Tactical Reconnaissance Strike in Ukraine: A Mandate for the U.S. Army

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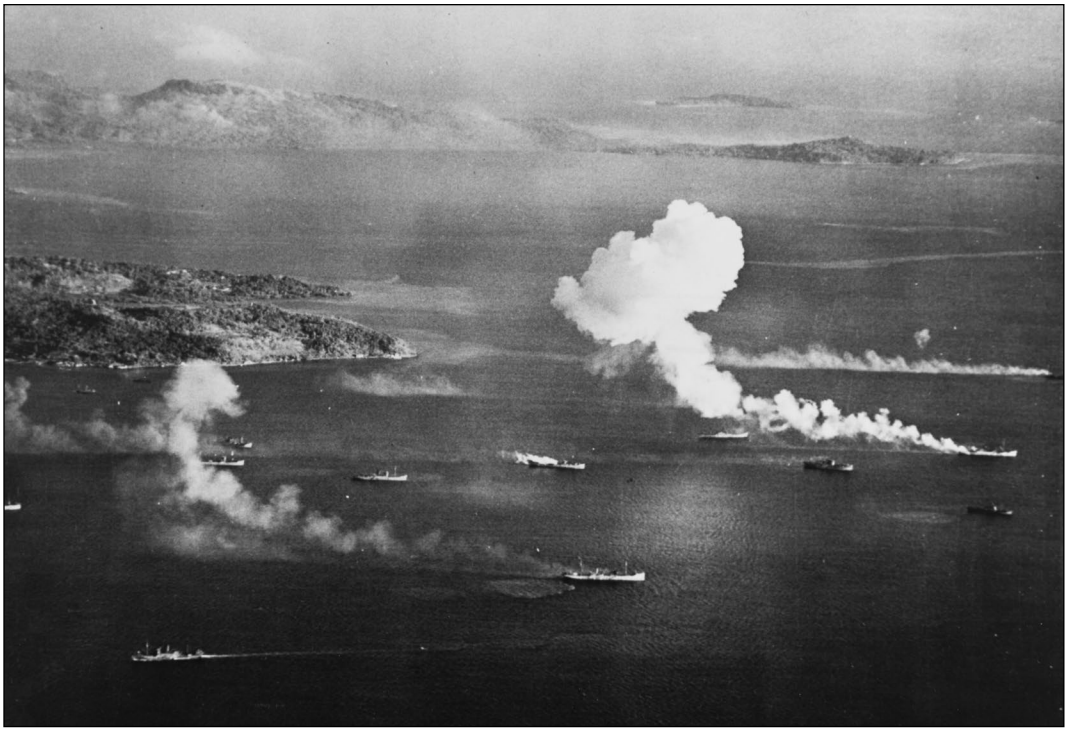
At first light on the morning of 17 February 1944, five aircraft carriers from the U.S. Navy's Task Force 58 turned into the wind and began launching F6F fighters. The formation of 72 Hellcats, rising into the cool, clear dawn, banked west to put the rising sun at their back and set a course for Truk Atoll, an important anchorage for the Japanese Navy in the Western Pacific. The planes were the first wave of a significant raid on the base that would consist of more than 500 carrier-based aircraft. The Hellcats made quick work of the Japanese fighter defense, much of which never got off the ground. They were followed by a continuous flow of dive bombers and torpedo bombers, all with an assigned target on the airbases or lagoon anchorages. By late morning, much of the Japanese fleet based there was reduced to floundering wrecks, but several destroyers and cruisers made a run for the north passage and the open ocean beyond. Dive bombers gathered overhead to finish off the badly crippled ships but were halted by the voice of the carrier boss, Admiral Marc Mitscher, on the radio: "Stay clear," he said, "do not sink that ship." Perplexed by the order, the aviators soon saw its origin: Admiral Raymond Spruance's flagship, the battleship *New Jersey*, arriving along with a surface task group of other battleships and cruisers. Apparently, they were there to warm up their big guns on a couple of helpless Japanese ships, which they quickly sunk. On its way down, one of the Japanese destroyers managed to get off several torpedoes that nearly hit the *New Jersey*. A dive-bomber pilot circling overhead mocked the effort, calling it a "great victory" for the battleships.[1]

