an attack or light a forward operating base during covert operations.

An integral concept in the expeditionary airfield program is the aircraft recovery system. The M–21 aircraft recovery system will stop a tailhook aircraft in 600 feet of rollout at an expeditionary field or on an existing runway, thereby greatly increasing the basing flexibility of naval aviation. Under development is the M–29 transportable system, a more mobile and versatile system, that will allow for expanded operations.

Getting EAF matting and equipment to where it is needed is an important consideration. Weight and cube are critical logistic commodities. Efforts are under way to reduce EAF footprints and to find alternative methods of transporting them. Both Maritime Prepositioning Squadrons 2 and 3 have enough AM–2 matting to build either a 1,000- by 72-foot or a 1,500- by 54-foot runway with 11 tactical parking spaces. Concurrent to setting up the matting, the associated Marine Air Traffic Control and Landing System, in this case probably consisting of a tower, tactical air navigation system, radio, and other equipment, would be flown in on two C–141s. Larger EAFs, like the full service 3,850-foot field with 75 tactical parking spaces, are usually shipped via break-bulk vessels and married with more robust air traffic control logistics including radar. Approximately six C–141 loads are required to deliver a full package.

The Navy and the Marine Corps are committed to making the best use of dwindling resources. It is not always obvious how best to invest so that readiness, force structure, and modernization are kept in balance. However, innovative uses of existing assets is always a winner. In that regard, the alliance of the expeditionary airfield and carrier aviation will result in mutual benefit. Joint exercises and wargames are opportunities which we should use to explore and to advertise this capability. A good start is already being planned for carrier aircraft to operate from the Strategic Expeditionary Landing Field at MCB Twentynine Palms. I expect the future will bring more operations where Marines fly from carriers and Navy aircraft operate from austere fields operated by Marines. Naval expeditionary forces, with the capability to operate from afloat and ashore, confront the enemy with combat power that extends along a continuum from the early strategic strikes to ground operations ashore. Only the naval service contains all of these capabilities in one integrated package.

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Sea Based FARP Operations

by Maj Richard L. Miller

Alternating aircraft basing ideas can add greatly to the flexibility and impact of Marine Corps operations. Here is one idea, easily in reach, that deserves further testing and refinement.

A naval expeditionary task group (NETG) has been assembled to support an extended relief operation off the coast of a Third World country in turmoil. Due to a lack of amphibious shipping, the number of amphibious ships making up this NETG is limited to two LPDs, one LST, and one maritime prepositioning force (MPF) ship. The special purpose Marine air-ground task force (SPMAGTF) of the NETG consists of a battalion landing team, a combat service support detachment (CSSD), and a composite helicopter squadron consisting of 10 CH–46 and 4 AH–1W helicopters. For political and security reasons the SPMAGTF commander has been directed to minimize the footprint ashore. A multitude of warring factions are hindering the relief effort, and some of the factions have made it known that they will employ any means to disrupt the relief effort. Accordingly the SPMAGTF commander declares there will be no shore basing of helicopters or a FARP (Forward Arming and Refueling Point). The aviation combat element (ACE) commander is now faced with a dilemma. The ability to operate helicopters from the ships of the NETG is limited by the shortage of available deck space on board the ships. Spotting, launching, refueling, and rearming these aircraft takes time and restricts the ability of the ACE to support and respond to the ever-changing situation ashore.

An innovative solution to this problem could be combining several pieces of lighterage from the MPF ship and commercial barges (acquired through a contract with the host nation) to form a floating FARP several miles from the beach. This floating FARP is situated outside the range of the indirect fire weapons of the warring factions and is protected from small assault craft by the naval guns of the amphibious task force.

Introduction

By improvising and making imaginative use of all the usually limited resources available to them, Marines are always finding ways to accomplish the mission. In 1987 the layout of the two-spot flight deck of the LPD USS *Dubuque* was modified to four spots to accommodate flight operations of two CH–46s, two UH–1Ns and four AH–1Ws. During Operation Ernest Will in the Persian Gulf (1987–1988), Marine and Army helicopters conducted operations from oil platforms. From these platforms the helicopters received fuel, ordnance, and maintenance support.

The use of commercial barges to support helicopter operations is not new, but the idea of using barges or lighterage sections from an MPF ship should be considered as one of the options available to the ACE in supporting the MAGTF. This paper will illustrate how lighterage sections from an MPF ship can be formed to make a floating FARP for helicopter operations.

