Refocusing Reapers

Tangible Improvements Today That Prepare for the Future

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Numerous entities internal and external to the conventional remotely piloted aircraft community have enthusiastically promoted MQ-9 utility in a post-Global War on Terrorism world, however the platform has been aggressively targeted for retirement. A two-stage approach will refocus MQ-9 training and development efforts for the remainder of its life to wring additional value from the weapon system and accelerate changes to meet future challenges.

In the wake of the 9/11 terrorist attacks, the US Air Force found itself without aircrew, aircraft, or a methodology for embarking on the massive airborne man-hunting mission that became characteristic of the Global War on Terrorism (GWOT). Seemingly overnight, a General Atomics demonstration aircraft was mass produced as the RQ-1. This platform was paired with an assortment of pilots and intelligence analysts to create the world's first remote combat aviation force, charged with satisfying near-infinite demands for airborne intelligence, surveillance, and reconnaissance (ISR), and precision strike.[1]

For nearly two decades, a firehose of contingency funds quenched flaming capability gaps in the hardware and software of remotely piloted aircraft (RPA) weapon systems, and aircrew continuation training was eclipsed by operational requirements.[2] In parallel, the highly directive and dynamic nature of the typical GWOT customer eroded mission planning skills and mission ownership culture at the squadron level. The result was a force proficient only in a narrowly scoped mission, highly dependent on external acquisition, operational design, mission planning, and command and control, yet fluent in change adaptation.

The *2018 National Defense Strategy* received a warm welcome in the conventional RPA force, harkening a return to traditional designed operational capability missions such as air interdiction and strike coordination and reconnaissance.[3] Friction arose as the force struggled to train for doctrinal air-to-ground missions with scant training resources while still shouldering 24/7 support to special operations GWOT missions.

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1. Richard Whittle, *Predator: The Secret Origins of the Drone Revolution* (New York: Picador, 2015).
2. Bernard D. Rostker et al., *Building toward an Unmanned Aircraft System Training Strategy* (Santa Monica, CA: RAND Corporation, 2014), https://www.rand.org/.
3. James N. Mattis, *Summary of the 2018 National Defense Strategy: Sharpening the American Military's Competitive Edge* (Washington, DC: Department of Defense, February 2018), https://dod.defense.gov/.

As the Air Force slowly pivoted to support US competition with other powerful states, the conventional MQ-9 community tried to align by demonstrating its ability to perform doctrinal missions in training environments. Decisionmakers proposed 4th generation plus versions of the Reaper that would attempt to survive in moderately contested areas.[4] Several individuals external to the force published strong arguments for MQ-9 viability in state competition and emerging missions.[5]

Unfortunately, the community has largely encountered tepid enthusiasm from customers in the combatant commands, and the firehose of acquisition funds has slowed to an intravenous drip.[6] The Air Force's vision for unmanned aircraft systems appears bifurcated on small numbers of expensive multimission vehicles operated in the traditional 1:1 crew/platform ratio and artificial intelligence-enabled teaming at the formation level with 5th or 6th generation fighters.

Christian Brose describes the dangers of this vision but also advocates for divestment of legacy platforms, a family to which the MQ-9 belongs.[7] Thus the outlook for today's conventional RPA units is that they will be left without a chair when the GWOT music finally comes to an end, leaving a highly experienced remote combat workforce—the most valuable component of the weapon system—in limbo until the Air Force executes the planned 2035 retirement of the MQ-9. Is half-hearted training against doctrinal missions, waiting for "MQ-next," and hoping it is what combatant commands need, the best use of time and effort?

This article proposes a path to significantly improve MQ-9 value to combatant commands today, while simultaneously preparing its people and processes for the future by developing adaptable leader-aviators and leveraging the intrinsic strengths of the weapon system design.

Stage 1: Reimagine and Refocus

> *You can't just ask customers what they want and then try to give that to them. By the time you get it built, they'll want something new.*
>
> Steve Jobs

4. John A. Tirpak, "Air Force to Upgrade MQ-9's Mission and Capabilities for Near-Peer Fight," *Air & Space Forces Magazine*, April 21, 2021, https://www.airforcemag.com/.

