

Mr. Chairman (Senator Cotton), Senator King (ranking member), and members of the Air-Land Subcommittee of the Senate Armed Services Committee, thank you for inviting me to appear today to present my thoughts on “all arms” warfare in the 21st century, and their implications for Army force design in the context of a fully integrated joint air-ground theater joint task force (JTF).

The American Republic, the U.S. Armed Forces and the U.S. Army stand at the cross roads of history. We cannot predict with certainty what great power or constellation of great powers may directly challenge the United States in 5, 10 or 20 years. But we can say with confidence that the outcome of a future major regional war involving the existential interests of the American Republic will be determined by the preparations we make during the next 5-10 years.

We know from blood-spattered experience that armed forces and armies in particular are more often defeated in war by clinging to doctrine, tactics and organizations that evolved from earlier successful operations than by the superior skills and capabilities of their opponents.¹ In this connection, the contemporary U.S. Army is in a strategic position reminiscent of the two decades that preceded the First World War (WW I).

From 4 February 1899 – 2 July 1902 roughly 126,000 U.S. Troops consisting primarily of infantry, cavalry, and horse-drawn artillery fought 80,000 to 100,000 Filipino insurgents supported by perhaps another hundred thousand Filipino auxiliaries. In a hard fought campaign that lasted more than three years approximately 6,000 U.S. soldiers were killed and 2,818 were wounded. Filipino combat losses exceeded 16,000, while Filipino civilian casualties numbered up to 200,000.²

The Army’s experience of combat in the Philippines confirmed the Army generals’ opinion that the rifleman rather than massed artillery fire was the decisive factor in warfare.³ This was certainly true for the Philippine insurrection, but WW I demonstrated the reverse: Accurate, quick-firing heavy artillery in combination with mines, machine guns and, eventually, tanks and aircraft, constituted a new dominant paradigm of warfare.

Nevertheless, like the generals commanding the British and French Armies, the U.S. Army’s senior leadership failed to grasp this reality even though the 1905 Russo-Japanese War actually threw it into sharp relief.⁴ The results were tragic. In 110 days of fighting during 1918, the U.S. Army sustained 318,000 casualties including 115,000 dead. In other words, on average, 1,000 American infantrymen died in every battle fought against the German Army.⁵

In a parallel analysis, suppressing the rebellion in the Philippines no more prepared the U.S. Army for World War I than the last 15 years of suppressing insurgents in Iraq and Afghanistan will prepare the U.S. Army for a future war involving peer or near-peer opponents. Yet, whereas the Philippine Insurrection made little difference to the grand sweep of human history, the U.S. Army's arrival on the battlefields of France in 1918 rescued French and British Forces from defeat and changed the course of world history.

The WW I experience helps to explain why the U.S. Army's future, exploitation of powerful new warfighting technologies and the emergence of a new, integrated, "All Arms-All Effects" warfighting structure—the ISR (*intelligence, surveillance, reconnaissance*)-STRIKE (*standoff, beyond-line-of-sight attack, theater air and missile defense*)-Maneuver (*positional advantage on land*)-Sustainment (*logistics*) Complex—must not be constrained by the insertion of new technologies into organizational constructs in use since 1942 or tactics tied to the recent past.⁶ Streamlined, integrated Command and Control (C2) on the operational level of war will not only deliver the timely and effective integration of warfighting capabilities across Service lines, joint integrated C2 promises a profound strategic advantage in war that will save American lives. With these points in mind, my presentation is organized into three sections:

1. Section I briefly sketches the environmental character of future operations against adversaries deployed into anti-access, area denial positions from an Army perspective;
2. Section II addresses the new Joint Operational Concept of "All Arms-All Effects," Cross Domain warfare and the concept's implementation through the ISR–STRIKE–Maneuver–Sustainment Complex and the Sustainment required to support a fully integrated joint air-ground theater JTF;
3. Section III examines the need for integrated command and control in the form of *Standing Joint Force Commands* to conduct integrated, "All Arms-All Effects warfare" and the strategic implications for sustainment operations.
4. Summary and (2) Recommendations.

Before turning to the first section, it is important to understand that the rapid assembly of Army ground forces anywhere on the greater Eurasian landmass depends on several preconditions: First, the creation of hardened national space-based C4ISR infrastructure combined with resilient, integrated cyber capabilities for electromagnetic spectrum domain dominance; Second, the availability of large numbers of advanced, survivable long-range reconnaissance and strike, manned and unmanned, aircraft with stand-off precision weapons; and, Third, U.S. Army ground forces developed, organized, trained and equipped from the bottom up for joint, integrated operations.

Otherwise U.S. Forces are unlikely to prevail against an established major power or alliance of regional powers fighting to sustain or expand their regional dominance. A long, arduous and exhausting conflict, rather than a decisive victory, would then ensue; the worst possible outcome for an American society intolerant of heavy casualties and the reduced living standards that such a war would entail.

SECTION 1 (Character of Future Operations)

Predicting the character of future conflict is always hazardous. Every war is unique, requiring an understanding of the warring parties' intentions, as well as, their capabilities. Yet, there is one inescapable conclusion about the future character of warfare: The proliferation of precision strike and persistent surveillance technologies presents extraordinary challenges to the projection of U.S. Military power.

