Joint Heavy Lift (JHL) - Requirements for 21st Century Warfare.

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Projecting and sustaining US forces in distant anti-access or area-denial environments and defeating anti-access or area denial threats is one of the DoD's six key operational goals.[1] The Department of Defense (DoD) in its Quadrennial Defense Review (QDR) has concluded that the "anti-access" threat- the complex mix of political, geographic, and military factors that could prevent or delay US forces from deploying to a combat theater- is the dominant strategic challenge confronting future US power projection operations in future conflicts, Particularly Asia.[2] This problem of access directly impinges on our force deployment, employment and sustainment timelines as well as limits our options. The changing nature of combat dictates significant revision to the method and means of conducting operations. This paper will look at the changing strategic and operational environment and concepts that drive the need to begin development of a Joint Heavy Lift aircraft.

Political access problems have erupted in almost every contingency and conflict in which the United States has engaged since World War II[3] and will likely grow in the future. Physical access problems grow with the corresponding proliferation of weapons and communications/satellite technology. Denial or limits to our access is unacceptable and inconsistent with the national goals of assure, dissuade, deter and defeat.[4] These advances give our adversaries the capability to hold vulnerable fixed airfields and ports at risk and deny or limit our operations. It should not be forgotten that most of the Pacific Theater operations where conducted to gain access to air bases for future operations. Indeed the pivotal Battle of Midway was a pivotal naval engagement over a small island with one critical airfield. Since World War 2 over 2000 military aircraft have been destroyed on airfields across the world in various conflicts by both direct and indirect attack on the airfields. The loss of airfields has been the direct cause of the outcome of several wars; French Indochina War and the Arab/Israeli Six Day War are the most apparent. The inclusion of modern precision weapons (like those fired at Commercial and military cargo aircraft recently in Iraq) such as small man portable guided missiles and mortars will only exacerbate the situation.[5] Airfields are the Maginot Line of the 21st Century. Our reliance on them and unwillingness to see past the huge investment makes this a direct corollary of one of the 20th Centuries greatest strategic errors. Our enemies while acknowledging our dominance in the air also are keenly aware of the single point of failure that comes with this dominance. We to a certain extent acknowledge this vulnerability as we continue to develop aircraft capable of global missions. This luxury does not exist in supporting forward deployed and engaged ground forces.


CTOL/STOL aircraft are reliant on undamaged landing areas

The imperative that we face is creation of options that project and sustain forces globally in the face of opposition or to areas where the infrastructure has collapsed or is non-existent. These challenges are being met today but with an ever-increasing vulnerability to our forces. At the time of this writing over 250 convoy operations are conducted a day in support of OPERATION IRAQI FREEDOM (OIF). The movement forces and their continual sustainment along extended ground lines of communication (GLOCs) limit our temporal advantage and expose the vulnerabilities of securing GLOCs in a distributed battlespace.

Future Joint Warfighting- OODA:

The National Military Strategy of the United States of America (2004) identifies Full Spectrum Dominance (FSD) as the Joint Vision for Future Warfighting.[6] FSD is the overarching concept that is supported by a family of Joint Operating Concepts (JOCs), Joint Integrating Concepts (JICs) and Joint Enabling Concepts (JECs). Together these concepts define the attributes, capabilities and metrics for joint force development and integration. Integral to these concepts is the ability to conduct networked operations that combine individual service capabilities with a shared awareness of the battlefield in a manner so that they can be dynamically tasked to conduct Effects Based Operations (EBO)[7] in a distributed environment.

