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FUTURE WAR PAPER

AMPHIBIOUS CONNECTORS: INCREASED SPEED AND MANEUVERABILITY IN THE RACE TO BUILD COMBAT POWER ASHORE

SUBMITTED IN PARTIAL FULLFILLMENT
OF THE REQUIREMENT FOR THE DEGREE OF
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“The increased likelihood of operations in the littorals requires a renewed focus on the Marine Corps’ responsibility to be organized, trained and equipped, for service with the fleet in the seizure and defense of advanced naval bases.”

Expeditionary Force 21

Introduction

Today, the Navy and Marine Corps team are working to tailor their amphibious capability and capacity to conduct amphibious operations¹ simultaneously with two Marine Expeditionary Brigades (MEB), as envisioned in the Marine Corps’ guidance for future employment of the force called Expeditionary Force 21¹ (EF21). EF21 builds on the foundational amphibious doctrine of the Marine Corps, as envisioned in MCDP 1-0, for conducting amphibious operations through Operational Maneuver from the Sea (OMFTS)² using Ship to Objective Maneuver (STOM) and Seabasing³ from Over the Horizon (OTH)⁴. While these operational concepts provide standoff distance for the Navy and the Seabase from Anti-Access and Aerial Denial (A2AD) threats, they do not necessarily facilitate forcible entry with the rapid buildup of combat power ashore. The Navy and Marine Corps team has created capability to build combat power at the seabase but with a limited capacity to project that force from the seabase to a hostile shore, with the continued rapid buildup of combat power.

Several innovative surface connector capabilities today could achieve the forcible entry requirement with the continued rapid buildup of combat power ashore, as well as enhancing littoral maneuver capability for those forces coming ashore. The high-speed aluminum sled is

¹ Expeditionary Force 21 is the Marine Corps future guidance for the Marine Corps over the next 10 years to provide the right force in the right place at the right time.

² Operational Maneuver from the Sea (OMFTS) is a concept that allows the Navy to operate from more than 60 miles off shore (Over the Horizon) to prevent the A2AD threat by allowing Marines and Navy to conduct Ship to Objective Maneuver (STOM) using both sea and vertical maneuver to establish a force beachhead and the rapid buildup of combat power. (MCCP 1 OMFTS)

³ Seabasing: The deployment, assembly, command, projection, sustainment reconstitution and reemployment of joint power from the sea, without reliance on land bases. (JP 3-02 Amphibious Operations)

⁴ Over the Horizon (OTH) amphibious operations is a concept that keeps Naval and Marine Corps forces outside of A2AD threats and allows the commander greater flexibility in deploying the force.

one of the innovations that would provide the Combatant Commander (COCOM) or Joint Force Commander (JFC) the flexibility to conduct any amphibious operation, whether conducting a forcible entry, disaster response, or power projection. The Navy and Marine Corps should buy the high speed aluminum sled now in sufficient quantity to lift a battalion sized unit of Amphibious Assault Vehicles (AAV), Amphibious Combat Vehicles (ACV) and/or Light Armored Vehicles (LAV) and crew or equivalent sized unit simultaneously from the seabase to shore.

Foil Assisted High Speed Sled (FASS)²

The high speed aluminum sled is a foil assisted planing hull transport vessel capable of carrying loads up to 30 tons or the equivalent of one AAV, ACV, or LAV. The design of the Foil

