POINT:

Mounted Vertical Maneuver: A Giant Leap Forward in Maneuver and Sustainment

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FOR ALMOST 70 YEARS, the U.S. military has possessed and employed a capability to conduct strategic, operational, and tactical maneuver by air with light forces through airborne operations. Nearly 50 years ago, the Army expanded that capability by developing the means to conduct air assault operations with dismounted units. Readers of *Military Review* can easily visualize these kinds of operations and recognize the advantages they provide to joint and ground commanders. However, their limitations are also well known. Once positioned by air, dismounted forces are limited in tactical reach, lethality, and survivability. In most situations, commanders must quickly reinforce air-delivered light forces with other capabilities to fully exploit the positions of advantage achieved and to generate meaningful operational momentum. This effort often requires considerable time and is dependent as well on the availability of strategic airlift and the improved airfields needed for their employment.

In contrast, imagine having the ability to move mounted forces by air directly to positions close to objective areas, then having that mounted force seize critical objectives without extensive pauses or the need for immediate reinforcement. For roughly the past 10 years, the Army has devoted significant efforts to investigating the near-revolutionary effects it might achieve with such intra-theater operational maneuver and tactical vertical maneuver.

Mounted vertical maneuver (MVM) is the Army's concept of a future capability to move mounted, protected forces by air across extended distances, from positions either outside or inside the boundaries of the joint operations area (JOA), to strike directly against critical enemy objectives throughout the depth and breadth of the battlespace. If realized, MVM will provide extraordinarily versatile new options that will extend the reach and power of future joint force commanders (JFCs). It will enable JFCs to respond more effectively to opportunity or uncertainty, to conduct forcible entry, to isolate portions of the battlefield, to exploit success, and to expose the enemy's entire force to direct attack by mobile ground forces at any point. Furthermore, MVM could be one of the key means future JFCs use to accelerate the defeat of the enemy by combining the defeat mechanisms of *dislocation* and *disintegration*, as described in both joint and Army futures concepts. The operational benefits that this kind of capability affords are so great that the Army thinks MVM should be pursued as a national program.

Mounted vertical maneuver is a fundamental component of the Army's family of future concepts for the future Modular Force. It provides a means

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Artist's rendering of a mounted vertical maneuver operation.

to fully exploit the advanced capabilities of the Army's medium-weight forces, including existing Stryker Brigade Combat Teams (BCTs) and BCTs that will be equipped with the Future Combat Systems (FCSs) in the next two decades. The concept is equally applicable to the maneuver and air-based sustainment of any light, motorized, or medium-weight mechanized forces that may be mission-tailored into future combined and joint task forces. As this article will demonstrate, MVM is relevant across the full range of military operations, including homeland security. Moreover, it is not merely an Army idea, but has substantial support from other elements in the U.S. defense community.

Historical Background

How new is the idea of MVM? One hesitates to mention the imaginative "mobile infantry drops" of Robert Heinlein's *Starship Troopers* (1959) simply because critics of the MVM concept often dismiss the book's ideas, quite wrongly, as pure science fiction. Brigadier General Richard Simkin's highly admired book *Race to the Swift: Thoughts on 21st Century Warfare*, published in 1985, is probably the best known early work that addresses the capability.[1] In it, one finds a scholarly treatment, well grounded in military theory, of the need for a mounted vertical maneuver capability. To quote Simkin: "The rotor is to track as track is to boot." Simkin clearly viewed the development of an MVM capability as both feasible and necessary to maintain a maneuver and mobility advantage in future conflict.

The former Soviet Union actually developed a capability for mounted vertical maneuver within its airborne forces. Soviet airborne divisions included three airborne regiments, each containing three airborne battalions equipped with light armored assault vehicles (BMDs). In the Soviet-Afghan War (1979-1989), the Soviets used these forces most often in direct action against the *mujahideen*, almost always deploying them into action by helicopter. Soviet air assault brigades were similarly structured, with two parachute-trained and two heliborne battalions, the latter equipped with BMDs and employed in the same manner. A variety of authoritative sources note the extraordinary mobility and agility of these forces during that war and uniformly confirm their effectiveness, characterizing them as the units feared most by the Afghan resistance.[2] Soviet doctrine at that time also envisioned using these formations for deep operational maneuver in theater war (a feature the U.S. Army touts as fundamental to the MVM concept).

The German Army, too, experimented with the concept of mounted vertical maneuver during the cold war. Viewing the Soviet capability for deep penetrations by armored formations as a major threat, the Germans examined the utility of moving battalions and brigades equipped with light armor and anti-tank guns rapidly by helicopter, to block any deep penetrations by mobile Soviet forces.

