CH–53 landing on *USS Dwight D. Eisenhower.*

U.S. Navy (Alisha M. Clay)

Joint Shipboard Helicopter Operations

By GEOFFREY C. LAMBERT *and* MARK M. HUBER

The use of both Army and Air Force helicopters from ships during contingency operations in Grenada, Panama, Somalia, and Haiti suggests that helicopters of all services should be capable of operating from naval vessels. But daunting incompatibilities exist between helicopters and ships from which they operate. Although the safe execution of past operations speaks well of the skill of the squadrons and ships involved, failing to resolve incompatibilities belies a serious dysfunction: the inability to address lessons learned to improve joint operations.

Understanding joint shipboard helicopter operations enables planners to efficiently prepare for the future. Such operations are likely to be short fused, highly visible, and dynamic in terms of the type and scale of missions. Considering joint shipboard helicopter operations in support of Uphold Democracy in Haiti and Earnest Will in the Persian Gulf is illustrative.

Major General Geoffrey C. Lambert, USA, directs the Center for Operations, Plans, and Policy at U.S. Special Operations Command and Lieutenant Commander Mark M. Huber, USN, serves as an air allocations officer at U.S. Special Operations Command.

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
2001		**00-00-2000 to 00-00-2001**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Joint Shipboard Helicopter Operations	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **National Defense University,Institute for National Strategic Studies,260 5th Avenue SW Fort Lesley J. McNair,Washington,DC,20319**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**6**	


U.S. Navy

Army helicopters on *USS Enterprise*, Uphold Democracy.

Operational Necessity

The Navy facilitated the application of military power in Haiti by embarking Army aviation units aboard *USS America* and *USS Dwight D. Eisenhower*. The former embarked Joint Special Operations Task Force 188 with 2,200 personnel. Special operations aviation units flew MH–53s, MH–47s, UH–60s, and light observation helicopters from *USS America* for more than a month to support Uphold Democracy. Meanwhile, conventional Army helicopter units flew personnel from 10th Mountain Division ashore to Port-au-Prince from *USS Dwight D. Eisenhower*.

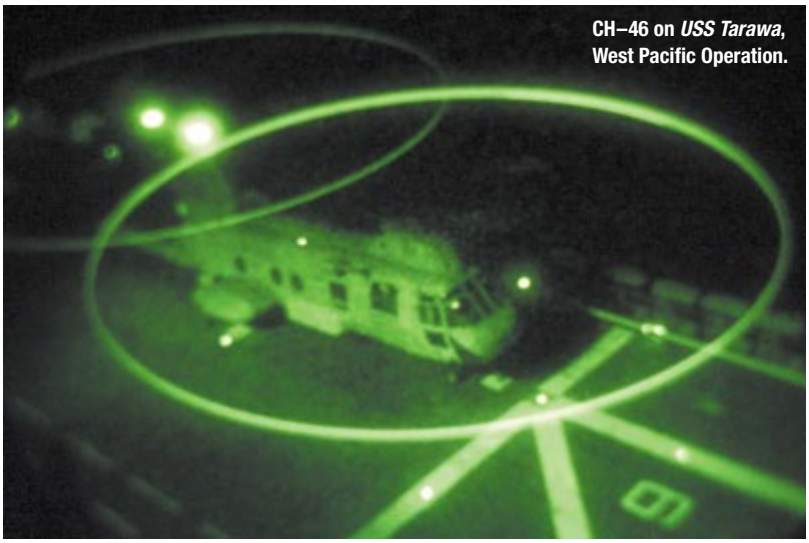
In Uphold Democracy, special operations and conventional aviation units were required to conduct operations on short notice. Issues of interoperability could only be raised in the time that it took for carriers to transit from the east coast of the United States to assigned stations off Haiti.

Even though many aviators had never flown from ships before embarking in the carriers, they were now tasked to conduct large-scale joint shipboard helicopter operations.

Not all joint shipboard helicopter operations are major efforts, nor are they always conducted from large carrier flight decks. Earnest Will is an example. Deploying Army special operations helicopters to the Persian Gulf in 1987 was not only a much lesser effort but involved ships (such as frigates and destroyers) with much smaller aviation facilities. Though deployment lead time was longer than in Uphold Democracy, equipment compatibility and operational procedures issues had to be addressed after, not before, the arrival of helicopters aboard various ships. Earnest Will was a case of highly innovative teamwork by the Army and Navy. The payoff was evident when the helicopters caught *Iran Ajr* laying mines in international waters and attacked it.

