) confirmed my initial observations. My critique of the aircraft carrier's current role in irregular warfare stems from a deep and abiding devotion to the importance of sea-based aviation. The intention of this argument is not to disparage previous operations nor provide ammunition to those who seek to dismantle the US carrier fleet. Instead, I hope to supplement the ongoing discourse regarding the expanding relevance of naval aviation in current and future operating environments.

Numerous individuals assisted me with this daunting project. Captain Ed McNamee provided invaluable insight into the complex worlds of naval requirements and carrier operations. Dr. Timothy Roberts at the Center for Naval Analyses guided my conceptualization of carrier capabilities and limitations in irregular warfare scenarios. Commanders Gary Patenaude and Edward Wetzell and Lieutenant Commanders Michael O'Leary, Eric Sinibaldi and Chris Sullivan responded to countless emails requesting information, clarification, and amplification on recent operations. Finally, Dr. Paul Gelpi offered crucial advice and mentorship that helped to mold my fledgling ideas into a cohesive and organized line of reasoning.

INTRODUCTION

Twenty-first century Sea Basing will be our nation's asymmetric military advantage, contributing immeasurably to global peace, international stability, and warfighting effectiveness. It is the key to operational independence in the dangerous decades before us.

*Sea Basing: Operational Independence for a New Century*¹

Most discussions of the future of carrier aviation consider one of two extremes: deterrence through presence or rapid response to major conflict. Few discuss the role of naval air power in Irregular Warfare (IW); a nascent, amorphous term that describes the spectrum of operations focused on maintaining the stability and cooperation of a given population through legitimate political authority.² The limited, remote, and protracted nature of IW requires continuous and persistent reconnaissance, mobility, and fire support for dispersed ground forces that aircraft carriers cannot currently provide. US carrier aviation must make significant changes in methods of operation in order to remain relevant to twenty-first-century conflicts.

The initial invasions for Operation *ENDURING FREEDOM* (OEF) and Operation *IRAQI FREEDOM* (OIF) provide striking examples of carrier aviation's ability to provide consistent and robust power projection during major combat operations (MCO). For the first ten days of OEF, naval aviation provided the only tactical aircraft, supported by Air Force tanking and supplemented by heavy bombers.³ OIF demonstrated the Navy's ability to surge its deployment cycle, providing five of its twelve carrier strike groups to support a single operation, with a sixth en-route.

Once MCO transitioned to IW and stability, security, transition and reconstruction (SSTR) operations, typical carrier presence for the entire Central Command Area of Responsibility (AOR) decreased to only one Carrier Strike Group (CSG) assigned at any given

time. In traditional warfare, the carrier overcomes its inability to conduct continuous flight operations by surging its sortie generation for a few days or sharing duties with a second carrier. Surge operations work effectively for conflicts that require overwhelming force over short periods of time, but fall short when major combat subsides and the US devotes but one carrier to support irregular operations.

For too long, the standard response has been that the aircraft carrier and its air wing were never meant to support continuous, long-term air operations; the US Air Force manages such requirements. The limitations of both services came into sharp relief during OEF and OIF, however, when the combatant commander requested effects that the Air Force inventory did not maintain and the Navy could not provide effectively from the carrier, forcing the Navy to send some of its aircraft ashore.

Yet the argument for improving the aircraft carrier transcends service parochialism. Future IW operations may not afford the US military the luxury of land-based aircraft and it must be ready for that contingency. Potential operating environments will not be conducive for the basing rights and force protection required for even the most spartan expeditionary airfields nor will CONUS-based strategic aircraft provide sufficient air support. Dr. Owen Cote at MIT's Security Studies Program sums up the primacy of naval carrier aviation in such a scenario: "the long-range, sea-based strike fighter, with its ability to engage in multiple, simultaneous and dispersed engagements 24 hours a day, is a key enabler of power projection ashore."⁴

Increasing the duration of daily flight operations will produce benefits beyond aircraft carrier support to IW. Such changes will also apply to amphibious ships with flight decks and to situations involving not just a single carrier on station but multiple carriers that are uniquely

task-organized and therefore not mutually supporting, such as when the USS *Kitty Hawk* (CV-63) operated as a sea-base for Special Forces fighting in Afghanistan.⁵ Although operations such as Peacekeeping, Humanitarian Assistance, and No-Fly Zone (NFZ) enforcement fall outside the published joint concept for IW, the missions have similar requirements for persistent and continuous air power and would benefit from the transformation as well.

Any effort towards aircraft carrier innovation must not diminish the ability to conduct traditional air operations in conventional warfare. The United States will continue to rely upon its carrier fleet because of its strategic flexibility. US Navy carriers provide the nation with sea-based deterrence and global power projection. With global commitments and responsibilities, the US military cannot risk losing the large war in the effort to win the small ones.

The solution to aircraft carrier limitations in IW will not come solely from scientific innovation. The Navy must make changes in mindset and organization that are aided by technological improvements. Without such transformation, the vision of Sea Basing as “the key to operational independence in the dangerous decades before us” will not be realized.⁶

IRREGULAR WARFARE AND ITS AIR SUPPORT REQUIREMENTS

The innovations that determine joint and Service capabilities will result from a general understanding of what future conflict and military operations will be like, and a view of what the combatant commands and Services must do in order to accomplish assigned missions.

*Joint Vision 2020*⁷

Irregular Warfare is a new term, but not a new idea. The concept describes types of conflict defined previously as “small wars”, “low-intensity conflicts”, and “operations other-than-war.”⁸ It includes operations such as counterinsurgency (COIN) and some aspects of SSTR.⁹ IW provides a useful framework to discuss the challenges posed by protracted and

asymmetric conflicts that are distinct from traditional, conventional warfare. The Department of Defense (DOD) introduced Irregular Warfare as a Joint Operating Concept (JOC) in 2007:

Irregular Warfare (IW) is defined as a violent struggle among state and non-state actors for legitimacy and influence over the relevant populations. IW favors indirect and asymmetric approaches, though *it may employ the full range of military and other capabilities*, in order to erode an adversary's power, influence and will. *It is inherently a protracted struggle* that will test the resolve of our Nation and our strategic partners.¹⁰ (Emphasis added)

From the perspective of air power application, several distinguishing features become salient. First, IW operations concentrate on influencing civilian populations rather than destroying enemy personnel and equipment.¹¹ Second, any belligerent forces that must be targeted will fight from within the population and therefore be difficult to discern.¹² Finally, the enemy will most likely seek a protracted conflict with an unpredictable tempo of action.

