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Employment of Armed Reconnaissance Helicopters in Support of Operational Functions  
in an Immature Theater—Does Comanche Have a Role?

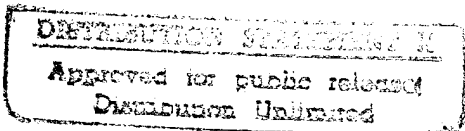
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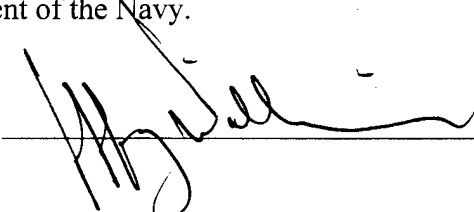
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A paper submitted to the Faculty of the Naval War College in partial satisfaction  
of the requirements of the Joint Military Operations Department.

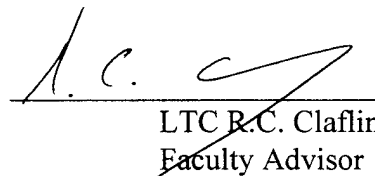
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14 June 1996

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13 Feb 96  
Date

19960501 276

## REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED			
2. Security Classification Authority:			
3. Declassification/Downgrading Schedule:			
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT			
6. Office Symbol:  C		7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207	
8. Title (Include Security Classification): Employment of Armed Reconnaissance Helicopters in Support of Operational Functions in an Immature Theater--Does Comanche Have a Role?			
9. Personal Authors: Jeffrey N. Williams, MAJ, USA			
10. Type of Report: FINAL		11. Date of Report: 15 February 1996	
12. Page Count: <del>22</del> 22			
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.			
14. Ten key words that relate to your paper: Operational Functions, Joint Operations, Attack Helicopters, Comanche, Information Systems, IPB			
15. Abstract: The RAH-66 Comanche helicopter, currently being developed by the Army, will undoubtedly bring revolutionary capabilities not only to the tactical battlefield but also potentially brings new capabilities to support the operational level of war in all types of theaters, particularly in the fulfillment of the requirements for operational functions. The scope of this paper is limited to investigating the potential of the RAH-66 to bring the theater commander contributions to the execution and synchronization of operational functions in immature theaters. The benefits and liabilities associated with early deployment of a Comanche unit into theater in support of the operational functions are considered. Comanche will offer the operational commander a great deal of flexibility and performance in developing an immature theater, and should be considered a unit of choice, under certain scenarios, for early deployment into theater for intelligence preparation of the battlefield, surveillance, and possibly operational fires and force protection. The Comanche operational employment should not be considered alone, however. Its employment presupposes an in-theater information architecture allowing real-time and continuous world-wide communications. It will also more effectively supplement other assets, both supporting and organic to the theater operational commander's organization.			
16. Distribution / Availability of Abstract:	Unclassified  X	Same As Rpt	DTIC Users
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841- <del>6461</del> 6461		20. Office Symbol: C	

Abstract of

EMPLOYMENT OF ATTACK HELICOPTERS IN SUPPORT OF  
OPERATIONAL FUNCTIONS IN AN IMMATURE THEATER—  
DOES COMANCHE HAVE A ROLE?

The RAH-66 Comanche helicopter, currently being developed by the Army, will undoubtedly bring revolutionary capabilities not only to the tactical battlefield but also potentially brings new capabilities to support the operational level of war in all types of theaters, particularly in the fulfillment of the requirements for operational functions. The scope of this paper is limited to investigating the potential of the RAH-66 to bring the theater commander contributions to the execution and synchronization of operational functions in immature theaters. The benefits and liabilities associated with early deployment of a Comanche unit into theater in support of the operational functions are considered. Comanche will offer the operational commander a great deal of flexibility and performance in developing an immature theater, and should be considered a unit of choice, under certain scenarios, for early deployment into theater for intelligence preparation of the battlefield, surveillance, and possibly operational fires and force protection. The Comanche operational employment should not be considered alone, however. Its employment presupposes an in-theater information architecture allowing real-time and continuous world-wide communications. It will also more effectively supplement other assets, both supporting and organic to the theater operational commander's organization.

