GCE Equipment

What the future holds for 2030

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There has been a plethora of organizational and conceptual documents released within the last several years that seek to reorient the Marine Corps' azimuth in preparation for great power competition against a peer adversary. In light of these conceptual developments, coupled with the Commandant's recent publication of *Force Design 2030*, new equipment sets are required to enable the capabilities demanded of the future Fleet Marine Force. While most professional journals have been smattered with jargon pertaining to the procurement of smaller naval platforms and implications for the F-35 Joint Strike Fighter, little has been done to convey advancements in GCE equipment. Arguably, this portion of the MAGTF will execute a disproportionate level of tasks in support of 21st century naval concepts. Executing these emerging warfighting concepts will require the GCE to equip and train for operations inside the enemy's weapon engagement zone characterized by increasing reach, greater lethality, and enhanced sensors. Several forward-looking acquisition programs and projects currently underway offer capabilities that align with emerging concepts for littoral operations. This article will shed light on the future enablers that will allow the joint Naval force the ability to seize terrain, fight from that terrain, and ultimately defeat adversaries through operations that facilitate sea control and denial within the context of a naval campaign.

Through a historic lens, amphibious combat has not evolved a great deal since our forebearers went ashore in the Pacific island-hopping campaign. Disproportionality, aviation systems and naval vessels have advanced to a great degree, while systems designed for ground combat, particularly those that support the foot mobile forces, have advanced little. For example, today's AAV is marginally more advanced than the landing vehicle tracked; the M27 Infantry Automatic Rifle is marginally more advanced than the Browning Automatic Rifle. The Commandant recently opined that the Marine Corps must be able to fight at sea, from the sea, and from the land to the sea; operate and persist within range of adversary fires; maneuver across the seaward and landward portions of complex littorals; and sense, shoot, and sustain.[1]

Fortunately, advances in electronics, autonomy, and advanced manufacturing are enhancing ground combat capability to levels not previously seen. The following offers an understanding of this future equipment.

ACV-30 undergoing manufacturer testing incorporating the Kongsberg turret. *(Photo by Kongsberg.)*

Amphibious Combat Vehicle (ACV)

> Provide protected mobility and general support lift to the infantry while possessing the requisite water and land mobility necessary to enable ship-to-objective maneuver.[2]

Undoubtedly, most Marines will have seen or heard of this platform as it fulfills a Service defining capability and it will replace an icon of the Marine Corps for almost half a century: the AAV. The ACV program is managed by the Program Manager Advanced Amphibious Assault and manufactured by British Aerospace Engineering Systems in concert with IVECO Defense. It is a modern, eight-wheel armored personnel carrier with ship-to-objective maneuver capability that can maneuver in high sea states, navigate through large surf swells, and rapidly maneuver on land—all with thirteen combat equipped Marines and two days of sustainment embarked. This vehicle offers maneuverability similar to the

AAV but with much advanced survivability and lethality characteristics that give it comparable CATII MRAP like armor protection and a fully stabilized weapons system that will allow for precision gunnery from a stabilized platform. This will afford it the ability to engage everything from adversarial UAS platforms to fast attack craft. The current vision for this vehicle has morphed into a family of vehicles that will include personnel, communications, recovery, and 30mm cannon variants. At the time of writing, the Service has completed testing of low rate initial production vehicles whereby the manufacturer's production capability is optimized while the vehicles themselves are thoroughly tested and analyzed to ascertain any deficiencies prior to a full-rate production decision this fall. The ACV will complete an operational test and evaluation in the fall of 2020 and initial operating capability will likely be met thereafter. This vehicle will allow the GCE to maneuver in the surface domain, seize terrain, and enable operations without the need for port or runway facilities. The opportunities are limitless with this vehicle, and time will determine whether the Service truly embraces this platform and uses it for other variants for which it is entirely suited.