5. Thomas Mahnken, Travis Sharp, and Grace Kim, *Deterrence by Detection: A Key Role for Unmanned Aircraft Systems in Great Power Competition* (Washington, DC: Center for Strategic and Budgetary Assessments, April 14, 2020), https://csbaonline.org/; and Lawrence A. Stutzriem, "Reimagining the MQ-9 Reaper" Policy Paper, vol. 30 (Arlington, VA: The Mitchell Institute, November 18, 2021), https://mitchellaerospacepower.org/.

6. Brendan W. McGarry and Emily M. Morgenstern, *Overseas Contingency Operations Funding: Background and Status*, R44519 (Washington, DC: Congressional Research Service, September 6, 2019), https://sgp.fas.org/.

7. Christian Brose, *The Kill Chain: Defending America in the Future of High-Tech Warfare* (New York: Hachette Books, 2022).

The disparity between MQ-9 proponents and opponents is that the former sees capability and potential whereas the latter sees cost without benefit and vulnerability. For any mission, commanders can certainly accept higher risk with an unmanned aircraft, however the operator community appears to fall short in selling the benefits of doing so. Why task an MQ-9 to bring a few thousand pounds of ordinance to a target in contested space when a variety of air-, land-, and surface-launched fires can achieve effects faster and without a sensational shoot-down incident?

While an RPA training exercise may demonstrate fantastic doctrinal air interdiction mission execution in an operationally representative context, the value proposition to the customer is essentially a low-speed reusable cruise missile. MQ-9s can also perform strike coordination and reconnaissance, but the commonly advertised advantage—that a crew removed from the flight environment can organize, sort, and task targets more effectively than a manned aircraft—is undocumented and likely not accepted outside the RPA community.

Generally, the roots of weak MQ-9 customer demand in the peer competition market lie in failing to embrace its unique strengths and in some cases suppressing them. Rather than shackling to specific doctrinal mission sets, the MQ-9 should present for the remainder of its service life as a flexible long-range/endurance find-fix-track (F2T) system that provides a modest array of immediate kinetic response options. Furthermore, the potential strengths of the ground-based cockpit need to be explored instead of ignored to identify costs and benefits of beyond-line-of-sight (BLOS) connectivity in either manned or unmanned system contexts.

Train, Plan, and Lead

The F2T task spans mission boundaries, answering fundamental questions about the battlefield.[8] The RPA's demonstrated ability to conduct high-fidelity intelligence, surveillance, and reconnaissance across the electromagnetic spectrum thousands of miles from its base without personnel recovery needs is unique in the Air Force inventory. But MQ-9 crews are undertrained, and accountability for mission accomplishment is disaggregated across multiple organizations with competing agendas. Conventional MQ-9 continuation training programs are largely devoted to single-ship weapon employment, disregarding the bulk of knowledge and skills required to close a kill chain. MQ-9 crews need significantly more training on tasks only they can do, at a speed that keeps pace with a dynamic battlespace.

This training starts with airspace access, underpinned by aircrew proficient in planning and flying anywhere in the world, in military or civil airspace, with minimal notice. Self-imposed limits on operating areas, long lead times for new areas, and reliance on external planning support tells customers that remote aviation is inflexible, and it enables planning

8. LeMay Center for Doctrine Development and Education (LeMay Center) *Targeting*, Air Force Doctrine Publication 3-60 (Maxwell AFB, AL: LeMay Center, November 12, 2021), https://www.doctrine.af.mil/.

activities to be consolidated in a few personnel to the detriment of the larger force. The consequence is that the majority of the force cannot begin a new operation until the few experts have distilled and taught the procedures and shouldered self-imposed squadron-level reference material burdens.

