

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

Extract

Deep Strike Fire Support (DSFS) Capabilities-Based Assessment (CBA) Report

Although the purpose of this CBA was to assess fire support to ground forces, it was conducted by a joint team consisting of representatives from the Army, Navy, Marine Corps and Air Force.

1. Scenarios. The scenarios supporting the DSFS CBA included potential global-level conflicts with Russia and China, and a variety of regionally based conflicts: the Korean Peninsula, South and East Asia, and the Middle East. The primary considerations were Joint land operations performed across the range of military operations with joint land forces (Army, Marine Corps, and special operations), with additional fire support provided by the Air Force and Navy. The study team concentrated on “worst case” scenarios with countries the most prepared for land combat, considering troop strength, main battle tanks, armored personnel carriers, attack helicopters, armed UAVs, and field artillery (cannon, rocket, and missile).

2. Threat Projection. The Army’s Intelligence and Security Command (INSCOM) produced a special threat environment projection in support of the DSFS CBA. The study team coordinated their results with the Defense Intelligence Agency (DIA). The INSCOM threat projection considered potential conflicts with China, Russia, North Korea, and Iran.

3. Mission - Level Findings: After decades of depending on air support, to ensure ground support for the Joint Force Commander, the Army needs its own long-range precision firepower to defeat high technology defenses to ensure US aircraft, warships, and ground troops can dominate the battlespace.

3.1. Cannon Artillery. Longer-range cannon artillery is needed to provide the desired level of standoff outside of the range of enemy artillery, where it can destroy those threats and open windows of opportunity to advance on the enemy in highly contested environments. Future capabilities must include smart munitions with built in ability to seek, detect, and identify targets.

3.2. Rocket/Missile Artillery. Munitions options for rockets and missiles are inadequate in range accuracy, and lethality. The Army requires rockets and missile artillery with increased range (70 – 500 plus km), increased lethality, and the ability to engage time sensitive, moving, hardened and fleeting targets. Future rocket/missile systems must maintain or improve accuracy in partial Global Positioning System (GPS)-denied environments.

3.3. Advantages and Disadvantages of Airstrikes Versus Land-Based Missiles. Aircraft can deliver large numbers of short-range missiles or precision-guided bombs. However, China and Russia have invested heavily in anti-aircraft defenses. They’ve also invested in long-range anti-

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

ship missiles to hold off American aircraft carriers and Tomahawk-missile-launching surface warships. If land-based Army deep-strike missiles are intercepted, the lives of expensively trained aircrew are not lost. If deep-strike missiles successfully evade enemy defenses they can destroy anti-aircraft defenses to open a path for airpower.¹ Army ground based deep strike systems could destroy enemy airfields and other strategic targets without risking long-range bombers and could supplement Navy deep strikes against these and similar targets by the Tomahawk and/or allied ship-borne missile systems with similar capability.

3.4. Conclusion. Longer-range cannon, rocket, and deep strike missile artillery surface-to-surface fires will mitigate or eliminate target engagement capability gaps in potential future conflicts with Russia and China. This capability will be an added advantage in support of ground forces in potential engagements with North Korea or Iran. Advanced Russian and Chinese air defense capabilities make it difficult for the joint force commander to quickly establish air supremacy and then divert air combat assets to engage in close air support (CAS) of ground forces. As a result, a land-based long-range deep strike capability would provide strategically vital and timely stand-off attack options for US and allied joint combatant commanders. The assessment to support these findings follows:

4. Assessment:

4.1. Environment: An assessment of the global environment in the 21st Century indicates that the United States will face a future more complex, more uncertain, and more challenging than ever.

As our most consequential strategic competitor, the PRC is unequivocal in its pursuit to reshape an authoritarian world order with no democratic values. The PRC is the pacing challenge for the Department. Russia is an acute threat with aggressive intent – as seen by its brutal and unprovoked invasion of Ukraine – that seeks to consolidate and strengthen its perceived Eurasian sphere of influence to counter Western influence. Other persistent threats include North Korea, Iran, and violent extremist organizations. National Military Strategy, 2022.