Advanced Reconnaissance Vehicle (ARV)

> Research and develop advanced technologies and full systems to demonstrate the realm of possible in order to inform the ARV requirements development process, jump start industry, and support and accelerate acquisition activites.[3]

The ARV is the Marine Corps' take on understanding the current and envisioned future technology that could reside within a reconnaissance vehicle to replace the venerable light armored reconnaissance vehicle (LAV). Although recently called into question by the Commandants commentary in *Force Design 2030* when he stated

> I remain unconvinced that additional wheeled, manned armored ground reconnaissance units are the best and only answer–especially in the Indo Pacific Region.[4]

This statement aside, efforts to develop the ARV have continued at full-pace. This effort is led by the Office of Naval Research (ONR) and they have contracted both General Dynamics and Science Applications International Corporation to build technology demonstrators that will begin testing in the latter part of 2020. The General Dynamics vehicle offers a relative contemporary replacement of the LAV, utilizing technology found in comparable platforms today. The Science Applications International Corporation offering will integrate future technology that may not be overly mature yet for full rate production. This includes initiatives such as a hybrid electric powerplant. Both variants will test a 30mm cannon, a UAS launcher and retriever, a new communications suite, and a new battlefield management system.

These will be the first vehicles within the Service to go through a battery of cyber testing. Both vendors are working toward a ship-to-objective capability while being able to transit a surf zone and also incorporate new technologies for locating underwater threats. The ARV technology demonstrators will ultimately inform requirements documentation for the full spectrum replacement effort of the legacy LAV.

Ground Based Anti-Ship Missile (GBASM)

> Ground Based Launchers add a new type of threat against a near peer adversary.[5]

GBASM is the Marine Corps' acquisition of a mobile missile system that can support sea control and denial while directly supporting calls from Service leadership to harness modern, long-range precision fire systems. This effort, led by Portfolio Manager Ground Combat Element Systems and its subordinate Program Manager–Fires, seeks to develop the Joint Light Tactical Vehicle into a mobile missile-launching platform capable of firing the Raytheon/Kongsberg Naval Strike Missile. This missile system, already utilized by our Navy and coalition partners, will give the Marine Corps its first ability to engage adversarial naval shipping out to ranges well beyond our capabilities today. Incremental range increases and warhead lethality are likely to increase over the missile systems life cycle. The GBASM is fully transportable via naval connectors and a handful of the Service's current and future aviation platforms. The command and launcher apparatuses will be digitally integrated with afloat naval assets to support the targeting process. Testing is currently ongoing with fielding likely to transpire middecade.

Unmanned Amphibious Craft

> Employing large numbers of relatively low cost unmanned assets in the first wave to overwhelm an adversary can be a game changer.[6]

Unmanned systems have been crucial in conflict since the turn of the century. The vast majority of these systems manifested themselves in the air domain where they gave friendly forces superior collection and prosecution capabilities in counterinsurgency conflicts. In a peer conflict, these aerial systems will be swept from the sky without significant protection. The technologies that have supported aerial systems for so long are now manifesting themselves within the surface domain. ONR seeks to develop an unmanned assault craft for the Service that will incorporate high water speed and payload capabilities coupled with a relatively low cost to support multiple functionalities. Capabilities will be evaluated via remote technology initially with increasing levels of integrated autonomy over time.

Autonomous-AAV (A-AAV) and Gibbs Quadski

> Development of a modular, vehicle agnostic autonomy package capable of unmanned operations in an amphibious environment.[7]

The development of autonomous technologies capable of operating within the complexities of the littoral domain has manifested itself in a joint effort by ONR, Naval Information Warfare Center-Pacific, and Johns Hopkins University among others. The hardware and software associated with autonomous technology is being developed on both an AAV and a Gibbs Quadski in an effort to further the requisite technology

to be employed on any vehicle or vessel that may operate within the littoral domain. To date, both the autonomous AAV and Gibbs Quadski have been successfully tested on land and in the water to include surf zone characteristic testing. This technology desires to remove the man from the machine, thus relegating highly dangerous missions—such as a beach assault to equipment that is unmanned—and can be programmed to execute a mission from the well-deck of a naval ship. This autonomous technology will be integrated into the unmanned amphibious craft and it is highly likely that it will find its way onto many other pieces of GCE equipment in the future.