## INTRODUCTION

The RAH-66 Comanche helicopter, currently being developed by the Army, will undoubtedly bring revolutionary capabilities not only to the tactical battlefield but also potentially brings new capabilities to support the operational level of war in all types of theaters, particularly in the fulfillment of the requirements for operational functions. The scope of this paper will be limited to investigating the potential of the RAH-66 to bring the theater commander contributions to the execution and synchronization of operational functions in immature theaters. The benefits and liabilities associated with early deployment of a Comanche unit into an immature theater in support of the operational functions, as well as the supporting requirements and presuppositions, will be considered.

## TODAY'S ENVIRONMENT

Theaters of military operations can be classified as being mature or immature; that is, either having or not having the developed infrastructure and architecture to support combat forces deployed there. In the post cold-war era, much of the emphasis upon which United States military strategy and doctrine has been based has been in the consideration of major regional contingencies and missions other than war.<sup>1</sup> Given recent world events, total force reductions, and policy assumptions, it is very likely that future operations will occur in immature theaters. Coupled with that probability is the influx of high technology on the battlefield and the so-called *revolution in military affairs*. In large measure, it is assumed that technology will overcome the liabilities associated with conducting operations with a reduced force structure in an immature theater. Hence,

come the concepts, evolving doctrines, and terms of *information warfare* and *information dominance*. Other examples articulating the current trends are the Army's Force XXI and the digital battlefield, renewed emphasis on integrated space systems for the battlefield, and systems such as Joint STARS.<sup>2</sup>

### OPERATIONAL FUNCTIONS IN AN IMMATURE THEATER

In the evolving current doctrine for joint operations, operational functions provide the joint force commander and his staff the means to plan, prepare, conduct, and sustain military actions within the theater of operations. The principle operational functions included in the overall operational design are:<sup>3</sup>

- Command, Control, Communications, Computers, and Intelligence (C<sup>4</sup>I) \*
- Information Warfare/Command and Control Warfare (IW/C<sup>2</sup>W)
- Operational Fires
- Operational Logistics \*\*
- Operational Protection

Although all of the functions are important aspects of the operational design, it could be said that the first two functions, C<sup>4</sup>I and IW/C<sup>2</sup>W, are the most critical simply because they enable the effective planning and implementation of the remaining functions. They are certainly critical to the efficient and effective development of an immature theater. Additionally, effective C<sup>4</sup>I will enhance the operational commander's ability for

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\* The title of this function, C<sup>4</sup>I, could mislead the reader to consider the *systems* which facilitate the command and control, and intelligence functions and not the *functions* themselves. The Army's terms, *Battle Command* and *Intelligence*, explained in FM-105, Operations, June 1993, are more descriptive of the *functions*, for example. This paper, although presenting some system description, is considering the contribution of Comanche to the *functions*.

\*\* It is assumed that the employment of Comanche early into theater would have little impact on operational logistics and, therefore, that function is not addressed.

synchronization of all of the forces and operational functions which will provide for reaching the strategic and/or operational objective(s) at the operational level.

**Intelligence and Information Warfare.** Perhaps the most crucial considerations for military operations in an immature theater are the intelligence and counterintelligence effort and the intelligence preparation of the battlefield (IPB), to include reconnaissance, surveillance, and targeting, and which are imbedded in the C<sup>4</sup>I and IW/C<sup>2</sup>W functions. It is principally from these activities that the final details of the selected course of action and operational design will flow. At the operational level, such as a joint task force, much of the intelligence and counterintelligence products will be provided to the Joint Force Commander by the supporting commands such as USSPACECOM and USSOCOM and integrated at the Joint Intelligence Center (JIC). As technology and doctrine merge in the future, a highly integrated digital battlefield can be envisioned where information is quickly compiled, filtered, and distributed across the theater and around the world near real-time. The products of supporting commands as well as other national agencies will be readily available but will undoubtedly produce additional intelligence target requirements in theater. Due to performance and availability limits on supporting resources, it can be considered a certainty that the Joint Force Commander will have to depend on assets under his control.