4.2. Strategy. Deterring or defeating long-term strategic competitors is a fundamentally different challenge than the regional adversaries and non-state actors that were the focus of previous strategies. The Army is restructuring its combat forces to be more responsive to the emerging great power competition with China and Russia. This effort includes restructuring the heavy Brigade Combat Teams (BCTs) with more lethal weapons and investigating options for longer-range fire support for a precision deep strike capability.

¹ Summarized from, *Joint World Warms Up to Army Long-Range Missiles*, Breaking Defense, Sydney J. Freedberg Jr, March 12, 2021.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

4.3. Strategic Competitors:

4.3.1. China.²

4.3.1.1. The PRC's (People's Republic of China's) national strategy is to achieve "the great rejuvenation of the Chinese nation" by 2049. The strategy is a determined pursuit of political, social, and military modernity to expand the PRC's national power, perfect its governance, and revise the international order in support of the PRC's system of governance and national interests. The PRC views the United States as deploying a whole-of-government effort meant to contain the PRC's rise, which presents obstacles to its national strategy.

4.3.1.2 People's Liberation Army Army (PLAA). The PLAA continues to modernize equipment and focus on combined arms and joint training in effort to meet the goal of becoming a world class military. The PLAA demonstrated a new long-range fire capability in the PLA military response to the August 2022 U.S. Congressional Delegation (CODEL) visit to Taiwan. The PLAA continues to incorporate a twice a year conscript intake. The long-term effects of the policy are not clear.

4.3.2. Russia.³

4.3.2.1. A surge in funding starting in 2000 enabled the development of Russian military forces more capable – in theory, than was the case in the first two decades following the collapse of the Soviet Union.

4.3.2.2. The modernization of Russia's weapons equipment, coupled with force structure changes, have emphasized improvements in strategic and operational air defenses. These improvements focused on key defensive bastions; faster generation of ground units; and improved long-range munitions.

4.3.2.3. War in Ukraine⁴. Russia's full-scale invasion of Ukraine failed in its initial objectives and exposed significant shortcomings in several areas of the Russian armed forces, including strategy, command and control, training, logistics and industrial supply.

4.3.2.3.1. The performance of some Russian weapons has been underwhelming. Russia's tanks and infantry fighting vehicles proved vulnerable to modern antiarmor systems while some air-launched weapons, such as its cruise missiles, were not as successful as they were in Syria.

² *Military and Security Developments Involving the People's Republic of China, Annual Report to Congress, 2023*, U.S. DoD (also called the "China Military Power Report")

³ *Trends in Russia's Armed Forces*, RAND Arroyo Center, Keith Crane, Olga Oliker, Brian Nichiporuk, 2019

⁴ *The Military Balance 2023*, the International Institute for Strategic Studies, London, February 2023.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

4.3.2.3.2. The heavy losses to Russia’s equipment inventory, particularly its armor and artillery, raises significant questions over the direction of Russia’s state armament program; the country needs to reconstitute its ground forces’ combat capability while they are at war, balancing current needs against existing and future development plans.

4.4. Regional Threats.

4.4.1. North Korea.⁵ The Korean People’s Army (KPA)—a large, ground-force-centric organization comprising ground, air, naval, missile, and special operations forces (SOF) units—has more than 1 million soldiers, making it the world’s fourth-largest military. Six percent of North Korea’s 25 million people serve on active duty, and another 25 to 30 percent are assigned to a reserve or paramilitary unit subject to wartime mobilization. About 70 percent of North Korea’s ground forces and 50 percent of its air and naval forces are deployed within approximately 60 miles of the Demilitarized Zone (DMZ), making the KPA a continuous threat to Republic of Korea and U.S. forces.

4.4.2. Iran.⁶ Iran will remain a threat to Israel and U.S. allies and interests in the region well after the Gaza conflict, and probably will continue arming and aiding its allies to threaten the United States as well as backing HAMAS and others who seek to block a peace settlement between Israel and the Palestinians. While Iran will remain careful to avoid a direct conflict with either Israel or the United States, it nonetheless enabled scores of militia rocket, missile, and UAV attacks against U.S. forces in Iraq and Syria; Hizballah exchanges of fire with Israel on the north border with Lebanon; and Huthi missile and UAV attacks, both on Israel directly and on international commercial shipping transiting the Red Sea.