Battlespace-

The concepts of operations with pockets of resistance in a distributed battelspace is discussed in *In Athena's Camp* [8] and is useful in presenting a new metaphor to help convey the new concepts and capabilities required. The metaphor is about strategic games. In western view the game of chess is often viewed as a game of war. But addressing the future the Oriental game of Go may more accurately reflect the nature of conflict. Chess is linear with defined sides and a defined end state of checkmate. Each piece has a specific function and value. In the game of GO the game starts with an empty board and each piece is strategically placed with the goal of controlling more of the battelspace than the opponent. As a result, there is almost never a front line, and action may take place anywhere on the board at any time. Thus Go is more about distributing one's pieces than about massing them. It is a more proactive insertion and presence than about maneuver. It is more about developing web-like links among nearby stationary pieces in combined operations. Further, there is often a blurring of offense and defense. Finally, the use of mass concentrations is to be avoided, especially in the early phases of the game, as they may represent a misuse of a time and later be susceptible to an implosive attack.

VTOL aircraft do not require fixed landing areas

Heavy Lift Vertical Takeoff and Landing aircraft provide battlefield opportunities within the constructs above, to commanders unachievable in previous combat operations. By adding rapid maneuver over restricted terrain at operational distances to mechanized forces and logistics efforts, JHL allows the Joint Task Force Commander to place significant mobile combat power suddenly at any locations in the battlespace, creating significant non-linear combat power unimpeded by terrain or traditional ground mobility hindrances. Combat and logistics operations conducted with joint air and ground mobility task force are more efficient, overcoming battlefield asymmetry and can be concluded in less time than operations without JHL mobility. When taken into account with emerging National Strategy illustrate a need to move to a capability to develop heavy lift requirements for the future joint force.

Concepts:

There are three emerging concepts for future operations which JHL capability becomes crucial;

Ship to Objective Maneuver (STOM) - is the execution of combined arms maneuver through and across the water, air, and land of the littoral battlespace directly to inland objectives. STOM's aim is not to seize a beach for lodgment, but to project combat units ashore in their fighting formations and to sustain them against a decisive objective to ensure mission accomplishment.

Seabasing - the ability to rapidly deploy, assemble, equip, command, project, retrograde, and reemploy joint combat assets from the sea, while providing continuous support, sustainment and force protection to expeditionary joint forces without initial reliance on land basis within the Joint Operating Area. These capabilities will enable operational maneuver and facilitate assured access and entry from the sea.

Vertical Maneuver - consists of air assault of dismounted infantry, along with selected equipment from their Future Combat Systems (FCS), and the air movement of mounted forces. Dismounted air assault is conducted to extend tactical reach, negate effects of terrain, seize key nodes, attain surprise, and dislocate or isolate enemy forces in contact or in imminent contact. Vertical maneuver of mounted forces is conducted to expose the entire enemy

area to direct attack; separate echelons prevent massing and deny enemy reinforcement. Vertical maneuver of mounted units adds a new operational dimension to the battlefield, and allows the joint commander to conduct operational maneuver from strategic distances. Similarly, maneuver of friendly forces, out of contact, enhances shaping of the battlespace and allows attack at the time and place of our choosing.

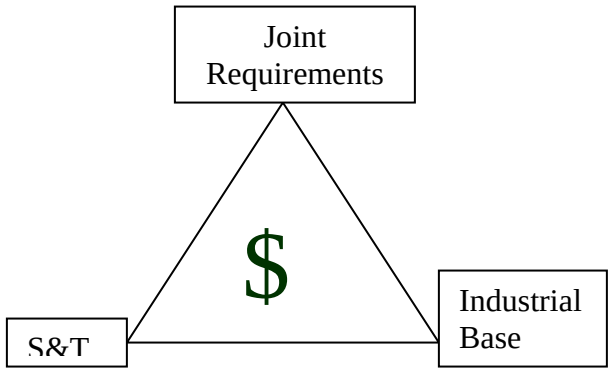
Studies:

Advances in technology and the programmed development of communications technology promise to give the warfighter the ability to leverage information and shared awareness on the battlefield. Applied to the Boyd Observe, Orient, Decide, Act (OODA) cycle; these advances will increase the probability of a given capability (or combination of capabilities) of producing useful options to deal with a given situation. (Po)[9] and gain a temporal advantage. The challenge we face is that networked operations increase our ability in the cognitive domain but are not matched with advances in the physical domain. You get the OOD but with a small A(act). One of the limiting capabilities in the physical domain is the lack of intra-theater vertical lift. This challenge has been addressed through different studies over the past 9 years with no tangible result.