**Operational Fires.** Requirements to employ operational fires are less probable in an immature theater. Planning and targeting will occur for subsequent fires in support of operational maneuver, for example, but that activity will rely on the IPB. It would be to the commander's advantage to delay combat action until the infrastructure to employ and

sustain the forces was in place. An exception would be a scenario where a quick response/engagement or demonstration of force was deemed necessary prior to the theater maturation process to deny the enemy a course of action or to show resolve.

**Force Protection.** Finally, force protection is critical in an immature theater where introduction of combat elements and systems is required to put in place the infrastructure necessary to employ and sustain combat forces. The necessary assets for force protection would come from outside the theater, across international boundaries within the theater, or, in the case of littoral environments, from warships.

To summarize, operational functions are necessary in any theater-level military operation. Immature theaters present significant challenges in that those functions will exist in very limited forms or not at all and will need to be developed to maturity within the theater. It is in this context that the RAH-66 Comanche helicopter will be considered as a unit of choice for early deployment into theater.

#### **COMANCHE SYSTEMS AND CAPABILITIES<sup>4</sup>**

To evaluate the RAH-66's utility in the enhancement of operational functions in an immature theater, the uniqueness of its systems and performance capabilities must be considered. Considering a modern attack helicopter immediately brings to mind mobility and firepower at standoff ranges. Comanche certainly will bring that but it promises

much more.\* The passive low-observable characteristics combined with the integrated mission equipment and advanced sensor suite will provide for the capability to avoid enemy weapons systems and remain undetected while gathering intelligence data for the operational commander. Assuming the aircraft successfully performs as it is designed, the potential impact for the commander on operational capability during the early phases of a campaign in an immature theater is tremendous.

The Comanche is being designed for the primary mission of armed reconnaissance, but it will also be designed to meet attack, air-to-air, and aerial fire support observer missions. The current plan is to field the aircraft at division and corps levels. The aircraft will be interoperable with other services and foreign allies.

The Comanche's integrated system will be built around a distributed "open" system architecture that will allow mission tailoring for various functional performance requirements and potential future upgrades or new capabilities. This architecture should allow flexibility and compatibility with future digitized battlefield and theater-level systems. The capability will also allow the operational commander to integrate Comanche units with strategic or theater-level communications or intelligence sensors and products.

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\* Integral in the design of the new aircraft are a mission equipment package (MEP) providing full integration of communications, navigation, mission management, and identification avionics systems, a new technology electro-optical target acquisition and designation subsystem (EOTADS) providing for day/night and all-weather targeting, target detection/classification capability, low-observable technology reducing radar, infrared, and aural signatures, and improved deployability and supportability. These particular systems are implementation of new technology and capability, and will significantly impact the ability to perform the tasks which this paper addresses. The theater must be developed while minimizing risk of detection and enemy engagement and maximizing the products, particularly in the areas of intelligence preparation of the battlefield and "information preparation of the battlefield."

**Target Acquisition.** The aircraft will be equipped with a forward looking infrared (FLIR) night sensor, a day sensor, and a laser rangefinder/designator used for automated or manual target detection, classification, tracking, and engaging. Target information will be storable and transferable via digital communications either to or from the aircraft, allowing near real-time assimilation of IPB efforts at the operational level.

**Integrated Mission Support System and On-board Map Displays.** The Integrated Mission Support System (IMSS) and on-board display capability promises to bring tremendous enhancement to the weapon system's effectiveness, which is especially significant in an immature theater for early deployment in support of the IPB. It will be able to integrate national asset and terrain data and interface the Comanche aircraft and external organizations such as the JIC. The IMSS is a lightweight, portable, ground-based system which will provide the capability of integrating mission data such as digital Defense Mapping Agency (DMA) terrain databases, map data, friendly and enemy situations, and overlays, and performing mission planning to include route planning and targeting. The IMSS product will be transferable to the aircraft via hardware or over communications radios and will also provide for voice communications with the aircraft. Additionally, when a mission is loaded on the aircraft, the MEP will provide for a mission rehearsal capability on-board the aircraft, further enhancing operational flexibility.