4.4.2.1. Iran’s missile, UAV, and naval capabilities will continue to threaten U.S. and partner commercial and military assets in the Middle East.

4.4.2.2. Iran’s unconventional warfare operations and network of militant partners and proxies enable Tehran to try to advance its interests in the region and maintain strategic depth.

4.4.2.3. Iran’s ballistic missile programs have the largest inventory in the region and Tehran is emphasizing improving the accuracy, lethality, and reliability of its missiles. Meanwhile, Iran’s work on space launch vehicles (SLVs)—including its Simorgh—would shorten the timeline to produce an ICBM, if it decided to develop one, because the systems use similar technologies.

⁵*Military and Security Developments Involving the Democratic People’s Republic of Korea 2017*, DoD Report to Congress, February 13, 2018

⁶*Annual Threat Assessment of the U.S. Intelligence Community*, Office of the Director of National Intelligence, Feb 5, 2024.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

4.4.3. Risk. Except for the Korean peninsula, the risk of a large-scale conventional regional conflict involving the United States during the next 10 years is low. Beyond 2025, however, and certainly by 2035, the major regional powers will have improved their forces to the point that, in the right situation, they can directly threaten the mission success in any given regional conflict.

4.5. Fire Support (FS). The characteristics of FS are⁷:

4.5.1. To violently apply lethal fires in accordance with the law of war and established rules of engagement (ROE).

4.5.2. To always operate in the spirit of the offense: FS must always be conducted in the spirit of the offense. Regardless of whether the maneuver force is engaged in the offense or defense, its FS must be offensively minded as it rapidly and continuously strikes high priority targets across all domains.

4.5.3. To always operate as a single entity. The FS system is a single entity composed of a diverse group of attack and delivery systems, personnel, and materiel, most of which operate in different ways.

4.6. Joint Fire Support is joint fires that assist air, land, maritime, space, cyberspace, and special operations forces to move, maneuver, and control territory, airspace, space, cyberspace, the EMS, and key waters and to influence populations.⁸ There are four Joint Fire Support (FS) Functions.⁹ This assessment considered all four:

4.6.1. Support Forces in Contact. The commander provides joint fire support to protect and enable freedom of maneuver to forces in contact.

4.6.2. Support the CONOPS. The CONOPS clearly and concisely expresses what the JFC intends to accomplish and how it will be done using available resources.

4.6.3. Integrate and Synchronize Joint Fire Support. Joint fire support planning begins with the commander's estimate and CONOPS and continues concurrently with development of the scheme of maneuver. Joint fire support must also be synchronized with other joint force activities (e.g., air operations, cyberspace operations, special operations, personnel recovery, and information-related activities) to optimize limited resources and avoid friendly fire incidents.

⁷ FM 3-09, Fire Support and Field Artillery Operations, April 2020, paragraph 1-19.

⁸ Joint Publication 3-0, Joint Operations, 18 Jun 2022, Chapter 3, Paragraph 5, Fires.

⁹ Joint Publication 3-09, Joint Fire Support, 10 April 2019, Executive Summary

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

4.6.4. Sustain Joint Fire Support Operations. Joint fire support planners will mitigate logistics limitations and exploit logistical capabilities.

U.S. Air Force aircraft in support of ground operations must accomplish the four functions simultaneously. However, the Air Force does not consciously plan to work the four functions. Rather, it accomplishes its ground support mission through its normal provision of close air support (CAS), air interdiction (AI), strike coordination and reconnaissance (SCAR), and suppression of enemy air defenses (SEAD).¹⁰

4.7. Deficiencies. The Depth and Simultaneous Attack Battle Lab, supported by The Research and Analysis Center (TRAC), conducted a review in support of the DSFS CBA analyzing deficiencies and future battlefield capabilities required through the year 2035. This review revealed important deficiencies in the 30-500 km and beyond range band. The CBA assessed the capabilities of the current rocket, missile, and cannon fire support systems:

4.7.1. Missile/Rocket Systems. In compliance with the Intermediate-range Nuclear Force (INF) treaty, ground launched missile systems, to include ground launched cruise missiles and armed unmanned aerial vehicles, were restricted to a range of no more than 500 km, until the U.S. withdrew from the treaty in August 2019. Current rocket artillery ranges are limited to approximately 70 km. As technology provides the opportunity to see further on the battlefield, and as threat counterfire range capabilities increase, the Army will require rocket systems that can range approximately 130 km. Missile ranges are now limited to approximately 150km. Future capabilities must include the ability to extend missile range to 500 km in the near-term, and beyond 500 km by 2035.