Eighty years later, on the outskirts of Chasiv Yar, Ukraine, a Russian armored column emerged from the tree line into a muddy field pockmarked with artillery craters. A T-80 main battle tank with a mine roller led the formation, and a series of other tanks and armored personnel carriers (APCs) followed in file, wary of the mines dotting the field. Russian artillery impacted around suspected Ukrainian positions forward of their maneuver, but supply issues meant no smoke rounds were available to obscure the assault. The Russian forces were entering an engagement area out of visual contact from Ukrainian tanks and infantry fighting vehicles, dug in and camouflaged two kilometers to the west. However, the Ukrainian brigade commander had a clear view of the attack from his command post behind the lines, thanks to a fleet of unmanned aerial systems (UAS) overhead. The commander began to direct his defense, relying heavily on his armed reconnaissance company and forward anti-tank guided missile (ATGM) teams. His tablet showed the tank with breaching equipment as a high-payoff target, and he directed an ATGM strike against it. Damaged and knocked off course by the missile, the tank hit a mine and was disabled, partially obscured by its own smoke. Two first-person view (FPV) UAS, with rocket-propelled grenade rounds strapped to their bellies, hung momentarily in the air above the target, their experienced pilots knowing that a little patience could pay off. As the smoke cleared slightly, one of them found his mark, hitting the T-80 at the base of the turret above the



Japanese ships burn after an air attack in Truk Lagoon, as seen from a USS Intrepid (CV-11) aircraft on 17 February 1944, the first day of raids. (National Archives photo)

engine. A massive explosion followed as the tank's ammunition cooked off. The rest of the Russian formation was quickly devolving: Another tank and two BMPs were disabled by FPV drones, their personnel dismounting for nearby cover. As Ukrainian artillery went to work on the disabled tracks, the remaining vehicles turned back for the wood line, lucky to make the turn without hitting a mine. Five kilometers away in a damp, mud-walled bunker, the two FPV pilots lifted their goggles and lit cigarettes to celebrate the day's success. Somewhere nearby in a Ukrainian tank, its gun tube cold, the gunner watched through his optics as smoke rose above the distant tree line. He turned to his platoon leader and asked, "Do you think they'll let us get up there to knock off a few more APCs?" "No way," said the platoon leader, "we move from this spot now and we'll be burning right there with 'em."[2]

The second of these two stories is fictional, drawn together from videos and other reporting from the front lines in Ukraine. Despite the license employed to create a compelling narrative, the parallels between the two are strong and unavoidable in the available evidence. The war in Ukraine has made clear that the appearance of armed and guided small UAS on the modern battlefield will have a revolutionary impact on the conduct of ground combat. The impact will be similar to that caused by the introduction of reconnaissance and attack aviation to warfare at sea. After years of slow development in Iraq, Syria, and Nagorno-Karabakh, what we are seeing in Ukraine is a miniaturization of the reconnaissance-strike complex, moving this form of aerial maneuver and precision fires into the hands of ground force commanders at the tactical level of war. By comparing this trend with the advent of naval aviation and its impact on naval surface warfare, we can gain a more complete understanding of how the new capabilities will change the future of conflict on land and draw conclusions about the way ahead for adopting and employing the tactical reconnaissance-strike complex for U.S. ground forces.

Naval Aviation and the Reconnaissance-Strike Complex

As aircraft emerged as a military tool with great potential in the early 20th century, there was broad disagreement about their utility and role in warfare at sea. Simultaneously, there was nearly universal consensus about the dominant role of big gun battleships. However, as the major global powers embarked on an arms race to build the biggest, fastest, and most heavily armed and armored battleships, aviation technology and its military utility improved at an exponential pace. World War I proved disappointing for battleship enthusiasts but saw increasing utility for aircraft in combat on land and, to a lesser extent, at sea as scouts and spotters for the line-of-battle ships.

