

Does the 1997 Quadrennial Defense Review (QDR) Adequately Address Third Wave Logistics?

MCWAR 1998

Subject Area Logistics

Does the 1997 Quadrennial Defense Review (QDR)  
Adequately Address Third Wave Logistics?

by

Lieutenant Colonel S. M. Fenstermacher  
United States Marine Corps

1 May 1998

Submitted in Partial Fulfillment  
of the Requirements for the  
Marine Corps War College  
Marine Corps University  
Marine Corps Combat Development Command  
Quantico, VA 22134-5067

# Report Documentation Page

Form Approved  
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE <b>1998</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-1998 to 00-00-1998</b>	
4. TITLE AND SUBTITLE <b>Does the 1997 Quadrennial Defense Review (QDR) Adequately Address Third Wave Logistics?</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Marine Corps War College, Marine Corps University, Marine Corps Combat Development Command, Quantico, VA, 22134-5067</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

## ABSTRACT

**Subject:** Does the 1997 Quadrennial Defense Review (QDR) adequately address Third Wave Logistics?

**Purpose:** To determine if the QDR adequately incorporates or accommodates the relevant futuristic defense logistics guidance found in Alvin and Heidi Toffler's "wave theory" and to make recommendations if it does not.

**Scope:** This paper will examine the "wave theory," the importance of the theory to US national civilian and military leadership in developing defense program guidance, the impact of the theory on logistics, and the extent to which the QDR addresses the theory's concepts and logistics implications.

**Summary:** The Tofflers argue that civilization transitions through "waves" of social structure and that specific characteristics of each wave define the criteria for societal success within that wave. The theory suggests that civilization has already passed through the agricultural wave (the First Wave) and the industrial wave (the Second Wave) and has now entered the information wave (the Third Wave). According to the theory, the foundations of the Third Wave military environment are information and knowledge which are based primarily on the integration of multiple highly sophisticated or emerging technologies. The new information environment will allow military force reductions, will change the nature of the national industrial infrastructure and organization, and will make the traditional concept of the ratio of combat power to support structure (tooth-to-tail ratio) irrelevant. New technologies and improvements in transportation and communication will allow reduced reliance on prepositioning and forward basing but will expose us to new vulnerabilities. The QDR addresses logistics in five broad categories: Focused Logistics, strategic mobility, the Revolution in Business Affairs (RBA), tooth-to-tail ratio, and the Army National Guard Division Redesign Program.

**Conclusions:** Many areas of the QDR logistics discussions are consistent with Third Wave requirements of accelerated and knowledge-based operations, reduced mass, constant innovation and systems integration. The following areas fall short: QDR discussions regarding prepositioning, tooth-to-tail ratio, agility of infrastructure, vulnerability of logistics data, strategic mobility, simultaneous multi-level operations and Third Wave industrial mobilization.

**Recommendations:** QDR guidance should be supplemented to include discussions emphasizing the use of strategic mobility to offset dependence on prepositioning, power projection in areas without forward support bases, the shift to information based infrastructure, tooth-to-tail balance to maximize combat effectiveness, the vulnerability of logistics data, the need to support simultaneous multi-level operations, and planning for Third Wave industrial mobilization.

## TABLE OF CONTENTS

DISCLAIMER	ii
ABSTRACT	iii
TABLE OF CONTENTS	iv
LIST OF FIGURES	vi
<b>Chapter</b>	<b>Page</b>
1. REVOLUTION	1
The Quadrennial Defense Review	1
Alvin and Heidi Toffler	1
Justification	2
Organization	2
2. THE WAVE THEORY	3
First Wave War	3
Second Wave War	4
Third Wave War	4
The Challenge	
3. LOGISTICS IMPLICATIONS OF THE WAVE THEORY	7
4. HOW THE QDR SEES THE FUTURE OF LOGISTICS	14
Focused Logistics	14
Strategic Mobility	15
Revolution in Business Affairs	16
Tooth-to-Tail Ratio	17
Army National Guard Division Redesign Program	17
Capability to Support Simultaneous Multi-Level Operations	18
Mobilization of Third Wave Industry	18
5. CONCLUSIONS & RECOMMENDATIONS	20
Focused Logistics	20
Strategic Mobility	21
Revolution in Business Affairs	23
Tooth-to-Tail Ratio	24
Army National Guard Division Redesign Program	25
Vulnerability of Logistics Data	25
Capability to Support Simultaneous Multi-Level Operations	26
Mobilization of Third Wave Industry	26
Summary	28
<b>Bibliography</b>	<b>31</b>

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
1. The TOFFLER Wave Theory	6
2. Third Wave Logistics Implications	12
3. Assessment of QDR Logistics Discussions	29

## CHAPTER 1

### REVOLUTION

A military revolution, in the fullest sense, occurs only when a new civilization arises to challenge the old, when an entire society transforms itself, forcing its armed services to change at every level simultaneously - from technology and culture to organization, strategy, tactics, training, doctrine and logistics.<sup>1</sup>

Because of the opportunities provided by emerging technologies and the new world order, we are in the midst of just such a revolution. Our success as a nation depends on the outcome of that revolution.

#### **The Quadrennial Defense Review**

As a means to address the military revolution, the U.S. Defense establishment conducted a comprehensive examination of America's defense needs for the period 1997 to 2015. That examination is entitled the 1997 Quadrennial Defense Review (QDR). The QDR is intended to provide a blueprint for a strategy-based, balanced, and affordable defense program. It is an attempt by today's civilian and military leadership to recognize and cope with the changing environment to ensure military success in the future. Logistics is an integral part of the blueprint and must be adequately addressed to ensure the success of the defense program. One way to determine if the future direction of logistics has been adequately addressed is to evaluate the QDR in relation to the logistics requirements of the *Toffler wave theory*.