In Earnest Will, though they were proficient in shipboard operations, neither the Navy nor Marine Corps could provide helicopters and crews for night, low-level countermine operations that might involve engaging small boats. While less proficient at shipboard operations, the Army had rotary-wing aircraft for such missions and crews trained to operate in a low-level environment with night vision devices. Thus Earnest Will established that joint solutions to new problems are often the answer and that interoperability is key to winning on the asymmetric battlefield.

Uphold Democracy and Earnest Will reveal that future contingency operations are unlikely to provide adequate time for preparation and that



CH–46 on *USS Tarawa*, West Pacific Operation.

U.S. Navy (Braden P. O'Brien)

ship crews and aviation personnel must overcome equipment compatibility issues quickly to establish operational procedures for all participants.

Experience suggests that future JFCs may seize the opportunity to employ the same assets in other useful mission profiles to increase combat effectiveness. Thus joint planners must grasp the general characteristics of joint shipboard helicopter operations and the means to appreciate the realities inherent in the employment of Army and Air Force helicopters from Navy ships. Otherwise, joint commanders may decide in crisis out of alignment with actual capability.

Army and Air Force helicopters often lack features that are considered essential by the Navy

Flawed by Design

Not all commanders and planners have shipboard or helicopter aviation experience, which can lead to the notion that joint shipboard helicopter operations are nothing more than helicopters taking off from and landing on ships. But the challenges are many and can be broadly categorized as material and nonmaterial.

Material challenges are primarily related to aircraft and ordnance. Both Army and Air Force helicopters often lack features that facilitate shipboard operations and that are considered essential by the Navy and Marine Corps. Their absence does not necessarily preclude using helicopters at sea, but it will diminish the efficiency of ships conducting flight operations; more troubling, the absence of certain equipment may lead to major safety hazards. A rotor brake, for example, simply stops the movement of helicopter blades more quickly after engine shutdown than when they are allowed to coast down. A Navy SH–60 helicopter with a rotor brake stops blades within 50–80 seconds but more quickly if necessary. Depending on wind conditions, an Army UH–60 without a brake may take up to five minutes to windmill to a stop. At low RPMs, helicopter rotor blades are prone to flap up and down, creating a hazard to equipment and personnel and, at the least, placing stress on rotor head components which can cause damage. The blades are also susceptible to flapping in turbulent winds commonly produced at flight quarters. As a result helicopters without rotor brakes pose a shipboard hazard that routinely endures for relatively long periods of time.

Rotor brakes are not the only concern. Ships cannot make turns during the disengagement or shut down of helicopter blades because turns exacerbate winds that make low-RPM blades vulnerable to flapping. Being unable to maneuver impacts on the ability to transit from one place to another in a timely fashion and can make ships more assailable to attack. Minutes and seconds count when maneuvering large ships, and the absence of a simple device such as a rotor brake could have profound consequences.

The lack of blade spread/fold systems on Army and Air Force helicopters is more onerous. Again, both Navy and Marine helicopters have automatic blade spread/fold systems, which in the case of folding systems quickly reduces the size of helicopters for storage on flight decks. Navy SH–60s can fold their blades in two minutes. Manually folding the blades of Army UH–60s can take up to 30 minutes. Because a ship must maneuver to keep winds within prescribed limits for blade fold operations, its capability to do so expeditiously or defensively is restricted. In addition, helicopters with blades spread on flight decks keep that location from being used to either launch or recover aircraft. In the case of fixed-wing operations from carriers, many Army helicopters could not be started or shut down within the time constraints presented by a normal carrier cycle for flight operations, making fixed- and rotary-wing operations mutually exclusive. This inability to conduct simultaneous fixed- and rotary-wing operations tremendously limits the flexibility of joint force commanders.