Naval aviation developed rapidly during the period after World War I, with the major naval powers building and experimenting with increasingly capable aircraft (in both range and payload) and the ships needed to carry them into combat.[3] In the U.S. Navy, this resulted in significant internal debate on

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the tactics that would dominate the next war and specifically a war against Japan in the Western Pacific. In a prescient statement, a member of the U.S. Navy's General Board asserted in 1935 "that in any war with Japan, the struggle between carrier air forces — not the engagement between the battle lines — would decide command of the sea."[4]

Despite such moments of clarity, the debate was not settled prior to the start of the war. Both sides were constrained by treaty obligations and adopted a hedging strategy, building a relatively small number of aircraft carriers to support their traditional battle line fleets.[5] The Japanese attack on Pearl Harbor and the subsequent carrier actions at the Coral Sea and Midway cemented the revolutionary status of naval aviation and the fast carrier task force. In fact, the Battle of the Coral Sea was the first decisive naval engagement in history in which the two fleets never made visual contact.[6] By the time of the raid on Truk in early 1944, described at the beginning of this article, the U.S. Pacific Fleet had completely reorganized around the fast carrier task force as its principal offensive and defensive weapon.

Simultaneously, the Imperial Japanese Navy (IJN) and its carrier air forces were in a state of rapid decline. Manpower and material constraints left them short of adequately trained pilots and relying on technically inferior aircraft.[7] They desperately needed to increase the efficiency of their attacks to have any chance of stopping the American advance towards the home islands. The IJN found that efficiency in the fatalistic and quasi-religious form of suicide weapons, known as kamikaze (usually translated as divine wind). The capability of kamikaze fighters greatly increased precision by pairing destructive power with an intelligence in the final attack, able to vector that destructive force and place it accurately to maximize damage to an enemy vessel. After witnessing a kamikaze attack on his flagship, the *USS New Mexico*, Admiral Spruance, the U.S. Fifth Fleet commander, commented, "The suicide plane is a very effective weapon, which we must not underestimate. I do not believe anyone who has not been around within its area of operations can realize its potentialities against ships. It is the opposite extreme of a lot of our Army heavy bombers who bomb safely and ineffectively from the upper atmosphere."[8]

The introduction of these weapons proved too little and too late to have a sizable impact on the momentum of the Allied

push against Japan, but it did signal the coming precision warfare revolution that would occur later in the 20th century. The kamikazes were a kind of crude missile (Andrew Krepinevich, a defense policy analyst, called them "human-guided cruise missiles"), and eventually missiles would all but replace bombs and direct fire weapons in the long-range engagements now characteristic of naval warfare.[9]

These naval air forces represented the very beginning of the "reconnaissance-strike complex," extending and coordinating the sensing and striking power of a military force. A reconnaissance-strike complex has three primary components: a reconnaissance element, a precision-strike element, and a coordinating element or "battle network."[10] For the U.S. Navy, those components were all visible in their nascent forms by the end of WWII, with the aerial and submarine reconnaissance and strike capability paired with coordination by wireless telegraphy. This crude battle network meant that effective combat command at sea could move from battleship bridges to aircraft carrier combat information centers.[11] A similar change is now happening for combat command at the tactical level of land warfare. Since their inception during WWII, reconnaissance-strike complexes have been employed with stunning effect on land, most notably in the U.S. Army's rapid destruction of the Iraqi Army in 1991. Now, the proliferation of small UAS and precision attack options is driving the miniaturization of the reconnaissance-strike complex, enabling tactical commanders to rapidly gather and analyze intelligence, conduct precision strikes, and adapt their maneuver in real time. This next generation of the precision warfare revolution is on full display on the front lines in eastern Ukraine.

Ukrainian Soldiers from the 25th Sicheslavska Brigade prepare an improvised first-person view (FPV) strike drone. (Photo courtesy of the Ministry of Defense of Ukraine, armyinform.com.ua)

Tactical Reconnaissance Strike in Ukraine

There has been widespread reporting on the proliferation of drones of all sizes on the battlefield in Ukraine. However, the increasing utility of these weapons in large-scale combat operations was demonstrated prior to the 2022 Russian invasion of Ukraine, most notably in the 2020 conflict between Azerbaijan and Armenia over the Nagorno-Karabakh region. Azerbaijan's lopsided victory was credited in large part to their successful use of a range of UAS variants, from modified WWII-era biplanes designed to deceive Armenian air defenses to sophisticated modern loitering munitions (LMs). In his book *7 Seconds to Die*, John Antal describes the thorough destruction of Armenian ground systems by these weapons, claiming that "Azerbaijani top-attack UAS strikes destroyed as many as 185 Armenian tanks, 89 armored fighting vehicles, 182 artillery guns, 73 multiple rocket launchers, 45 air defense systems, and 450 other vehicles."[12] That's roughly two armored divisions of combat power destroyed in a conflict that only lasted 44 days.