Once in the tactical segment of the mission, MQ-9 units need additional training to organically plan, execute, and debrief ISR to their aircraft's maximum potential, skills which atrophied in GWOT where customers' ISR tactical coordinators (ITCs) performed those functions and fed direction to the crew.[9] Some have publicly questioned GWOT targeting practices that trace back to Special Operations Forces' Bosnian war criminal hunting in the late 1990s.[10]

Regardless of the efficacy of these practices, the conventional MQ-9 force has never rallied to take ownership and potentially improve GWOT targeting, despite their platform being the center of it. Mission ownership, not to be confused with formal supported/supporting unit relationships, has languished.

Under the typical GWOT operation, conventional MQ-9s supported task forces or strike cells charged with relatively narrow objectives, which frequently involved a kinetic strike and obvious indicators of mission results. The system was effective in removing terrorists from the battlefield, but it fostered an atmosphere where aircrew were prone to taking direction blindly from external intelligence or fires coordinators and thus abdicating their responsibility for mission failure or success. [11]

As these crews transition to executing predominantly ISR in the broader mission objectives of state competition, they find themselves members of a loose group, together with representatives from various sensor payloads, analysts, and operations center staff, where mission results and accountability for outcomes is nearly impossible to determine. While it may be tempting to reboot the ITC, adding another human to an already confusing structure of job titles and text chat windows will not improve effectiveness.

Instead, conventional RPA needs to reboot the ownership that the supported units exercised through ITCs, at the pilot-in-command level, and promote it at all levels of command.[12] A focus on the core strengths of aviation knowledge and skills, ISR expertise, and mission ownership will build airmanship that is timeless, platform independent, and crosses doctrinal mission boundaries. Critical details unique to specific missions will still need attention but given the high level of education across the ranks, digesting a Joint

9. Kenneth J. Hintz, *Sensor Management in ISR* (Norwood, MA: Artech House, 2020), chap. 7.

10. Joe Ritter, "Getting Drones Ready for Conventional War," War on the Rocks, June 20, 2022, https://warontherocks.com/; and Sean Naylor, *Relentless Strike: The Secret History of Joint Special Operations Command* (New York: St. Martin's Griffin, 2016).

11. Hearing before the Senate Committee on the Judiciary on 'Targeted Killing' and the Rule of Law: The Legal and Human Costs of 20 Years of US Drone Strikes, 117th Cong. (February 9, 2022) (statement of Nathan A. Sales, former ambassador-at-large and Coordinator for Counterterrorism), https://www.judiciary.senate.gov/.

12. Don J. Yates, "The ISR Traffic Jam: How to Improve ISR Operations in USINDOPACOM (master's thesis, US Naval War College, May 10, 2021), https://apps.dtic.mil/.

service tactics publication and platform-specific content should be feasible in the weeks leading up to a new tasking.

Consequently, the goal of aircrew development for the remaining MQ-9 service life should shift away from building experts in its designated operational capability mission sets of questionable utility to building adaptable, platform-agnostic remote combat aviators and leaders. For leadership, the challenge will be striking balance between traditional readiness metrics and a more subjective assessment of a unit's critical thinking, planning, and execution in response to unforeseen operational requirements. A force proficient only in kinetic portions of the mission will be hollow if the crews cannot efficiently get the aircraft to a new fight and independently close kill chains.

Ground-Based Cockpit

Remotely piloted aircraft offer the unique ability to bring unprecedented data, connectivity, and processing directly to the tactical edge via the command-and-control link. Although these links have been highlighted as a vulnerability baring RPA from major combat operations, growth in commercial space launch capacity and bandwidth availability challenge this claim even before intersatellite links and quantum cryptology are fielded.[13] Small numbers of flagship communication satellites in geosynchronous orbit have been joined by thousands of low-cost analogs in low Earth orbit, obfuscating jamming targets and blunting the threat of direct-ascent antisatellite missiles.

Meanwhile, the theoretically infinite network access and processing power that is possible in the RPA cockpit has been largely ignored and, in some cases, suppressed in future hardware design or operating principles in pursuit of a flying experience characteristic of a bygone era. The RPA cockpit today can funnel data from a wide variety of classified and open sources including signals intelligence, synthetic aperture radar, electro-optical imagery, and more, commonly referred to as national tactical integration.[14] This data is frequently available in graphical user interfaces with minimal training requirements, poising the RPA to become a desirable source of situational awareness over the battlefield vice a sink.