Many countries, not just China and Russia, are developing and will implement A2AD strategies.⁷ They will exploit sea mines, space and terrestrially based surveillance, precision strike, cyber-attacks, and electronic warfare to create "no-go" zones into which it will be difficult and costly for the United States to project military power.⁸ In a future conflict with near-peer or peer nation-state opponents on the Eurasian landmass, U.S. Forces must anticipate all or most of the following conditions:

On the strategic and operational levels, U.S. command, control and communications, particularly space-based capabilities, will be disrupted, if not for long periods, then, certainly long enough to create operational havoc. In addition, even mid-sized powers are building a large, diverse, and reliable range of conventional ballistic missiles for deep precision strikes designed to operate within terrestrial and space-based sensor networks. As a result, U.S. Forces must expect that future opponents to launch theater ballistic missiles and self-navigating long range cruise missiles to strike ports, airfields, refineries, desalinization plants and food storage facilities vital to U.S. Forces. For example, unless U.S. and allied air defenses can shoot down Russian Kaliber Cruise Missiles, these missiles can strike all European ports and airfields with the exception of those in the far southwestern corner of the Iberian Peninsula.

On the operational and tactical levels: the skies over U.S. Army Forces will be crowded with loitering munitions, or unmanned combat aerial vehicles (UAVs or drones). These agile UCAVs are really cruise missiles designed to engage beyond line-of-sight ground targets. With proximity-fused, high-explosive warheads, these systems will remain airborne for hours, day or night. Equipped with high resolution electro-optical and infrared cameras, enemy operators will locate, surveil, and guide these drones to targets on the ground—primarily, U.S. ground forces.⁹

When these loitering missiles are integrated into the enemy's Strike Formations armed with precision guided rocket artillery that fires high explosive, incendiary, thermobaric, warheads including sub-munitions with self-targeting anti-tank and anti-personnel munitions *warfare as we know it changes*.¹⁰ Rockets fired from just 5 of these modern rocket launchers can devastate an area the size of New York City's Central Park (843 acres or 3.2 square miles) in minutes.¹¹

Meanwhile, at every level—tactical, operational and strategic—integrated air defenses protect the enemy's Strike Formations from U.S. air and missile attack. It would be a serious mistake to underestimate the impact of integrated air defenses with phased array radars. Some of the newest air defense systems—like the Russian S-500—are so capable that many U.S. Defense Officials privately worry that even warplanes like the F-22, F-35 and the B-2 risk destruction if they attempt to penetrate them.¹² There is, however, no debate about the impact of new increasingly lethal and accurate air defense technology on the tactical level: Any manned or unmanned, low-flying, subsonic platform, whether it is a conventional rotorcraft, a tilt-rotor, or a fixed wing prop/turboprop aircraft, will be highly susceptible to detection, engagement and destruction.¹³

While U.S. Forces struggle with the combined power of enemy IADS and Strike systems the enemy's armored forces maneuver to exploit the ensuing chaos on the ground to close in with accurate, devastating direct fire from automatic cannon, anti-tank guided missiles and high velocity guns.¹⁴ The close battle also takes place on the opponent's geographical doorstep conferring a serious home court advantage on the opponent's attacking ground forces.

The implications of this snapshot of future warfare are clear: "Holding ground" in the face of ubiquitous overhead military surveillance and reconnaissance linked to an array of precision guided weapons is extremely dangerous. Survivability depends on mobility and protection from top, as well as, direct attack. Mobility depends on off-road maneuver. Off-road maneuver requires tracked (not wheeled) mobility. Protection necessitates armor (active and passive) in combination with accurate, devastating firepower and integration within the aerospace-maritime dominated ISR-Strike complex. For reasons of physics, tracked armored platforms provide superior all-around survivability and stability for modern weapon systems during on-the-move engagements.¹⁵

The requirement that results from the proliferating ISR-Strike revolution is a warfighting environment that rewards *dispersed, mobile warfare*, a brand of warfare that elevates tactical dispersion to the operational level of war. To cope with the conditions that dispersed mobile warfare creates, maneuver forces must infiltrate a theater of war at points where the enemy's air defenses are weak or nonexistent. These are the points where manned and unmanned

aircraft or missiles cannot easily attack them. This means that unless the U.S. Army moves rapidly away from the last two decades' focus on "permissive non-contested operations" in counterinsurgency to higher-end operations in more contested, non-permissive environments future U.S. Army and Air forces will face certain defeat.¹⁶

SECTION 2 ("All Arms-All Effects," Sustainment and Army Force Design)

The technological trends in lethality, accuracy and range outlined in the previous section point to a very different Army from the U.S. Army we have today; an overly light-infantry-centric force equipped for low intensity conflict much like the Marine Corps. In the 21st Century, the nation needs an Army that consists of mainly mobile, armored forces with accurate, devastating firepower designed to operate on land the way ships operate at sea; within the limits of their organic ISR, Strike and Sustainment capabilities. Like individual naval combatants, Army ground maneuver formations must be able to operate independently or rapidly assemble into larger forces.