Serious U.S. Army investigation of what was then called air-mechanization began in the mid-90s under the auspices of the U.S. Army Training and Doctrine Command (TRADOC). With the initiation of the Army After Next (AAN) program under Chief of Staff of the Army Dennis Reimer, TRADOC began a series of annual war games, supported by pre- and post-analytical excursions, that featured a variety of air platforms and organizational structures employed in MVM over operational and strategic distances. Concept exploration was pursued through the Army Transformation War Game series from 2000-2003 and subsequently continued through the Unified Quest series of annual war games in support of Future Force (and future Modular Force) development.

Since 2001, TRADOC has imported the MVM concept into war-gaming venues with the Marine Corps, Navy, Air Force, Joint Forces Command, and Office of the Secretary of Defense. The concept has

also informed three Defense Science Board (DSB) panels (2004-2006) and been identified as one of 10 critical future capabilities recommended for development by the DSB Sea-basing Task Force.

During the course of this eight-year period, TRADOC examined a variety of rotary, tilt-rotor, and fixed-wing platforms with Vertical and Super Short Take-Off and Landing (VTOL and SSTOL) profiles, as well as various organizational structures and equipment complements.[3] The command projected an assortment of other joint enablers, such as airborne lasers, persistent and pervasive ISR (Intelligence, Surveillance, Reconnaissance), networked joint fires, and advanced escort aircraft, that would support large-scale vertical maneuver. Concept planners also examined vertical maneuver within the context of joint sea-basing and produced a maturing parallel concept for the temporary basing of advanced vertical-lift capabilities on board a variety of sea platforms, such as converted container ships and aircraft carriers. This supporting concept, known as the Afloat Forward Staging Base, was explicitly incorporated into the Sea-basing Joint Integrating Concept (JIC). It is currently influencing several naval research and design efforts.[4]

In short, the MVM concept is founded on a comprehensive body of work carried out over a long period of time and exposed to a wide variety of experimental conditions, within a broad spectrum of service, joint, and defense forums.

Conceptual Foundations

Lessons learned from active operations around the globe comprise one of the primary foundations of the MVM concept because they reveal known operational shortfalls that MVM capabilities can address beneficially. Among the more important known shortfalls are—

- Absence of an agile heavy-airlift capability that can deliver forces and stocks to the point of need.
- Runway-dependent fixed wing airlift, leading to excessive dependence on improved airfields.
- Unsuitability of fixed-wing aircraft to conduct air-based sustainment into forward operating areas.
- Virtually non-existent capability to conduct forcible entry operations by air with mounted forces (except in a follow-on, airlanding framework).
- Tactical vertical maneuver and operational maneuver by air limited exclusively to light, dismounted forces because of the non-existence of suitable aircraft.
- Limited capability for ground force self-deployment over operational distances directly to the fight.
- Absence of capability to conduct vertical maneuver or sustainment by air from sea-based platforms except by dismounted forces, limited to tactical depths.
- Shortfalls in air refueling capability that could extend the depths to which non-strategic airlift can operate.

These deficiencies have serious operational consequences. Overall, they severely curtail the options available to joint force commanders to exploit the vertical dimension with ground forces. In addition, they reduce the operational agility of the joint force and limit simultaneity, while increasing the predictability and vulnerability of operations to enemy interdiction. Finally, they exacerbate the need for operational pauses and simplify the operational challenges facing any future adversary.

Assured access challenge. The emerging Joint Operational Environment (JOE) also drives the MVM concept.[5] For several years, the JOE strongly emphasized that future U.S. forces will likely face an increasingly complex challenge to regional access. The significance of this challenge was explicitly recognized by the 2001 National Defense Panel and the 2002 and 2006 Quadrennial Defense Reviews. Several components of this challenge were clearly apparent in recent operations.

The first component is political in nature. The United States can no longer take for granted that it will have the political access to theater staging bases, ports, or overflight rights that it has enjoyed in the past. Adversaries will, in fact, take overt action to limit U.S. regional access through a variety of means, including diplomatic action, threats, and coercion. Even erstwhile allies may deny the United States political access, as Turkey did during the force build-up for Operation Iraqi Freedom. In the future, responsible joint planners must avoid overly optimistic assumptions about regional access. They must prepare for the likelihood that U.S. forces will have to conduct deployment, forcible entry operations, and sustaining operations from more distant intermediate staging and forward operating bases than has been the case in the past.

Mere geography can also pose access challenges. Although it is reasonable to expect that U.S. forces will continue to operate largely within the littoral regions of continental land masses, that may not always be the case. Operation Enduring Freedom (OEF), for example, represents a notable exception to that rule. Had the United States not been able to secure basing rights in Pakistan and Central Asia, its ability to carry out OEF objectives would have been gravely compromised.