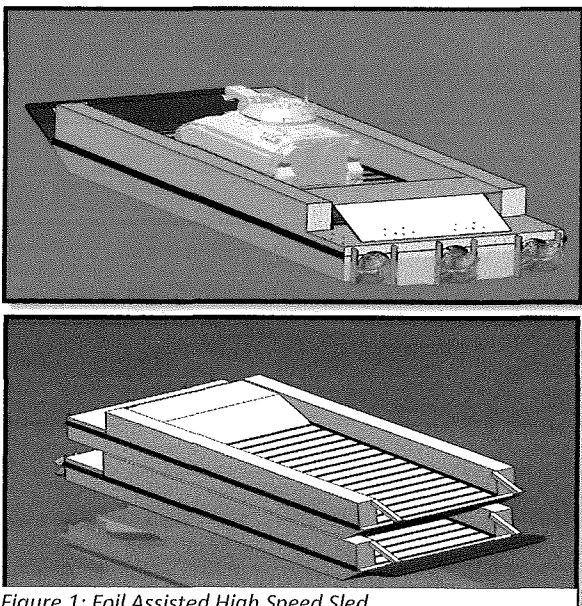


Figure 1: Foil Assisted High Speed Sled

Assisted High Speed Sled (FASS) is to operate at or below a sea state of three (SS3), while transporting an ACV, AAV, LAV or equivalent weight. The FASS is capable of speeds of up to 30 knots for up to 200nm to achieve the requirement for OTH amphibious operations from a seabase³. The FASS will not incorporate in its design the ability for it to be beached (permanently run aground on the beach). The FASS design will incorporate a front bow ramp

that allows for the deployment and/or recovery of an ACV, AAV, or LAV at distances comparable to their characteristic abilities to swim to or from shore. This capability not only meets the Marine Corps' requirement as outlined in EF21, but exceeds it⁴. Also included in the design of the FASS was the simplicity of its employment. Each crew of the AAV, ACV, or LAV

can operate the FASS, either under the armor protection of their combat vehicle or riding on the deck of the FASS as they maneuver toward the shore. Once the cargo has been deployed from the FASS, it is then returned to the seabase autonomously, either by satellite communication, GPS plots or by a remote operator aboard the Amphibious ship. The autonomous controlled movement can also be programmed to move the FASS to a loitering area until room is made to dock the FASS with the seabase, whether that it is an MPF, ARG, and/or MLP ship. The FASS will then be loaded for follow-on flow to the shore or with equipment from ships for transfer to build up the seabase.

Other uses for the FASS could be to offload cargo between ships, backload cargo, or transfer vehicles and cargo, movement of vehicles and equipment for riverine operations, fuel transfer operations, a fire support platform, a surf zone preparation (MICLIC) platform and a causeway interface⁵. The FASS, procured in sufficient quantities, is a dynamic connector when used in conjunction with the LCU, to conduct forcible entry operations to land a MEB sized force very rapidly. Furthermore, the FASS can deliver a battalion of ACVs to the shore, thus facilitating the link up of the ACV and the vertical inserted force deep inland in order to provide armored protected transportation in follow-on missions. This ability would allow flexibility to the commander by providing speed of maneuver to a force already inserted inland. This type of rapid power projection would overwhelm the enemy, allowing the Marines to maintain momentum and the initiative.

The FASS does not necessarily require amphibious shipping for its employment. Any type of ship, whether naval or civilian, could transport the FASS to the seabase as long as it had the means to Lift on/Lift off (LO/LO) or Roll-on/Roll-off (RO/RO) its cargo. Once the FASS ties-in with the Amphibious Task Force commander (CATF), the FASS can then be deployed as

needed, whether in the assault wave, follow-on waves, or movement of vehicles or equipment from the MPF and ARG to the MLP. The FASS has the potential to do it all with limited manpower requirements, high speed, and increased fuel economy.

Table 1: Foil Assisted High Speed Sled⁵

	Small Variant	Large Variant⁶
Overall length	45 ft. ramp stowed	71 ft.
Overall Width	14 ft.	16 ft.
Weight	32 tons	45 tons
Speed	30 kts.	30 kts.
Draft	3.3 ft.	3.3 ft.
Cargo Capacity	30 tons	70 tons ⁷
Range	200 nms	200 nms