After the Russian invasion of Ukraine in February 2022, it seemed that Ukraine had taken note of the lessons from Nagorno-Karabakh. Its forces employed armed and unarmed drones to great effect while repelling the initial onslaught against their capital, Kiev. Drones, along with top-attack ATGMs, gave the Ukrainians an edge in the defense against the much larger and more conventionally well-equipped Russian military. Videos of strikes from Turkish-built Bayraktar TB2 drones proliferated in western media reporting on the conflict. Similar in size and armament to a U.S. MQ-1 (Predator or Grey Eagle), the employment pattern of the TB2s tracked with how this class of UAS had been employed elsewhere as unmanned armed intelligence, surveillance, and reconnaissance (ISR). However, the large size of these platforms meant that they were susceptible to conventional air defense, and Ukraine's fleet of TB2s was quickly degraded.[13]

In the second summer of the war, after the front lines had roughly stabilized in eastern and southern Ukraine, videos began to emerge of FPV drone strikes against Russian vehicles.[14] At first, these strikes used modified racing drones employed by volunteers or Ukrainian special operations forces. By 2024, both sides of the conflict had dramatically increased production of one-way attack (OWA) UAS, with Russia benefiting from a larger industrial base and partnerships with China and Iran to field more sophisticated LM and deep-strike capabilities. Both countries have leveraged and been impacted by these new capabilities. In the case of Ukraine, the value is evidenced by a massive surge in domestic drone production, increasing from seven drone manufacturers to 80 in just one year.[15]

The authors of a recent study on UAS strike capability published by the Royal United Services Institute (RUSI), a British think tank, conducted extensive research in Ukraine and identified five functions of UAS-based "mass precision strike" complexes there. These functions are close ISR, close precision strike, deep ISR, deep strike, and enabling deep joint fires.[16] The only one of these functions that is really novel to this conflict is the close-strike capability. Armed small UAS and LMs give commanders at the tactical level of war a compact kill chain, with sensor and shooter wrapped into a neat, low-cost package. Both sides in the conflict are seeing the lethality advantage these tools provide, particularly when paired with existing indirect fire weapons and other precision effects. As a result, Ukraine is reorganizing within its armed forces for more effective employment and support of these tools. Reporting indicates that motorized brigades in the Ukrainian armed forces (UAF) now have a UAS company that deploys reconnaissance and FPV strike drone platoons in support of its operations. These FPV strike units work in dispersed teams of one or two pilots with a small support element for arming and launching the drones. Further to the rear of the line, the company has a headquarters with maintenance, repair, and supply facilities tucked into urban terrain or heavy cover.[17]

Despite the growth of military organizations that specialize in close reconnaissance-strike operations, Ukrainian bureaucracy has been cited as a hindrance to doctrine formation and procurement.[18] Crowdsourcing and non-governmental organizations (NGOs), often supported by the government of Ukraine, have played a key role in bridging the gap for funding of drone procurement and training operators and maintainers. The "Army of Drones" campaign raised more than $108 million in support of UAS procurement and training.[19] Another NGO-funded training program claims to employ 150 instructors and have a throughput of 5,000 people a month. The Ukrainian Ministry of Digital Transformation supports a number of these non-governmental training schools, claiming to have trained 10,000 personnel.[20] These public-private partnerships predate the current war and grew out of necessity in support of the conflict in the Donbas that began in 2014.[21]

A Ukrainian soldier holds an FPV loitering munition with RPG-7. (Photo courtesy of the Ministry of Defense of Ukraine, armyinform.com.ua)

For Ukraine, commercial satellite internet connectivity and homegrown software for encrypted battlefield coordination facilitates integration of the tactical reconnaissance-strike capability. Smartphone and tablet-based applications with names like Delta, GIS Arta, and Kropyva increase situational awareness for UAF commanders and enable rapid precision targeting.[22] GIS Arta has been described as the "Uber for artillery," facilitating direct sensor-to-shooter connectivity and shortening the kill chain for Ukrainian ground forces.[23] We know more about this integration on the Ukrainian side because of better access, but we have to assume the Russian armed forces are also using modern networks to integrate tactical reconnaissance-strike functions across echelons.