Complex terrain and immature infrastructure within operational theaters further complicate assured access. A long-range vertical maneuver and sustainment capability could be one of the most important means of overcoming these kinds of access limitations.[6] (See figure 1.)

Figure 1. Operational Example of MVM, Task Force 58, Afghanistan. From a sea base in the Indian Ocean, armored forces could have been introduced at night and sustained without forward operating base or airfield requirements.

Third, future adversaries will challenge U.S. access at the strategic, operational, and tactical levels. *Strategic preclusion* may rely primarily on diplomatic action, coercion of U.S. regional allies, or direct use of force against strategic deployment capabilities. *Operational exclusion* involves enemy use of physical means to deny, degrade, and delay the entry of U.S. forces into the theater. Adversaries will likely also conduct *tactical denial* to prevent U.S. use of air and sea entry points anywhere within the joint operations area.

Physical methods and capabilities to deny access will range from high- to low-tech and be applied, potentially, at any point in the U.S. land-sea-air power projection chain of operation from home base to tactical assembly areas. At the high end, the most capable enemies will employ theater ballistic missiles (TBMs), air- and ground-launched cruise missiles, advanced integrated air defense systems, sea mines, submarines, space and undersea denial operations, and NBC munitions. Farther down the scale, anti-access measures could include intentional contamination, wide-spread employment of landmines and complex obstacles, direct action by special operations forces, terror strikes, use of human shields to deter attack of key anti-access capabilities, and information warfare to degrade automated elements of the U.S./coalition deployment command, control, and planning process.

All of these challenges—political, geographic, and enemy anti-access action—will be exacerbated by the existing shortfalls enumerated earlier. Thus, it is imperative that the defense community empower future JFCs with capabilities that enable U.S. forces to adjust to and overcome such challenges. Mounted vertical maneuver that is not dependent on easily targeted airfields is one of the best means of meeting those challenges.[7]

Joint concepts. Although the MVM concept is most closely associated with the Army, many foundational joint concepts identify capability gaps in this area and point to the future need for vertical maneuver and sustainment. The Capstone Concept for Joint Operations and a number of other approved joint operating and joint integrating concepts all

identify future operational requirements for MVM capability.[8] These joint concepts recognize that future joint operations must account for the assured-access challenge. In addition, virtually all of them project that U.S. joint forces will conduct simultaneous, non-contiguous operations distributed broadly throughout the JOA. The joint concept of distributed operations is predicated on JFCs having the ability to dispose forces and focus operations against those enemy forces and capabilities whose defeat will lead most quickly and effectively to overall victory. This approach is in contrast to the highly sequential and highly phased campaigns of the past. It enables the JFC to combine the traditional defeat mechanism of destruction with those of dislocation and disintegration.[9]

Figure 3 below describes how JFCs will likely want to conduct campaigns in the future. Clearly, the ability to conduct non-contiguous, distributed operations within the land domain represents transformational change that will present significant operational benefits to the future joint force. Mounted vertical maneuver and sustainment are critical to enabling this kind of transformational change.

The MVM and Sustainment Concept

The centerpiece of the MVM concept is the ability, by means of advanced theater airlift platforms, to maneuver and sustain operationally significant, combat-configured, medium-weight mounted forces to tactical and operational depths for immediate employment against objectives of particular significance. The future Modular Force will execute joint-enabled operational maneuver by air to extend the reach of the JFC, to enable him to respond to opportunity or uncertainty, to isolate or dominate specific portions of the battlefield, and to exploit success. (See figure 2.) Operational *movement* positions or repositions forces to secured positions of advantage to dislocate enemy forces or place them at a disadvantage for subsequent operations. In contrast, operational *maneuver* repositions forces in proximity to objective areas for immediate operations, potentially exposing the entire enemy area of operations to direct attack.[10]

Originating from either land- or sea-based staging areas and terminating in a vastly expanded number of entry points, vertical maneuver manifestly enables

Strike with fires and maneuver throughout enemy's entire dispositions ★★★
- Lift combined arms formations with integrated sustainment throughout the JOA
- Conduct operational maneuver with mounted and dismounted forces ★★★
- Conduct air mobile strike operations against high value, high payoff targets
- Deny the enemy key terrain and facilities
- Strike from bases outside the theater

These are the ways and means to achieve dislocation and disintegration

Maintain continuous, high-tempo operational pressure ★★★
- Fully exploit the third dimension and the non-contiguous battlespace
- Mass effects without massing forces
- Rapidly move and shift forces and fires against critical objectives by air and sea
- Conduct forcible entry at any point, in any phase of the campaign
- Exploit a ground-air mobility advantage over a ground-bound opponent