These desired attributes point to Army forces that are organized, trained and equipped for mobile, dispersed war within an integrated, joint operational framework; an army that consists of self-contained fighting, mission-focused force packages organized around the warfighting functions of modern warfare: maneuver, strike, ISR, and sustainment capabilities. They must be equipped with the Joint C4ISR and organic sustainment to operate inside a joint military command structure that tightly integrates ground maneuver forces with the ISR and Strike capabilities that reside in the aerospace and maritime forces. The resulting formations of 5-6,000 soldiers under the command of brigadier generals with robust staffs are designed to deploy and fight as unreinforced, stand-alone formations and plug directly into a Joint Task Force without intervening division headquarters. With this new, integrative organizational paradigm in place, the 21st Century U.S. Army becomes an operationally flexible grouping of capability-based formations, faster to deploy, easier to transport and maneuver.

Recognizing the potential this organizational construct represents, Senator John McCain, SASC Chairman, and Members included a provision in the FY 17 National Defense Authorization Bill directing the Chairman of the Joint Chiefs to model, assess and report on a new prototype ground combat maneuver formation, the Reconnaissance Strike Group (RSG). The RSG is a *6,000 soldier Reconnaissance Strike Group (RSG); a special purpose organization designed to lead change by exploiting new, but proven technologies in a joint, integrated, operational context. In other words, the RSG is a force design that links strategy with concept and capabilities to ensure capability integration and shared technological development across Service lines (RD&A).*

The RSG is organized to capitalize on the application of precision “Strike” informed by networked ISR. With the proposed use of the PUMA infantry fighting vehicle (IFV) as a universal platform for all of its weapon systems, radars and logistical support, the RSG is not a fragile force. It employs manned and unmanned aircraft, sensors, radars and air defense systems (NASAMS National Advanced Surface-to-Air Missile System (NASAMS)), forward with ground maneuver elements to provide the coverage needed to exploit the formation’s accurate, devastating, direct firepower including 30mm autocannon, spike anti-tank missiles and either 120mm or 130mm smooth bore tank cannon.¹⁷ Along with strategic and tactical mobility, the RSG has the precise striking power of loitering munitions, rocket artillery, and advanced 120mm mortar systems to conduct its own fire and close air support, as well as, strike operations against enemy concentrations.¹⁸

The RSG is organized and equipped to fight for information and to rapidly exploit the information its subunits collect. It’s designed for integration with, but not dependence on, air strikes for survival and effectiveness. The RSG is a mobile armored force that reflects the understanding that regardless of how well new technologies are networked, they will never provide perfect situational awareness or perfect information; that information is often of fleeting value. The RSG’s robust, organic C4ISR integrates the RSG’s ground combat capabilities (including the capability to dismount 840 soldiers) within the framework of integrated, “All Arms/All Effects” Cross Domain warfare.

These points notwithstanding, the RSG is simply the vanguard for the Army ground force that must emerge to defeat 21st Century threats. Thanks to the marriage of space-based and terrestrial ISR capabilities with the timely dissemination of analyzed intelligence through networks, the near-simultaneous application of Strike and Maneuver forces can be decisive in 21st Century warfare. This recognition suggests that massed, accurate firepower or, STRIKE seeks to facilitate operational maneuver over distance, dislocate enemy C2, crush large concentrations of enemy forces, isolate the battlespace through interdiction and destroy enemy facilities with operational significance.

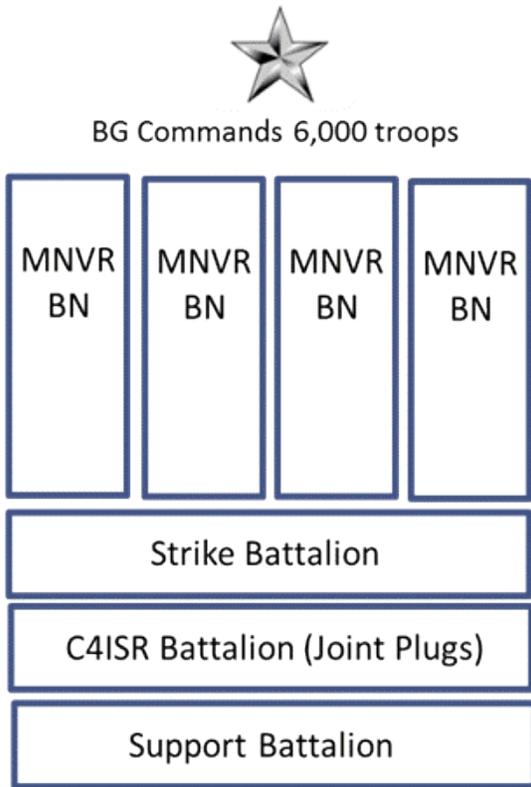
Army Strike Groups are the inevitable result of the ISR-Strike revolution. Consisting of precision rocket artillery, cruise missiles and, potentially, intermediate range ballistic missiles, Army Strike Groups are ideal for Joint, integrated Strike Operations with aerospace and naval forces. These formations together with RSG-like Battlegroups can and must also play a key role in the methodical destruction of the enemy’s integrated air defenses from the tactical to the strategic levels, thus, liberating American aerospace power to conduct unconstrained strike operations throughout the strategic depth of the opponent’s area of operations.