Options to transport and/or stow the FASS can come in many forms. As discussed above, the amphibious ships do not have to transport the FASS, however they could be used if space allows. The well decks of the LPD -17, LSD-41, or LHD amphibious ships are current transport options. The LPD-17 can transport six FASS’ and one LCAC or only 12 FASS. The LSD-41 can transport 15 FASS’ and one LCAC. The LHD can transport nine FASS and one LCAC. However, since the design of the FASS incorporated their ability to be stacked and tied-down, options for stowage become more numerous. The FASS can be stacked on the ships top deck out of the way or by hanging them off the sides. Future Navy ship construction, not just amphibious ships, could facilitate a stackable stowage platform to stow up to ten FASS per ship. This option would give the MEU/ARG an additional surface connector capability of 30 FASS for an increased landing force capacity in a forcible entry scenario. Due to the simplicity of the operations and transporting of the FASS, the FASS is exactly what the Marine Corps needs for

⁵ Characteristics came from a information paper written by LtCol Rob Bodisch to Seabasing Integration Division and from a presentation from Seabasing to the Surface Connector roundtable on 9 Oct 2014.

⁶ The larger variant could carry 3 LAV, 2 ACV, 2 AAV or 1 Tank.

⁷ This weight is anticipated since large variant sled has not been built or tested.

OTH amphibious operations from a seabase, whether conducting a forcible entry, a disaster response, a power projection or a crisis response scenario.

Current Surface Connector Capability

The current surface connector capability within the Navy and Marine Corps team is limited to the Landing Craft Air Cushioned (LCAC), Landing Craft Utility (LCU), and Joint High Speed Vessel (JHSV). Amphibious ships are used to transport the LCAC and LCU, however those ships are limited to the amount of landing craft they can carry due to well deck space. With a limited number of amphibious ships in the Navy and associated landing crafts, there is a loss in building capacity of Marine Corps combat power that can be brought to shore rapidly. Further, these already limited means of transporting combat power further decrease as the movement cycles continue over time due to hourly manpower safety/rest restrictions for the LCAC and LCUs crews. These manpower restrictions imposed by the Navy on moving personnel, gear and equipment further complicates the rapid build-up of combat power ashore.

With the above mentioned connectors in the Navy inventory today, only the LCU provides the ability to fire platform specific organic weapons while attacking to a hostile shore. However, this connector has reached the end of its life cycle and can no longer facilitate the weight it once was able to lift. Moreover, the LCU lacks significant speed to traverse from seabase to the shore from OTH in less than six hours, thus only providing two runs in a 24-hour period. If you add crew rest into the 24-hour period, the LCU cannot make two runs in a 24 hours period with manpower safety restrictions. Also, the restrictions the LCU has on the amount of weight it can carry (i.e. two M1A1 tanks or 140 tons equivalent) and with the limited number of LCUs in the Navy inventory, adds to the reduced ability to rapidly build combat power ashore. For example, if the ARG only had two LCUs, then the commander would only get four tanks

ashore in a 24-hour period from OTH. To complicate matters further, the LCU draft is 3.6 ft for the forward and 6.10 ft for the aft, which makes its draft too deep to cross most atolls, depending on tide conditions.

The LCAC has the speed but lacks the maneuverability with increased weight, as well as it lacks the survivability to assault a hostile shore. The LCAC can make several runs from seabase to shore in a 24-hour period, but lacks the ability to carry significant weight. The Navy and Marine Corps are in the process of building larger LCACs (Ship to Shore Connector [SSC]) because of its speed and increased ability to carry more weight, though not a significant amount (see Table 2). Nevertheless, the SSC is only a stopgap measure through 2044 or until the Navy and Marine Corps team can achieve a more viable solution to OTH amphibious operations⁶. A problem the SSC and LCAC bring with it is its cushion vulnerability. The SSC and LCAC ride on an air cushion that is driven by large fan propellers. If these vessels come under fire by medium or heavy machineguns, or greater weapons, which the enemy will have on the beach, then the LCAC is of no use in conducting amphibious operations on hostile shores, until a beachhead is established and secured.