Sustain high-tempo, distributed operations within non-contiguous framework
- Augment ground LOCs with air lines of communications
- Sustain by air from sea-based stocks and supplies
- Distribution sustainment directly to units in forward areas
- Significantly reduce sustainment demand ★★★

★★★
Transformational Change

Figure 2. How will the future joint force commander want to fight?

distributed operations within a non-continuous battlespace and permits direct attack against enemy centers of gravity with maneuver and fires. It can also be used to seize key terrain and decisive points. Because it compels the enemy to defend in all directions, it constrains enemy efforts to mass, reinforce, sustain, and resynchronize forces and operations. In all cases, it is intended to have a definitive impact on the course and outcome of major operations, often accelerating decision or setting conditions for subsequent phases of the campaign.

Operational maneuver by air depends on the suppression or destruction of enemy air defenses and security of the landing area. It will normally be most effective when it is supported by the rapid advance of ground-mobile forces to reduce risk, reinforce, and exploit the results of the air-based maneuver. At the tactical level, vertical maneuver will often lead to rapid tactical decision, shortening the duration of battles and enabling forces to move quickly from one engagement to the next without a significant operational pause. In all cases, forces must be capable of reorientation against follow-on objectives with minimum delay. Subsequent to force insertion, the same airlift assets will then be employed to sustain those forces until ground lines of communication are established. In this manner, vertical maneuver changes the geometry of the battlespace and mitigates the assured-access challenge at the operational and tactical levels. (See figure 3.)

Planners envision that the future Modular Force structure will conduct operational-level vertical maneuver and sustainment by multiple battalions, either mounted, dismounted, or mixed. Joint allocation of advanced heavy-lift VTOL and fixed-wing (SSTOL and current aircraft) assets will be required to generate and sustain operational maneuver by one or more brigades in close sequence.

Relevant to All Operations

The discussion above necessarily focuses on major combat operations as the best means of describing the benefits of the MVM concept. However, the broader relevance of MVM across the range of military operations is evident. Capabilities that enable MVM will also materially improve counter-WMD (Weapons of Mass Destruction) and other special operations due to extended range, higher payloads, improved terrain negotiation, greater simultaneity, expanded operational access, and increased options for force employment. Similarly, the inherent requirement of large-scale stability operations for widely distributed sustainment and maneuver of rapid, mobile response forces over extended distances will be better satisfied by MVM

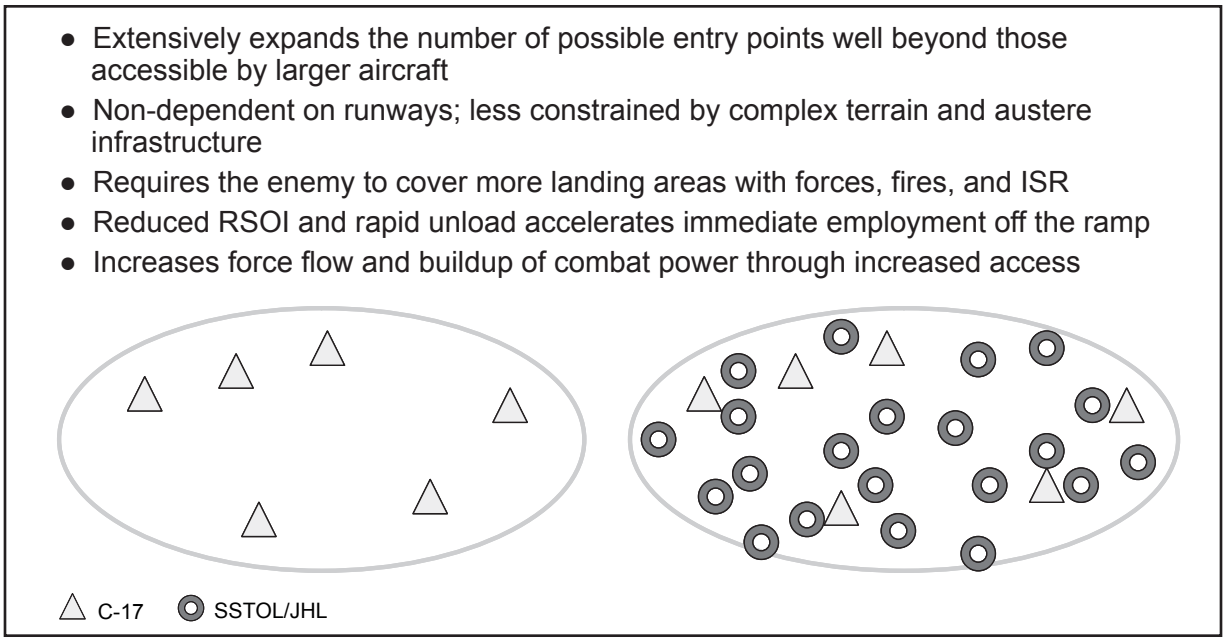


Figure 3. Vertical maneuver addresses the assured access challenge.

capabilities. Their applicability to border-security operations against hostile neighbors or to the isolation of enemy sanctuaries is also clear.[11] Furthermore, vertical maneuver would improve the U.S.'s ability to strike terrorists with mobile ground forces when remote, long-range fires won't suffice.