The aircraft displays will allow for horizontal maps, or perspective views of the terrain from any selected point and toward any selected heading and elevation angle, during ground operations or flight. Display capability will include pre-mission data,

onboard sensor data, and data received through the communications system. Display of inter-visibility to selected points and depiction in real-time of areas masked from enemy threats will also be possible. The MEP will also provide the crew preflight and enroute route planning capabilities which will ensure the aircraft remains outside of any known threat sensor or engagement range or minimize the exposure time, and will perform a continuous situation assessment (SA) for the crew as it relates to friendly and enemy situations, terrain, weapons engagement, and active threats. The on-board database will accommodate the storage requirements for high resolution coverage of 300 km by 300 km at 1:50,000 scale, using DMA data.

This technology is already in use, although not in a cockpit. In Bosnia, Operation Joint Endeavor is being supported by a three-dimensional "PowerScene" program from the DMA, hosted on a computer workstation, that allows a virtual "walk" or "flight" through the terrain before actually conducting the movement.<sup>5</sup>

**Deployability and Transportability.** With the use of auxiliary fuel tanks, the aircraft will be able, by specification, to self-deploy from the continental United States to either Europe or South America requiring only user-level maintenance and fuel prepositioned enroute. It will have a range capability of 1069 nautical miles without refueling. A maintenance crew (of five) will be able to reconfigure a self-deployed Comanche, upon arrival in theater, to full mission capability status for combat operations in less than 45 minutes. This capability will support early deployment into theater with significantly less logistics support requirements over current systems. By specification,

the Comanche will be transportable in all current Air Force cargo aircraft.

Transportability requirements and performance for cargo aircraft are shown in Table I.

Table I  
Comanche Transportability

Cargo A/C Type	Maximum RAH-66 transported	Manpower required	Time to embark/disembark all RAH-66 in minutes (see note)	Time to embark/disembark one RAH-66 in minutes (see note)
C-130	1	8	21.5 / 67	21.5 / 67
C-141B	3	8	35 / 80	21.5 / 67
C-17	4	5	45 / 88	20 / 66
C-5	8	5	75 / 116	20 / 66

note: times are applicable for configurations without/with Longbow radar, respectively.

The time required includes the specification time it takes from preparation to securing for embarkation and from unsecuring to flight-ready for debarkation. The system specification mandates that a maintenance test flight will not be required after debarkation, further reducing the logistics requirements for deployment.

**Shipboard Operations.** By specification, Comanche will be designed with full shipboard compatibility and a wide performance envelope. This design criteria will offer much flexibility for the operational commander in deploying the aircraft from all types of warships in maritime or littoral environments. The utility will be apparent for intelligence and surveillance efforts as well as maritime force protection.\*

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\* The early version of the OH-58D(I) Kiowa Warrior was developed initially to meet an operational force protection requirement. The aircraft was used to protect merchant shipping and combat seapower in the Persian Gulf from the Iranian patrol boat threat in 1987. The Kiowa Warrior, however, was not designed for shipboard operations. It has demonstrated some compatibility problems and is also limited in its performance, reducing the commander's flexibility in its use. Despite the shortcomings, the OH-58D(I)'s utility in maritime surveillance, reconnaissance, and force protection has been significant. Comanche promises to bring a significant increase in performance and flexibility.

**Supportability.** The Comanche development system specification requires that the aircraft be maintainable at only two levels of maintenance—user-level maintenance and depot-level maintenance. The deletion of intermediate maintenance requirements should significantly reduce the logistics requirements for both hardware and personnel over current combat helicopters. Ground support equipment will be minimized and flight line tools will be stored and carried on the aircraft.