The JHSV is a very fast and maneuverable vessel that is capable of carrying large heavy loads (up to 750 S/T) over greater distances. This vessel is a great addition to the movement of forces and rapid buildup of combat power and supplies. However, this vessel can only operate from OTH to a secured port or docking system established on the beach, but cannot off load cargo on the beach itself. The JHSV cannot operate around a hostile beach and cannot land at a hostile port, as the JHSV has no means to defend itself from attack and is lightly armored. Therefore, while the JHSVs capability is superior in increasing combat power ashore and with the increased speed, it does the Marine Corps little good until the landing area is secured and an

expeditionary docking system is built so the JHSV is able to mass combat power ashore. However, there are only 10 JHSV currently scheduled to be built over the next several years. Of those ten, three are already in operation, with another two scheduled to be delivered in 2015⁷. On a positive note, the JHSV does not travel in the amphibious ship but travels on its own accord so this capability does not take away from amphibious shipping well deck space. This means the JHSV can bring up to 24 AAVs (2 infantry company reinforced lift) to the fight and drop them away from shore, freeing LCAC spaces on the amphibious ship for more lift capability on the assault wave and follow-on waves.

The Navy and Marine Corps surface connector council⁸ has made significant progress in their search for high speed surface connectors. The counsel has taken steps to replace the aging fleet of LCACs and LCUs but remains wedded to a paradigm that designs surface connectors specifically for an amphibious ship. The below connectors are currently in service or are scheduled to enter service over the next five years. Each connector identified is built for transport and launch from an amphibious ship.

Table 2: Landing Craft Characteristics/Dimensions

	LCU 1600	LCAC	SSC ⁹	SC (X)R ¹⁰
Overall length	135 ft.	87.11 ft.	91.90 ft.	LCU comparable
Overall Width	29.9 ft.	47 ft.	48.27 ft.	LCU comparable
Speed	11 kts.	40+ kts.	35 kts.	20-30 kts
Draft	Fore: 3.6 ft. Aft: 6.10 ft.	No draft	No Draft	3 ft draft
Cargo Capacity	180 tons 400 troops	75 tons PTM ¹¹ 144 troops	79.63 tons PTM 144 troops	225 tons 400 troops
Range	1200 nm	200 nm	86 nm	1200nm

⁸ The Navy and Marine Corps surface connector council has roundtable discussions quarterly to discuss the relevant Navy and Marine Corps surface connector issues and recommends outcomes to support both services operational and tactical needs to support strategic goals.

⁹ Ship to Shore Connector to replace aging LCACs.

¹⁰ Surface connector (X)R replacement to replace the current LCU

¹¹ Personnel Transportation Module capable of carrying 144 Marines with gear.

Amphibious Shipping and Surface Connector Projections

Between now and 2044, the Navy has projected a reduction in the surface connector capability to the MEU/ARG by 55%.⁸ When Plans, Policy and Operations (PP&O) division, Headquarters Marine Corps analyzed the surface connectors availability plan from 2014 through 2044 they found a reduction in surface connector spots on board amphibious ships.⁹ In Fiscal Year (FY) 15 there are projected to be 30 amphibious ships with 82 total surface connector spots. In FY 31 the number of amphibious ships increases to 34, however the number of surface connector spot decreases to 79. This decrease trend continues through FY 44 with only 31 amphibious ship and only 60 surface connector spots. The Navy is currently contracting to procure 73 SSC's and 32 SC(X)R from FY 15 to FY 31 to fill the 60 surface connector requirement the Navy sees as its well deck availability in FY 44 (see Table 3).¹⁰ This reduction in surface connectors on amphibious shipping will affect the Marines Corps' ability to project 2.0 Marine Expeditionary Brigades from OTH to conduct amphibious operations and to rapidly build combat power ashore.

Table 3: Surface Connector Availability Plan¹¹

	FY 15		FY 31		FY 44	
	# of Ships	# of LCAC Spots	# of Ships	# of LCAC Spots	# of Ships	# of LCAC Spots
Big Decks (LHA, LHD)	9	24	11	25	9	16
LDP 17	9	18	11	22	11	22
LSD 41 / LX(R)	13	40	12	32	11	22
Total	30	82	34	79	31	60

“BLUF: The Marine Corps’ ground tactical vehicle strategy, which is greater dependency on connectors, coupled with the Navy’s long range shipbuilding strategy, which plans for a decrease in connector capacity across the amphibious force, requires an increased reliance on a diminishing resource.”¹²