The RPA cockpit also enjoys reach-back to the entire Intelligence Community via web, voice, and text chat communication systems. MQ-9 aircrew and organic intelligence professionals should begin developing operating procedures immediately that integrate internet-derived data in all mission segments, from real-time weather to potential target locations, to friendly force disposition with an eye towards increasing Joint Force situational awareness regardless of mission set.

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13. Sandra Erwin, "Interoperability Demo Planned between DARPA's Blackjack and PredaSAR Satellites," Space News, December 16, 2021, https://spacenews.com/; and Denis Mandich, "Quantum Encryption: The Basics," *Infosecurity Magazine*, February 14, 2022, https://www.infosecurity-magazine.com/.

14. Lisa Crawford, Jeanette Rankin, and Ronald II Mims, "Air Force National Tactical Integration (AF NTI) FOCUS 2013 Planning Working Group (PWG) – Observation Handbook and Presentations" (SURVIAC, May 30, 2013).

Further, the MQ-9 community should strive to become an active participant in a real-time intelligence ecosystem, utilizing wide-area apertures to inform search areas, consequently improving target fidelity with onboard sensors and improving confidence through sensor fusion or complementary collection geometry. This also provides a forum for efficient tasking and cross-cueing while airborne. The community should also replace 4-way intersections and traffic cops with traffic circles.[15]

Lastly, the RPA force should significantly increase integration with practitioners of software-defined, wirelessly delivered effects to explore true "tactical cyber" applications in doctrinal mission sets and beyond.[16] Lessons learned pursuing these improvements with MQ-9s can be directly applied to the next generation of RPA or indirectly to future autonomous combat aircraft development.

The ground-based cockpit, and more generally, ability of an attack squadron to present forces remotely from a static CONUS location unlocks agile combat employment on a global scale. In theory, it allows MQ-9 capacity to reflow to alternate locations in only the time required for aircrew to digest local aviation and military directives, plan the flight, and reconfigure network settings.

In practice today, MQ-9s fully meet the core agile combat employment elements of posture, command and control, and movement and maneuver, and are actively improving protection and sustainment as defined by Air Force Doctrine Note 1-21.[17] MQ-9 agile combat employment can be further developed for contingency response by discretizing the flight and providing just-in-time training for essential tasks.

For example, if a regional crisis erupts in an unfamiliar operating area over which a squadron's RPAs are tasked to provide real-time ISR and immediate kinetic response options, the first wave of crew members would plan and execute enroute procedures to get sensors in the area as soon as possible. During the transit, a second wave of crews would plan the tactical ISR segment and swap in when the aircraft arrives on station. Over the course of only a few days, the cycle would continue with successive personnel shifts building upon the lessons learned from the previous.

Concurrently, a separate cadre would develop a concept of fires, rehearse in simulators, and remain on call for weapon employment for the duration of the operation or until enough crews were trained to provide coverage. The intent is not to turn every new operation into a pick-up game but replace an all-or-nothing training mentality with a tailored approach that is resilient to unforeseen mission requirements and leverage unique RPA strengths in agile combat employment. Developing squadron-level agile combat employment skills now will improve MQ-9 utility to combatant commands and establish a foundation for subsequent platforms.

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15. Yates, "ISR Traffic Jam."

16. Isaac R. Porche III et al., *Tactical Cyber: Building a Strategy for Cyber Support to Corps and Below* (Santa Monica, CA: RAND Corporation, 2017), https://www.rand.org/.

17. LeMay Center, *Agile Combat Employment*, Air Force Doctrine Note 1-21 (Maxwell AFB, AL: LeMay Center, August 23, 2022), https://www.doctrine.af.mil/.

Stage 2: Accelerate Change

If it feels comfortable, you're doing it wrong. We need to kill set-and-forget tendencies.

General Charles Q. Brown Jr., USAF

As the RPA community remains sandwiched between satisfying mission requirements today and meeting readiness requirements for tomorrow, the community should see value in regular exposure to combat theaters, embrace residual GWOT operations as a tactics sandbox, and capitalize on these as opportunities to pull advanced concepts and capabilities to the battlefield.