At the moment, consensus is forming around the paralyzing effect of the proliferation of small ISR and strike UAS.[24] This new form of mass is greatly complicating the concentration of forces in the offense, appearing to favor the defense. Writing in *Foreign Policy,* Franz-Stefan Gady concludes, "If the enemy can see everything on and behind the front lines, including units and even individual troops moving in the rear, the classic ground attack made up of massed armored formations is dead."[25] His conclusion is premature, given the technology described did not come into widespread use in Ukraine until after the lines had stabilized and become entrenched, a condition that generally favors the defense. Also, there are no absolutes in ground combat, and it is impossible to "see everything," even with the most sophisticated tools. However, the proliferation of this technology certainly means that any large ground assault will first need to deal with the adversary's tactical reconnaissance-strike capability before it can effectively concentrate its forces for an attack. This fight will occur outside of direct fire range and rely on a well-integrated and protected UAS-based tactical reconnaissance-strike complex.

Implications for the U.S. Army

The war in Ukraine has resulted in skepticism about the future of the main battle tank in light of its vulnerability to top-attack ATGMs, armed UAS, loitering munitions, and other threats. My intent with this article is not to wade into the argument about the future of the tank. Others have made convincing arguments on both sides in *Military Review* and elsewhere.[26] My goal is to emphasize that current and future main battle tanks must be paired with the means to maneuver and employ the new tactical reconnaissance-strike complex.

Proponents of the continued relevance of the tank point to what Guderian called "striking power" as essential to victory in war — consisting of the capability to close with and destroy critical enemy systems with direct fire weapons.[27] The armed UAS capability on the battlefield today blurs the line between direct and indirect fire, but it behaves like the direct fire weapons in Guderian's formula. Tactical commanders now have their own miniaturized "human-guided cruise missile" (to use Krepinevich's description of the Japanese kamikaze) and can apply precision fires against high-payoff targets within and beyond the range of their direct fire weapons. This new form of tactical precision is a critical component of modern

mobile-striking power (a new component of the combined arms fight) and essential for dominance in land warfare.

A comparison to the balance between battleships and carriers in the Pacific Theater is relevant on this point. In a *Naval War College Review* article, Thomas C. Hone's analysis is instructive and worth quoting at length: "Though the long-awaited clash of battle lines never occurred, the fast battleships were an essential element of the Navy's plan for decisive battle and therefore collectively an essential part of the campaign. Put another way, what took place during the war was not a simple substitution of carriers for battleships but the creation of a modern, combined-arms fleet, one that included submarines and land-based aviation. That was the innovation."[28]

The U.S. Army is now faced with a mandate and an opportunity: to build a new tactical operating concept that integrates ground-based reconnaissance and attack UAS as a component of combined arms maneuver. According to Krepinevich, "dramatic shifts in the character of military competitions… find the most successful military organizations developing and refining operational concepts that are very different from those that dominate the existing warfare regime."[29] This will require new doctrine, organizational structures, training strategies, materiel solutions, and the personnel and expertise needed to make it a reality. We can benefit directly from observations of the current conflict, but without participating directly, we must rely on exercises and experimentation to refine these solutions. Developing and implementing an initial organizational structure and manpower requirement is a good place to start.

Organization in the Operating and Generating Force

From an organizational standpoint, the echelon at which this combination occurs will vary based on scale and function, similar to the scaling of indirect fire from the company up to the corps level. The authors of the RUSI study on UAS strike capability concluded that grouping precision strike and reconnaissance capabilities into a specialized unit would be more effective than distribution across a larger tactical formation. They propose a "UAV battalion, equipped to deliver close and deep strike, deep ISR and enabling action" as the most logical organizational structure.[30] In my view, the U.S. Army is large enough to require further specialization based on echelon, grouping close ISR and strike functions at the brigade level and deep ISR, strike, and joint fires enabling functions at the division and corps.

