Science and Technology Jujitsu

Keeping ahead of the technology curve

by Col Kevin Murray

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Today's globally engaged operating environment is one characterized by continuous and rapid technological advancements. To take advantage of these advancements, our Commandant, Gen David H. Berger, has invigorated Marine Corps capability development with his most recent Planning Guidance to our Corps.[1] One initiative established the Marine Corps Warfighting Laboratory (MCWL)

> as the focal point and integrating ground for new concepts, capabilities, and technologies that we develop, as well as a key enabler for accelerating the Service's future force development efforts.[2]

The Commandant goes on to state:

> To ensure investment in critical 'leap ahead technologies,' the MCWL shall be responsible for providing investment recommendations and development, field testing, and implementation of future operational and functional concepts, along with supporting technologies. The output is to accelerate change across not only technology but doctrine, organization, and training.[3]

As a smaller Service with limited personnel and fiscal resources, the Marine Corps must be creative when it comes to research and development because our margin for error is smaller. The MCWL's approach to punching above its weight is by leveraging what we call "science and technology (S&T) jujitsu." Jujitsu is defined as "the ability to turn a situation to one's advantage by exploiting one's own weaknesses or another's strengths"[4] and S&T jujitsu does just that by focusing on three main areas: maximization, leverage, and coordination.

Given the CMC's guidance, MCWL is in the midst of conducting a comprehensive review of how it best interfaces with the larger research, development, test and evaluation (RDT&E) enterprise to determine how it can most effectively influence modernization efforts while keeping a focus on longer term technological advancements. Before MCWL asks for more resources or moves out on S&T initiatives, it is prudent we understand holistically the investments of commercial industry, other Services, federally funded research and development R&D centers, and the Office of the Under Secretary of Defense for Research and Engineering. Within this larger construct, we must understand MCWL's value proposition to the Marine Corps, the Department of the Navy, and then the larger joint RDT&E establishment. The end state is to provide the best return on Marine Corps investments (ROI) by working with the other Services and DOD enterprise, avoiding duplication of effort, and accelerating the acquisition process without creating stovepipes of programs that run counter to becoming "joint, common, and interoperable," a fundamental tenant of the Goldwater-Nichols Act of 1986 that is also further reinforced in our recent *Commandant's Planning Guidance* (CPG).[5]

This end state is simply good "business sense" and maximizes the most effective force the Marine Corps has at its disposal: the innovative spirit of our Marines. The Corps, as a smaller Service, has a unique ability to influence the larger Services and DOD S&T enterprise by seeding them with our innovations and ideas, and then reaping the fruits of their basic and applied S&T investments both at the time of our choosing and at a technology readiness level for which it is ideal to integrate into fleet-level experimentation in order to inform capability development. It would be irresponsible to simply focus just on S&T efforts without also looking across the continuum of the larger acquisition process to determine when to invest in efforts from basic and applied research (6.1 and 6.2 in budget terminology), conduct advanced technology development (6.3), ensure there is sufficient funding to carry those into prototype (6.4), and sustain that prototype in the fleet, and/or transition to a program of record (6.5-6.7).[6] This holistic business approach starts with the end in mind and allows us to creatively make use of new authorities for acquisitions to

rapidly prototype to the fleet and then iterate faster with programs of record (PoRs) that last for 5 or 10 years, vice the existing mindset of 20 or 30 years, which will inevitably fall behind the advance of technology in today's age.[7]

The methodology of "S&T jujitsu" leverages the *100's of billions of dollars* of RDT&E investments across government agencies and industry each year. Some of these agencies include Defense Advanced Research Agency (DARPA), the Missile Defense Authority, the Office of Naval Research (ONR), the Navy, Army and Air Force Research Labs, the different service Rapid Capabilities Offices, Special Operations Command, the Army's Futures Command, the Joint AI Center (JAIC), the National Air and Space Administration, the Defense Industry Unit, Federally Funded Research and Development Centers, and especially commercial industry themselves, who are also investing billions in their own RDT&E efforts. Partnering with other organizations in order to maximize the effect of our smaller dollars, with an emphasis on efficient modernization, ensures we stay abreast of the technology advancement curve indefinitely.[8]