Vertical maneuver capabilities will also improve U.S. responsiveness to natural disasters and humanitarian crises. These crises often occur in remote regions or in regions hampered by austere transportation infrastructure (or infrastructure damaged in the course of the disaster). Recent contingency operations highlight the efficacy of MVM capabilities, particularly VTOL with extended range and payload. Since MVM capabilities can also be employed to move, maneuver, or sustain allies who may be hindered by the lack of even rudimentary airlift capabilities, they may also be an important factor in strengthening coalitions.

Keys to a Concept of Operations for MVM

In today's environment, an operation to move mounted forces by air is highly constrained, first by the number of C-17 aircraft allocated from the force pool, and secondly by the number of improved airfields and the maximum-on-ground capacity (MOG) of those airfields at both ends. Generally, these operations are highly sequential, relatively predictable (because of their dependence on airfields), displaced a considerable distance from objective areas, and long in duration.

In contrast, the airlift platforms envisioned for MVM will maximize the simultaneity of an air operation by using multiple departure points and landing areas—not just improved airstrips, but also clearings, roads, agricultural fields, playing fields, large parking lots, golf courses, dirt strips, and other unimproved sites. Moreover, the use of multiple flight paths will enable the simultaneous delivery of formations in volume rather than sequentially, thereby reducing exposure time to enemy detection and complicating hostile engagement.

Planners will select landing sites based on their tactical proximity to the objective area (roughly 20-100 km, depending on the enemy's ability to detect and oppose) and to each other in order to enable rapid assembly and forward movement for immediate attack. Aircraft will move mounted platforms internally loaded, fueled, and armed with crews on board. Although larger insertions will normally be desirable, landing sites will be sized no lower than platoon level and arranged in time and space to permit rapid assembly to battalion strength. Aircraft characteristics will permit rapid egress to reduce exposure on the ground for both air and ground elements. If suitable airfields are available, current airlift may also be used to move selected elements of the committed force that are not immediately required for assault. Naturally, planners will consider a variety of factors in building the operation, to include the types and numbers of aircraft available and the need to sustain committed forces by air lines of communications through and beyond the operation's initial stages.

As noted earlier, vertical maneuver will be supported by a suite of dedicated joint capabilities to ensure protection from enemy detection and engagement during flight and landing, to enhance situational awareness, and to establish favorable conditions in the objective area. En route updates will keep leaders abreast of changing conditions and permit adjustments to flight paths and landing areas, if required.

Operationalizing the Concept

The first new capability required to operationalize MVM is advanced theater airlift. *Marginal improvement over current theater airlift will not be sufficient to enable vertical maneuver*. Fundamental requirements for new airlift include:

- VTOL or SSTOL capability to avoid reliance on improved airfields and to increase the number of entry points that can be employed simultaneously.
- Payload weight and volume sufficient to move one or more medium-weight armored vehicles with crews, fuel, and ammunition (26-30 tons, sized to Stryker and FCS).
- Extended unrefueled range (500 nautical miles) with maximum payload and improved speed (250-300 knots/hour).
- Ability to fly at altitude to reduce exposure to short-range surface-to-air missiles.
- Suitability for use in air-based sustainment.

VTOL and fixed-wing SSTOL have advantages and disadvantages when compared to each other in operational scenarios. Generally, fixed-wing SSTOL will fly faster, further, higher, and with larger payloads. On the other hand, VTOL aircraft

provide substantially more access, permit more simultaneity, have a higher degree of agility, may be more night-capable, and enable insertions closer to objective areas. Survivability considerations appear to be comparatively equal.

Currently, the Army places highest value on the qualities of access and operational agility, favoring VTOL over SSTOL (or STOL) capability for those reasons, although the combination of the two capabilities is the most desirable approach. Certainly, the cost to research, develop, and acquire VTOL or SSTOL airlift will be substantial, as it is for any new, non-incrementally developed major system, but numerous credible studies have demonstrated reliably that heavy-lift VTOL development is technically feasible.