### **OPERATIONAL EMPLOYMENT IN AN IMMATURE THEATER**

Immature theaters obviously bring unique challenges to the operational commander in the overall operational design, in general, and in the execution of operational functions, in particular.

As has been summarized, the Comanche will have designed into it unique system capabilities in deployability, mission equipment (communications, navigation, mission management, etc.), targeting, and weapons systems. The question is: How can those capabilities, employed in the context of the overall battlefield system, contribute to the operational functions in an immature theater?

**Intelligence.** Effective C<sup>4</sup>I is critical to the commander, especially the intelligence function in an immature theater. Initial intelligence and information preparation of the theater will most likely come from national assets and supporting commands such as satellite products and special operations activities. Those sources, from national assets and supporting organizations, will undoubtedly require augmentation and supplemental products, and sources external to the theater will be over tasked. The

staff estimate and the commander's estimate will be based on information available and assumptions made. Many assumptions will have to be verified. Enemy strengths, weaknesses, and vulnerabilities will need further evaluation and verification. The Comanche will bring the operational commander, not only organic sensors, but the ability to effectively employ those sensors against targets to supplement the products from national assets. Employing sensors is only the first step, however. The products must also be rapidly transportable within the theater and worldwide. The technology and the utility in doing that has already been demonstrated, for example, using Apache sensors and sending video images around the world in real-time.<sup>6</sup>

Already, efforts are underway to integrate products from national sources supplemented with input from organic sources to support the warfighter at all levels.<sup>7</sup> It has been recognized that much of today's capabilities in information systems, such as intelligence and communications, are poorly integrated at the operational and strategic level and training and doctrine are being developed for all levels of warfare. That emphasis on integrated information warfare doctrine and the resulting synergism within the theater and worldwide information architecture will allow the realization of effective operational and strategic employment of Comanche into an immature theater, where it will provide for additional intelligence preparation of the theater, as directed by the CINC and his intelligence staff. One proposal for early use employs the RAH-66 with advanced unmanned air vehicles (UAV's). The former would guide the latter, linked by "infotechnology," thus extending the operational reach of both platforms.<sup>8</sup> No matter what the operational solution, Comanche will not stand alone. It's effectiveness as a

theater intelligence asset will be highly dependent on a fully integrated human and material architecture. Such an architecture was, at least in part, realized during recent operations in Haiti in the Joint Task Force JIC, for example.<sup>9</sup>

**Operational Fires.** Army aviation doctrine, for both conventional and special operations forces, has evolved in recent years to include operational level warfare. Mobility, range, standoff firepower, and night capabilities offer opportunities to attack and destroy enemy strategic systems (such as command and control systems and sites), control operationally significant terrain or littoral regions, or attack enemy operational forces. According to one regional CINC, this capability is key to meet operational and strategic objectives and Comanche will be the “centerpiece” of that capability.<sup>10</sup>

Comanche has the potential of bringing effective and new operational fire capabilities, principally because of its information management capabilities within the overall information architecture previously assumed and the sharing of information and imagery with other ground, air, sea, and space-based sensors. With its sensor and mission management equipment it will be able to locate, target, destroy, and perform BDA of operational and strategic targets such as enemy air defense, command and control nodes, and ballistic missiles.

**Information Warfare / Command and Control Warfare.** Information has been called the “defining factor” for the future of military operations. To be effective, the information architecture must have a virtual presence in any theater of operations prior to physical presence. Thus is the promise of space-based assets and the envisioned digital battlefield. For Comanche to be effective in its physical presence in support of

operational functions in an immature theater, it must be able to plug into that virtually present information architecture. The importance of this envisioned capability is highlighted by the following experiences and observations of Desert Storm:<sup>11</sup>

- Combat-ready troops and sophisticated weapons were bottlenecked at ports and airports, awaiting large communications vans which subsequently failed to keep up with fast-moving ground units.
- Communications networks, though operating at near perfection, failed to meet the information traffic requirements because of the immense volume and because of the inability to transport imagery.
- Images and firing solutions, during actual combat, arrived late to the shooters.
- Battle damage assessment (BDA) functioned at a different tempo from the cycles of targeting and shooting, and were not synchronized.
- Vital intelligence products were efficiently and effectively produced but could not be delivered in a timely manner.