Unmanned Assault Amphibious Vehicle (U-AAV)

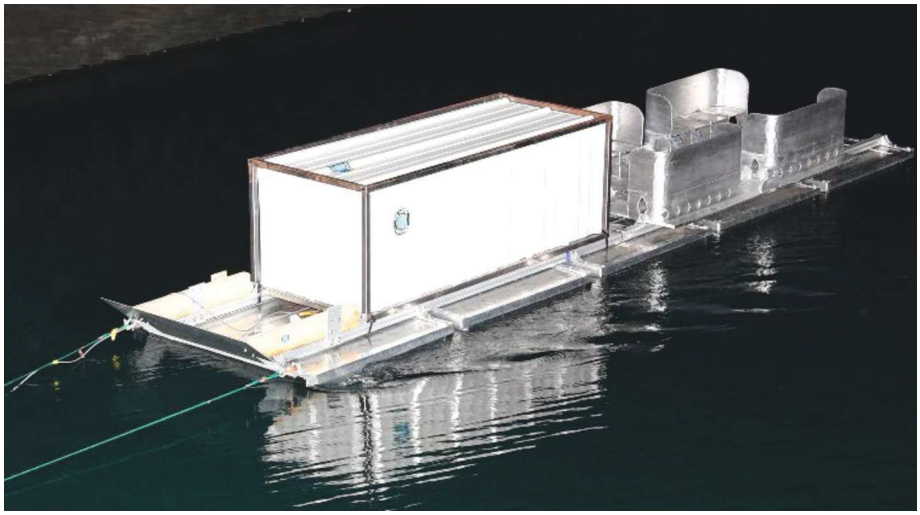
> Develop a fully integrated, mission-capable U-AAV to allow for automate control to provide a proofing, overwatch, deception, and/or logistics capability for lead surface assault elements.[8]

The U-AAV is being developed by ONR and Naval Surface Warfare Centers-Panama City and Indian Head and seeks to create an unmanned amphibious breaching platform to execute one of the most material and manpower-intensive tasks associated with littoral combat. In essence, autonomous technology is being incorporated onto an AAV platform that also contains a MK-154 line charge kit for explosive breaching, a mine plow for lane proofing, a lane marking system to identify and mark proofed lanes, and a remote demining vehicle to further substitute the mine plow. All incorporated, this system desires to achieve fully autonomous breaching. While it has been many years since an amphibious breach under duress has been called for, this is undoubtedly a Service-defining capability and allows the Marine Corps to penetrate a hostile shoreline should no adversarial gaps be located. A similar system, although manned, is currently fielded within assault amphibian units and is utilized by the engineering community. With murkiness revolving around the future of the Assault Breacher Vehicle platform, the U-AAV may very well become the Service's sole explosive breach capable armored platform. Such a capable, unmanned vehicle may be highly sought after in the future; the reoptimization of a legacy platform such as the AAV is a sound use for just this task.

Ship-to-Shore (STS) Connector

> The rapid forward manufacture of expendable floating logistics and assault platforms provides a critical asset to support littoral operations.[9]

The STS Connector is an initiative by Marine Corps Systems Command, Advanced Manufacturing Operations Cell to harness large-scale advanced manufacturing into an easily replicable platform that can be built in an expeditionary environment. The Advanced Manufacturing Operations Cell has sourced Big Metal Additive Inc., to build the STS Connector utilizing three-dimensional, additive manufacturing—incorporating wire arc printing to create large metallic platforms. In this case, the STS Connector is developed from wire aluminum, which is printed to form in order to create structure; this structure will support a landing connector that resembles a barge that can transport two twenty-foot standard shipping containers or two fifteen Marine transport modules or some combination of both. The STS Connector will be towed by an ACV or AAV. This easily configurable platform is being used to showcase expeditionary manufacturing capabilities that can rapidly produce parts and equipment to replace combat losses. Initial testing of a 1:4 scale demonstrator at Naval Surface Warfare Center-Carderock was highly successful; the full-scale STS Connector is currently being manufactured with testing this Summer.