An Excellent Pickup Truck

Plank holders of the RPA enterprise remember the RQ-1 as a concept demonstrator that was directly fielded despite glaring human-machine interface issues and performance gaps.[18] While some tend to view that as an isolated uncomfortable event, where is the guarantee it won't happen again? What can the force do to hedge against a repeat?

The conventional Reaper force can provide a nurturing environment for high-readiness developmental efforts, regardless of the intended host aircraft. Numerous MQ-9 characteristics make it ideal for rapid modification: low speed and low acceleration (small performance envelope and test burden), nonlow-observable (no outer mold line to maintain, simple external carriage), large electrical generation capacity, long range and endurance, low cost per flight hour, and large number of domestic and international operating locations (opportunities for operational utility evaluations).

More importantly, after a decade of spiral development in pursuit of GWOT objectives featuring many niche or small-batch systems, MQ-9 aircrew are perhaps the most familiar in the Air Force with implementing new capabilities. In 2014, US Special Operations Command embarked on an agile acquisitions program anchored on operational flight program updates in six-month increments, delivering 50 new system-level capabilities in just the first three years.[19]

The adaptable aircrew/aircraft team coupled with a focused rapid development effort offers several advantages. This combination exposes today's aircrew to new systems and operating concepts, introduces emerging capabilities to current operational environments, and provides a surrogate to preserve signature or airframe time on classified platforms.

As a peripheral benefit, US Special Operation Command's MQ-9 program fostered collaboration between operators, acquisition professionals, and industry throughout the development process. Each operational flight program release improved the final deliverable, reduced training time for line aircrew, and reduced the number of discrepancy reports. Lastly, the current MQ-9 force laydown offers numerous opportunities to expose

18. Whittle, *Predator*.

19. Andrew Smith, "Agile Values in the MQ-9 Reaper's Software Development," *Defense Acquisition Magazine* (blog), September 1, 2018, https://www.dau.edu/.

new capabilities to operational environments. Even if an operating location is currently supporting counterviolent extremism organization missions and will not interact with an advanced adversary, core F2T functions cross mission boundaries such as mobile target tracking in complex terrain. A system's introduction in an unplanned use case may reveal unexpected value.

Humans and Hardware of the Future Force

Numerous combat experiences with silver bullets including air-to-air missiles, helicopters, and low-observable aircraft have shown that over-reliance on technological solutions can hinder flexibility and foster apathy.[20] US military culture in the last century has also shown that disruptive technologies can be resisted in the absence of a crisis or until significant time and effort generates overwhelming proof of utility.[21]

To preempt both unhealthy behaviors, the conventional MQ-9 force should regularly observe and advise developmental activities far upstream of operational fielding. The first goal is to improve end-item quality by incorporating line operator inputs early in the acquisition process when changes are far easier to make, exposing acquisition professionals and vendors to operational problems. This is not to say the program should be steered to solve today's problems but to ensure they are not duplicated by distilling tactical vignettes into fundamental tasks that are or are not being adequately addressed with today's systems.

The second goal is to season remote aviators with advanced technology early in their career to build deeper understanding and confidence, since they will be the ones leading its implementation later. In the case of the MQ-9, large portions of the force struggled to embrace automatic checklists and automatic takeoff and land capability. If the community cannot trust and utilize this relatively low level of automation, how can it be expected to trust and utilize any number of revolutionary autonomous unmanned airfcraft system concepts currently in development? Junior remote aviators should not only strive to master their trade as it exists today but be cognizant of how it could be made more efficient and/or lethal tomorrow.

Solve Joint Force Problems

Traditional Air Force large force exercises such as Red Flag certainly improve aircrew skills and unit-level planning expertise for designated operational capability missions. But the Reaper community has struggled to demonstrate value in these exercises, remaining firmly associated with the GWOT and aggressively targeted for divestment.[22] This

20. Pete Blaber, *The Mission, the Men, and Me: Lessons from a Former Delta Force Commander* (New York: Dutton Caliber, 2017).