For close reconnaissance and strike, the Army should immediately begin the process of transforming its remaining cavalry squadrons in the heavy and Stryker brigade combat teams into armed reconnaissance squadrons that can employ OWA munitions and other UAS in support of brigade fires and ground maneuver. Beginning with at least a troop (or company), the conversion could occur over time and respond to the results of experimentation to modulate the size and composition of the force. These formations offer

A U.S. Army Origin autonomous weapons system uses a tethered unmanned aircraft system to help Soldiers perform reconnaissance of an area during Project Convergence 22 experimentation on 26 October 2022 at Fort Irwin, CA. (Photo by SPC Jaaron Tolley)

existing tracked and wheeled platforms that can be modified for use as mobile ground stations to transport, launch, control, and repair the unit's UAS systems and associated munitions. General purpose or mission command variants of the Army's new Armored Multi-Purpose Vehicle (AMPV), as well as modified Strykers, could serve this purpose almost immediately.

For the majority of the Army's light infantry formations and many of its Stryker BCTs, the recent restructuring decision eliminated the cavalry squadrons, removing those units as a potential base for tactical recon-strike transformation. Part of that manpower is moving to M10 Booker units, the Army's new protected firepower solution for light infantry divisions. On its face that appears to be a technologically regressive approach, based on a decades-long effort to replace the direct fire capability of the Sheridan tank. Still early in the acquisition and deployment of this capability, the Army should consider experimentation to see if a formation built around a short-range strike UAS platform could more effectively support light infantry maneuver. The new Infantry Squad Vehicle (ISV) has proven to be highly modular and could be employed immediately as a mobility platform and ground station for OWA UAS.

Organizations at the division and corps level will have principal responsibility for the deep reconnaissance, deep

strike, and joint fires enabling functions. This aligns well with the Army's current operational concept of multidomain operations, which seeks to converge effects from multiple domains at the decisive point.[31] UAS squadrons designed for deep reconnaissance, strike, and enabling functions — with both OWA and traditional ISR UAS — would fit well into existing fires or multidomain formations at the division and corps level (division artillery and the field artillery brigade or multidomain task force, respectively). Others see the combat aviation brigade and the Army's future vertical lift aircraft as the nexus for these UAS-based deep reconnaissance and strike functions, representing a potential employment concept that should be explored.[32] Targeting systems and processes at the division and corps level are well-developed to support the employment of long-range OWA munitions since they are similar to existing Army and joint armed UAS and deep fires capabilities. As a result, this article will not dwell on these functions and the changes required to maximize their employment.

Within the generating force, I agree with others who have argued for the formation of an Army branch dedicated to UAS-based reconnaissance-strike capabilities.[33] As a critical component of modern combined arms maneuver, the ideal umbrella organization for this new branch would be the Maneuver Center of Excellence at Fort Benning, GA, the current home for the Infantry and Armor branches. The new branch could also find a home at the Fires Center of Excellence at Fort Sill, OK, which would create advantages for building a comprehensive tactical recon-strike complex that includes precision fires and the short-range air defense necessary to protect formations from the adversary's capability. A third option could be to incorporate the capability into the Army Aviation Branch, but I think that is likely to subordinate it to the interests of the manned rotary-wing aviation community.

Historical examples of military innovation support the need for senior leader sponsorship and intellectual advocacy, talent management and incentives, and a degree of organizational autonomy — all of which would be enhanced or facilitated by a branch proponent.[34] In the naval aviation example, there is no doubt that high-level advocacy and talent development proved critical to the readiness of the capability at the outset of WWII. The founding father of the Navy's Bureau of Aeronautics, Rear Admiral William Moffett, was a former battleship captain and certainly could have endorsed the common view within his community: the airplane as a scout for the battleship fleet. Instead, he took a more holistic approach and supported the idea that naval aviation could become an independent striking force. This had significant implications for the promotion of aviators and the construction of fast carriers that could be used for this purpose.[35]

Personnel

An official proponent branch within the Army bureaucracy will facilitate the necessary step of assigning and training personnel in support of this new capability. Japanese air power in the Pacific nearly evaporated by 1944 — not because they ran out of planes, but because they ran out of trained pilots. They could no longer create mass to have an impact on the U.S. Navy and instead shifted to precision — through the adoption of kamikaze tactics.[36] If we know that the operation of reconnaissance and strike UAS will be a critical component of modern ground combat, then why aren't we moving faster to train a cadre of operators/pilots? The Soldiers entering the military today come from a generation of gaming natives, so we shouldn't let the slow pace of materiel acquisition prevent us from selecting and training this critical resource.