Let us look at what the above table will do to the MEU/ARG over the next 30 years. Today the MEU/ARG takes out three amphibious ships with nine connector spots. That could mean nine LCACs, or perhaps five LCACs with two LCUs and 15 AAVs. The 15 AAVs use two LCAC spots on an LSD. If we look at the future projection of what the MEU/ARG will look like in 2044 the reduced surface connector spots on that deployment will total only four spots. That is an overall reduction of 55% of the surface connector lift. How does that translate in the tactical lift or rapidly building combat power ashore? This means the Marine Corps will have to come up with new and innovative ways to build combat power ashore. That could be the FASS, a new innovative approach to rapidly build combat power ashore.

Today the initial assault wave (pre-boated) from the MEU/ARG of the LHD-3, the LPD, and the LSD-44 consists of a sortie of 15 AAVs, which amounts to about 225 Marines or one and a half infantry companies lift. The remaining five LCACs and two LCUs would carry 200 additional combat Marines with LAVs and CAAT teams and the BMU/LFSP beach support from the Navy to establish the beach for follow-on waves. The current total assault wave brings to shore 585 Navy and Marines for forcible entry and beach establishment. The projected assault wave in 2044 from LHA-8, LPD, and LX(R) would consist of eight ACV totaling 72 Marines, an SSC cabin with 28 personnel per SSC, and the BMU/LFSP of only 80 personnel to prep the beach for follow on waves.¹³ The Marine Corps' Plans, Policy, and Operations division stated in a brief to the connector round table that, "Following the projected strategic capability of the Navy through 2044, it will require three surface assault waves to match the power projection capability of the assault wave today."¹⁴

If Marines accept the Marine Corps' current vision (EF 21) in conducting amphibious operations from OTH, then the Marine Corps' reliance on surface connectors to get Marines to

the fight is justified. However, that view is a divergence from the Navy's strategy of reducing surface connectors across the amphibious spectrum over the next 30 years. With that, the Marine Corps should find alternative ways to achieve its mission of seizing advanced naval bases from OTH using seabasing. In reality, the Marine Corps should find surface connectors that do not need to use well deck spots nor do they require a long logistical tail.

The FASS and its implementation in Amphibious Operations

Since FASS is a relatively small transport that can be moved with a relatively small logistical footprint, it makes the best addition to the Marine Corps' surface connector concerns over the next 30 years. Ten FASS could be stowed on each amphibious ship. For an ARG/MEU that would mean an additional 30 transports on the assault wave. Today if the Marine Corps added an additional 30 transport platforms (FASS) for the assault wave, that would double the AAVs, LAVs, or CAAT teams going ashore, if supported by just one JHSV. In 2044, the addition of the 30 FASS, incorporated with the JHSV, and SSC, would facilitate the deployment of every ACV dropped 12 miles or closer off shore, plus the LAVs, leaving the SC(X)R to bring the remaining assault forces from the MEB. The FASS would be instrumental in the rapid building of combat power ashore with its high speed and autonomous return feature. Furthermore, the FASS does not require reduced manpower hours and can continuously run follow-on forces from the seabase to shore since vehicle crew members operate the FASS until they are deployed from the transport.

Another option to get the FASS to the seabase would be through MPF and/or civilian leased shipping. The FASS can be stacked on the MPF shipping in the same manner as it would have been on the amphibious ships. Since the MPF brings more ships than an ARG/MEU, more FASS would be employed in the fight thus facilitating the rapid build-up of combat power

ashore. Another alternative would be to lease commercial shipping that could carry up to, if not more than 100 FASS transports. Major Brad Bean states in his School of Advanced Warfighting paper in 2013, “with little to no modification, Yacht Ferries can be used to transport surface connectors anywhere in the world.”¹⁵ With the use of one Yacht Ferry to transport more than 100 FASS connectors, the assault of 2.0 MEBs and the rapid build up of combat power ashore would be better attained. Moreover, by using the FASS from OTH would significantly reduce the A2AD threat to the naval fleet, allowing for its continued mission of sea dominance.