The effectiveness of Comanche will not be realized in a vacuum, but from a robust worldwide information grid and architecture which will satisfy operational and strategic needs worldwide from the National Command Authority to the aircraft cockpit, and all levels in between.

**Operational Protection.** In an immature theater where enemy hostile action is in progress or probable, introducing combat forces involves a phase of significant vulnerability. Forces will enter via such avenues as ports, airfields, amphibious assault, or land routes. Operational protection of forces is critical as the theater is matured. Given all of the system capabilities and firepower of Comanche previously discussed, it promises to be a critical asset to employ in the operational protection role. It will be deployable inter- or intra-theater from land or sea, produce a very small footprint and, as

a component of the information virtual presence, effectively counter enemy threats to the buildup and massing of forces.

An indirect method of force protection would be an economy of force mission, designed to deceive or divert enemy forces. Comanche would be one of the forces of choice to use in that mission, as well.

Another type of operational protection is as experienced in the Persian Gulf in 1987. Army armed reconnaissance helicopters, with night capability, were effectively used to counter the threat of small Iranian gunboats to merchant shipping (see footnote, pg. 8). Comanche's surveillance, targeting, weapons, and mission information systems will only enhance that capability for operational protection of maritime forces and merchant shipping.

**Deployability and Supportability.** When the utility of an armed helicopter for early deployment into an immature theater is considered, the biggest challenge is to get it there, support its operation, and get it back.

Increases in deployability of Comanche over current attack helicopters are significant, not only in terms of airlift requirements and self-deploy capabilities, but also in logistics requirements to support deployment. Current aircraft require significantly more maintenance actions to include maintenance test flights after reassembly. Those requirements add to the manpower and support equipment required at the destination or at enroute stops. Comanche will therefore be much closer to the goal of "ready-to-fight" upon arrival in theater.

The Comanche design has integrated into it significant reductions in maintenance requirements in terms of manpower, tools, and support equipment. This will translate to improved effectiveness and efficiency in its use to enhance operational functions in an immature theater.

The biggest support requirement will continue to be fuel and possibly ammunition. Those requirements will have to be met from remote bases across international boundaries or shipboard in littoral environments, or by transporting the fuel and ammunition to a forward base of operations. Forward bases will produce additional security requirements. A possible solution to the forward base option is to use heavy lift helicopters to carry all of the fuel, ammunition, and security requirements, which provides for the mobility, agility, and flexibility required in an immature theater.\* Another option which will extend the operational reach is the use of ferry fuel tanks during operational missions.\*\* Regardless of the options, the support requirements will continue to limit the operational reach of the weapon system.

**Operational Readiness.** A final factor which must be considered in addressing the question at hand is the training and readiness of a conventional tactical unit to perform such a task, which is closer to a special operation than conventional employment of combat forces. Those unique aspects of training requirements will have to be

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\* CH-47D Chinooks are currently being deployed with internal fuel bladders and refueling equipment to function as a Forward Area Refueling and Rearing Point in support of armed reconnaissance helicopter operations in immature theaters.

\*\* During Desert Storm, refueling rapidly moving Apache helicopter forces was a significant challenge because of the extended range requirements. The workaround was to use an external fuel tank, designed for ferry flights. The cost was a reduced weapons load capability and also using a system not designed for combat operations in terms of survivability and mission management.

addressed and met prior to considering the early deployment of Comanche units into an immature theater.

## CONCLUSIONS

Comanche will offer the operational commander a great deal of flexibility and performance in developing an immature theater, and should be considered a unit of choice, under certain scenarios, for early deployment into theater for IPB, surveillance, and possibly operational fires and force protection. The Comanche operational employment should not be considered alone, however. It will more effectively supplement other assets, both supporting and organic to the theater operational commander's organization. Such assets include space-based intelligence resources, strategic reconnaissance aircraft, special operations forces, and assets within the component commands such as high performance aircraft, and UAV's.