Survivability. Ensuring aircraft survivability throughout the course of an MVM operation is a significant challenge that the Army fully recognizes. The proliferation of man-portable air defense missiles (MANPADS) and projected improvements in enemy capabilities to detect and oppose vertical maneuver are major threats. The complexity of the challenge demands a holistic solution set with the following components:

- Aircraft equipped with passive and electronic protection systems that deny, degrade, or deceive enemy detection and acquisition, coupled with active protection systems that effectively neutralize enemy fires in flight.
- Ability to fly at altitude for the majority of transit, with terrain-masking flight profiles nearing terminal points.
- Improved capability for joint suppression of enemy air defenses and the networks supporting them.
- Persistent surveillance of landing areas, tied to active means for suppression of enemy capabilities to oppose insertions.
- Neutralization of the MANPADS threat.[12]
- Deception operations.
- En route updates that enable commanders to adjust operations in flight.

Naturally, the development of effective tactics, techniques, and procedures (TTP) will also be important. TTP will address the use of escort aircraft, pathfinders, and special operations forces to monitor and assist in setting appropriately secure conditions and to enhance situational awareness of landing areas.

Joint fires. As a joint-enabled operation, MVM will require support by long-range and air-delivered joint fires characterized by high levels of synchronization, timeliness, positive control, and accurate targeting of enemy capabilities positioned to oppose the operation. Research suggests that both lethal and nonlethal (e.g., electronic suppression) munitions will be especially relevant for MVM. The quality and diversity of joint fire support must also be sustained during the ground assault phase of the operation.

Situational awareness. Vertical maneuver operations demand a high level of situational awareness because of their vulnerability, complexity, and simultaneity. Conditions in objective areas and enemy capabilities to oppose the operation must be identified with a high degree of fidelity. Again, improvement in capabilities for persistent surveillance and en route updates to situational awareness are imperative. Although the complete elimination of uncertainty is neither likely nor necessary, it is reasonable to expect that future advances will enable an appropriately high quality of situational awareness to support MVM operations.

Recent Analytical Efforts

While it is true that the Army has taken the lead in developing the MVM concept, joint and multi-service organizations have recently undertaken several significant analytical efforts. The most important of these is the Joint Vertical Airlift Task Force (JVATF). Directed by the Assistant Secretary of Defense for Acquisition, Technology, and Logistics (ASD/AT&L) in 2004, the JVATF was based on OSD's assessment that the lack of a heavy-lift VTOL capability is the military's most critical rotary-wing capability gap. After several months of preliminary study, the JVATF evolved to pursue two parallel joint research efforts focused on what is now called Joint Heavy Lift (JHL). Those two efforts—concept refinement and requirements analysis—are cosponsored by OSD and the Army, with joint participation in integrated product teams enriched by industry participation. The eventual goal is to complete an Initial Capabilities Document for approval by the Joint Requirements Oversight Council.

The concept refinement effort comprises modeling and simulation-based evaluation of five different technical approaches to JHL in a variety of

scenarios, missions, and environmental settings.[13] In parallel, a 30-person joint government team of scientists and engineers is conducting cost and technical feasibility analysis for the five technical approaches. Overall, these efforts represent the most authoritative operational and technical analysis to date in the area of heavy-lift VTOL.

Joint sea-basing is another area in which the MVM concept has been vetted with some degree of joint rigor. This article previously cited the incorporation of the Afloat Forward Staging Base concept for sea-based vertical maneuver within the Sea-basing Joint Integrating Concept. In 2005, the Army also partnered with the Marine Corps in a bilateral analysis of sea-basing capability gaps that has informed the refinement of the Joint Integrating Concept and been endorsed by the Joint Staff. That analysis explicitly cites MVM as an existing capability gap.

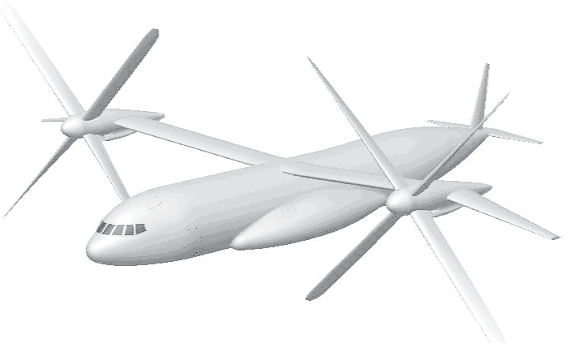
Third, the Defense Science Board HLVTOL/SSTOL Task Force is nearing completion of its 18-month study and is expected to release its draft report in early 2007. The MVM concept constitutes an important component of that study. The Army eagerly awaits its release.