The US Navy has shown modest appreciation for the significance of limited conflict. Current naval doctrine, written in the 1990s, refers to the "operations-other-than-war" concept.¹³ *Maritime Strategy*, the Navy's only doctrinal statement since the Global War on Terrorism (GWOT) began, discusses conflicts that are "increasingly characterized by a hybrid blend of traditional and irregular tactics."¹⁴ The Navy does not address air support for IW in any of its doctrinal publications, however. The approaches of the other services toward IW air support must serve as a starting point.

The US Marine Corps discussed air operations in irregular conflict as far back as the 1930s in its *Small Wars Manual*, which included a chapter that described aerial reconnaissance, combat, and transport missions and recommended scheduling alert aircraft since, "small wars situations often require prompt action on the part of the supporting air force."¹⁵ More recently,

the Marine Corps collaborated with the US Army to develop a modern counterinsurgency (COIN) manual, reversing a doctrinal trend of neglect by all the services toward IW since the end of the Vietnam War.¹⁶ *Counterinsurgency* (FM 3-24/MCWP 3-33.5) includes a five-page appendix discussing the interdependent roles of air and ground forces in COIN operations.¹⁷

Despite several essays written by thoughtful airmen and academics regarding the importance of irregular conflict, the US Air Force as an organization discounted such cries from the wilderness for the last four decades, preferring to consider IW as a lesser variant of conventional operations.¹⁸ In 2007, the Air Force recognized that IW is, “significantly different from traditional conflict to warrant a separate keystone doctrine document” and published AFDD 2-3 *Irregular Warfare* concurrent with the IW JOC.¹⁹ This new doctrine examines the “unique challenges” presented by IW and lists a number of air power capabilities in irregular operations such as intelligence collection, electronic warfare (EW), psychological operations, air mobility, precision engagement, and command and control (C2).²⁰

From the described doctrinal evolution, a useful conceptualization of IW air support can be developed. Through the variety of specific missions delineated in AFDD 2-3, air power acts as a force multiplier that provides an asymmetric advantage in mobility and adaptability for ground forces engaged in IW.²¹ The advantages of air superiority enjoyed by US air forces in an irregular campaign are offset by the challenges of rapidly detecting and identifying the enemy during a protracted conflict that includes significant lulls in the rhythm of violence.²² In order to provide freedom of action to dispersed ground forces, air assets must be constantly available to react swiftly to unpredictable demands. In short, IW requires “continuous and persistent” airborne presence.²³

For the last twenty years, US forces have conducted numerous limited operations in which air power proved critical: Somalia, Bosnia, Kosovo, Haiti, Afghanistan and Iraq. Irregular warfare will continue to be the most prevalent form of future conflict.²⁴ In 1989, defense analyst Loren Thompson presciently stated, “for the remainder of the present century and well into the next, most of the contingencies US military forces will be called upon to respond to will be less than conventional warfare; they will be terrorist incidents, guerrilla wars, policing of truces, and the like.”²⁵ The ongoing GWOT and increased US engagement in Africa, Asia and South America ensure there is no risk of “fighting the previous battle” by drawing these lessons.

AIRCRAFT CARRIER LIMITATIONS IN IW

In discussing naval aviation’s limitations in irregular conflict, an important distinction must be made between the aircraft carrier and its air wing (CVW). Naval aircraft continue to evolve and improve with respect to the various IW air support missions.²⁶ Strike/fighter range and endurance shows an increasing trend in design.²⁷ The limitations on ordnance “bring-back” can be mitigated with the continued development of smaller, more precise bombs and improvements in the utility of gun systems originally designed for air-to-air employment but used throughout OEF and OIF for strafing ground targets.²⁸ The Navy has recognized the CVW’s lack of robust mobility capability and experimented with adding additional rotary-wing assets to the carrier.²⁹ CVWs spend significant amounts of time, prior to deployment, training towards missions in the IW environment. The Army now embarks Ground Liaison Officers (GLOs) who assist carrier aircrew with mission preparation by briefing ground maneuver schemes and battlespace coordination measures prior to launch, as well as communicating with joint and coalition forces to solve persistent coordination challenges.³⁰

In contrast to incremental improvements in aircraft capabilities, aircrew training, and coordination measures, the unaltered methods of carrier operation continue to impede the Navy's ability to provide the continuous and persistent air support demanded in IW. During operations that last longer than a week, the aircraft carrier can only conduct flight operations for a limited number of hours in a given day and a limited number days in a given month.³¹ For the most part, current manning levels dictate these constraints, although technology, doctrine and mindset play a role as well.

Since the late 1990s US aircraft carriers have demonstrated the ability to surge flight operations to 24 hours per day for a maximum of three to four days with considerable personnel augmentation.³² Such surge capability supports short-term contingency operations, such as Operation DESERT FOX, or conducting MCO prior to the completion of Air Force deployment to the theater. At the other end of the conflict spectrum, short-term surge capacity does not address the demands of IW in which air operations may continue indefinitely.³³

The US Navy designed and organized its aircraft carriers' flight decks to conduct operations for 12-14 hours per day. Even with two carriers on station during the initial invasion of Afghanistan, the realities of distance meant that 14-hour flight-deck operations translated into only 10 hours of in-country air coverage per carrier.³⁴ USAF F-15E Strike Eagle sorties from Kuwait covered the existing four-hour gap.³⁵

The limitation on the flight operations window is driven mostly by manning: a *Nimitz*-class carrier has one flight deck crew, by definition capable of working only a single shift.³⁶ Twelve hours of flight operations does not encompass the whole day's work since many tasks must be completed in preparation for and at the conclusion of flight operations. The timing of

the limited flight operations window within a given day also has constraints. Aviators must maintain currency in night carrier landings: at a minimum, they need one each week without additional proficiency sorties scheduled.³⁷ For practical purposes, squadrons schedule each pilot for two to three night sorties per week, which means that the carrier usually schedules at least half of its cycles between sunset and the last recovery of the fly day.³⁸

Limiting the availability of CVW aircraft to a portion of the day reduces naval aviation's flexibility to respond to IW requirements that have no such bounds. Conventional forces conduct patrols and convoys both day and night. Special Forces typically execute direct action missions at night between midnight and sunrise. Ground units may request ISR, EW and PSYOP for specific times of day to synchronize with their scheme of maneuver.