The realities of future force projection dictate that logistical support must be embedded at the tactical level as shown in the RSG, as well as, present on the operational level to respond to the needs of the JTF. Today's Army centralizes too much logistical support at the division and corps levels robbing subordinate BCTS of the capacity for independent operations. Today, the active force also depends too heavily on contracted logistical support. Army C4ISR and Combat Support Groups must be designed within a broader, Joint framework to ensure mutual reinforcing dependence, not unneeded redundancy. (See illustration) As my distinguished colleague, Lieutenant General Dave Deptula has stated in previous testimony, "A dollar spent on duplicative capability comes at the expense of essential capacity or capability elsewhere."¹⁹

For decades, America has underinvested in strategic lift—a calculated choice to accept risk that shortages in lift could be offset by either taking more time to get forces to the theater or by prepositioning equipment in regions of foreseeable conflict. Smart planning and better acquisition strategies that result in formations like the PUMA-based RSG that are designed with intercontinental transportation in mind can help enormously. Vehicles sized to facilitate rapid transportation to forward locations can avoid the need to devise newer airframes or new ships capable of lifting and accommodating heavier vehicles.

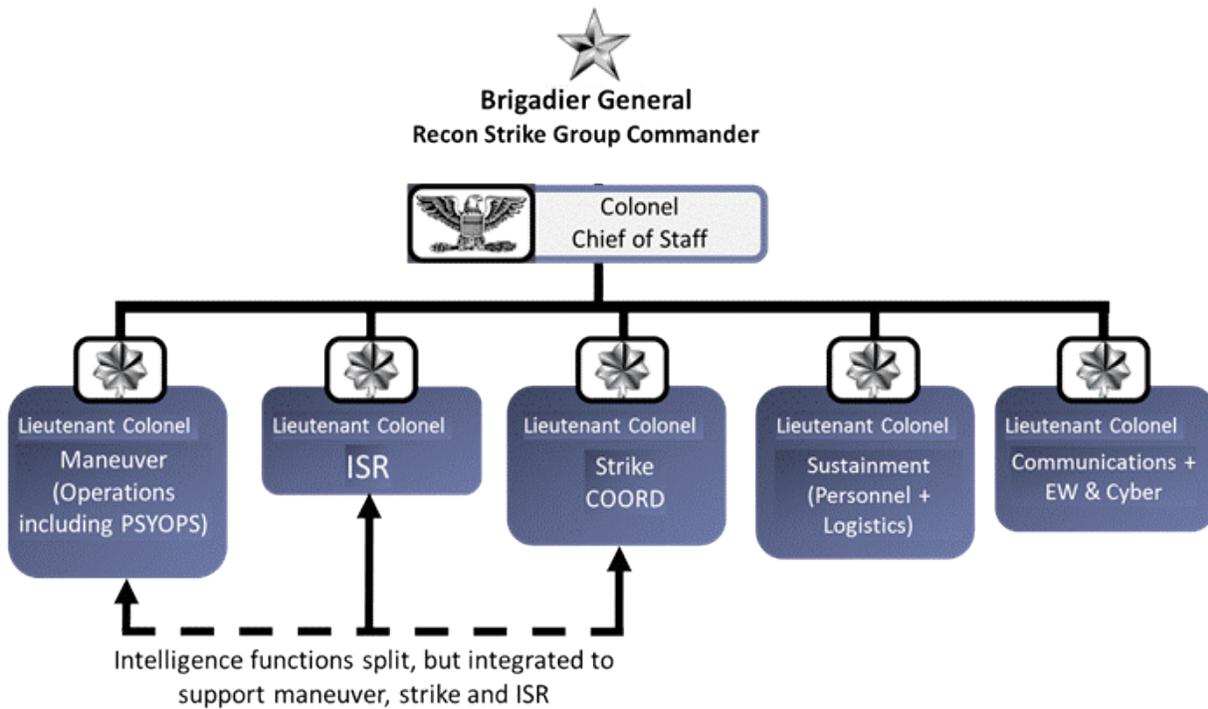
Still, it is not enough to simply expect the private sector to step in and transport the bulk of the military to war on a moment's notice. Dedicated airlift and short-notice private sector support must be readily available, because long lead times to ramp up for war are becoming a luxury in the age of missiles with transcontinental ranges. The capability to lift hazardous cargos such as ammunition and explosives, as well as heavy outsized cargo that cannot easily be lifted using commercial equipment along with investment in transportation support systems to off-load military cargo in unimproved locations is vital.