4.7.1.1. Multiple Launch Rocket System (MLRS). MLRS M270A1 is a full-spectrum, combat-proven, all-weather, 24/7 lethal and responsive, tracked precision strike weapon system organic or assigned to Field Artillery Brigades. The M270A1 program consists of a modified M993A1 Bradley Carrier mounted with the M269 Launcher Loader Module. It will launch all MLRS Family of Munitions (MFOM) rockets and missiles. The MLRS carries two launch pods, each containing either six Guided MLRS (GMLRS)/MLRS rockets or one Army Tactical Missile System (ATACMS) missile. Reaction time from receipt of target location is about 20 minutes. The M270 launcher is transportable by Air Force C-5 and C-17 aircraft.

4.7.1.2. M142 High Mobility Artillery Rocket System (HIMARS). HIMARS is a C-130 air transportable wheeled launcher mounted on a 5-ton Family of Medium Tactical Vehicles XM1140A1 truck chassis with a crew protected armored cab. HIMARS is organic or assigned to active duty and National Guard Field Artillery Brigades. The HIMARS carries one launch pod containing either six GMLRS)/MLRS rockets or one ATACMS missile. It will launch all MLRS Family of Munitions rockets and missiles. HIMARS is designed to support joint early and forced

¹⁰ FM 3-09. Fire Support and Field Artillery Operations, April 2020, paragraph 1-18.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

entry expeditionary operations with high-volume destructive, suppressive, and counter-battery fires. Reaction time from receipt of target location is about 20 minutes. The HIMARS launcher provides 24-hour, all-weather, lethal, close- and long-range precision rocket, and missile fire support for joint forces, early-entry expeditionary forces, contingency forces, and FA brigades supporting Brigade Combat Teams. HIMARS is rapidly deployable by C-130, quickly enhancing combat effectiveness.

4.7.1.3. MLRS/HIMARS Family of Munitions.

4.7.1.3.1. Guided Multiple Launch Rocket System (GMLRS) is a surface-to-surface system used to attack, neutralize, suppress, and destroy targets using indirect precision fires up to 70-plus km. GMLRS munitions have greater accuracy than ballistic rockets with a higher probability of kill and a reduced logistics footprint. The current GMLRS family of munitions consists of three fielded variants: Dual-Purpose Improved Conventional Munition (DPICM) and the Alternative Warhead (AW) variants to service area targets; and the Unitary variant with a single 200-pound-class high-explosive charge to service point targets with low collateral damage. GMLRS is employed with the M270A1 MLRS and M142 HIMARS launchers.

4.7.1.3.2. Army Tactical Missile System (ATACMS) is a ground launched conventional missile system with a surface-to-surface semi-guided ballistic missile and Antipersonnel/ Antimaterial (APAM) warhead. ATACMS is launched from a modified M270 MLRS launcher, carrying a pod with two ATACMS missiles, or a HIMARS launcher carrying a pod with one ATACMS missile. This system can range targets out to 300 km. Improvements to reduce weight, increase range and reaction time are technically achievable. The suite of ATACMS are 24/7, all-weather, surface-to-surface, inertially guided missiles used to engage targets in the corps/Army area of influence. Due to the range and altitude of the ATACMS, target engagements require detailed airspace coordination and integration.