Early deployment of a RAH-66 unit into an undeveloped theater also presupposes a developed and functioning information architecture which allows real-time transfer of information to include digital communications, data, imagery, and video. Realization of so called information dominance and the planned space-base capabilities will be required.

Advocating Comanche's use in the subject role also comes with a recognition of the challenges associated with supporting such an operation. Despite the technical advances, providing the logistical support, primarily in fuel, will continue to be the most significant challenge to the commander. That support requirement will limit the operational reach of the system and will drive requirements for additional assets such as

cargo helicopters or transport aircraft. As a result, utilizing the Comanche for enhancing operational functions in an immature theater will be especially effective when long ranges are not required.

When all of the potential benefits are considered along with the challenges, Comanche comes out as a strong contender to meet the requirements of the Joint Force Commander during the early development of an immature theater, whether opposed or unopposed, and across the total spectrum of military operations from war to operations other-than-war.

## NOTES

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- <sup>1</sup> William J. Clinton, A National Security Strategy of Enlargement and Engagement, The White House, February 1995.
- <sup>2</sup> David Alexander, "Information Warfare and the Digitised Battlefield," Military Technology, September 1995.
- <sup>3</sup> Milan N. Vego, "Operational Functions," unpublished, Joint Military Operations Department, Naval War College, August 1995.
- <sup>4</sup> RAH-66 Comanche Development Program, System Specification 2000-315-512-1, Revision A, 1 April 1993.
- <sup>5</sup> Bob Brewin and John Stein Monroe, "U.S. Troops Employ Advanced Comm," Federal Computer Week, December 18, 1995, 33.
- <sup>6</sup> Clarence A. Robinson, "Vivid Digital Imagery Offers Real-Time Tactical Control," Signal, November 1993, 22.
- <sup>7</sup> William A. Ross, "Space Support to the Warfighter," Military Intelligence, January-March 1995, 24.
- <sup>8</sup> David Alexander, "Information Warfare and the Digitised Battlefield," Military Technology, September 1995, 64.
- <sup>9</sup> Darren Sawyer, Lieutenant Commander, USN, "JTF JIC Operations: 'Critical Success Factors,'" Military Intelligence, April-June 1995, 8-12.
- <sup>10</sup> J.H. Binford Peay III, Gen., "Triumphant Flight: Army Aviation in the Central Region," Army Aviation, January 31, 1996, 36.
- <sup>11</sup> Alan D. Compen, editor, The First Information War, AFCEA International Press, Fairfax, VA, October 1992, 180.

## BIBLIOGRAPHY

- Alexander, David, "Information Warfare and the Digitised Battlefield," Military Technology, September 1995.
- "Army Aviation: Modernization Strategy Needs to be Reassessed," General Accounting Office, National Security and International Affairs Division, Washington, DC, November 1994.
- "Attack Helicopter Remote Targeting and Threat Display Project Test Plan," Joint Over-the-Horizon Targeting Test and Evaluation Program, Washington, DC, January 1992.
- Brewin, Bob, and Monroe, John Stein, "U.S. Troops Employ Advanced Comm.," Federal Computer Week, December 18, 1995.
- Burgdorf, Charles E., "An Appreciation for Vulnerability to Deception at the Operational Level," Army Command and General Staff College School of Advanced Military Studies, Fort Leavenworth, KS, 7 May 1987.
- Cadorett, R.E. LTC, and Curry, H.A., LTC, "Strategic Mobility: Can We Project Our Military Power?," Defense Logistics Agency, Washington, DC, March 1988.
- Champagne, Lynn M., "Let's Put Joint Back into JFACC," Naval War College, Newport, Rhode Island, ADA283537, May 1994.
- Clinton, William J., A National Security Strategy of Enlargement and Engagement, The White House, February 1995.
- "Comanche Helicopter: Program Needs Reassessment Due to Increased Unit Cost and Other Factors," General Accounting Office, National Security and International Affairs Division, Washington, DC, May 1992.
- "Defence Technology: The Information Advantage," The Economist, 10 June 1995.
- Deverill, Shane M., "Bridging the Gap for the Operational Commander: Hunting Relocateable Ballistic Missiles with Advanced Attack Helicopters," Army Command and General Staff College, Fort Leavenworth, KS, June 1992.
- Dunn, Richard J., "From Gettysburg to the Gulf and Beyond: Coping with Revolutionary Technological Change in Land Warfare," McNair Papers, Number 13, The Institute for National Strategic Studies, National Defense University, Washington, DC, March 1992.