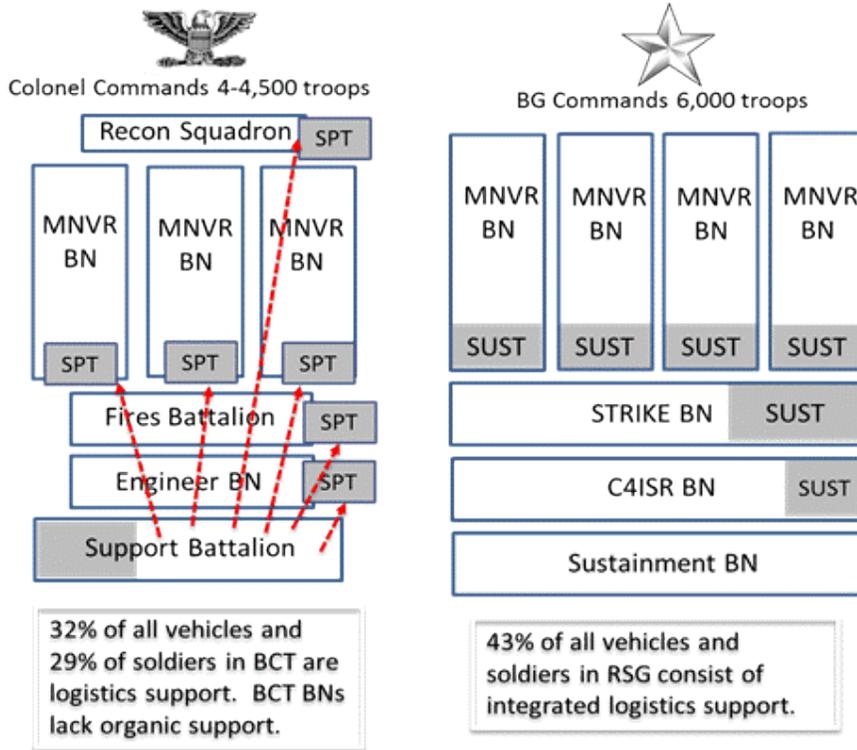
In sum, to terminate future conflicts on terms that favor the United States and avoid long, destructive wars of attrition, the U.S. armed forces must combine the concentration of massive firepower across service lines with the near-simultaneous attack of ground maneuver forces in time and space to achieve decisive effects against opposing forces. Integrating ground maneuver forces into the larger ISR-Strike complex that already exists in U.S. aerospace and naval forces is critical to this outcome. Organizing Army forces into Lego-like mission-capable force packages on the RSG model and investing in the right mix of air and sea lift are indispensable to future force projection.



RSG is designed to *Jointly* find, target and maneuver to annihilate the enemy:

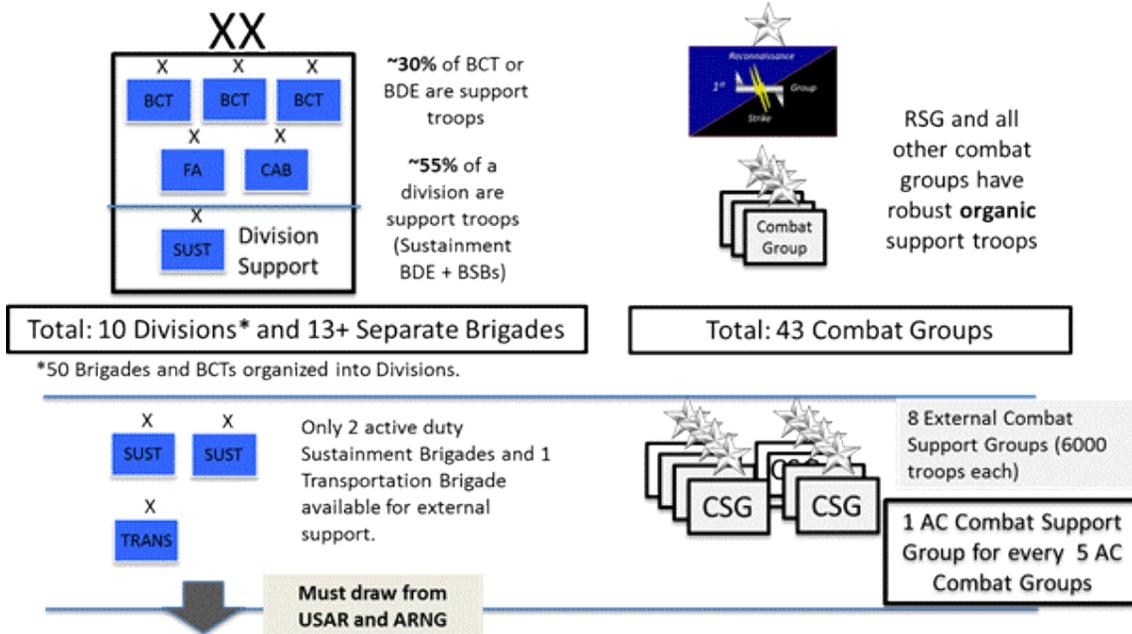
- Consolidates more combat power under fewer headquarters;
- Focus is on enemy's destruction, not on holding ground;
- Multiple radars provide layered top attack/air and missile defense;
- Use of medium and long range unmanned ISR and Strike systems is maximized through cross domain integration;





- ✓ RSG Sustainment Battalion is a “Stand Alone” unit unlike the BCT’s Brigade Support Battalion (BSB).
- ✓ RSG integrates more sustainment troops (2,426 Soldiers) than an entire Brigade Support BN (1,357 Soldiers).