4.7.1.3.2.1. M39 Block I

- Range: 25-165 km
- Payload: 950 Anti-Personnel, Anti-Materiel (APAM) bomblets
- Guidance: Inertial

4.7.1.3.2.2. M39A1 Block IA

- Range: 70-300 km
- Payload: 300 APAM bomblets
- Guidance: Inertial with Global Positioning System (GPS) Aided

4.7.1.3.2.3. M48 Quick Reaction Unitary¹¹

¹¹ Unitary. A single high-explosive charge to service point targets with low collateral damage.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

- Range: 70-300 km
- Payload: Unitary Warhead
- Guidance: Inertial with GPS Aided

4.7.1.3.2.4. M57 TACMS 2000 Unitary

- Range: 70-300 km
- Payload: Unitary Warhead
- Guidance: Inertial with GPS Aided

4.7.3.3. Block 2 was to be the anti-tank version of the ATACMS system. Equipped with guided anti-armor Brilliant Anti-Tank (BAT) guided submunitions. The system released the BAT submunitions over an area and the munitions were found and homed in on vehicles. It was intended to attack and destroy moving armored units or stationary missile/rocket vehicles. In 2002 due to changes in the threat, funding for the Block 2 was cut, and the program closed. Considering the current threat situation there may be a need for a similar capability.

4.7.2. Cannon Artillery. Cannon artillery ranges are limited to approximately 40 km. As technology provides the opportunity to see farther on the battlefield, and as enemy counterfire range capabilities increase, the Army will require cannon systems that range out to approximately 70 km and beyond.

4.7.2.1. M109A7 Self-Propelled Howitzer. The M109A7 Self-Propelled Howitzer (SPH) and M992A3 Carrier Ammunition Tracked (CAT), replaced the M109A6 Paladin and the M992A2 FAASV respectively starting in FY 2018. The M109A7 SPH and M992A3 CAT improve size, weight, power, cooling, readiness, force protection and survivability. They increase M109A6 Paladin and the M992A2 FAASV platforms' sustainability through 2050. Characteristics:

- Crew: 4
- Combat Loaded Weight (Tons): 39
- On-Board Ammunition (Rounds): 42
- Rate of Fire: 4 rounds/minute for first 3 minutes; 1 round/minute sustained.
- Cruising Range: 180 miles
- Speed: 38 mph
- Fire Support Network: Paladin Digital Fire Control System software supports Fire Support Network.

4.7.2.2. Extended Range Cannon Artillery (ERCA) uses the existing M109A7 chassis and modernizes the vehicle above the turret ring to increase range and rate of fire in coordination with ammunition upgrades.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

4.7.2.3. M777A2 155mm (Light Weight 155mm) Towed Howitzer. Direct support, general support, reinforcing, or general support reinforcing artillery system jointly developed by the Army and Marine Corps to replace the M198 155mm Medium Towed Howitzer. Compatible with fielded and projected U.S. 155mm munitions, Excalibur, Family of Medium Tactical Vehicles (FMTV), Medium Tactical Vehicle Replacement (MTVR), and 5-ton trucks. Towed by the USMC MTVR and Army FMTV and M939 Series trucks. Two M777A2 Howitzers are transportable in a single C-130 aircraft. Externally slung below medium lift helicopters to include CH-47, CH-53 and the MV-22. Characteristics:

- Weight: 10,000 pounds
- Emplace: Less than three minutes
- Displace: Less than three minutes
- Rate-of-Fire: Four rounds per minute for two minutes; two rounds per minute sustained.
- Maximum Safe Towing Speeds: 45 mph on improved roads; 35 mph on secondary roads; 15 mph cross country

4.7.2.4. M119A3 Towed Howitzer (105mm). Acquired in 1986 as a Non-Developmental Item from Royal Ordnance of the United Kingdom. Fielded as two six-gun batteries for each M119A3 battalion in infantry brigade and National Guard brigade combat teams. Air Assault/Airborne Drop Capable. The digitally upgraded M119A3 includes software and hardware component upgrades, GPS for navigation, a digital gunner's display, and digital communication between each gun and the fire direction center to speed up the process of receiving firing data and firing shells. Approved Air Mobility: UH-60 Blackhawk, CH-47 Chinook, C-130, C-17 and C-5 Cargo Planes. Approved Prime Movers: HMMWV, 2.5 ton and 5-ton trucks. On-Going Modernization Efforts: Recoil System Upgrade, Breech Block Upgrade, Suspension Lockout System, and Titanium Firing Platform.