- Eshelman, Mark J., "Air Commander Control of Army Deep Fire Assets," Army Command and General Staff College School of Advanced Military Studies, Fort Leavenworth, KS, 1993.
- FM 100-5, Operations, Headquarters, Department of the Army, Washington, DC, 14 June 1993.
- Franks, Frederick M., Jr., General, USA, "Full Dimensional Operations," Military Review, December 1993.
- "Gulf's Electronic Marvels Set For Multiple Upgrades," Signal, August 1991.
- Handel, Michael I., Intelligence and Military Operations, Frank Cass, London, 1990.
- Harding, Peter, "C<sup>3</sup>I Supporting the Commander's Game Plan," Signal, October 1987.
- Hardy, Stephen M., "Accessing in the Digital Battlefield," Defense Electronics, January 1994.
- Hood, Jay W., "Operational Fires and the Joint Force Commander," Naval War College, Newport, RI, September 1995.
- Joint Pub 1-02, Department of Defense Dictionary of Military and Associated Terms, The Joint Chiefs of Staff, Washington, DC, 1994.
- Joint Pub 3-0, Doctrine for Joint Operations, The Joint Chiefs of Staff, Washington, DC, 1 February 1995.
- Joint Pub 3-09, Doctrine for Joint Fire Support, Second Draft, The Joint Chiefs of Staff, Washington, DC, 1995.
- Joint Pub 6-0, Doctrine for Command, Control, Communications, and Computer (C4) Systems Support to Joint Operations, The Joint Chiefs of Staff, Washington, DC, 30 May 1995.
- Joint Pub 3-56, Command and Control Doctrine for Joint Operations, Third Draft, The Joint Chiefs of Staff, Washington, DC, 3 May 1995.
- Klaus, Leigh Ann, "ATM—The Future of Battlefield Communications," Defense Electronics, January 1944.
- MacGregor, Douglas A., "Future Battle: The Merging Levels of War," Parameters, Winter 1992-93.

- Mendel, Williams H. and Tooke, Lamar, "Operational Logic: Selecting the Center of Gravity," Military Review, June 1993.
- Pierce, Terry C., "The Tactical-Strategic Link," Proceedings, September 1990.
- Porter, Laning M., "Preconceptions, Predilections, and Experiences: Problems for Operational Level Intelligence and Decisionmaking," U.S. Army Command and General Staff College School of Advanced Military Studies, Fort Leavenworth, KS, 12 May 1986.
- "RAH-66 Comanche Development Program," System Specification 2000-315-512-1, Revision A, 1 April 1993.
- Robinson, Clarence A., "Vivid Digital Imagery Offers Real-Time Tactical Control," Signal, November 1993.
- Ross, William A., "Space Support to the Warfighter," Military Intelligence, January-March 1995.
- Stewart, MG John F., Jr., "Command and Control Warfare and Intelligence on the Future Digital Battlefield," Army Research, Development and Acquisition, Nov-Dec 1994.
- Vego, Milan, "Fundamentals of Operational Design," Naval War College, Newport, RI, July 1995.
- Vego, Milan N., "Maritime Theater and Its Element," Naval War College, Newport, RI, July 1995.
- Vego, Milan, "Operational Functions," Naval War College, Newport, RI, August 1995.
- Whelden, Craig B., "Light Cavalry: Strategic Force for the Future," Army War College, Carlisle Barracks, Pennsylvania, January 1992.