Beyond the inability to cover an entire day of flying for any significant length of time, the aircraft carrier typically does not conduct flight operations every day of the month. During its most recent deployment, the USS *Eisenhower* (CVN-69) averaged six no-fly days per month, and an additional two fly-days not in support of ground operations.³⁹ No-fly days may occur as a result of a scheduled port call or due to the necessary replenishment of aviation fuel, ordnance, food, equipment and other stores while underway.

Naval vessels make port calls for a variety of reasons, morale of the crew being the most obvious. Beyond that consideration, however, lay the demands for ship's upkeep tasks that cannot be done at sea, the resupply of additional stores too large, heavy, or voluminous to be replenished underway, and the political benefits gained by bringing a CSG and its associated money into a foreign port. In addition to the days that the aircraft carrier is physically at anchor or pier-side, a port call usually demands at least one day of transit in each direction from the

operating area, further reducing the fly days in support of theater operations available that month. Port calls can be neglected if sufficient demand for continued carrier presence exists, as evidenced by the USS *Enterprise* (CVN-65) in OEF.⁴⁰

Unlike port calls, the requirement for the aircraft carrier to perform an underway replenishment (un-rep) every 8-10 days cannot be neglected. Although the re-supply process does not necessarily negate an entire day of flight operations, the impact is significant. The carrier cannot conduct any significant fixed-wing flight operations while a supply ship steams alongside.⁴¹ Before and after the un-rep evolution, the flight deck crew must spend several hours re-positioning aircraft and equipment on the flight deck and in the hangar bay to facilitate the movement of stores brought aboard.⁴² Although the crew might be able to work a 20-hour shift on a fly day that includes a morning un-rep, that pace is not sustainable and does not result in a longer fly day.

The Navy has already recognized the various limitations imposed on sea-based aviation by flight deck constraints, port calls, and the realities of distance. Shore-basing became the obvious and expedient answer. Although an adequate solution in the context of OEF and OIF, land-based airfields have limitations of their own.

NAVAL AIRCRAFT ASHORE: AN INCOMPLETE SOLUTION

Land-basing carrier aircraft is not without precedent. During World War II, Vice Admiral Fletcher sent naval aircraft from Task Force 61 to join Marine and Army squadrons at Guadalcanal once it was clear that his carriers were too vulnerable to the Japanese. The joint air group proved vital to the Allied victory on the island.⁴³ The benefits of land-basing carrier aviation, however, had to be weighed against the risk of the US fleet losing the mobility of its

airborne firepower. The Japanese interior lines of communication, combined with the sheer size of the Pacific theater, required Nimitz to rely on mobility to concentrate his forces wherever intercepted enemy naval ciphers indicated the Japanese would strike next.⁴⁴ With a finite number of available airfields in an era before aerial refueling, aircraft carriers provided the necessary flexibility.

In more recent conflicts, aircraft designed for carrier operations have operated from shore not due to carrier vulnerability concerns but to fill gaps in Air Force capabilities. After the Air Force retired its sole tactical electronic attack platform, the EF-111, in the early 1990s, the Navy established four “expeditionary” EA-6B Prowler (VAQ) squadrons that would deploy overseas with Air Force wings.⁴⁵ After the initial OIF invasion, the requirement for land-based Prowler squadrons appeared to decrease significantly. The Navy decommissioned one of its expeditionary squadrons and discontinued the creation of another.

The DOD failed to recognize the continued demand for electronic effects on the IW battlefield. After the Taliban’s limited air defenses were destroyed, EA-6Bs transitioned to communications denial missions to prevent al Qaeda and Taliban forces from targeting coalition units.⁴⁶ In 2002, the USS *George Washington* (CVN-73) sent an EA-6B detachment to Qatar so that these critical electronic attack missions could continue while the carrier made a port call.⁴⁷ A year later, the *Enterprise* sent its Prowler squadron ashore to Bagram Air Base to smooth coordination with ground forces and increase on-station time.⁴⁸ Shortly afterward, the three remaining expeditionary VAQ squadrons began to rotate to Bagram for six-month deployments.

Likewise, in OIF the demand for electronic effects outstripped the ability of carrier-based aircraft to supply them. EA-6Bs first deployed to Al Asad Air Base in western Iraq while the

USS *John C. Stennis* (CVN-74) transited the Suez Canal. From 2005 to 2007, every carrier that deployed to support OIF detached part of its Prowler squadron ashore.⁴⁹ CVW-8 also sent strike/fighter aircraft to Al Asad during a *Roosevelt* port call.⁵⁰

In the context of OIF and OEF, flying from an airbase in-country results in a much shorter transit time. A carrier-based aircraft launching from the Arabian Sea and overflying Pakistan to reach its station in Afghanistan spends over 3 hours in transit, whereas an aircraft flying from Bagram can be on-station in minutes.⁵¹ Shorter transits require less tanking per aircraft, which allows more aircraft to operate in theater since the finite number of tankers can support a greater ratio of customers.

Airfields have a greater potential to provide around-the-clock operations every day of the week. They can be re-supplied concurrently with normal flight operations and their runways repaired with limited impact to sortie flow. Multiple squadrons ashore can divide the 24-hour day into shifts, so that each squadron has its own battle rhythm yet still provides flexible and responsive air support. The airfield would not necessarily have to be manned to normal capacity at all hours but have the ability to surge when required, as shorter aircraft transit times allow for ground alerts to be set instead of aircraft airborne throughout the night.

Despite the demonstrated benefits of staging carrier aircraft ashore, such deployments involve a variety of risks and challenges. Employing a carrier with a partial or non-existent air wing represents a considerable risk both in the littoral and blue-water environments. Although surface combatants provide much of the aircraft carrier's defensive capability, air wing aircraft provide significant support in the anti-air, anti-submarine, and counter-targeting roles. Beyond defending against potential threats, the CSG has only two tools for power projection: aircraft

and cruise missiles. A carrier without an air wing does not pose a credible threat as a means of deterrence.