Logistics Comparisons: Current Army Compared with a Reorganized Army



SECTION 3 (Integrated, Joint Command and Control in Expeditionary Warfare)

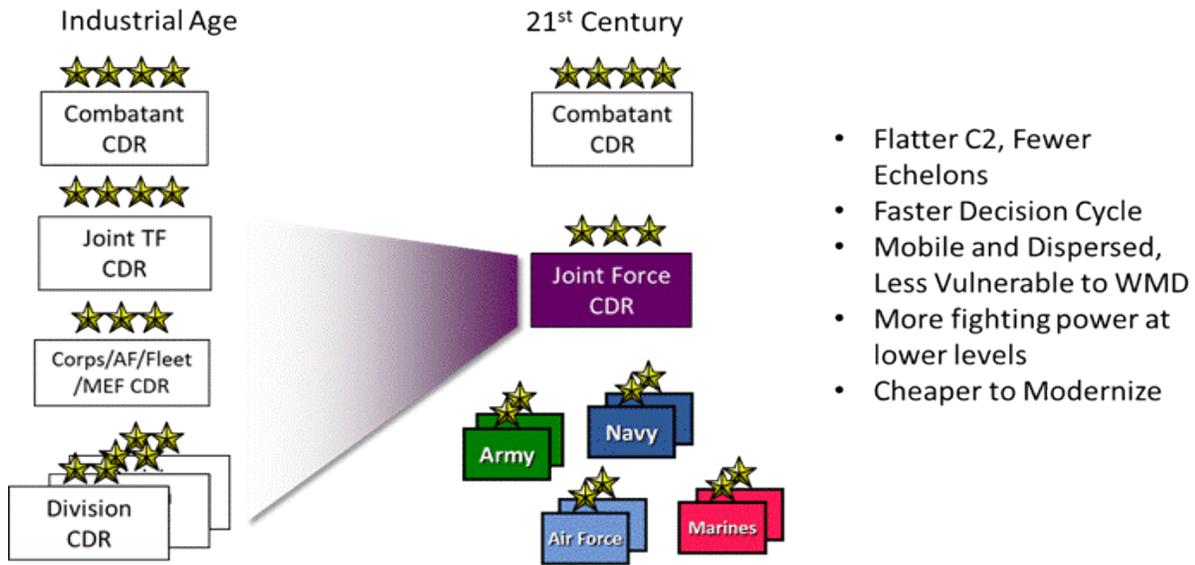
As noted in the Section 2, the Army's organizational constructs of the past—corps, divisions and brigades—with their roots in WW II are the wrong constructs for 21st Century Warfare. This observation applies with equal force to command overhead.

In the 1944-45 advance from Normandy to the Rhine, General Montgomery's headquarters controlled only two armies, which in turn had only two and three corps respectively, and the corps operated only two to three divisions—sometimes, even, only one. The ratio of headquarters was no more economic in the U.S. Army until a late stage. On top of both was Eisenhower's H.Q.—reputedly comprising some 30,000 officers and men. The abundance of headquarters was one reason why the advance to victory was so protracted, despite mobile instruments and exhausted opponents.²⁰

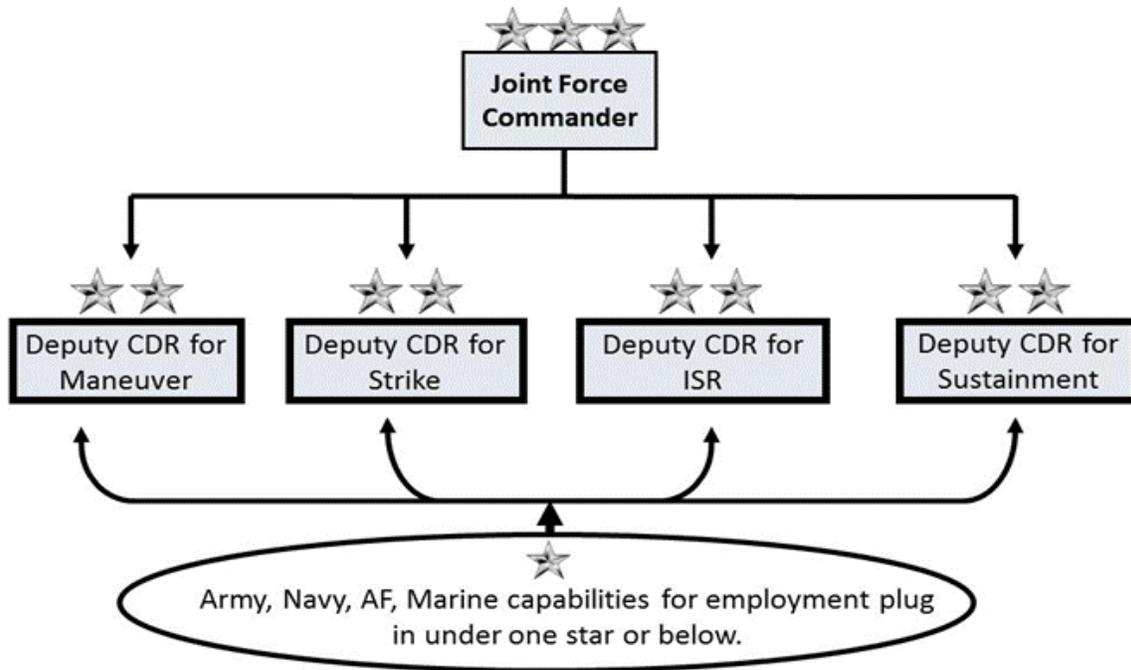
A discussion of the massive C2 overhead inside the Services and the Combatant Commands is beyond the scope of this testimony, but a flattening of the echelons of C2 is long overdue. In future conflicts and crises, there will be no time for a "pickup game." By the time the U.S. gets its operational construct and "C2" act in order, China, Russia, Iran (or any other future great power or coalition of powers) will defeat U.S. forces.