Another area requiring immediate human capital investment is electromagnetic warfare (EW) expertise. Observers of the war in Ukraine have commented on the increasingly important role of EW, with one stating that "even more than physical factors… the fight over the electromagnetic spectrum will be decisive in raising or reducing battlefield transparency for one side, with all its consequences for the future character of warfare in Ukraine and elsewhere."[37] The Army has historically been underinvested in this expertise. When it was called for in Iraq to deal with radio-controlled improvised explosive devices (IEDs), we had to deploy Navy EW officers to program our counter-IED jammers. The Army has come a long way since then, but a tactical reconnaissance-strike squadron will need significant EW

A robotics and autonomous systems platoon sergeant from Alpha Company, 1st Battalion, 29th Infantry Regiment, 316th Cavalry Brigade, carries the Ghost-X Unmanned Aircraft System during Project Convergence - Capstone 4 on 11 March 2024. (Photo by SGT Charlie Duke)

expertise to guarantee UAS control in a highly contested spectrum.

The HIVE unmanned aircraft system prepares to take flight during an experiment as part of Project Convergence – Capstone 4. (Photo by SGT Gianna Chiavarone)

Experimentation and Training

This article will not address the doctrinal implications of the tactical reconnaissance-strike complex, other than to say we will need new doctrine for combined arms maneuver that incorporates the capability, and the best way to develop that doctrine is through experimentation. The Navy's successful integration of naval aviation is credited in large part to a series of fleet problems conducted in the 1920s and '30s. Beginning in 1923, these fleet problems involved large-scale force-on-force maneuver. In the beginning, aircraft carriers were replicated by other ships and not represented in kind until 1925 when the Navy's first carrier, the *Langley*, participated in Fleet Problem V. The questions of carrier design, aircraft employment, and fleet composition were all addressed (and argued about) through these fleet problems, particularly in the 1930s once purpose-built carriers and larger air wings were available for experimentation.[38] Despite this deliberation, none of those questions were fully resolved prior to 7 December 1941, when the Japanese surprise attack on Pearl Harbor settled the issue, both by demonstrating the striking power of carrier aircraft and crippling the U.S. Pacific Fleet's battleship force. The U.S. Army should take note of the value of this experimentation and begin a program of force-on-force maneuver problems featuring ground units employing UAS reconnaissance-strike capability.

Fortunately, the U.S. Army possesses two of the most well-developed combat training and experimentation centers in the world. The Army's combat training centers (CTCs) in Louisiana and California are tailor-made for experimenting with the incorporation of UAS strike at the division and brigade combat team levels. Units training at the CTCs are already encountering and dealing with adversary UAS controlled by the opposing force (OPFOR). The OPFOR drones effectively replicate the close ISR function and, to a lesser extent, some close-strike capability. Experimentation could begin immediately by attaching FPV UAS strike teams to rotational training units at the CTCs and allowing commanders to deploy them in the offense and defense against the OPFOR. Of course, addressing safety concerns will be paramount in the force-on-force training that occurs at the CTCs. Specified target vehicles, target pits, nets, and other measures could be employed to safely replicate the lethal effects of FPV strike capability. Only through this kind of experimentation will we learn how the new tactical reconnaissance-strike complex can be employed in tandem with the other components of combined arms maneuver to reinvigorate mobility on the modern battlefield.