Conversely, without the carrier, the CVW loses much of its mobility and flexibility and ceases to exist as a theater reserve for contingency operations. In January 2007, the *Eisenhower* left its station in the Arabian Sea and transited 2100 nm to the eastern coast of Africa to provide air support to Special Forces units combating Al Qaeda in Somalia.⁵² Although AC-130 gunships supported the operation, CVW-7 provided most of the fixed-wing tactical aviation and supported itself with organic tanking.⁵³ Had the entire air wing been ashore, the *Eisenhower* would not have been capable of such a rapid response.

Operating from shore presents two significant challenges to carrier aviation. First, carrier aircrews lose proficiency in sea-based operations. Pilots must maintain carrier qualification currency if they are going to operate from the carrier at any point later in the deployment, which has direct impact on the air wing's mobility. Prowler squadrons ashore during OIF typically sent pilots back to the carrier every two weeks, posing a considerable scheduling and logistics requirement.⁵⁴ More importantly, it means that some CVW aircraft and personnel must remain aboard the ship.

Second, the Navy neither trains nor equips its carrier squadrons for expeditionary operations, as a matter of practice.⁵⁵ Operating in a foreign country with an ongoing insurgency presents significant force protection requirements. Despite units dedicated to base security, all personnel must be trained in small arms proficiency and the use of bio-chemical protective gear, as well as provided the necessary uniforms, body armor, weapons, and ammunition. The Navy has addressed this issue in an ad-hoc manner, relying on the individual squadron to coordinate

proper training and providing equipment prior to deployment only for the units already designated to go ashore. No capability exists to equip squadrons on short notice for shore-basing once on deployment.

Although the benefits of land-basing carrier aircraft may outweigh any of the risks and challenges at the tactical and operational levels, the reliance on the existence of suitable and proximate airfields remains a strategic risk. The periodic and transitory partnerships that define post-Cold war US diplomacy manifest themselves in similarly unpredictable agreements for basing forces in allied countries.⁵⁶ Despite access to a sizable air base in Saudi Arabia from which to conduct NFZ enforcement for Operation SOUTHERN WATCH, the Saudi government placed significant restrictions on the type of aircraft that could fly from Prince Sultan Air Base.⁵⁷ During OEF, the British government demanded veto power on any target attacked by US aircraft operating from Diego Garcia.⁵⁸ Even established agreements are no guarantee of future access, as demonstrated by Turkey's denial of Incirlik as an operating base for OIF despite its use by coalition aircraft during Operation NORTHERN WATCH.

IMPROVING SEA-BASED IW AIR SUPPORT

In OEF and OIF, the Navy has addressed the challenges presented by aircraft carrier limitations in a piecemeal fashion. Those assets unique to naval aviation have been sent ashore to ensure that their effects can be provided on a more persistent and continuous basis. Land-basing remains an option in those specific campaigns because joint air forces have access to airfields in host countries where the US military still maintains a large presence.

IW environments must be considered in which US presence on the ground is limited or non-existent, however. Many countries welcome assistance and support yet balk at any overt

presence or footprint that may fuel anti-Western sentiment. Disaster relief provided to Indonesia by the USS *Lincoln* (CVN-72) ran into such restrictions. Despite providing 5 million pounds of supplies over 35 days, CVW-2 helicopters did not remain on the ground in Indonesia overnight.⁵⁹

The US currently assists the Philippine government with COIN and counterterrorism operations on the southern island of Mindanao and in the Sulu Archipelago by providing monetary assistance in addition to a small footprint of advisors limited by agreement to 600 personnel.⁶⁰ Should the conflict escalate to the point in which US tactical air support is required, the Philippines may not welcome a large American presence at their airfields.⁶¹ Such overt US involvement may impact government legitimacy, as it has the potential to fuel insurgent motivations and provide valuable propaganda.

The nearest allied countries in which the US could realistically base air assets (Thailand, Singapore, Australia and Japan) are all more than a thousand miles away. Similar to the northern campaign in the OIF invasion, the only available land-based offensive air support would be the occasional heavy bomber. Such an aircraft can drop all of its ordnance at one location - which is rarely a requirement in IW - or smaller amounts of ordnance at different consecutive locations.⁶² Only multiple sea-based strike/fighters could simultaneously support several dispersed ground units in the described scenario.⁶³ In this scenario, the shorter distance and faster re-fueling and re-arming turnaround time make sea-based air support the better option.

Analysts from the Research and Development (RAND) Corporation make a similar argument in considering a potential state of affairs in Colombia, in which leftist guerilla groups begin to prevail against national police and military forces.⁶⁴ Since regional sensitivities would preclude a robust US presence, they conclude "carrier based aviation will be the primary means

of providing reconnaissance, surveillance, and strike missions to support the Colombian forces.”⁶⁵ As the *Lincoln* tsunami-relief operation demonstrated, an aircraft carrier provides sea-based air support that is far less intrusive than an air base that requires significant force protection and logistics footprints.⁶⁶

Even in operations in which the Air Force has in-country basing rights and aircraft with similar capabilities, naval carrier aviation has played more than a merely supplementary role. When the Air Force grounded all of its F-15 Eagle fighter aircraft in late 2007, including those flying missions over Afghanistan, F/A-18 Hornets aboard the *Enterprise* in the Arabian Sea filled the resulting vacancy.⁶⁷ Although stationed in the Arabian Gulf in support of OIF when initially tasked, the aircraft carrier transited to the Arabian Sea and launched OEF sorties within twenty-four hours, further demonstrating the inherent flexibility of sea-based air operations.⁶⁸

Potential IW scenarios which require air support provided principally by sea-based aircraft dictate a developed capability for US aircraft carriers to conduct around-the-clock flight operations for extended periods. Despite this demonstrated need the Navy has yet to establish continuous operations as a formal requirement.⁶⁹ Although naval aircraft have evolved radically since the commissioning of the USS *Nimitz* (CVN-68) in 1975, the design of the “modern” aircraft carrier has not been altered in 40 years.⁷⁰

According to a Center for Naval Analyses study examining the maximization of carrier sorties and firepower, manning is the biggest limitation to expanding flight deck capacity.⁷¹ The second flight deck shift required for long-term 24-hour operations requires additional personnel assigned to the ship’s company: aircraft directors, catapult officers, fueling and ordnance personnel, air traffic controllers and tower operators. Additionally, the CVW squadrons would

need extra maintenance personnel.⁷² An inherent trade-off to a carrier's flexibility exists in its limited ability to expand its operational capacity; a finite number of personnel can be embarked at any given time.