Finally, the commander of the U.S. Transportation Command directed the initiation of the Joint Future Theater Airlift Assessment (JFTACA) in October 2006. Its stated purpose is to analyze potential joint-force theater airlift implications facing the future joint warfighter. JFTACA will examine non-materiel and materiel solutions such as Joint Heavy Airlift, the Advanced Joint Air Combat System, the Joint Precision Airdrop System, and other emerging technologies that may be available during the 2015-2025 time period. Targeted for completion in late 2007, the JFTACA concept-based analysis study may culminate with prioritized recommendations for both materiel and non-materiel solutions to theater airlift shortfalls. TRADOC is leading the Army's participation in the study. The MVM concept and the body of analytical work supporting it, including the Joint Heavy Lift project cited above, will inform the study comprehensively.

The Critics

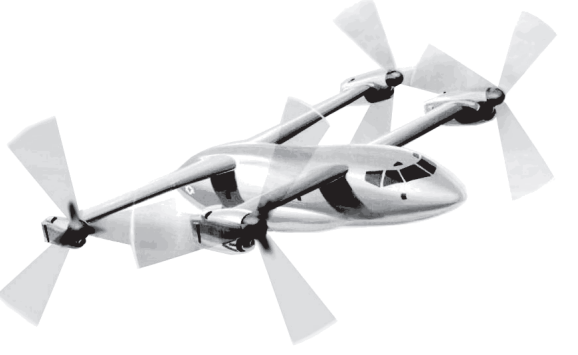
The MVM concept is not without its critics. It must be stated forthrightly that some of the objections emerge from less than a full understanding of the concept and often result in its mischaracterization or oversimplification. For example, one recent evaluation of the concept characterized it largely as being a means of rapid strategic deployment, whereas the Army clearly views MVM primarily for employment at the operational and tactical levels. Critics also tend to focus on the significant challenges to MVM's realization without examining the ways and means by which these challenges can be overcome. Overall, the primary objections to the concept are—

Slowed rotor tilt rotor



Advanced tandem rotor

Quad-tilt rotor aircraft



- *The risks are too great*. This argument rests largely on assertions that MVM will be too vulnerable to enemies employing inexpensive off-the-shelf capabilities, such as MANPADS, and that sufficient levels of situational awareness to support MVM will never be achieved. The Army perspective is that there is risk in every operation, but it can be dealt with effectively by using a holistic systems-of-systems approach with redundant capabilities.[14] One might also observe that the "too risky" argument is an old one that often accompanies debate over new programs. With respect to situational awareness, it would be difficult to identify any capability that is receiving more attention today for improvement across the joint force. The Army clearly recognizes the importance of situational awareness and understands its challenges. Given the ongoing work in this area it is possible to be confident about continuing advances despite the complex requirements of vertical maneuver.
- *MVM is unnecessary*. The Army considers that the need for MVM has been sufficiently established by the uniform concern within the defense community about future assured-access challenges; the emergence of a non-contiguous battlefield framework characterized by widely distributed operations; the operational demands of the war on terrorism; the rising importance of counter-WMD operations; the frequent involvement of U.S. forces in disaster relief and humanitarian crises; the lessons of recent operations; and strong support within joint concepts for maneuver and sustainment throughout the depths of a theater in conflict.
- *History says it cannot be done today; ergo, it cannot be done in the future*. This is another old argument that has accompanied the development of almost every major new advance in military capability, from the tank to the aircraft carrier. History is usually a good teacher, but it does not define the future. It can be a bad teacher if used selectively or if historical examples are mischaracterized.[15] Fortunately, the American military experience in modern times is to find a way to develop and employ new capabilities once they have been determined to be desirable and feasible.
- *U.S. industry will be challenged to develop and build the airlift.* While there is no question that the U.S. technical base regarding VTOL has atrophied over the past 20 years, a national commitment to develop new airlift will lead to revitalization.
- *HLVTOL and SSTOL capability are technically infeasible*. Critics charge that any aircraft built to carry heavy payloads into austere landing areas will fly too slow or too low to be survivable. This conclusion is disputed by a number of objective analyses that are readily available, including the work of the JHL government technical team cited above. In addition, none of the three DSB studies that have examined vertical maneuver requirements has reached this conclusion. Although there is technical risk, it falls within an acceptable range and no major technical breakthroughs are required.
- *Costs will be too high*. Some critics tend to exaggerate the cost of developing advanced HLVTOL or SSTOL airlift. One recent article cites a unit cost of $250 million per VTOL aircraft, which is roughly double the price tag cited in the two-year-long JHL study effort. More importantly, this argument is premature. The question is best left to a later date, after the joint requirements process has had full opportunity to determine the need. Ultimately, the question of how much cost is too much is a direct function of need and desirability.