- Weight: 4,700 pounds
- Rate-of-fire: eight rounds per minute fir three minutes; three rounds per minute for 30 minutes
- USA made cannon and breach.
- Maximum Safe Towing Speed: 30 mph on improved roads; 15 mph cross-country

4.7.2.5. Cannon Artillery Munitions.

4.7.2.5.1. Excalibur (XM982, M982 and M982A1) is a 155 mm, Global Positioning System (GPS)-guided, extended range artillery projectile in use as the Army's next-generation cannon artillery precision munition. It provides improved fire support to the maneuver force commander, increases lethality, and reduces collateral damage. The Excalibur projectile uses a jam-resistant internal GPS receiver to update the inertial navigation system, providing precision in-flight

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

guidance and dramatically improving accuracy to less than two meters miss distance regardless of range. The Excalibur projectile has three fuze options (point detonation, point-detonation delay and height-of-burst) and is employable in all weather conditions and terrains. The Excalibur's capabilities allow for first-round effects-on-target while simultaneously minimizing collateral damage and the number of rounds required to engage targets. Characteristics:

- Maximum range with Zone 5 Modular Artillery Charge System (MACS): 39.3 km
- Minimum range from with Zone 3 MACS: 8.7 km
- Precision achieved: less than 2 meters miss distance.
- Fuze modes: point-detonation, point-detonation-delay and height-of-burst

4.7.2.5.2. High Explosive, M1 105mm. The 105mm High Explosive (HE) M1 cartridge is semi-fixed that can be fired from most existing 105 mm artillery howitzers. Its M67 propelling charge is made of seven increments that can be combined to achieve various ranges. The projectile, filled either with 2.1 kg of TNT or Composition B, can be fitted with a wide variety of NATO standard fuzes. Upon impact on the ground or proximity to a target, the projectile detonates to yield blast and fragmentation effects. Maximum range: 11.5 km

4.7.2.5.3. High Explosive, M107 155mm. The 155 mm High Explosive (HE) M107 HE cartridge is a separately loaded howitzer munition used for blast and fragmentation effects. Its projectile is filled with approximately 7 kg of either TNT or Composition B and it is compatible with standard NATO fuzes. The M107 can be fired using the M3A1/M4A2, M119A2 or MACS charge systems. The M107 is being superseded in the US military by the M795.

4.7.2.5.4. High Explosive, M795 155mm. The M795 is a 103lb 155mm high fragmentation steel (HF1) body projectile filled with 23.8 pounds of TNT or IMX-101 with a gilded metal rotating band for compatibility with all current and future towed and self-propelled 155mm howitzers. The IMX-101 reduces vulnerability from unplanned detonations providing greater safety while handling. The M795 projectile is employed against personnel, trucks, electronic surveillance and target acquisition devices, supply points, command and control and communications (C3) installations, and mechanized and armored forces. Maximum range: 22.5 km.

4.7.2.5.5. High Explosive M549A1 Rocket Assisted (HERA) Projectile. The M549A1 is an extended range, rocket assisted high-explosive projectile for use in long range harassment and interdiction (H&I) fire missions. The rocket motor is in the aft end of the two-piece forged alloy projectile body. The rocket is initiated by a pyrotechnic delay which ignites upon a gun launch and provides a 7-second delay. This delay maximizes the range extension effect of the rocket motor. Rocket motor initiates automatically in the gun tube
Maximum range: 30 km

4.8. International Implications.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

4.8.1. MLRS was developed jointly by the United Kingdom, United States, West Germany, France, and Italy. Variants of MLRS are fielded to the following partner countries. NATO: Germany, Italy, France, Greece, Turkey, and the United Kingdom. Non-NATO: Bahrain, Israel, Japan, Saudi Arabia, and South Korea

4.8.2. HIMARS was a residual of the Rapid Force Projection Initiative (RFPI) Advanced Concept Technology Demonstration (ACTD). It was initially fielded only to US Army and Marine Corps artillery battalions. Currently, international operators include Ukraine, Singapore, United Arab Emirates and Jordan. Potential future operators include Canada, Qatar, and Poland.