As an additional complication, numerous "principals" must be present during all flight operations that have little or no redundancy in the current system: the Commanding Officer (CO), the Air Boss and Mini Boss, and the Flight Deck Handler.⁷³ While conceivably additional Air Bosses and Handlers could be assigned to the ship, there is only one CO. No explicit rules exist about when the CO must be on the bridge but traditional expectation and common-sense leadership demand his presence during flight operations.⁷⁴

The next generation of aircraft carrier will be manned with even less personnel than a *Nimitz*-class. The design for CVN-78, the first of the *Ford*-class carriers, provides for the reduction of 1200 personnel compared to a *Nimitz* carrier.⁷⁵ Modernized systems that require less maintenance and upkeep, improvements in weapons/material movement processes, and flight deck configuration changes make these cutbacks possible. Such manpower savings have a cumulative effect, as fewer personnel onboard results in fewer support billets required for "hotel" services such as laundry and food preparation.⁷⁶

Unfortunately, at the present state of CVN-78 development the planned personnel savings cannot be redistributed to add redundancy. CVN-78 design reduces racks and living space by 1100 sailors, making the anticipated reduction of 1200 a *de facto* requirement.⁷⁷ As a result, further personnel cuts would be necessary to make room for the additional manpower needed for continuous flight operations. The Navy has tasked the Office of Naval Research to assess the potential of reducing carrier manning to 1000 billets through process automations and ergonomic

designs collectively known as human systems integration (HSI).⁷⁸ Such an examination, although theoretical until the *Ford* class enters service, points toward the possibility that the manpower challenges to aircraft carrier support of IW can be overcome. HSI advances would need to be applied to existing ships as well, since *Nimitz*-class carriers will still account for six of the eleven carriers in 2040.⁷⁹

Significant incentive exists for manning reductions, which greatly decrease the overall life-cycle cost of a ship. According to an MIT study, "manpower represents the most expensive single element in the operation of a carrier."⁸⁰ Analysts estimate that each enlisted billet costs the navy \$100,000 per year or \$5 million during carrier's lifetime.⁸¹

Life-cycle costs should not be the only metric applied to manning decisions, however. An aircraft carrier with the additional manning of a second flight deck shift would still cost less than the second carrier required to operating alongside to provide continuous air support. Beyond operating expenses lays the opportunity cost of tying up that additional CVN. The four carriers required at the start of OEF resulted in no carrier presence available for the Pacific or European Commands.⁸² On average, the geographic Combatant Commanders' collective demand for carriers each year outpaces the fleet's supply by 5 ships.⁸³

Many analysts consider Unmanned Combat Air Vehicles (UCAV) to be the solution to increasing naval persistence.⁸⁴ Potentially, UCAVs could launch on the last cycle of the fly day, after which the flight deck shuts down for 8-12 hours until the UCAV recovers on the first cycle of the next day.⁸⁵ Unlike a single-piloted aircraft, UCAV can regularly complete 12-hour missions without the complications of fatigue and other human factors. Unmanned technology should be embraced cautiously, however. The lack of on-site human presence, vital in situations

with troops engaged with the enemy in which aircrew must make rapid decisions based on experience and gathered situational awareness, makes the UCAV a poor IW platform in all but the most elementary ISR missions.

Neither a second flight deck crew nor unmanned vehicles will solve the limitations presented by un-reps and port calls. CVN-78 will still require replenishment underway, but those un-reps will be faster due to better elevators and conveyors, and less frequent thanks to larger tanks to store aviation fuel and recent food storage innovations.⁸⁶ Adding the MV-22 Osprey to the CVW would increase the capability to conduct vertical replenishment for most supplies except fuel.⁸⁷ Port calls, due to their diplomatic benefits, should not be eliminated all together but scheduled only for the beginning and end of deployments, with the understanding that three to five months will be on-station with no break. The impact on morale should not be understated but Navy land-based squadrons (not to mention Army and Marine ground forces) face much more rigorous deployments.

CONCLUSION

Technological innovation must be accompanied by intellectual innovation leading to changes in organization and doctrine. Only then can we reach the full potential of the joint force – decisive capabilities across the full range of military operations.

*Joint Vision 2020*⁸⁸

Every IW conflict exists in a unique geo-political context and requires distinctive methods of military operation. Stating that one approach trumps another in all cases becomes a fool's errand. As such, Naval Aviation must set short-term and long-term objectives for enhancing its ability to support irregular warfare with carrier-based aircraft.

In the short term, the Navy must fully embrace the prospect of sending aircraft ashore when the benefits outweigh the risks, as they did in OEF and OIF. Making carrier air power available every hour of the day will not conquer the limitations imposed by distance. Certain operations may allow aircraft to be land-based much closer to the fight than an aircraft carrier in the littorals. Due to misplaced fears of jeopardizing the relevancy of the aircraft carrier, the Navy has land-based only small numbers of carrier aircraft and personnel. All carrier squadrons should be properly trained and equipped for potential expeditionary operations on every deployment.

Land-basing is not a panacea, however. Airfields ashore take time to build or adequately renovate; are subject to tenuous agreements with host nations; and provide large and vulnerable targets for insurgent forces. Furthermore, reliance on shore-basing as a preferred solution risks raising a generation of naval aviators with limited experience operating from a ship and conducting missions in a maritime environment.