However, because we are a smaller Service with limited total obligation authority, we are not in a position to spend our precious resources on copious amounts of basic and applied research (6.1 and 6.2) because it would greatly detract from our ability to fund the RDT&E required beyond S&T (rapid prototyping, 6.4; systems development and demonstration, 6.5; RDT&E management support, 6.6; and operational system development, 6.7) to bridge the "valley of death" in acquisitions, and turn those good ideas into actual capabilities (i.e. our definition of true innovation).[9] Often, basic and applied research efforts fail, are high risk, or take a long time to mature. MCWL's approach ensures we gain and maintain our "value proposition" to the combatant commanders in an era of shrinking budgetary space and increasing threats for which our current force is woefully under-equipped. There are many examples of the Marine Corps attempting to go it alone, most of which have resulted in the Corps over extending itself for the sake of a single technology deemed "Service defining," lacking the ability to effectively pay for the program "wholeness" necessary to advance a capability quickly into the fleet. The CH-53K, as a "Service unique" capability, has cost the Service billions in RDT&E, with an effective cost per platform of $131 million, *per aircraft*, according to recent reports.[10] The "MUX" program, recognized by several urgent needs statements from the fleet over a decade or more, calling for an armed medium altitude, long endurance UAS for the Marines, is still largely unfunded, requires over $2.5 billion in RDT&E over the span of the next five years and will result in merely a prototype capability by 2026, with another $4 billion required for full fleet integration out to 2035.[11] The Expeditionary Fighting Vehicle program spent over $3 billion in RDT&E, and then the Service had to cancel the program because of poor performance, leading to further delays in future capabilities in the fleet.[12] In the end, MCWL recognizes that technology does not define the Marine Corps. Our ethos as Marines, our innovative concepts of operations and employment, and how we use technology to achieve an overwhelming effect as a combined-arms fighting force in all domains is what sets us apart from the other Services, and therefore our RDT&E program must reflect these characteristics.

In order to achieve the rapid modernization that the CPG directs and sustains our ability to iterate faster in this world of constant technological change, it is important that we learn not to "go it alone." Right now, DARPA itself has over *$3.5 billion per year,*[13] and the whole of the DOD spends over *$8.8 billion per year* on just basic and applied research as a subset of the larger *$99 billion* RDT&E budget.[14] The government is also planning on spending over $4 billion next year on artificial intelligence (AI) research alone.[15]

> The military services account for 222 different AI R&D activities valued at a combined $1.6 billion; the U.S. Navy is in the lead with 60 activities worth $886 million. The Pentagon's largest sources of AI funding are the Office of the Secretary ($1.3 billion) and the Defense Advanced Research Projects Agency ($506 million). In addition, the fiscal 2020 budget request includes 92 new AI-related activities worth a combined $1 billion, including $209 million for the JAIC, *that will coordinate research and prototyping initiatives within the DOD* and in conjunction with industry and academia."[16]

Even if the Marine Corps chose to invest in a larger percentage of total obligatopn authority on AI, it would be like dumping a bucket of water into the ocean and expecting the sea level to rise. A far better and more acceptable approach is to increase our ability to influence where existing dollars are spent, and ensure these entities are addressing Marine Corps' innovative ideas, while focusing our limited 6.3–6.7 funding where we can "harvest the fruit" of these investments as these efforts mature and then rapidly speed them to the fleet.

To put it more succinctly, there is plenty of money in basic and applied research, but to maximize "S&T jujitsu," we need a framework for leveraging it and a mechanism for turning those efforts into innovative solutions in the fleet in a rapid and repeatable manner which keeps ahead of the technology curve and maximizes our ROI. What the Marine Corps really needs is threefold:

Maximization: Additional funding in the "right side" of the RDT&E profile (6.3-6.7) to maximize our ROI focused on modernization.

Leverage: Increased manpower in the correct places to have greater influence within the larger RDT&E enterprise, while also leveraging other services investment in S&T.

Coordination: An appropriate command and control (C2) architecture for S&T efforts to reduce "fratricide" and "death by a thousand cuts" occurring because multiple entities across the Marine Corps attempt to build and fund their own specific S&T capabilities, without effective integration in the greater design effort or the requirements process.

The Marine Corps should enhance funding to support advanced technology development (6.3) and a transition