4.8.3. Exportability of systems with technological capabilities to reach beyond the range of current cannon, rocket, and missile artillery was not explored in detail by the DSFS CBA. The national security implications of exporting deep strike capabilities need to be studied prior to any commitments.

4.9. Non-materiel Alternatives. The DSFS CBA considered DOTmLPF-P alternatives to a new materiel acquisition program. There were no changes in training, leadership and education, personnel, facilities, or policy that would provide increases in range or lethality of rocket, missile, or cannon systems. The following changes in Organization, Doctrine and materiel were considered and rejected for reasons shown.

4.9.1. Organization. Organization of Early Deploying Forces. The addition of unconventional warfare, or Special Operations Forces (SOF), to early deploying light infantry and mechanized battalions was considered. These SOF units would then be covertly transported to positions within the enemy area of operations to find and destroy targets located by national sensors. This alternative required unacceptable tradeoff of other required conventional warfighting capability; further a net addition of manpower to early deploying units is prohibited due to airlift constraints.

4.9.2. Doctrine. Current combined arms tactics provide for the positioning of field artillery systems 5 to 20km behind the forward line of troops (FLOT), and behind the supported maneuver units. Covert positioning of artillery forward of the FLOT is possible. However, analysis indicates that survivability of these forward displaced units falls to an unacceptable level once they are used. Detection by threat target acquisition assets would be almost immediate. It would not be possible to divert maneuver assets forward for protection of these fire support systems.

4.9.3. Materiel.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

4.9.3.1. Joint and Combined Operations. An analysis of providing additional USAF assets revealed some serious shortfalls. Availability of USAF sorties in the early days of combat could not be guaranteed under any of the scenarios.

4.9.3.1.1. Operation DESERT STORM (1991). The *Gulf War Air Power Survey* results indicated that air power had almost no effect against high priority, time sensitive, mobile surface-to-surface missile targets.

Iraq's attempts to split the Coalition by firing Scud¹² missiles at Israel were anticipated before the war, and for that reason the fixed Scud sites in western Iraq were targeted on the first night's raid. These strikes failed to neutralize what became the true Scud threat mobile Scud launchers capable of moving from hidden sites. firing, then hiding again before aircraft could attack them.... By war's end, nearly every type of strike and reconnaissance aircraft employed in the war participated in the attempt to bring this threat under control, but with scant evidence of success.¹³

4.9.3.1.2. Iraq War (Major Combat Operations, Sep 2001 - May 2003).

Some preliminary reports indicate that the United States was able to use long-range artillery and artillery rockets like the ATACMS to strike at Iraqi forces long before those forces could close on U.S. forces and also to compensate for the problem's airpower experienced in flying attack and close air support (CAS) missions during sandstorms.¹⁴

One lesson that the Iraq War does not support is trade-offs between artillery, rotary-wing attack helicopters, and fixed-wing attack aircraft. The data to date indicate that Iraqi forces could rarely close on U.S. Army and Marine Corps forces in sufficient strength to put a major strain on air attack resources. Some have suggested that this makes systems like the MLRS and ATACMS less important. It seems doubtful, however, that many wars against major regional opponents can be fought with a similar degree of air supremacy, and one key to the ability of U.S. ground forces to maneuver so quickly and aggressively is their ability to bring firepower to bear in an emergency. It is dangerous to propose trade-offs based on an opponent that may be unique in many ways without far

¹² Scud. Soviet-made surface-to-surface missile. Scud variants are employed by North Korea and Iraq. More sophisticated mobile missile systems are fielded by Russian and China.