J-8 Overarching Rotorcraft Commonality Assessment (ORCA) (2001)

The primary purpose of the ORCA study was to assess the potential for commonality opportunities and life cycle cost (LCC) savings associated with "generation-after-next" rotorcraft.
The study recommended a "Way Ahead", for the development of a long-term rotorcraft planning strategy that requires the establishment of a Joint Advanced Rotorcraft Technology (JART) office that serves as an information integrator for requirements, technology, acquisition, and industry information. The most pressing need and opportunity for commonality between services was a Joint Heavy Lift requirement.

OSD-J-8 led Non Fixed Wing Aviation Study (2003)



The study recognized the need for increased attributes in networked operations, operational reach (speed, range, and payload), and survivability. They recommended the creation of an OSD AT&L led Joint Vertical Lift Aircraft Task Force (JVATF).

The study identified four interconnected areas essential to the JVATF and developed a list of priorities. The interconnected areas are:

- Requirements- Identify joint common requirements.
- S&T- Identify the S&T required to meet requirements.
- Industrial Base- Identify changes required and impacts to the industrial base to manufacture systems. 4 of the 6

intensely managed 2004 Defense Planning Guidance (DPG) studies were rotary wing. CH-47, AH/UH-1, Comanche, and V-22 underwent Nunn-McCurdy notification or certification. Indicators are that the rotary wing industry needs attention.
- Acquisition- Identify an acquisition strategy that would be executable.

The overarching priorities are:

1. Net the force- To conduct netted operations.
2. Develop Heavy Lift NFW Platform- Increase operational reach & capacity.
3. Invest in Common Engine Program- Increase operational reach & performance.
4. Develop Common Affordable Countermeasures- Increase survivability.
5. Enhance ballistic protection- Increase survivability.
6. Develop Medium Lift NFW Platform
7. Integrate Attack/Reconnaissance/ ISR NFW Platforms

Joint Vertical Lift Aircraft Taskforce (JVATF) (2003 - Present)

The JVATF was formed at the direction of Deputy Secretary for Defense to implement the NFWA study findings. It is OSD AT&L led with Joint Staff and the Services participation.

Joint Heavy Lift (JHL) Aircraft Task Force (2003-04)

The JHL task force was a subgroup formed under the JVATF to address the emerging requirements for a JHL aircraft. It presented a draft JHL Initial Capabilities Document (ICD) for staffing in the Joint Capabilities Integration and Development System (JCIDS) process. A Joint Procees Action tem has been chartered to propose a concept refinement strategy for JHL.

Operational Experiments (2002 – Present)

Various war games conducted by Joint Forces Command in conjunction with the services over the last three years have allowed the JHL to be used conceptually within operational environments. These war games series include UNIFED QUEST (Army), UNIFIED COURSE (Navy) and SEA VIKING (USMC). These exercises have allowed repeated opportunity to use the JHL capability to demonstrate the concepts discussed above in scenarios that the Department of Defense anticipates will be likely to be faced in the future.

Below are some of the missions that have been implemented in four years of experiments and war gaming venues mentioned above where a JHL capability was used within a Joint Force operational construct;

The JHL was used to defeat the enemies attempt to restrict access to an urban area through airfield denial. The main airfield was surrounded by shanty town on three sides and a major urban complex on the remaining one. The enemy force having refused conventional battle had retreated into urban guerilla operations and used massed MANPAD and mortar fires to restrict access to the airfield. Through

the use of the JHL combat equipment, supplies for the combatants and humanitarian relief for the urban populace were delivered from the theater staging facility at an operational distance of several hundred miles. Landing areas around the city were identified and used on a rotational basis so that the enemy was not given the opportunity to plan for and attack a landing zone. This effort demonstrated to the local population that we could overcome the enemy attempts to stop our efforts and allowed us to move large support pulses direct to the units needing the support.