fund encompassing 6.4–6.7 from Aviation, Intelligence, Logistics and Capabilities Development Division (CDD) funding "pots" to ensure we get new capabilities into the fleet faster. Despite the partnership between CDD, Marine Corps Systems Command, and MCWL to effectively "flow out" next generation capabilities across the budget, we have yet as an institution grasped the need to effectively enhance prototyping funds, to get capabilities to the fleet faster and overcome the "valley of death" associated with transitioning new technologies to the fleet. It is also true that the Marine Corps does not invest equally as the other services in S&T, specifically in 6.3 funding. Recognizing this, the Marine Requirements Oversight Council approved an increased RDT&E funding in the Warfighting Investment Program Evaluation Board for POM-21; however, they did not fund the increases in prototyping or follow on RDT&E (6.4-6.7) to carry these technologies into fleet use nor sustain them until the program objective memorandum cycle could catch up.[17] This is an area for improvement. One consideration would be to also increase 6.3-6.4 funding sufficiently to ensure each MEF was given a specific RDT&E budget, managed by MCWL, such that prototypes could go to the fleet and stay there, and the fleet could conduct continued experimentation and tactics development in alignment with the MCWL-led overall experimentation plan. Marine aviation has an RDT&E budget that is roughly $1 billion per year, which has largely been used to upgrade existing programs of record—vice placing emphasis on "what's next."[18] Allocating a larger percentage of aviation RDT&E toward next generation aviation capabilities in the 6.3 realm, such as advanced Unmanned Aircraft Systems, long-range loitering munitions, and electric vertical take-off and landing prototypes, in partnership with Army, Navy, and Air Force efforts, would go a long way to ensuring the ability to get caught up to the technology curve instead of always being late to need.

Second, MCWL requires an increase in our most precious commodity: people. In order to effectively conduct S&T jujitsu, the Marine Corps needs to invest active duty personnel, both officer and enlisted, in more places across the RDT&E enterprise. Under Gen Berger's guidance, when he was Deputy Commandant Combat Development & Integration, MCWL and ONR took the first steps by dissolving ONR's Code 30 and distributing the Marines and civilian personnel across the other ONR Codes in order to increase naval integration and reduce redundancy across the entirety of ONR.[19] Gen Berger assigned a Marine colonel to provide direct oversight of the Marine Corps funding portfolio within ONR. And, MCWL established the S&T Advisory Group, made up of colonel-level advocates from across HQMC and the S&T Executive Steering Committee, which is dual chaired by the one-star within CDD and MCWL, in order to guide S&T investments along a path to becoming programs of record. These changes have had an immediate and profound effect as evidenced by smart program objective memorandum investment and divestment decisions made over the past year.

The Marine Corps now has better oversight into the execution and allocation of its funding within ONR and has already seen a significant ROI in terms of new S&T program alignment.[20] S&T Advisory Group and S&T Executive Steering Committee guidance has allowed the Marine Corps to make hard decisions on S&T programs to cancel, continue, or accelerate with matching funding from ONR in the Future Naval Capabilities and Innovative Naval Prototype portfolios. Meanwhile, per the CPG, we have become far more naval integrated as these moves have enhanced our efficiency and effectiveness.[21] The best example of this is within Code 31, which "supports research in … Command & Control (C2), Communications, Cyber, EW, Intelligence, Surveillance and Reconnaissance."[22] In the past, both the Marines and Navy were moving in divergent directions when it came to our future C2 and network architecture. Now, in partnership with MCWL's Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance Branch, Cyber/Electronic Warfare Branch, and ACE Branch, ONR Code 31 is actively supporting enhanced AI efforts for battle management and C2 for the Navy and Marine team, building a comprehensive advanced aerial network layer to augment traditional networks, and leading the Services right now in terms of advanced C4ISR innovation.[23]

While this was a good start, however, it is clear we have a long way to go. We have a limited number of Marines at ONR and need more at Naval Research Laboratory, the Strategic Capabilities Office, and DARPA. We also need to establish liaisons to the Army Futures Command, Air Force Warfighting Integration Capability Office, and with suborganizations such as PMR-51 (one of the divisions of ONR specifically chartered to address advanced technology development and prototyping) which specializes in advanced technology development within ONR itself.[24] We need to emphasize commands such as Naval Research Laboratory and PMR-51 by placing the right Marine colonels in those organizations. Further, there needs to be a promotion path for those Marines to ensure a culture which is always looking forward toward "what's next" and never gets complacent.

Additionally, MCWL and DC Information have recently invested personnel into the JAIC, which continues to prove itself to be a sound investment.[25] One of the most recent examples of this partnership is the effort to leverage Special Operations Command's development of an autonomous, AI enabled UAS, capable of flying within buildings, to map out their interiors, and determine threats. Given a recent deliberate urgent need statement sponsored by Plans, Policies, and Operations, MCWL worked through the Marines' within the JAIC, the Defense Industry Unit, and CDD to provide insight into the technology readiness and capability of this system. From this collaboration, the Marine Corps was able to make smart decisions on deferring the purchase of this capability a few months, until the most updated version of the technology was available, saving funding from the JAIC for a time when it would have a greater impact on the Marine Corps. The fact that the Corps invested a few people

in these key locations has enabled our ability to more effectively leverage the greater RDT&E enterprise, and maximize the available joint and organic funding to create a critical effect at the right time and place.