In the long term, the Navy should examine methods to change the nature of carrier operations. First, a change in mindset and doctrine must occur: the primary metric for maximizing air power in IW should not be the number of sorties launched and recovered per cycle but rather the number of cycles available for flight operations per day. Many cycles may only launch a handful of aircraft but those few sorties are vital to maintaining persistent and continuous air support for ground forces. Second, around-the-clock flight operations require a second flight deck shift, which is only possible through the leveraging of systems technologies and process improvements to re-distribute manning levels appropriately. Additionally, design enhancements must allow streamlined underway replenishment evolutions that minimize impact

on flight operations. Third, once the requirement and capability have been established, pre-deployment training and certification must address this new paradigm of long-term, continuous flight operations. Finally, the Navy should re-evaluate its approach to port-calls by placing a higher priority on supporting ground forces while in combat AORs and setting aside shore liberty until relieved by the next carrier.

Ultimately, the Navy must evaluate each situation by careful analysis of the risks and benefits and decide the most appropriate course of action: sea-basing or land-basing (see Appendix A). The ability to adapt to the realities of a conflict and capitalize on available strengths must be the overriding factor in such decisions. Thus, the Navy must prepare for future irregular operations by fully investing for both contingencies not only with dollars but also with personnel, training, and doctrine.

ENDNOTES

¹ Vice Admiral Charles W. Moore and Lieutenant General Edward Hanlon, "Sea Basing: Operational Independence for a New Century," *US Naval Institute Proceedings*, January 2003, <http://web.ebscohost.com>.

² US Department of Defense, *Irregular Warfare Joint Operating Concept Version 1.0*, (Arlington, VA: Department of Defense, September 11, 2007), 7.

³ Benjamin S. Lambeth, *Air Power Against Terror: America's Conduct of Operation Enduring Freedom* (Santa Monica, CA: Rand Corporation, 2005), 91.

⁴ Owen R. Cote, Jr. *The Future of Naval Aviation* (Cambridge, MA: MIT Security Studies Program, February 2006), 7.

⁵ Scott C. Truver, "The US Navy in Review," *US Naval Institute Proceedings*, May 2002, <http://proquest.umi.com>.

⁶ Moore and Hanlon.

⁷ US Joint Chiefs of Staff, *Joint Vision 2020* (Washington, DC: Government Printing Office, June 2000), 14.

⁸ C.E. Callwell, *Small Wars: Their Principles and Practice*, 3rd ed. (London: His Majesty's Stationery Office, 1906; Lincoln, NE: University of Nebraska Press, 1996), 21. Citation is to the Nebraska edition; US Departments of the Army and Air Force, *Military Operations in Low Intensity Conflict*, FM 100-20/AFP 3-20 (Washington, DC: Departments of the Army and Air Force, 1990), 1-1. Although he did not invent the term "small war", Charles Callwell wrote the definitive study. He acknowledged that the concept had "no particular connection with the scale on which any campaign may be carried out; it is simply used to denote operations of regular armies against irregular forces." The definition of Low-Intensity Conflict (LIC) varied significantly over the decades, but at the term's high-water mark in 1990, the US Army considered LIC as "political-military confrontation between contending states or groups below conventional war and above the routine, peaceful competition among states. It frequently involves protracted struggles... [and] ranges from subversion to the use of armed force." The DOD would later place many LIC operations under the term Military Operations Other-than-War (MOOTW), a cumbersome term that did little to clarify the ambiguous nature of such endeavors.

⁹ *Irregular Warfare Joint Operating Concept*, 10-11, B-2 and B-3. "Insurgency and counterinsurgency are at the core of IW." Counterinsurgency is defined as "military, paramilitary, political, economic, psychological, and civic actions taken by a government to defeat...an organized movement aimed at the overthrow of a constituted government through the use of subversion and armed conflict." (JP 1-02 *DOD Dictionary of Military and Associated Terms*, quoted in the IW JOC). SSTR operations such as humanitarian assistance, disaster relief, and peacekeeping "occur outside the context of IW or armed conflict."

¹⁰ *Irregular Warfare Joint Operating Concept*, 1.

¹¹ *Irregular Warfare Joint Operating Concept*, 8.

¹² *Irregular Warfare Joint Operating Concept*, 17.

¹³ US Department of the Navy, *Naval Warfare*, NDP 1 (Washington, DC: Department of the Navy, March 28, 1994) and US Department of the Navy, *Naval Doctrine for Military Operations Other-Than-War*, NWP 3-07 (Washington, DC: Department of the Navy, September 1998)

¹⁴ US Department of the Navy, Headquarters US Marine Corps and Headquarters US Coast Guard, *A Cooperative Strategy for 21st Century Seapower* (Washington, DC: Department of the Navy, October 2007), 6.

¹⁵ Headquarters US Marine Corps, *Small Wars Manual* (Washington, DC: Government Printing Office, 1940; Washington, DC: Department of the Navy, 1990), 9-15 to 9-16.

¹⁶ US Department of the Army, *Counterinsurgency*, FM 3-24/MCWP 3-33.5 (Washington, DC: Department of the Army, December 15, 2006), vii.

¹⁷ *Counterinsurgency*, E-1.

¹⁸ Dennis M. Drew, "Air Theory, Air Force, and Low Intensity Conflict: A Short Journey to Confusion." in *The Paths of Heaven: The Evolution of Air Power Theory*, ed. Phillip S. Meilinger, 321-355 (Maxwell AFB, AL: Air University Press, 1997), 321. For good examples of essays written by USAF personnel, see Raymond Knox, "High Speed Jets in a Low Speed War: The Utility of Tactical Airpower in Low-Intensity Conflict," (Unpublished monograph, School of Advanced Military Studies, US Army Command and General Staff College, April 20, 1989)

and Arthur D. Davis, *Back to the Basics: An Aviation Solution to Counterinsurgent Warfare, Wright Flyer Paper No. 23* (Maxwell AFB, AL: Air University Press, December 2005) <http://stinet.dtic.mil>.

¹⁹ US Department of the Air Force, *Irregular Warfare*, AFDD 2-3 (Washington, DC: Department of the Air Force, August 1, 2007), Foreword.

²⁰ AFDD 2-3, vi and 27-45.

²¹ James S. Corum and Wray R. Johnson, *Airpower in Small Wars: Fighting Insurgents and Terrorists* (Lawrence, KS: University of Kansas Press, 2003), 434-436. Air power "provides the flexibility and initiative that is normally the advantage of the guerilla."