Ordnance also poses vexing challenges. It makes little sense to operate Army or Air Force helicopters from Navy vessels if they cannot launch with the proper complement of defensive and offensive ordnance. But not all Army and Air Force ordnance is certified for storage aboard ships. Even when ordnance is certified, handling

and loading may be problematic. The Army 2.75 inch rocket is a case in point. Naval procedures require mounting pre-loaded rocket pods on aircraft so pods do not have to be replenished with rockets manually. The Navy method keeps rockets safe from exposure to electromagnetic interference or accidental firing. But mounting pods on AH–6s invalidates boresight alignment and degrades their accuracy. Replacing pods poses a hard choice: conducting boresight alignment with each reload or accepting some degree of inaccuracy. In either case, uploading rocket pods is more time-consuming than inserting new rockets in a pod attached to an aircraft—even without boresight alignment. Barring changes in existing protocol for reloading rockets, JFCs must accept mission degradation. One obvious alternative solution is finding ways to certify Army procedures for manually reloading rockets.

Even though Army and Air Force helicopter hardware issues impact on their capabilities once embarked, avionics challenges are also worth noting. First, some aircraft do not have navigational equipment to facilitate finding and recovering aboard ships, especially at night or in poor weather. Second, many Army and Air Force helicopter avionics and flight control systems are not designed to operate within the intensive electromagnetic environment of ships. Often helicopters cannot land in close proximity to ship emitters because of interference or radar hazards. Consequently, JFCs find themselves on the horns of a dilemma. They may elect to secure some ship emitters, such as navigation or air defense radars that may be crucial to safety, to launch and recover helicopters. Alternately, they can accept limits while conducting flight operations, such as restricting the spots on deck that can be used, to keep radar systems operating. Either choice means compromise in the overall capability of the joint force.

Navy flight deck personnel must rely on Army squadron members to move aircraft

People Problems

Nonmaterial challenges—aircrew as well as ship crew procedures—are significant as well. Familiarity with shipboard operations among Army and Air Force helicopter aircrew and support personnel varies considerably. Special operations aviation units are most accustomed to operations aboard vessels; some personnel are as familiar with the shipboard environment as naval pilots. On the other hand, conventional units with virtually no shipboard experience are periodically tasked to train and operate from ships. Likewise, Navy experience with Army and Air Force aviation varies widely. Some ship crews are well versed with challenges of supporting non-naval helicopters; others may have no experience whatsoever.

Repositioning aircraft on deck appears to be a simple procedure conducted countless times daily on large aviation ships. In fact, it is rife with danger unless done by trained professionals. Aircraft weighing tens of thousands of pounds are routinely maneuvered within inches of the edge of decks and one another on a surface that is slick with rain and grease, not to mention pitching and rolling motion. Mishaps involving aircraft running over people or even slipping overboard offer common and vivid testimony to hazards of moving aircraft on deck. Flight deck personnel safely effect aircraft movement because they assiduously follow procedures. Introducing airframes that were not designed for flight decks requires careful management of elevated risks.

The AH–6 is a prime example. Navy and Marine aircraft are moved on large decks by tow bars coupled to tractors. Tow points on AH–6s were designed for winch and cable systems, not tow bars and tractors. Consequently, the only way to move aircraft on ships requires six people to push it, a method that presents many more hazards afloat than ashore. Furthermore, Navy flight deck personnel are not trained to perform the procedure. Thus they must rely on Army squadron members to move aircraft. This cumbersome situation could disrupt the flow of flight operations, especially in cases of unexpected aircraft movements.

Lack of familiarity with Army and Air Force helicopters presents added challenges. Flight deck personnel are well acquainted with associated hazards and fire-fighting and rescue procedures for naval aircraft operating from ships. The same can't be said of Army and Air Force helicopters. AH–64s, for instance, create particular hazards for flight deck personnel who might be required to extract incapacitated pilots from cockpits. Cockpit windows can be jettisoned by explosive charges to expedite pilot egress. Without knowledge of this feature and procedures for gaining access to cockpits, Navy flight deck personnel could be injured trying to remove pilots from aircraft that are on fire or have crashed on deck.

Army and Air Force pilots with little experience of embarked operations have much to learn in order to operate from ships and all the more so when functioning with Navy or Marine aircraft. When conducting cyclic flight operations, aircraft carriers routinely launch and recover up to forty aircraft at a time, making airspace deconfliction critical. Army and Air Force pilots must quickly be familiarized with launch and recovery procedures to avoid interfering with flight operations.

UH–60A landing on board *USS Peleliu.*

U.S. Navy (Erin A. Zocco)

U.S. Navy (Erin A. Zocco)

Briefing on procedures for Army helicopters.