Finally, it will not work to have increased numbers of personnel across the RDT&E enterprise if they all have different reporting chains and there is not unified guidance and direction which informs divestment and investment decisions. Each Deputy Commandant should consider consolidating their personnel assigned to RDT&E efforts and put them under MCWL's cognizance. The Deputy Commandants would then provide their guidance to the CG MCWL, who would direct the appropriate divisions within MCWL S&T to work toward those priorities. These personnel within MCWL would have a communication requirement back to their Deputy Commandants and commanders, to ensure common understanding while daily actions and allocation of resources are directed by the CG, MCWL. Deputy Commandant Installations and Logistics (DC I&L) and MCWL are currently working on such an arrangement. The integration of DC I&L's NEXLOG innovation cell and MCWL will lead to more focused attention on installations and logistics equities within the RDT&E community while enhancing DC I&L's influence on concept development and experimentation.[26] DC I&L has also allocated more personnel to ONR, such that they now have better influence on basic, applied, and advanced logistics technology development.

The MCWL is leading innovation efforts for the Marine Corps, and using S&T jujitsu to maximize the ROI in order to meet the Commandant's guidance. Our recent efforts during Advanced Naval Technology Exercises, Info-Pacific Command, and Joint Staff led globally integrated wargames, joint concept development efforts, and the Naval Capabilities-Based Assessment Integrated Process modeling and simulation efforts have led to recognition by Defense leadership and Congress, and we have been rewarded in the form of significant Congressional additions in funding, and with the approval to stand up our own Rapid Capabilities Office as a "new start."[27] MCWL has doubled its "buying power" leveraging this method and can continue to grow further if properly resourced. The recommendations in this article to increase 6.3 and later RDT&E funding, place manpower in the correct places to maximize our influence on S&T efforts, and to get organized for RDT&E execution with an efficient C2 structure, fall directly in line with the Commandant's directives, which states

> [By the summer of 2023 we will have] re-established our primacy within the Department as the most innovative and revolutionary thinkers, the most well-disciplined and accountable force, and the most transparent and responsive force to our collective civilian leadership across the Joint Force and Department."[28]

Applying S&T jujitsu through maximization, leverage, and coordination will sustain these successes into the future.

Notes

1. Gen David H. Berger, *Commandant's Planning Guidance*, (Washington, DC: July 2019).

2. Ibid.

3. Ibid.

4. *Dictionary.com,* s.v. "Jujitsu," available at https://www.dictionary.com

5. Information on the *Goldwater-Nichols Act of 1986* is available at https://history.defense.gov.

6. Information available at https://fas.org.

7. Daniel Gouré, "Wining Future War Modernization and the 212st Century," *Heritage.org*, (October 2018), available at https://www.heritage.org.

8. Ibid.

9. Information available at https://fas.org.

10. Information on the total cost of the CH-53K is available at https://www.defensenews.com.

11. HQMC, *Aviation Brief to the CMC on MUX*, (Washington, DC: April 2019).

12. Information on the Marine Corps' amphibious combat vehicle program is available at https://news.usni.org.

13. Information available at https://www.darpa.mil.

14. Information available at https://fas.org.

15. Information on "Finding artificial intelligence money in Fiscal Year 2020 budget" is available at https://about.bgov.com.

16. Ibid.

17. Information on the Marine Corps Expeditionary Force Development System (EFDS) is available at https://www.hqmc.marines.mil.

18. HQMC Aviation, *Aviation Plans & Programs Ops and Budget Update*, (Washington, DC: June 2019).

19. Information is available at https://www.onr.navy.mil.

20. Col Brian Magnuson, "USMC S&T Program Brief," (Washington, DC: USMC Portfolio Director, ONR).

21. *Commandant's Planning Guidance.*

22. Information available at https://www.onr.navy.mil.

23. Dr. Mike Pollack, "Cross Platform Electromagnetic Technology Accelerator (CPETA) brief," (Washington, DC: July 2019).

24. Information on ONR's Framework can be found at https://www.onr.navy.mil.

25. Information on the JAIC can be found at https://dodcio.defense.gov.

26. Information on DC I&L's NEXLOG organization can be found at https://www.iandl.marines.mil.

27. Information on the Marine Corps Rapid Capabilities Office can be found at https://www.mcwl.marines.mil.

28. *Commandant's Planning Guidance.*