With current connectors pre-boated with combat equipment already, the FASS could move combat vehicles from the MPF ships to the MLP and seabase for the rapid flow of follow-on forces, prior to the assault wave. Then the FASS could be loaded with the assault wave and launched at the same time to maximize the combat forces in the assault wave. Then it could return to the seabase to for follow-on force projection and the continued rapid build-up of combat power. The FASS could be a force multiplier for the Marine Corps and the Navy by assisting in the Navy strategic aims and the Marine Corps vision in EF21.

The FASS would allow the maneuver force leader/commander to use the water as maneuver space much as he would on land, as envisioned in OMFTS and EF21. This seemingly small concept of maneuver makes for a large tactical advantage when conducting forcible entry of a heavily defended beach by allowing the force to land at the place and time of its choosing. No longer would the unit commander be dependent on the Navy to get them ashore before they can fight, they could begin the fight as soon as they were within weapons range. The FASS would allow firing of all vehicle organic weapons while assaulting the shore, to include an indirect fire platform. Every weapon on the AAV, LAV, or CAAT section could be fired while assaulting the shore. The unit could also use organic tactical formations while in the water as it

assaults the beach. The FASS could bring a new dimension to war fighting and amphibious operations and adhere to the guidance envisioned in EF21.

Cost Comparison

Since the Navy is working to develop new innovative connectors to facilitate amphibious operations through 2044, cost is a factor in the approach the Marine Corps should take to facilitate its outlook beyond 2025. The Marine Corps is exploring new technological advances to achieve high speeds and increase weight transports in surface connectors to transport the ACV 1.1 in the near term through 2025. The Navy has begun procurement of 73 SSC surface connectors that will take them out to 2044. The cost of each SSC surface connector is estimated at \$90 million with a total cost of \$6.5 billion for 73 SSC surface connectors.¹⁶ The SC(X)R replacing the LCU is currently under testing and study. The SC(X)R would be a like type craft of the LCU with equal or better capabilities. The SC(X)R will be of equivalent cost to the SSC. The JHSV is a surface connector used to deploy the AAVs or ACVs 12 miles from shore and allows them to swim to shore. The Navy currently has three JHSV delivered with a total of 10 scheduled overall through 2025. The contracted price per JHSV is over \$185 million with a total price of \$1.9 billion for all ten JHSVs.¹⁷ The FASS prototype is estimate to be \$3.5-4 million for testing and the production price per unit is estimated to be \$2-3 million per unit (See table 4).¹⁸

If price alone were considered when looking at which connector to procure, the FASS would win easily. However, more needs to be looked at when considering the options. While the LCU and JHSV can operate independently, they still have to link up at some point for refuel and resupplies of the crew and ship. The SSC has wedded itself to the amphibious ship or to the shore but cannot operate for extended durations without rest. The JHSV cannot operate around a

hostile shore as it cannot defend itself, nor is it protected from A2AD threats. Currently the LCU and SC(X)R are the only surface connectors designed to conduct a forcible entry mission.

Table 4: Surface Connector Cost comparison

	SSC / SC (X)R	JHSV	FASS
Unit Cost	\$90 mil	\$186 mil	\$3 mil
Number Procured	73	10	100
Total cost	\$6.6 billion	\$1.86 billion	\$300 million

If a Yacht Ferry was the commercial ship chosen to transport the FASS to the seabase for amphibious operation, the cost would be somewhat negligible compared to mass production of large surface connectors (i.e. SSC or LCU). Major Brad Bean states, “that large civilian companies, like Maersk line, offer charters that would typically cost between \$40,000 and \$45,000 per day based on a 30-40 day charter.” That price to transport 100 FASS to the AoA and stay for 40 days would cost \$1.8 million in total. That charter cost is less than buying a Yacht Ferry or similar ship, for \$18.5 million, as a permanent FASS transport.¹⁹ A charter ship would ensure the timely arrival of the FASS at the seabase, which is also out of the A2AD threat and would be able to transport any remaining FASS to other locations as needed. The FASS alternatives thus far outweighs the other options.