A Final Word

The Army acknowledges the objections to MVM and accepts the need to evaluate them all as it continues to explore the concept. At the same time, it is desirable to encourage all interested parties to fully examine the large body of research and analysis that underpins the MVM concept. Three other concluding points are noteworthy:

- First, all should realize that MVM is a maturing concept, not a program. However, the concept has broad support that extends beyond the Army and appears to be growing. MVM is rooted in a mindset that looks 15 to 20 years into the future to consider what will be feasible and desirable in that timeframe; thus, it is focused far more on future opportunities than on current challenges.
- The MVM concept is not just about the Army; it is about enabling future joint force commanders to fight differently and more effectively.
- The capabilities MVM promotes are highly relevant not just to major combat operations, but across the entire spectrum of conflict.

Given this perspective, one can assert confidently that the defense community as a whole will benefit broadly from further exploration of the MVM

concept. Its ongoing development is particularly timely given the near-term requirement to replace the C-130 fleet. If continuing investigations confirm the operational significance of MVM and its ability to meet the diverse challenges of the future joint operating environment, the potential benefits to the future joint force could legitimately be characterized as near-revolutionary in quality. ***MR***

NOTES

1. Richard E. Simkin, *Race to the Swift: Thoughts on Twenty-First Century Warfare* (London: Brassey's Defence, 1985).

2. The most authoritative sources are those from Soviet military journals such as *Military Herald, Red Star*, and *Military History Journal*. For English-language sources, see Scott R. McMichael, *Stumbling Bear: Soviet Military Performance in Afghanistan* (London: Brassey's UK, 1991) or Mark Urban, *War in Afghanistan* (London: Macmillan Press, 1988).

3. Short Take Off and Landing (STOL) is defined by DOD as the ability to take off and land an aircraft within 1,500 feet over a 50-foot obstacle. Super STOL reduces the distance to 1,000 feet.

4. Department of Defense, Sea-basing Joint Integrating Concept, August 2005.

5. U.S. Joint Forces Command, *The Joint Operational Environment: The World Through 2030 and Beyond*, November 2006.

6. U.S. relief operations in Indonesia following the 2004 tsunami were particularly hampered by austere infrastructure made worse by the tsunami's destruction. Those operations relied heavily on vertical airlift to go where fixed-wing aircraft could not.

7. U.S. forces will likely face all aspects of the access challenges described here in any significant contingency involving operations against Iran.

8. Major Combat Operations, Joint Forcible Entry Operations, Sea-basing, and Joint Logistics (distribution) concepts also support the key ideas of mounted vertical maneuver.

9. Defeat by dislocation emphasizes using the maneuver of combined arms forces to obtain significant positional advantage over the enemy in a manner that renders the enemy's dispositions less valuable, perhaps even irrelevant. Disintegration focuses on integrating dislocating and destructive effects to shatter the coherence of the enemy's operational integrity through direct attack of his most critical capabilities.

10. The distinction between operational movement and maneuver is significant with respect to the immediate impact achieved against the enemy and the time available for the enemy to respond. The mobility capabilities required for operational maneuver and the level of joint support it will require will normally be considerably more demanding than for movement.

11. U.S. operations in Afghanistan and Iraq, as well as recent Israeli operations in Lebanon, were all hindered by the difficulty of securing borders with hostile states.

12. Although many of them are classified, significant programs explicitly focused on neutralizing the MANPADS threat have long been underway.

13. The Joint Heavy Lift (JHL) organization has completed two of the three functional analyses required by the joint requirements process, as well as a draft initial capabilities document. The performance parameters for JHL have been derived from this work.

14. Every offensive system that exists today is vulnerable to cheaper defensive means if other means are not routinely incorporated through complementary and reinforcing action to reduce the risks. [For example, infantry to accompany armor]

15. History can be a malleable tool for parochial interests. For example, because Serb authorities eventually acceded to NATO demands, the 1999 Kosovo campaign is often cited by air-power proponents as an operational example of the effectiveness of remote precision strikes. However, those proponents fail to mention that the Serbs continued their ethnic-cleansing program during the NATO bombing campaign and made no concessions until their goals were largely achieved. One senior NATO official, Secretary General Lord Carrington, subsequently observed that NATO strikes actually caused rather than prevented ethnic cleansing. Many observers at the time asserted that ground forces were the best way to prevent ethnic cleansing and vertical assault was the best means of doing so quickly. Air-power proponents have challenged that perspective as being infeasible, ineffective, and excessively risky. Their assessment might have been true at the time, but it asks and answers the wrong question. A better approach to this bit of history would be to examine how ground forces could have been introduced, given different capabilities, and then assess their operational impact on that kind of military problem in the future.