¹³ *Gulf War Air Power Survey, Summary Report*, Thomas A. Keaney and Eliot A. Cohen Washington, D. C. 1993. <https://web.archive.org/web/20080926224252/http://www.airforcehistory.hq.af.mil/Publications/Annotations/gwaps.htm>

¹⁴ *The Iraq War Strategy, Tactics, and Military Lessons*, Precision Artillery as a Partner to Precision Air Power, Anthony H. Cordesman, Center for Strategic and International Studies, 2003.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

clearer data in terms of the actual killing power of air and artillery systems, and without full consideration of the risks imposed in terms of maneuver warfare.¹⁵

4.9.3.2. Army Materiel. The DSFS CBA considered Army rotary wing attack aircraft (AH-64 Apache/Apache Longbow) for the deep attack role. However, aircraft with early deployment forces are fully committed to close combat requirements until D+4. Further, until air superiority is achieved (estimated to be not earlier than D+6) survivability of attack helicopters operating beyond the ground-based air defense umbrella is degraded to unacceptable levels.

5. Hypersonic Technology.¹⁶ The DSFS CBA team considered the use of emerging hypersonic technology to mitigate the range and lethality gaps in current missile systems. The term “hypersonic weapon” refers to a missile that travels at speeds at least five times the speed of sound in air (Mach 5 or above) and that spends most of its flight inside the Earth’s atmosphere (rather than in space), where it can use aerodynamic design features to maneuver. Moving at very high speeds within the atmosphere creates thermal challenges.

5.1. Hypersonic missiles are considered a possible counter to the anti-access and area-denial (A2/AD) systems that potential near-peer adversaries such as China and Russia are deploying to prevent U.S. forces from operating freely in their regions. In theory, hypersonic weapons could be launched from outside the range of those systems and could reach targets within minutes over medium to intermediate ranges (from hundreds to a few thousands of kilometers), with a high degree of accuracy and less vulnerability to defenses than existing missiles.

5.1.2. The Congressional Budget Office analyzed the relative capabilities and possible costs of hypersonic missiles and potential alternatives in scenarios in which long-range, rapid-response weapons might be useful. Hypersonic missiles with those ranges, however, would be more expensive than similar ballistic missiles and pose much greater technical challenges. CBO estimates that hypersonic missiles would cost roughly one-third more than ballistic missiles with maneuverable warheads that had the same range and accuracy and traveled at similar speeds.

5.1.3. Hypersonic weapons would provide a capability to address threats that were both well-defended and extremely time-sensitive (requiring a strike in 15 minutes to 30 minutes). If time was not a concern, much cheaper cruise missiles could be used. If targets were time-sensitive but were not protected by defenses that effectively intercept incoming ballistic missiles, less costly ballistic missiles with maneuverable warheads could be used.

¹⁵ *The Iraq War Strategy, Tactics, and Military Lessons*, MLRS and ATACMS, Anthony H. Cordesman, Center for Strategic and International Studies, 2003.

¹⁶ *U.S. Hypersonic Weapons and Alternatives*, Congressional Budget Office, January 2023.

**This Document is a Notional Artifact Developed for Use in the DAU
RQM-2100 Course, Application Skills for Requirements Managers**

5.1.4. Hypersonic weapons could be useful in ways other than thwarting A2/AD defenses. Notable examples would be scenarios in which the United States wanted to conduct a rapid, long-distance strike because it had intelligence indicating the location of a high-value target, such as the leader of a terrorist organization or a nuclear-armed missile about to be launched by a rogue nation. Such intelligence would have to be acted on quickly because of potential movement of the target.

5.2. Hypersonic Missile Programs. DoD is designing hypersonic boost-glide missiles with likely ranges between 1,000 km and 3,000 km.

5.2.1. The Army and the Navy are developing separate missile systems, but they are collaborating on a joint glide body for those missiles—the Common Hypersonic Glide Body, or C-HGB—and a common two-stage booster. The Navy is responsible for designing the glide body and the booster, and the Army is responsible for producing them. (The Air Force participated in that collaboration until 2020, when it chose to focus on a different glide-body design for its boost-glide missile.) The Army and Navy will use identical glide bodies but plan to separately develop different launch platforms for the missiles.

5.2.3. The hypersonic boost-glide missile that the Air Force is developing, the AGM-183A Air-Launched Rapid Response Weapon (ARRW), is based not on the Army and Navy’s common glide body but on the Tactical Boost Glide (TBG) vehicle developed by DARPA. The ARRW missile is designed to be launched from B-52 bombers, although there is discussion about using additional launch platforms, such as B-1 bombers.