A 1:4 scale ship-to-shore connector undergoing testing at Naval Surface Warfare Center–Carderock (NAVSEA Warfare Center–Carderock Division). *(Photo provided by author.)*

Rolling Fuel Transporter (RFT)

> Design, develop, manufacture, and test an amphibious towable fuel container.[10]

The RFT is an initiative by the Marine Corps Warfighting Laboratory to investigate the ability to produce an amphibious logistics trailer that can be towed behind an amphibious connector. The Marine Corps Warfighting Laboratory has chosen the manufacturer Musthane to develop this effort, which has manifested itself in a floating fuel trailer that can be towed behind an AAV or ACV. Moreover, up to five trailers could be towed by one vehicle. The trailer attempts to mitigate the historic burden placed upon aviation assets to establish fuel replenishment points in support of disaggregated operations. The trailer prototype is simple in design: two large tires that naturally have buoyancy are attached to a T-type trailer that are further attached to the tow pintle of the towing vehicle. The

RFT promises to reduce logistical burdens and will allow elements executing disaggregated operations the ability to self-sustain for a longer duration if needed. While prototypes will support the transportation of petroleum's, further design iterations could be utilized to transport other classes of supply. Testing will commence this summer on the platform.

Unmanned Surface Vessel (USV)

> We're looking for a long-range vessel that has the ability to do resupply, move personnel or move cargo.[11]

The USV is being developed by ONR in conjunction with Textron Marine and features a large unmanned watercraft that can be used as a facilitator for disaggregated operations over great distances. Similar in context to the aforementioned autonomous technology, the technology for this craft has been developed on a specific craft built by Textron Marine and also a common eleven-meter rigid inflatable watercraft; in essence, vessel agnostic technology. The USV will likely morph into a long-range platform capable of unmanned resupply operations; thus, it will be able to maneuver classes of supply from naval shipping to expeditionary bases at great distance, minimizing threats to naval shipping while ensuring critical classes of supply support the warfighter. As sustainment distances drastically continue to increase due to force protection measures for naval shipping, this platform will undoubtedly be crucial to supporting naval concepts. Further, this platform has potential to employ a vast array of weaponry should the service desire to exploit its potential further.

The Road Ahead

It is incumbent on a new generation of warfighters to refine and optimize these expanding capability sets through experimentation and operational exercise as they come to fruition. The lessons learned potentially provide for validation and refinement of the desired rudder shift in our warfighting approach. The future is here and now to embrace advancing technologies pertaining to autonomy, advanced manufacturing, digital communications and more while still being able to execute combat within the last 300 meters of an infantry assault if the requirement arises. We owe it to our warfighters who thrive in the mud and blood of battle to give them optimized and lethal equipment for which they can prosecute a future naval campaign. Developing and procuring the requisite equipment enablers will be imperative to allow forces the ability to execute published naval concepts, further develop concepts and enable newly developed warfighting structure and, most crucially, fight and persist in the envisioned future conflicts and scenarios of tomorrow.

A USV supporting an exercise at Camp Lejeune, NC. *(Photo by LCpl Nicolas Guevara/Marine Corps.)*

Notes

1. Headquarters Marine Corps, *Force Design 2030*, (Washington, DC: March 2020).

2. Marine Corps Combat Development Command, "Capability Development Document for the Amphibious Combat Vehicle Phase 1, Increment 2 (ACV 1.2) Family of Vehicles (FoV) and Mission Role Variants (MRV)," (Quantico, VA: July 2019).

3. Jeff Bradel, "Armored Reconnaissance Vehicle (ARV) Advanced Technology Development Future Naval Capability Brief," (brief, Office of Naval Research Code 33, Arlington, VA: June 2019).

4. Ibid.

5. John McPherson, "Ground Based Anti-Ship Missile (GBASM) Overview," (presentation, Program Manager Fires, Marine Corps System Command: December 2019).

6. "Unmanned Amphibious Craft Brief," (brief, Office of Naval Research Code 30, Arlington, VA, November 2018).

7. Naval Information Warfare Center–Pacific, "Modular Autonomous Robotic Systems (MARS)," (2020).

8. Bobbi Wood and Dustin Bride, "Mission Ready Unmanned Assault Amphibious Vehicle (U-AAV)," (brief, Naval Surface Warfare Center, 2018).

9. "Forward Manufacture of Expendable Floating Logistics and Assault Platforms," (brief, Advanced Manufacturing Operations Cell: August, 2019).

10. Marine Corps Warfighting Laboratory, "Rolling Fuel Transporter (RFT)," (Quantico, VA: 2020).

11. Shawn Snow, "The Corps is Looking at Unmanned Ships for a Pacific Fight," *Marine Corps Times*, (August 2019), available at https://www.marinecorpstimes.com.

>Authors Note: Specific details regarding equipment capabilities are not present within this document due to its unclassified nature.