Adding maneuver and sustainment to the ISR-Strike framework is vital step joint interoperability cannot be created on the fly. Without unity of command, there is no unity of effort. Effective integration is the key to unity of command. Unity of effort, speed of decision, and action demand integrated command structures midway between the strategic and tactical levels that create and maintain a coherent picture of operations. The challenge is to integrate the diverse military capabilities from the aerospace and maritime forces with the Army's ground maneuver forces as seamlessly as possible when Army forces are committed as part of a Joint Task Force.

Because command and control of geographically dispersed armed forces requires "brain to brain" as well as "box to box" connectivity, C2 structures on the operational level must involve trained professionals from all of the services. Shared battle space awareness is both technical and intellectual. Within the operational framework of ISR-Strike-Maneuver-Sustainment, the planning and execution of operations become routinely integrated through multi-service command and control—common mission purposes. The outcome is a regionally focused standing Joint Force Headquarters capable of commanding whatever mission-capable force packages are assigned to it.



- ✓ Develop template for JFCs across regional unified commands. Consider stand up of initial 3 star Joint Force Headquarters (JFC) at Joint Base Lewis-McChord.
- ✓ Flag officers for JFC are drawn from all services.



A Regionally Focused Joint Force Command Structure.
 These are modular HQTRS.

To briefly sum up, the ISR-Strike-Maneuver-Sustainment Framework is not just about “things.” It’s about integrating existing and future capabilities within an agile operational framework guided by human understanding. The goal is to create a *coherent view of warfare*, (not just operations) across service lines. The JFC concept moves the armed forces beyond the last minute lash up of single-service headquarters, or the ad hoc coordination of individual federal agencies and service-based elements of integration.

Summary and Recommendations

Today and in the future, the United States’ military response to future regional wars depends on our general purpose, non-nuclear capabilities. The United States needs powerful forces-in-being (professional ready, deployable, air, land and sea) that are prepared to win the first fight, because we may not get the chance to win a second. The last fourteen years severely eroded the United States’ military-technological edge and operational flexibility—particularly those of the U.S. Army. The focus on irregular warfare—suppressing weak, insurgent opponents without armies, air forces or air defenses let alone naval power—must end. At a strength of 500,000 or less, the active U.S. Army cannot preserve its vital warfighting forces and still maintain large light infantry-centric and paramilitary forces for counterinsurgency and nation building in the Eastern hemisphere.

Members of the Air-Land Committee must apply Peter Drucker’s private sector advice to National Defense: “If you want something new, you have to stop doing something old.”²¹ To survive and prevail in twenty-first-century close combat the vast majority of soldiers should be mounted in tracked armored platforms equipped with accurate, devastating firepower and tightly integrated with ISR and Strike capabilities in all of the services.²²

Finally, a flattening of the American military command structure is equally critical. The multiplicity of higher headquarters in the chain of command not only slows decision making and increases friction, it drains the fighting formations of too many capable soldiers. These points suggest two critical recommendations:

1. Urge the Chairman of the Joint Chiefs and the incoming Secretary of the Army to accelerate the RSG’s evaluation and provide funding for rapid prototyping of PUMA platforms to produce an experimental RSG maneuver battalion set as soon as possible;
2. Direct the CJCS to stand up an experimental 3 star Joint Force Headquarters on the model presented in this testimony with the goal of developing a template for Joint Force

Commands inside the regional unified commands. The Joint Base Lewis-McChord should be considered for the testing and evaluation of the proposed JFC C2 structure.