Conclusion

Earlier I described the M10 Booker armored fighting vehicle as a technologically regressive addition to modern light infantry formations. That might be a little harsh and certainly undermines the utility of the platform in environments like the Pacific theater and elsewhere.[39] "Mobile Protected Firepower" is the name of the U.S. Army program that became the M10 Booker, but it represents in general terms the three things that all tanks and armored vehicles represent — a kind of euphemism for the principles of heavy maneuver. Simply put, all tanks provide commanders with a protected and mobile direct fire weapon. The three components (mobility, protection, and firepower) will always be relevant, but their presentation and combination have and will change over time.[40]

As new technology emerges, however, we need to continually assess if we have the right combination of mobility, protection, and firepower employed to produce a tactical advantage over our adversary. The war in Ukraine is showing us that we do not, and rapid action is needed to address the shortfalls. It is hard to overstate the urgency of the situation for the U.S. military. From the perspective of tactical units in the U.S. Army, it feels like we are moving in the opposite direction, with comparatively ancient on-hand UAS being phased out and few viable replacements on the horizon for even the most basic of the tactical recon-strike functions listed earlier. Units throughout the Army are engaged in innovative efforts to grow this capability organically, but they are not sufficiently resourced to build and employ strike UAS at scale. The Department of Defense's Replicator program is a move in the right direction: trying to jumpstart the acquisition of attritable unmanned systems.[41] But the Army must act quickly to prepare for the effective employment of these new tools.

In 1937, Admiral Richard Turner wrote that the emergence of carrier-based aircraft meant "nothing behind the enemy front is entirely secure from observation and attack," and therefore "we should, as with other means of action, be sure

to employ a concentration of enough airplanes to produce the desired effect."[42] The same condition now exists for land forces, and we have the same mandate to ensure we can concentrate the capability in support of ground maneuver. Just as the introduction of carrier-launched aircraft irrevocably changed naval warfare, the emergence of armed small UAS will be a significant disrupter for ground force maneuver. We must move fast to develop and test a new tactical reconnaissance-strike complex to both leverage the capability to our advantage and defend against its effects. The technology exists today — all we need are the resources and resolve to make it a reality in our force.

Notes

[1] Ian Toll, *The Conquering Tide: War in the Pacific Islands* (NY: Norton, 2013), 404-412.

[2] Source material includes: "How Drone Warfare Has Transformed the Battle Between Ukraine and Russia," PBS NewsHour, 13 December 2023, video, 7:51, https://www.youtube.com/watch?v=uuQwjbCAFIE; "Darwin's War: Inside the Secret Bunker of Ukraine's Ace FPV Drone Pilot," Scripps News, 19 May 2024, video, 21:46, https://www.youtube.com/watch?v=WipqeFgzdTc; and Yaroslav Trofimov, "Tech Deployed in Ukraine Fight is Reshaping Modern Warfare," *The Wall Street Journal*, 29 September 2023.

[3] Andrew F. Krepinevich Jr., *The Origins of Victory: How Disruptive Military Innovation Determines the Fates of Great Powers* (New Haven, CT: Yale University Press, 2023), 335.

[4] Ibid., 322.

[5] Ibid., 332.

[6] Ian Toll, *Pacific Crucible; War at Sea in the Pacific, 1941-1942* (NY: Norton, 2012), 374.

[7] Ian Toll, *Twilight of the Gods: War in the Western Pacific, 1944-1945* (NY: Norton, 2020), 198.

[8] Letter of Admiral Raymond Spruance to Carl Morse, dated 13 May 1945, quoted in Toll, *Twilight of the Gods*, 619. Full letter available from the U.S. Navy at https://www.history.navy.mil/browse-by-topic/wars-conflicts-and-operations/world-war-ii/1945/battle-of-okinawa/spruance-letter.html.

[9] Andrew F. Krepinevich Jr., "Maritime Warfare in a Mature Precision-Strike Regime," Center for Strategic and Budgetary Assessments, 2014, 37; https://csbaonline.org/uploads/documents/MMPSR-Web.pdf.

[10] Krepinevich, *Origins of Victory*, 9.

[11] Toll, *Conquering Tide*, 480-482.

[12] John F. Antal, *7 Seconds to Die: A Military Analysis of the Second Nagorno-Karabakh War and the Future of Warfighting* (Havertown, PA: Casemate, 2022), 136.

[13] Ellie Cook, "Why Ukraine's Once-Feared Bayraktar Drones Are Becoming Obsolete," *Newsweek*, 2 November 2023, https://www.newsweek.com/ukraine-bayraktar-tb2-russia-1839972.

[14] Trofimov, "Tech Deployed in Ukraine."

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