²² AFDD 2-3, 1.

²³ *Irregular Warfare Joint Operating Concept*, C-6.

²⁴ Corum and Johnson, 425.

²⁵ Loren B. Thompson, "Low-Intensity Conflict: An Overview," in *Low Intensity Conflict: The Pattern of Warfare in the Modern World* ed. Loren B. Thompson, 1-25 (Lexington, MA: Lexington Books, 1989), 23.

²⁶ Specific improvements to IW capability include: providing more accurate fires and limiting collateral damage with smaller and more precise GPS and laser-guided weapons, supporting non-traditional ISR with improved Forward-Looking Infrared Radar and reconnaissance pods, and enabling increased IO capabilities with the EA-6B Prowler and greater capacity for the Airborne Battlefield Command and Control Center (ABCCC) mission with the improved E-2C/D Hawkeye.

²⁷ Moore and Hanlon. F/A-18C Hornet has an unrefueled radius of 500 nautical miles (nm). The F/A-18 E/F has an increased radius of 650 nm and the F-35 Joint Strike Fighter will reach 800 nm.

²⁸ Davis, Jessica, "GW Pilots Soar with Purpose but Fight in Relative Obscurity," *Navy Times*, August 26, 2002, <http://infoweb.newsbank.com>; Headquarters US Air Force, *Operation Anaconda: An Air Power Perspective* by Grant, Rebecca and Office of Air Force Lessons Learned (Washington, DC: Department of the Air Force, February 7, 2005), 117. Every carrier-based aircraft has a "max-trap" weight, which limits the amount of fuel and ordnance the aircraft can be carrying when it makes an arrested landing. Any ordnance brought back to the ship is at the expense of fuel, a precious commodity in the dynamic environment of carrier flight operations. Such considerations either prohibit certain mission configurations or force aircrew to jettison ordnance prior to recovery. Ordnance jettisons have costs not simply in monetary terms, but in the wasting of ammunition from the carrier's limited magazine storage, thus increasing replenishment requirements with no associated combat benefit. IW air operations most clearly demonstrate the "max-trap" challenge since the persistent presence of airborne ordnance is a more relevant requirement than the actual expenditure of the weapons. Even in Operation ANACONDA, an IW battle unusual for the amount of airborne firepower expended, numerous navy sorties brought back unexpended ordnance.

²⁹ Mark S. Leavitt, Jeffery M. Vorce and Michael M. Hsu, "For Compassion and Country-Unified Assistance," *US Naval Institute Proceedings*, April 2005, <http://proquest.umi.com>.

³⁰ CDR Gary Patenaude, USN, VAQ-137 Executive Officer, email message to author January 2, 2008. The Army first embarked GLOs aboard the *Enterprise* in 2006, and has continued the program for every subsequent aircraft carrier deployed to the CENTCOM AOR.

³¹ Angelyn Jewell, *Sortie Generation Capacity of Embarked Airwings* (Alexandria, VA: Center for Naval Analyses, December 1998), 28-29 and 100.

³² Angelyn Jewell and Maureen Wigge, *Surge 97: Demonstrating the Firepower Potential of an Aircraft Carrier* (Alexandria, VA: Center for Naval Analyses, February 1998), 5.

³³ Corum and Johnson, 434-436.

³⁴ Lambeth, 92.

³⁵ Lambeth, 92.

³⁶ Angelyn Jewell, Timothy Roberts and Kevin DeBisschop, *Manning to Maximize Carrier Firepower and a New Structure for the Carrier Reserve Units* (Alexandria, VA: Center for Naval Analyses, February 2002), 4.

³⁷ Naval Air Systems Command, *NATOPS Landing Signal Officer Manual* (Patuxent River, MD: Department of the Navy, 01 May 2007), 6-7.

³⁸ LCDR Christopher Sullivan, USN, CVW-7 Assistant Operations Officer, email message to author, March 18, 2008.

³⁹ Sullivan, email message to author, December 12, 2007.

⁴⁰ LCDR Eric Sinibaldi, USN, email message to author, January 18, 2008. The *Enterprise* deployed shortly after September 11, 2001 and proceeded directly to the Arabian Sea to participate in the Afghanistan invasion. The ship operated for 159 consecutive days without a port call.

⁴¹ CDR Edward Wetzel, USN, CSG-3 Air Operations Officer, email message to author, March 12, 2008

⁴² Wetzel, email message to author, December 12, 2007.

⁴³ Frank N. Latt, "Carrier Strike Group TACAIR Expeditionary Operations Ashore: "Every Sailor A Rifleman," (Master's Thesis, Marine Corps University, 2005), 20, <http://12.1.239.226/isispeq.html>.

⁴⁴ John B. Lundstrom, "Chester W. Nimitz: Victory in the Pacific," in *Quarterdeck and Bridge: Two Centuries of American Naval Leaders*, ed. James C. Bradford, 327-344 (Annapolis, MD: Naval Institute Press, 1997), 336.

⁴⁵ The Air Force also flies EC-130 electronic attack aircraft which perform similar but not identical missions to the EA-6B. The expeditionary squadrons, made up of both navy and air force aircrew, never embarked on aircraft carriers, but instead deployed to Turkey, Saudi Arabia, Japan and Italy as part of a shared rotation schedule with the four Marine Corps Prowler squadrons.

⁴⁶ John B. Nathman, "We Were Great," *US Naval Institute Proceedings*, March 2002, <http://web.ebscohost.com>.

⁴⁷ Patenaude, email message to author January 2, 2008.

⁴⁸ Latt, 24-25.

⁴⁹ Curtis A. Utz, Mark L. Evans, and Dale J. Gordon, "The Year in Review 2005," *Naval Aviation News*, July-August 2006, 26 and "The Year in Review 2006," *Naval Aviation News*, July-August 2007, 18, <http://www.proquest.umi.com>.

⁵⁰ Brian Harvill, "VAQ-141 Hosts CVW-8 in Al Asad," *Northwest Navigator*, December 9, 2005. <http://www.northwestnavigator.com>.

⁵¹ Latt, 26.

⁵² Sullivan, email message to author, December 14, 2007.

⁵³ Sullivan, email message to author, December 12, 2007.