Conclusion

If the Marine Corps has tied its future to EF21 and amphibious operations, as mandated by federal law, then surface connectors will be in its future for years to come. As the Navy continues to reduce its surface connector capability over the next 30 years, the Marine Corps should look at more cost effective and innovative approaches to transport more combat power from the seabase to shore, whether in a permissive environment or a hostile environment. If well deck space is a precious commodity in future operations, then the Marine Corps needs an alternative that does not rely expressly on the well deck, but uses another option. The FASS is

that option. The price of each FASS is \$3 million a unit (small variant), significantly lower price than any other connector under consideration. The FASS would not be operated by a standard Navy crew, but is operated by the Marines being transport from seabase to shore. Once the combat power has deployed from the FASS, it has an autonomous function that brings it back to the seabase for follow-on operations. Finally, the FASS could be used as a maneuver platform on the water instead of a straight shot from seabase to shore, giving the maneuver force commander the ability to conduct a true assault to the shore objective using organic vehicle firepower, at the time and place of his choosing.

The FASS should be the Marine Corps' surface connector of the future for amphibious operations from disaster relief operations to forcible entry. The FASS provides a platform for the rapid build up of combat power ashore to win the race in seizing the advance naval base. If EF21 is the Marine Corps vision for future operation, then without the FASS, the Marine Corps may not be able to mass combat power when needed. The FASS provides the Marine Corps with a low cost viable option to mass combat power where needed or to assisted with logistical buildup in a crisis response or disaster relief operation. The FASS is capable of working around the clock in any environment and situation. No other surface connector can advertise the same. The Marine Corps needs the FASS to stay relevant in amphibious operations and to achieve the vision of EF21.

Endnotes:

¹ Headquarters U.S. Marine Corps, Expeditionary Force 21(EF21). Washington DC: Headquarters U.S. Marine Corps, 4 March, 2014.

² LtCol Rob J. Bodisch, Connectors and Doctrine Branch to Mr. Jim Strock, Director, Seabasing Integrations Division, Marine Corps Combat Development Command, 29 April 2014.

³ Headquarters U.S. Marine Corps, Expeditionary Force 21(EF21). Washington DC: Headquarters U.S. Marine Corps, 4 March 2014. P 22.

⁴ Ibid., P.22

⁵ LtCol Rob J. Bodisch, Connectors and Doctrine Branch to Mr. Jim Strock, Director, Seabasing Integrations Division, Marine Corps Combat Development Command, 29 April 2014.

⁶ Dave Groves (Connector Branch Head, Seabasing Integration Division, Marine Corps Combat Development Command, Quantico, Va) Interview by Major Jeff Lee on October 10, 2014.

⁷ Ibid.

⁸ Dave Groves, "Navy and Marine Corps Surface Connector Council Brief." PowerPoint Presentation. Washington DC, 9 Sept 2014. 56.

⁹ Ibid., 55.

¹⁰ Ibid., 56.

¹¹ Ibid., 55.

¹² Ibid., 55.

¹³ Ibid. 57.

¹⁴ Ibid., 57.

¹⁵ Brad Bean. "The Connector Carrier: U.S.M.C. Use of Yacht Ferries to Augment Amphibious Operations," (master's thesis, Marine Corps University, Quantico, Virginia , 2013)

¹⁶ Dave Groves, "Navy and Marine Corps Surface Connector Round Table Brief." PowerPoint Presentation. Washington DC, 9 October, 2014.

¹⁷ "Joint High Speed Vehicle," United States Navy, accessed December 22, 2014., http://www.navy.mil/navydata/fact_display.asp?cid=4200&tid=1400&ct=4

¹⁸ LtCol Rob J. Bodisch, Connectors and Doctrine Branch to Mr. Jim Strock, Director, Seabasing Integrations Division, Marine Corps Combat Development Command, 29 April 2014.

¹⁹ Brad Bean. "The Connector Carrier: U.S.M.C. Use of Yacht Ferries to Augment Amphibious Operations," (master's thesis, Marine Corps University, Quantico, Virginia , 2013)

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