The JHL was used to move both combat (Stryker) and associated logistics assets over a 400 NM move to support repositioning of an entire Stryker Brigade Combat Team (SBCT). In order to reduce the vulnerability of the SBCT as it moved along a single road from one operational area to another, a majority of the Support Battalion was moved by JHL to the new base location to keep them from being likely targets within the formation. Also an element from one of the SBCT battalions was moved to key locations along the MSR in order to secure them. This precluded the enemy from denying movement along the route and prevented the use of natural choke points for attacks on the column.

The JHL was a critical high speed connector from the secure airfield in another country. By not being reliant on fixed facilities and having the range and speed to operate over extended ranges the JHL was able to make direct delivery of logistics materials to units in the field. This reduced the reliance of forward units on ground lines of communications for supply. This was repeatedly demonstrated as the opposition cut the GLOCs between cities due to the extended distances of the roads.

The JHL by virtue of its ability to use other any sufficiently open area, precluded being a competitor for Movement On Ground (MOG), how many aircraft can occupy an airfield at any given time, at the operational airfields within the exercises. Within theaters with few available airfields, MOG will be a crucial capability that will be at a premium. This is magnified when we consider that need for civil (humanitarian) and coalition assets to use the same space. Also the ability of the JHL to move significant quantities from airfields to field locations was noted as a means to reduce the time for logistics resupply and security requirements due to fewer convoy operations. This is consistent with the issues experienced by the joint forces attempting to work out of the Rinas airfield in Albania.[10]

The JHL was used as a high speed connector for the Sea Base. The ability to move equipment and classes of supply throughout the Sea Base and the Area of Responsibility (AOR) were noted as crucial, given its vast size. (3000 NM by 1200 NM). This was made more evident and crucial by the degraded infrastructure of the area of operation. The ability for the JHL to move significant quantities of supplies and systems from the sea base on short notice to the requiring organizations with minimal displacement, if any of the sea base, allowed for little disruption of the existing Joint Naval Component Commanders operations. Ironically less than a year after this exercise the events

in Southeast Asia with the effects of the tsunami validated this observation.

If the HVTOL has the ability to give away twenty tons of fuel then each airframe is a flying 6000 gallon tanker. This capability was used for both air and ground refueling of U.S. Army and Joint assets in the austere infrastructure environment. Of note at one point the when the JTF was operating ground and Army air assets over a 600 kilometer main supply route and line of communication, through the use of the JHL the ground commander was able to resupply units without the requirement to establish an intermediate logistics base. The JHL served as a temporary logistics base. While this capability was important to allowing unimpeded operations, it did consume considerable numbers of aircraft to support this mission.

The JHL was used to support the humanitarian efforts throughout the AOR, with a twenty ton capability, able to land on any of the numerous football pitches throughout the area. This allowed much more rapid and efficient distribution, without having to use vulnerable ground lines of communications with unprotected vehicles. It also relieved the commanders of having to provide significant combat power to escort the humanitarian efforts, although it did not make it unnecessary. Significant quantities of humanitarian supplies were rapidly delivered directly to the area required, this helped to not only improve relations with the indigenous people being assisted but also demonstrated support to the humanitarian agencies involved.

The JHL was used for medical evacuation. The capability of the aircraft made it not only capable of moving large numbers of casualties at a time to the hospital ships, but allowed for the evacuation directly to the airfields where they could be moved direct to further care facilities in Japan or CONUS. The JHL used in this roll was able to bypass the intermediate transfer point and deliver patients to secure facilities for onward care and movement to the rear.

The tremendous distances that the JHL were operating across will require the aircraft to have a significant secure, long range and uninterrupted communications and data sharing capability commensurate to the operational distances required. The aircraft were transiting distances equal to that of St. Louis to Los Angeles.