MPF Ships

An MPF's squadron of ships contains the equipment and materiel to supply a Marine expeditionary brigade (16,500 Marines) for 30 days. MPF ships are prepositioned at three locations around the world: Maritime Prepositioning Ship Squadron (MPSRON-1) at Norfolk, MPSRON-2 at Diego Garcia, and MPSRON-3 at Guam. An MPF ship can unload its materiel and supplies pier side or "in stream." Each ship has the transportation assets it needs to perform an in-stream operation. These assets include LCM-8 landing craft, side-loading warping tugs (SLWT), and lighterage (barge) sections. These craft are carried on the weather deck of the ship and placed in the water by the ship's cranes.

A normal load-out for the MPF ship consists of 2 LCM-8s, 1 SLWT, and 12 lighterage sections for the Waterman-class ship, 10 for the Amsea, and 8 lighterage sections for the Maersk-class ship. Lighterage sections have a flat deck with a dimension of 90 by 21 feet, and there are three types—a causeway section (CS), a beach end (BE), and a powered causeway section (CPS). The ships use the lighterage sections either as barge ferries or as a roll-on/roll-off discharge facility (RRDF). Lighterage sections can be joined end-to-end to form barge ferries and one type is also side connectable to allow a floating dock to be formed. A complete discussion of these operations and how the lighterage sections can be combined is given in Center for Naval Analyses (CNA) Memorandum 91-172. All lighterage is connectable end-to-end, but only the CS have been designed to be side connectable (eight of the CS in MPSRON-1, however, are currently not side-connectable). The BE and the CSP can be joined at the side with other sections by the use of mooring lines.

The number of lighterage sections carried by the ships can be increased by replacing LCMs or the SLWT with lighterage sections or by increasing the stack size of the lighterage sections. Replacing the LCMs or SLWT with lighterage sections is not favored by the MPFs because of their usefulness. The LCMs have proven to be very efficient in getting heavy equipment to shore and the SLWT has the unique function of laying fuel and water hoses from the MPF ship to the shore. Presently, lighterage sections are stacked four high. Increasing the number of lighterage sections carried by an MPF ship by stacking sections more than four high is an option, but the maximum practical number is not presently known by the author.

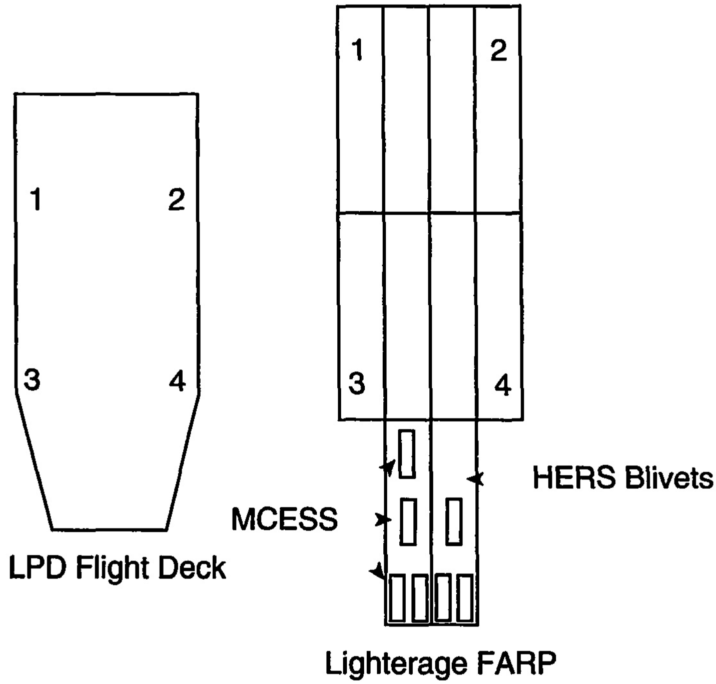

Figure 1

Sea-Based FARP

Sea-based logistics is a concept which the Marine Corps can use when the mission permits only a minimum number of people and supplies (i.e., a small footprint) ashore. The largest contributor to footprint ashore is the logistics tail—the maintenance and supply personnel and the storage depots for fuel and ordnance. Supplying the needs of Marines ashore directly from the ships means the overall footprint ashore can be reduced. Sea-based logistics can be accomplished by using amphibious and MPF ships. Recent restructuring within the MPF squadrons has given these ships the ability to support contingencies ranging from a one-ship operation in support of a Marine expeditionary unit (MEU) to the entire squadron deploying as was done with all three MPSRONS during DESERT SHIELD/DESERT STORM.