Moreover, shipboard conditions do not always favor launch or recovery procedures used by Army pilots. When flight deck spots are limited, pilots accustomed to launching many aircraft simultaneously may have to wait to cycle aircraft on the same spots for launch over a long period before rendezvousing and advancing to mission objectives. The inability to launch simultaneously can significantly reduce the radius of action, a critical consideration for joint planners.

Finally, simply bringing Navy and Army or Air Force units together can strain planning procedures and execution. Typically, ship companies are unfamiliar with the embarking Army and Air Force unit organization and structure and vice versa. Confusion results as each organization endeavors to learn the other's functional counterparts. Until these relationships are understood, coordination suffers, diminishing joint planning effectiveness.

Changing Course

Recognizing that lessons from joint shipboard helicopter operations did not lead to changes in tactics, techniques, and procedures, the Office of the Secretary of Defense established a test and evaluation program in 1998. Designated the joint shipboard helicopter integration process (JSHIP) and located at Naval Air Station Patuxent River, it is innovative in accomplishing its mission and ultimately in providing more options to commanders.

Some of the most ambitious program tests involve ship-helicopter combinations most likely to be used in joint operations. Compatibility issues are identified and tests are performed. After data is evaluated, legacy products and recommended changes to improve future operations result.

There have been positive developments: improved ordnance handling procedures; changes to simultaneously launching multiple helicopters from large amphibious ships; training packages to prepare aviation units to embark more easily; and electromagnetic vulnerability software designed to represent transmitter stand-off distances. Ultimately this process will result in a revision of

1st Combat Camera (Sean M. Worrell)

HH–60 during Desert Rescue VII.

Joint Pub 3-04.1, *Joint Tactics, Techniques, and Procedures for Shipboard Helicopter Operations.*

Though sea tests are the most visible manifestation of ongoing efforts, work in other areas also has promise. The program recognizes that crew training is enhanced by flight simulators that more accurately replicate the shipboard environment. Toward that end, data has been collected to develop simulation software that not only reproduces turbulent airflow encountered around ship structures but replicates pitch and roll. The result will be flight simulations to prepare helicopter crews to operate in a joint shipboard environment.

Reasonable Expectations

It is unreasonable to expect Army and Air Force helicopters to operate with the same ease on ships as their Navy and Marine Corps counterparts. Even with unlimited resources and time, the current program could not accomplish that result. In any case, the cost would be enormous. And although joint shipboard helicopter operations have become more commonplace, they are still too infrequent to justify higher spending. The cost of retrofitting even a fraction of existing Army and Air Force helicopter fleets with rotor brakes and automatic blade fold and spread systems is prohibitive, much like the cost of certifying Army ordnance for shipboard storage.

Realistically, joint planners must make operational compromises in dispatching Army and Air Force helicopters to fly off ships. Nevertheless, improvements should be made. With a five-year charter and total budget of $25 million, the current program is on track to provide JFCs with greater advancements than the resources devoted to it.

But can joint shipboard helicopter operations be enhanced if deliberate integration efforts no longer exists? Sadly, the answer is no. At the least, as the services acquire new classes of ships, aircraft models, and ordnance, the interoperability issues of today will appear. Unless Army and Air Force rotary-wing aircraft are designed with shipboard operations in mind—an expensive and unrealistic proposition—the same challenges will arise. Joint shipboard helicopter operations are dynamic in terms of mission type and scale, characteristics that are likely to endure. A conclusion that one must reach, given the dynamic nature of such operations, is that an enduring organization is needed to address emerging challenges. Nonetheless, if this process in its present form ceases to exist altogether at the end of its charter, some organization may become the main repository of the program legacy products. Otherwise, tools that deliver enormous operational advantages to joint warfighters will be lost.

One logical repository for legacy products and home for a reorganized and smaller JSHIP staff is U.S. Joint Forces Command. But it would be naïve to propose that this command or any other organization should assume responsibilities like these without sufficient resources.

Joint commanders will lead more joint shipboard helicopter operations in the future. These efforts will be short-fused and highly visible, but variable or unpredictable in both their mission and scale. They will be demanding because of interoperability challenges presented by hardware and procedural differences among the services. By initiating test and evaluation efforts for JSHIP, the Department of Defense realizes that lessons can be learned and that joint shipboard helicopter operations can be improved to provide greater operational flexibility and reliable options.

Joint shipboard helicopter integration will allow for improvements to a degree, and for a time. But additional steps must be taken to ensure that those improvements are available to joint force commanders in the future. **JFQ**