The importance of the JHL to the efforts of the US and Coalition forces was not lost to the Red forces. They recognized it as a “flag ship” system. A concerted effort was made to destroy the aircraft and/or cause them to reduce usage in theater. The ability to operate out of parking lots and even soccer pitches dramatically increased the dilemma to the Red Force to predict where the aircraft would be going to. A concerted effort was made by the blue players to preclude providing opportunity for the aircraft to be attacked through continued changing of operating procedures and landing locations.

The ‘flagship’ status of the JHL will require them to receive and maintain up-to-date Aircraft Survivability Equipment (ASE) due to their cost and the environment they will habitually

operate in. A consideration for the joint commander as he develops his plan for their introduction into the area of operation will be how and where to base these aircraft due to their size. This system will not likely be a "field system" in the same context as current aviation combat systems used by ground commanders.

While the JHL was a critical asset in allowing the JTF Commander to accomplish the anti-access and Future Force concepts, it will require a new method of operation upon the Army. It is unlikely that these assets will operate as we currently conduct aviation operations. While they would certainly be able to operate from austere locations their size and internal logistics requirements will require several new considerations;

a. Fuel. Regardless of the airframe type these aircraft will consume fuel at a rate greater than the current fleet of Army aircraft. This will mean that the operating locations for start and end of mission will have to have a significant fuel capability resident.
b. Footprint. These aircraft will be larger than any other Army aircraft. Whereas a football field can hold three UH-60 size aircraft and two CH-47, a JHL aircraft will each need a football field sized area to operate out of.
c. Crew. While it is probable that the JHL will be highly automated, there is a potential that the aircrew will run out before the aircraft. Depending on the final decision of required cruise speed for the aircraft, the number of sortie that can be accomplished by a flight crew in a given crew day over the anticipated distances may be cause for consideration of a manning level greater than current practice to fully utilize the potential of the JHL.

We must be careful not to use current capabilities and limitations to judge the capabilities of the JHL. For instance a modern Boeing 767 aircraft has the capability to take off fly a transcontinental flight and land without ever having the controls touched by human hands. The levels of automation in most commercial aircraft being produced today are of at least the same standard. By 2015 we should require this level of capability in our military aircraft. Our investment in automation for Unmanned Vehicles should allow us to have aircraft with significantly reduced workloads. Other consideration/expectations for any JHL;

a. Brownout. Loose of visual reference should not be a major concern for future aircraft. A significant cause for loss of aircraft today, we are already working on means to overcome this problem. Advanced flight controls and assisted vision systems should relegate this issue to non-existence.
b. Automated Terrain Flight. The United States Air Force and Navy have both operated aircraft capable of automated

terrain flight for over forty years (F-111, F-15E, B-52, B-1, HC-130, and A-6). An investment into an aircraft of this nature should be expected to be able of operating in a like manner. Several recent and ongoing programs (Rotorcraft Pilot Associate, DARPA UCAR program) have or are making significant investment in automated low altitude flight capability.

c. Adverse Weather flight. For the same reasons as given above in b., future weather minimums should be significantly reduced.
d. Anticipatory Maintenance. Modern commercial aircraft are capable of informing maintenance personnel of both current and potential requirements. Again we should anticipate that a future aircraft should have the same capability as found today in commercial aircraft.

The JHL will require greater coordination and integration with the ground forces that it will support. As expressed above, an enemy will likely understand the criticality of the JHL to our efforts and will look for means to adapt and defeat it. This will mean that in many circumstances after the initial entry operations where surprise can preclude the enemy knowing the locations of arrival, security and changing landing zones (remaining unpredictable) will enhance the survivability of these large aircraft. The flight crew of the JHL should have means to maintain situational understanding with the supported ground forces.