21. Brose, *Kill Chain*.

22. Hearing before the Senate Appropriations Committee, Subcommittee on Defense on Weapons Systems Divestment, 117th Cong. (July 21, 2021) (statement of David S. Nahom), https://www.appropriations.senate.gov/.

contrasts sharply with the potential offered by an adaptable force flying adaptable aircraft, which was recently observed in US Naval Forces Europe's BALTOPS 22 exercise.

In the scenario, a fictional malign state seizes an Ally nation's coastal territory, driving a US-led amphibious assault with NATO support. US Air Force MQ-9s participated primarily in a close air support role but offered little unique value to the combined task group's organic AH-1, UH-1, AV-8B, and surface-based, land-attack capabilities. Meanwhile, the Ally fleet consisting of dozens of vessels and thousands of personnel was held at risk by an unknown number of camouflaged coastal defense cruise missiles similar to Russia's controversial Club-K launchers disguised in intermodal shipping containers.[23]

Closing an F2T2EA cycle on this "new" threat poses significant challenges: collecting signatures of targets in ubiquitous form factors, identifying patterns of life that separate them from surroundings, persistent surveillance, and immediate availability of fires when the target has been fixed—in other words, exactly the challenges the MQ-9 and its crews have been successfully overcoming for nearly two decades. Narrow focus on designated operational capability mission training turned BALTOPS 22 into a missed opportunity for crews to leverage decades of proven tactics against today's emerging battlefield problems.

Had the coastal defense cruise missile hunt required collection of a new signature, the MQ-9 would have offered several internal and external interface options for new sensor integration. Opponents will point out that mission success in this scenario is contingent upon permissive airspace. While true, this does not reduce relevant participation in that the MQ-9 creates an instantly useful capability if paired with suppression of enemy air defense and prepares crews and tactics that can be used on future survivable platforms for a similar mission. In either case, approaching current operations and large force exercises with a team-oriented, problem-solver mentality will reveal desperately needed, creative solutions given current fiscal, logistical, and technological constraints.

Conclusion

Numerous entities internal and external to the conventional RPA community have enthusiastically promoted MQ-9 utility in a post-GWOT world; however, the platform has been aggressively targeted for retirement. Without a clear vision for force development in the remaining years, thousands of highly experienced remote combat aviators will tread water with residual counterviolent extremist operations and training for improbable missions. This will continue until one of two events occur: an abrupt transition to "MQ-Next" subject to crew complement or reassignment after conventional RPA are abandoned in favor of low-quantity expensive, multimission unmanned aircraft systems and attritable "loyal wingmen."[24]

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23. Robert Clarke, "The Club-K Anti-Ship Missile System: A Case Study in Perfidy and Its Repression," *Human Rights Brief* 20, no. 1 (September 30, 2012), https://digitalcommons.wcl.american.edu/.

24. David A. Ochmanek, *Determining the Military Capabilities Most Needed to Counter China and Russia: A Strategy-Driven Approach* (Santa Monica, CA: RAND Corporation, 2022), https://www.rand.org/.

A two-stage approach will refocus MQ-9 training and development efforts for the remainder of its life to wring additional value from the weapon system and accelerate changes to meet future challenges. Stage 1 reimagines current MQ-9 operations anchored in intrinsic strengths, breaking from the notion that the community's identity is in the GWOT, when it actually rests in adapting to a mission when no one else can. A renewed training focus on airmanship, ISR, and mission ownership, executed with the cockpit as the heart of the weapon system, provides a means to significantly improve mission effectiveness, integrate with the intelligence ecosystem, and grow agile combat employment competency.

Stage 2 turns the MQ-9's twilight years into an incubator and information exchange that on-ramps advanced capabilities by exposing them to the operational environment and highly experienced RPA crews. This has the peripheral advantage of educating and preparing personnel today that will be needed to fully propagate advanced capabilities on future platforms. In short, the conventional Reaper force needs to refocus on playing to its strengths today while preparing people and processes for the future. ✈