A subset of sea-based logistics is the employment of a sea-based FARP whose structure can be made from lighterage sections of an MPF ship. The number of lighterage sections needed to build a sea-based FARP will depend on the number and type of helicopters the FARP must support. The overall constraint on the size of the FARP is the number of lighterage sections available. If lighterage is used from an MPF ship, there is a tradeoff that commanders must evaluate. Taking lighterage sections away from the MPF ship will degrade the MPF ship's ability to conduct in-stream loading and unloading operations.

An example of a 4-spot sea-based FARP using 10 lighterage sections is shown in Figure 1. In this case eight lighterage sections are combined using CS or BE sections to form the landing area of the FARP. The area formed by these eight sections is larger in size than the four spots used on an expanded-deck configured LPD class amphibious ship. The greater distance between adjacent spots allows the FARP to operate four CH-46s simultaneously (unlike the LPD which can only operate two CH-46s at a time). A single CH-53E could land on the FARP depicted in Figure 1, but because of its 79-foot rotor diameter and rotor wash the CH-53E would not be recommended for routine operations from a FARP of this size.

Two additional lighterage sections are attached to the landing platform to accommodate fuel and ordnance storage areas. The amount of JP-5 and ordnance stored at the FARP would be dependent on the intensity of the operations and the frequency of resupply. In the example

A maritime prepositioning ship heads out to sea.

given in Figure 1, there are twelve 500-gallon fuel bladders, or blivets, which give this FARP a 6,000-gallon capacity.* A 6,000-gallon capacity would allow the FARP to provide the necessary fuel to support 30 hours of CH–46 flight time. Three of the seven Marine Corps expeditionary support shelters (MCESS) depicted in Figure 1 would be used for communications and shelter. The remaining four shelters could be used for ammunition storage.

A sea-based FARP constructed from lighterage sections allows the FARP to be easily resupplied by using other lighterage sections or landing craft. To resupply the FARP using lighterage sections is the simplest method because all of the sections are of the same height. All that is required is for the resupply lighterage section to be tied up to the sections that make up the platform of the FARP and to move the supplies across. Resupply by landing craft would require the FARP to consist of at least one BE lighterage section to allow the transfer of supplies from the ramp of the landing craft to the ramp of the BE. Additionally, the FARP can receive supplies by helicopter for rapid resupply.

*There are 18 bladders in the standard helicopter expeditionary refueling system (HERS).

If lighterage sections or landing craft are used to resupply the FARP, the logistician can use truck assets, where the trucks are simply driven onto the FARP. A fuel truck could then pump fuel into the HERS or be left at the FARP to add to the fuel capacity of the FARP. Trucks loaded with ordnance can also be used in the same manner. Any rolling stock would need to be secured to keep it from going overboard (as would all the other gear onboard the FARP).

A FARP constructed from lighterage can be moved from location to location by towing (using an MPF ship, amphibious ship, surface combatant, landing craft), by pushing (using a SLWT, CSP lighterage section, even assault amphibious vehicles (AAV), or on its own power if the FARP is constructed with at least one CSP lighterage section. CSP lighterage sections are owned and operated by the beach group. If CSPs are used in building the FARP, coordination with the beach group will be necessary.

The number of personnel needed to run a 4-spot FARP is estimated to be 26—9 Marines to run the HERS, 13 to form the ordnance crew, and 4 communicators. This would allow the FARP to be run around the clock. Because of living conditions, FARP crews should be rotated every 3–7 days. A FARP could be operated for a longer period of time by a single crew if additional sections and shelters were added to provide additional space.

There are some significant unknowns that need to be addressed before this concept is used:

In what sea states can various lighterage FARPs continue to operate? (The RRDF the MPF ships form to conduct in-stream offloads is capable of operations up to sea state three.) Are there restrictions on storing fuel and ordnance in close proximity to one another or problems with radio emissions (HERO)? Can the present deck of a lighterage section take the stress of a landing helicopter, and if not can the deck be beefed up using dunnage? (Lighterage sections can take the weight of an M–1 tank, but the weight of the tank is spread evenly across the tread of the tank. The landing of a CH–46, which distributes the weight of the aircraft unevenly across three sets of tires, might exceed the structural limit of the lighterage's deck.) What are the environmental constraints? Would it be necessary to place a fuel spill containment boom around the FARP?

Conclusion

As the number of amphibious ships available to embark Marines decreases, the need to find alternate methods of employment is necessary. A sea-based FARP operation using MPF lighterage sections is a possible solution and its potential impact in future operations warrants further study. This and other alternate concepts for aircraft basing should be devised and extensively tested during exercises.

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