The possibility that the (rocket) artillery raid could be executed as an operational or strategic level effort is made possible with the use of the JHL to move HIMARS with an ATACM load to a launch point that would allow fires in support of the effort to destroy the Integrated Air Defense Systems and critical infrastructure of the threat country during the initial entry operations of the Joint Force. The VTOL capability allows the artillery system to be moved to a location that is less likely to be observed (as opposed to an airfield or seaport). In fact it could be executed within the same construct as a classic air assault artillery raid, in that the aircraft can deliver the vehicle and weapon to a Landing Zone (with the system maintaining knowledge location through an interface to the aircraft system) where it will drive off the aircraft, move to a safe distance, fire, return to the aircraft and depart. Theoretically these raids could be done in such a manner that the effort originates and ends well outside of the JOA. The aircraft could operate to and from a Sea Base. Thus the firing unit has minimal dwell time and indeed could present an almost covert capability. This allows these joint force elements to participate in the Joint Forced Entry Operations without alerting the enemy intelligence apparatus.

Flexibility of the JHL was a key enabler of its functionality within the operational and tactical efforts of the war games. The ability to execute multiple missions within a single sortie was a great benefit, especially to the logisticians as they looked for means to

distribute classes of supply over the extended non-contiguous battle space.

The JHL was used for SOF operations that required an airframe capable of recovering heavy classified payload. The ability of the aircraft to land without use of a prepared surface allowed the SOF effort a significant increase in flexibility to execute the mission without seizing or establishing an airfield or fixed landing site. The aircraft was able land vicinity of the objective and recover both the payload and the SOF personnel.

Conclusion:

Developing a Joint Heavy Lift aircraft would address the challenges of access, sustainment and extend our operational reach and reduce our operational risk. This capability would enable the concepts of STOM, Sea basing and Mounted Vertical Maneuver (MVM) to meet the Joint Force requirements to operate over an extended non-contiguous battle space by positioning Joint and Combined Forces in positional advantage while overcoming enemy anti-access efforts through the use of unguarded entry points. Winning depends on choosing appropriate focal points and having the capability and flexibility to bring superior combat power to bear at each in the right sequence, even though these foci may be widely distributed in space. Shifting these locus (and focus) of the main effort rapidly and in a sequence optimized for success in a larger strategic and operational framework creates a cascading effect to which the enemy is less and less prepared to react. Acceleration of the cascade toward campaign success depends on reliable and swift results at each point. In order to maintain the tempo of this form of operational parameter, not only must the force have the means to conduct them, but also to sustain them, either through pulsed or contiguous effort. To do so the sustainment function of a force must meet the same capabilities as the emplaced force (not reliant on logistics foci).

1. Donald Rumsfield, Quadrennial Defense Review Report September 30, 2001.

2. Andrew Krepinevich, *Transformation Strategy*, Center for Strategic & Budgetary Assessments, July 2002.

3. Christopher J. Bowie, The Anti-Access Threat and theater Air Bases, Center for Strategic & Budgetary Assessments, 2002.

4. The strategy that results is built around four key goals that will guide the development of U.S. forces and
capabilities, their deployment and use:
- **Assuring** allies and friends of the United States' steadiness of purpose and its capability to fulfill its security
commitments;
- **Dissuading** adversaries from undertaking programs or operations that could threaten U.S. interests or those of our
allies and friends;
- **Deterring** aggression and coercion by deploying forward the capacity to swiftly defeat attacks and impose severe
penalties for aggression on an adversary's military capability and supporting infrastructure; and
- Decisively **defeating** any adversary if deterrence fails.
Donald Rumsfield, Quadrennial Defense Review Report September 30, 2001.

5. Alan Vick, Snakes in the Eagle’s Nest, Rand. 1995.

6. Chairman of the Joint Chiefs of Staff, National Military Strategy of the United States of
America 2004: A Strategy for today; a vision for Tomorrow.

7. Edward A. Smith, Effects Based Operations, Applying Networked Centric Warfare in Peace, Crisis, and War, Command and Control Research Program (CCRP), 2003.

8. John Arquilla & David Ronfeldt, In Athena's Camp: Preparing for Conflict in the Information Age, RAND, Santa Monica, CA 1997.

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10. Bruce R. Nardulli, Walter L. Perry, Bruce Pirnie, John Gordon IV, John G. McGinn, Disjointed War, Military Operations in Kosovo, 1999, RAND, Santa Monica, CA, 2002.