ENDNOTES

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- ¹ J.F.C. Fuller, *Memoirs of an Unconventional Soldier*, (London, UK: Ivor Nicholson and Watson Ltd, 1936), page 26.
- ² Timothy K. Deady, "Lessons from a Counterinsurgency: The Philippines 1899-1902," *Parameters*, spring 2005, page 64.
- ³ Edmund Morris, *Theodore Rex*, (New York, NY: The Modern Library, 2001), page 127.
- ⁴ Paddy Griffith, *Battle Tactics of the Western Front: The British Army's Art of Attack 1916–1918*, (New Haven: Yale University Press, 1994), pages 48–49.
- ⁵ Leonard P. Ayres, Colonel, US Army, *The War with Germany: A Statistical Summary*, (Washington, DC: Government Printing Office, August 1919), pages 121-123.
- ⁶ "Strike" as defined here can be kinetic or non-kinetic depending on the mission.
- ⁷ Ankit Panda, "After China, India Will Become Second Buyer of Advanced Russian S-400 Missile Defense Systems," *The Diplomat*, 5 November 2015. <http://thediplomat.com/2015/11/after-china-india-will-become-second-buyer-of-advanced-russian-s-400-missile-defense-systems/>
- ⁸ Barry Watts, "Precision Strike: An Evolution," *NationalInterest.org*, 2 November 2013.
- ⁹ At least 9 nation-states including Russia, China, Israel, Turkey, Iran and India possess these precision weapon systems. The U.S. Army fields the *Switchblade*, a miniature, remotely-piloted 5.5 pound vehicle with ten kilometer range and ten minutes endurance in the air. This is purely tactical weapon with limited utility compared with the systems discussed here.
- ¹⁰ Sydney Freedberg, "Russian Drone Threat: Army Seeks Ukraine Lessons," *Breaking Defense*, 14 October 2015. <http://breakingdefense.com/2015/10/russian-drone-threat-army-seeks-ukraine-lessons/>
- ¹¹ The Russian Smerch-M, a system that is proliferating, can fire many types of rockets such as the 9M55K which carries 72 unguided fin-stabilized high-explosive fragmentation sub-munitions, the 9M55K1 which carries five parachute-retarded MOTIV-3F top-attack anti-armor sub-munitions, the 9M55K4 which carries 25 anti-tank mines, the 9M55F an unitary warhead with a charge of 95,5 kg of high explosive, the 9M55S a fuel air explosive munition, and the 9M55K5 with 646 shaped charge fragmentation sub-munitions that are dispensed over the target. The BM-30 Smerch-M 9A52-2 can fire rockets with a maximum range of 90 km. http://www.armyrecognition.com/russia_russian_army_vehicles_system_artillery_uk/9a52-2_smerch-m_bm-30_multiple_rocket_launcher_system_technical_data_sheet_information_description_u.html
- ¹² Dave Majumdar, "Russia's Deadly S-500 Air-Defense System: Ready for War at 660,000 Feet," *The National Interest*, 3 May 2016. <http://nationalinterest.org/blog/russias-deadly-s-500-air-defense-system-ready-war-660000-16028>. The dramatic improvements in the massive processing of signals to find patterns and filter out noise have dramatically improved the precision and capability of radar. The algorithms that enabled NASA to exploit microwaves for exploration of the moon also apply to IADS.
- ¹³ As demonstrated by the failed RAH-66 Comanche, it is impossible to develop a rotor-driven manned craft with sufficiently reduced radar, IR, visible and acoustic signatures to avoid destruction in the mid-to-high intensity warfighting environment. <http://nation.time.com/2012/05/25/real-lessons-from-an-unreal-helicopter/>
- ¹⁴ Tamir Eshel, "New Russian Army: First Analysis," *Defense Update*, 9 May 2015. http://defense-update.com/20150509_t14-t15_analysis.html
- ¹⁵ Paul Hornback, "The Wheel versus Track Dilemma," *Armor Magazine*, March-April 1998, pages 33-34.
- ¹⁶ In his work as Deputy Secretary of Defense, Robert Work, concluded that the density and lethality of future anti-access/anti-denial capabilities raised questions about the viability of Marine light forces in a contested environment. His observations are important because they apply to light-infantry centric forces in general. He observed: "The Navy-Marine team will never contemplate littoral maneuver until an enemy's battle network, capable of firing dense salvos of guided weapons, is suppressed. Consequently, the initial phase of any joint theater-entry operation will require achieving air, sea, undersea, and overall battle-network superiority in the

amphibious objective area. . . . Thus far we have only argued that some capability to conduct theater-entry operations and littoral maneuver must be retained. But it is fair to ask how much amphibious capacity is needed.” Robert Work and F. C. Hoffman, “Hitting the Beach in the 21st Century,” U.S. Naval Institute *Proceedings* 136/11/1 (2010), page 293.

¹⁷ National Advanced Surface-to-Air Missile System (NASAMS)

<http://www.raytheon.com/capabilities/products/nasams/>

¹⁸ AMOS®. "Advanced Mortar System," (BAE Systems Hagglands AB). A double barreled breech-auto-loading 120 mm mortar turret mounted. System operates autonomously with direct and indirect fire capability together with Multiple Rounds out to 10 km. One RSG contains 60 '120mm Mortar' variants (System Fielded). MLRS (Lockheed Martin Missiles and Fire Control). The weapon can fire guided and unguided projectiles from 42 to 300 km. (System fielded). One RSG contains 12 MLRS launchers/systems variants. TARES (Tactical Advanced Recce Strike) is a UCAV with a 200 km range and endurance time of four hours. It autonomously searches for, identifies and engages targets. Up to 24 TARES can be flown simultaneously. System is tested ready for fielding. One RSG contains 24 TARES launcher variants. <http://www.army-technology.com/projects/taifun/>

¹⁹ Quoted by Walter Pincus, “Senate Armed Services Committee tackles inter-service rivalries—finally,” *Washington Post*, 9 November 2015.

²⁰ B. H. Liddell Hart, *Defence of the West*, (New York, NY: William Morrow & CO., 1950), page 244. Forrest Pogue puts the number of officers and soldiers assigned to Eisenhower’s HQ at 16,000. The difference lies in which supporting elements are included in the count. Forrest Pogue, *The Supreme Command*, (Washington, DC: Center of Military History, 1954), pages. 533-535.

²¹ Peter Drucker, *Management Challenges for the 21st Century*, (New York, NY: Harper Business, 1998), page 32.

²² For a good assessment of the lethality that confronts U.S. and allied ground forces, see Ron Tira, “Breaking the Amoeba’s Bones,” *Strategic Assessment*, Jaffee Center for Security Studies, Tel Aviv University, autumn 2006. <http://www.tau.ac.il/jcss/sa/v9n3p3Tira.html>