⁵⁴ LCDR Michael O'Leary, USN, email message to author, January 21, 2008; Sullivan, email message to author, March 11, 2008. More experienced pilots (O-4 and above) were often allowed up to four weeks between night traps. During 2005 deployments, S-3B Vikings proved invaluable for shuttling aircrew between Al Asad and the carrier. Subsequent deployments by CVWs lacking the S-3B had to rely on a difficult logistics train to rotate aircrew: C-2 Greyhound from CVN to Bahrain, C-12 to Al Udeid, and C-130 to Al Asad. This complicated route took three days (one way) to accomplish.

⁵⁵ Latt, 37-39.

⁵⁶ Cote, 15.

⁵⁷ Only "support" aircraft were authorized (C2, EW, tankers, fighters). Any aircraft that could potentially drop a bomb in Iraq had to be based elsewhere.

⁵⁸ Lambeth, 317.

⁵⁹ Leavitt, Vorce and Hsu.

⁶⁰ Robert Kaplan, *Imperial Grunts: On the Ground with the American Military, from Mongolia to the Philippines to Iraq and Beyond* (New York: Random House, 2005), 147.

⁶¹ Dr. Timothy Roberts, Director Aviation Systems and Technology Team, Center for Naval Analyses, interview with author, December 21, 2007.

⁶² Roberts interview.

⁶³ Roberts interview.

⁶⁴ John Gordon, Peter A. Wilson, John Birkler, and Steven Boraz, *Leveraging America's Aircraft Carrier Capabilities: Exploring New Combat and Noncombat Roles and Missions for the US Carrier Fleet* (Santa Monica, CA: RAND Corporation, 2006), 42.

⁶⁵ Gordon, Wilson, Birkler, and Boraz, 42.

⁶⁶ Leavitt, Vorce and Hsu.

⁶⁷ "F-15s Grounded - Again," *Navy Times*, December 10, 2007, 4.

⁶⁸ Patenaude, email message to author, March 11, 2008.

⁶⁹ Captain Ed McNamee, USN, OPNAV N885E (Future Aircraft Carrier Requirements- CVN-21), phone interview with author, December 13, 2007.

⁷⁰ Defense Science Board Task Force, *Future of the Aircraft Carrier* (Washington, DC: Department of Defense, October 2002), <http://www.policyfile.com>, 5.

⁷¹ Jewell, *Sortie Generation Capacity of Embarked Airwings*, 101.

⁷² Although manned to conduct around-the-clock maintenance, CVW squadrons limit the number of personnel qualified to work on the flight deck during flight operations (troubleshooting, final checks, and ordnance loading) to the most capable in the maintenance department.

⁷³ Roberts interview.

⁷⁴ CAPT McNamee, email to author, January 18, 2008. Other senior personnel, such as the Executive Officer (XO) and Navigator, are often qualified and trusted to take the CO's place on the bridge during flight operations, but scheduling them for that watch on a regular basis would significantly detract from their primary responsibilities.

⁷⁵ "CVN-21 Program Readiness Review," OPNAV N885E PowerPoint brief, provided on December 17, 2007 by Captain Ed McNamee. CVN-78 has been previously known as "CVN-X" or "CVN-21".

⁷⁶ Adam Siegel and Robert M. Schatzel, "CVN-21 HSI" *Wings of Gold*, Spring 2004, 31.

⁷⁷ McNamee interview.

⁷⁸ Andrew Scutro, "Downsizing on the Decks," *Navy Times*, October 22, 2007, 12.

⁷⁹ "CVN-21 Program Readiness Review."

⁸⁰ Reuven Leopold, *Sea-Based Aviation and the Next US Aircraft Carrier Design: The CVX* (Cambridge, MA: MIT Security Studies Program, 1998), 13.

⁸¹ Siegel and Schatzel, 30. Not accounting for inflation and other cost increases.

⁸² Lambeth, *Air Power Against Terror*, 332.

⁸³ McNamee interview.

⁸⁴ *Quadrennial Defense Review Report*, 46.

⁸⁵ McNamee interview.

⁸⁶ McNamee interview; and Gidget Fuentes, "Getting Fresh: Carrier Tests Promising Produce Packaging," *Navy Times*, February 25, 2008. The USS *Ronal Reagan* (CVN-76) Services Officer predicts that new packaging "could extend our need to replenish by five to seven days, if not more."

⁸⁷ Vert-reps do not require supply ships to be right alongside the carrier, and can be conducted between normal recoveries and launches.

⁸⁸ US Joint Chiefs of Staff, *Joint Vision 2020*, 44-45.

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APPENDIX A – Risk/Benefit Analysis of Options for Providing Naval Aviation Support to Irregular Warfare

	Send Aircraft Ashore	Single CVN w/ 24 hour flight op capability	Deploy Two CVNs to theater
Persistence	In-country bases: High Nearby bases: limited by distance	Limited by Distance	Limited by Distance
Continuity	Most Likely High- Limited by aircrew / aircraft	Numerous implementation challenges Limited by aircrew / aircraft	Most likely, but not guaranteed Operating costs of 2 nd CVN
Access	Subject to HN limitation or refusal	Limited only by CVN survivability and over-flight of adjacent airspace	Limited only by CVN survivability and over-flight of adjacent airspace
Base Survivability	Airfield is a potential target CVN lacks CVW	CVW embarked	CVW embarked
Flexibility to respond to higher priority crisis w/in theater	Limited and at expense of current operation	High- but at expense of current operation	High
Flexibility to respond to crisis in separate region	Highly restricted	Handled by separate CVN deployed to that theater	Requires 3 rd CVN. Opportunity cost of 2 nd carrier in same theater
Personnel Training & Equipment Requirements	Body armor, small arms, NBC gear	None additional	None additional
Coordination w/ Ground Forces	Face-to-face briefs / Better connectivity	Ground Liaison Officers embarked	Ground Liaison Officers embarked
Pilot CQ Proficiency	Logistics/Sked challenges	No risks	“Day shift” CVN may have challenges
Ordnance Loads	Restricted only by Airframe limitation	Restricted by “Max-trap”	Restricted by “Max-trap”

= Benefit
 = Risk Mitigated with Cost
 = Risk