#### **Alvin and Heidi Toffler**

The *Toffler wave theory* was developed by futurists Alvin and Heidi Toffler who have been refining and advancing their ideas for nearly thirty years. Their published works

---

<sup>1</sup>Alvin & Heidi Toffler, War and Anti-War (New York: Warner Books, Inc., 1995), 34.

have become required reading in professional institutions and their conclusions about the future have been accepted and successfully applied by business, political and military leaders. The most notable example of the influence of their ideas is their work with the U.S. Army Training and Doctrine Command in developing the concepts that became the doctrine of Air/Land Battle. As the U.S. Defense establishment continues to plan for the years to come, it should allow military programs to be shaped by the Tofflers' refined vision of the future. Their wave theory will be discussed in the next chapter. The evaluation of the QDR in relation to the wave theory is the subject of this paper.

### **Justification**

This research is important to ensure that the capstone guidance for future defense programs (i.e., the QDR) adequately addresses changing societal characteristics, the associated conditions for military success and the criteria for logistics support of those conditions. If the QDR does not adequately address the issues listed above, the U. S. armed services may develop logistics policy, doctrine, structure, organizations or equipment procurement plans that will not support the criteria for "Third Wave" military success.

### **Organization**

This paper will examine the Toffler wave theory and its importance to U.S. civilian and military leadership in developing defense program guidance. It will also examine the impact of the theory on logistics and the extent to which the QDR addresses the concepts and the logistics implications of the theory. It will conclude with recommended improvements to the QDR where it does not adequately address the issues listed above.

## CHAPTER 2

### THE WAVE THEORY

Several years ago, Alvin and Heidi Toffler developed a thesis that the transformation of war can be studied in the same conceptual framework as the transformation of economics and sociology (i.e., "the way we make war reflects the way we make wealth"<sup>2</sup>). They tied their theory of war to their earlier social theory regarding the transition of civilization through major "waves" or "cycles" of societal structure. Their earlier theory argued that "the agricultural revolution of 10,000 years ago launched the first wave of transformatory change in human history; that the industrial revolution of 300 years ago triggered a second wave of change; and that we, today, are feeling the impact of a third wave of change."<sup>3</sup> Each wave brings a new kind of civilization and new measures of success.

#### First Wave War

According to the Tofflers' wave theory, "agriculture became the womb of war" and generated the first great wave of societal change. They argue that although pre-agricultural society was violent, its conflicts did not possess the characteristics of true warfare (i.e., "clashes between organized states.") The food surplus generated from agriculture contributed to development of the state and provided both a reason and a means for warfare. The general character of the resultant wars was shaped by the agricultural society's technology, organization, communication, administration and reward structure. For example, the timing of First Wave wars coincided with seasonal fanning requirements. Like farm tools, weapons were generally not standard. Combat was

---

<sup>2</sup> Alvin & Heidi Toffler, War and Anti-War (New York: Warner Books, Inc., 1995), 2.

<sup>3</sup> *Ibid.*, 8.

face-to-face, military organization was poor, communication was primitive and orders were usually oral. Soldiers were paid with food or land. With few exceptions, First Wave warfare was a reflection of the First Wave economic engine: agriculture.

### **Second Wave War**

According to the Tofflers, the industrial revolution launched the Second Wave of historical change. The characteristics of Second Wave society include mass production, mass consumption, mass education and mass media all linked together and served by specialized institutions and improved networks of transportation and communication. A key goal in a Second Wave society is to achieve economies of scale. Second Wave military structures mirror Second Wave society with huge military industrial complexes, mass armies and standardization of equipment, training, organization and doctrine. A key goal for Second Wave military development is the continual increase in range, speed and lethality of weapon systems. Second Wave warfare is characterized by mass destruction.

### **Third Wave War**

Third Wave social characteristics include knowledge as the central resource, de-massification (specialization) of production, markets and work units, increased skill requirements, constant innovation, systems integration and acceleration of operations. A key goal of a Third Wave society (an information-based society) is to achieve economies of speed. Third Wave military structure will become smaller with fewer organizational layers, more decentralized decision making and weapons based on information instead of volume of firepower.<sup>4</sup> Since modern technology has pushed the Second Wave elements of military development (range, speed and lethality) to their outer limits,<sup>5</sup> the emerging integration of technologies is creating new ways to apply and measure military power and

---

<sup>4</sup> Alvin & Heidi Toffler, War and Anti-War (New York: Warner Books, Inc., 1995), 73-93.

<sup>5</sup> Ibid., 33.

effectiveness. The Third Wave goal in application of military power is to achieve increasingly finer precision and greater selectivity.<sup>6</sup> In other words, maximizing military effectiveness by being able to know precisely what, when and where the "threat" is located and then being able to react with the precisely appropriate response to achieve the exact desired results.

### **The Challenge**

A key challenge for today's military leadership is to recognize and cope with the wave transition. US military leaders must understand that the emergence of the Third Wave is causing a collision of wave fronts and the collision by itself will create conflict.<sup>7</sup> For example, social tensions can increase as industrial work forces finds themselves unemployed and ill-prepared for new high-tech jobs. Misinterpretation of the cause of tension or failure to provide adequate solutions can result in conflict. US military leaders must also understand that the world will have different sectors functioning at all three levels of civilization simultaneously. The leadership must act quickly to prepare the US military to compete in this "tri-sected" world. While the First Wave took thousands of years to play itself out and the Second Wave peaked in three hundred years, Alvin Toffler suggests that "it is likely that the Third Wave will sweep across history and complete itself in a few decades."<sup>8</sup>

In coping with the Third Wave transition, numerous aspects of operational doctrine, organization, training, equipment and force structure will have to change in harmony with one another. Failure to synchronize improvements in these areas will cause

---

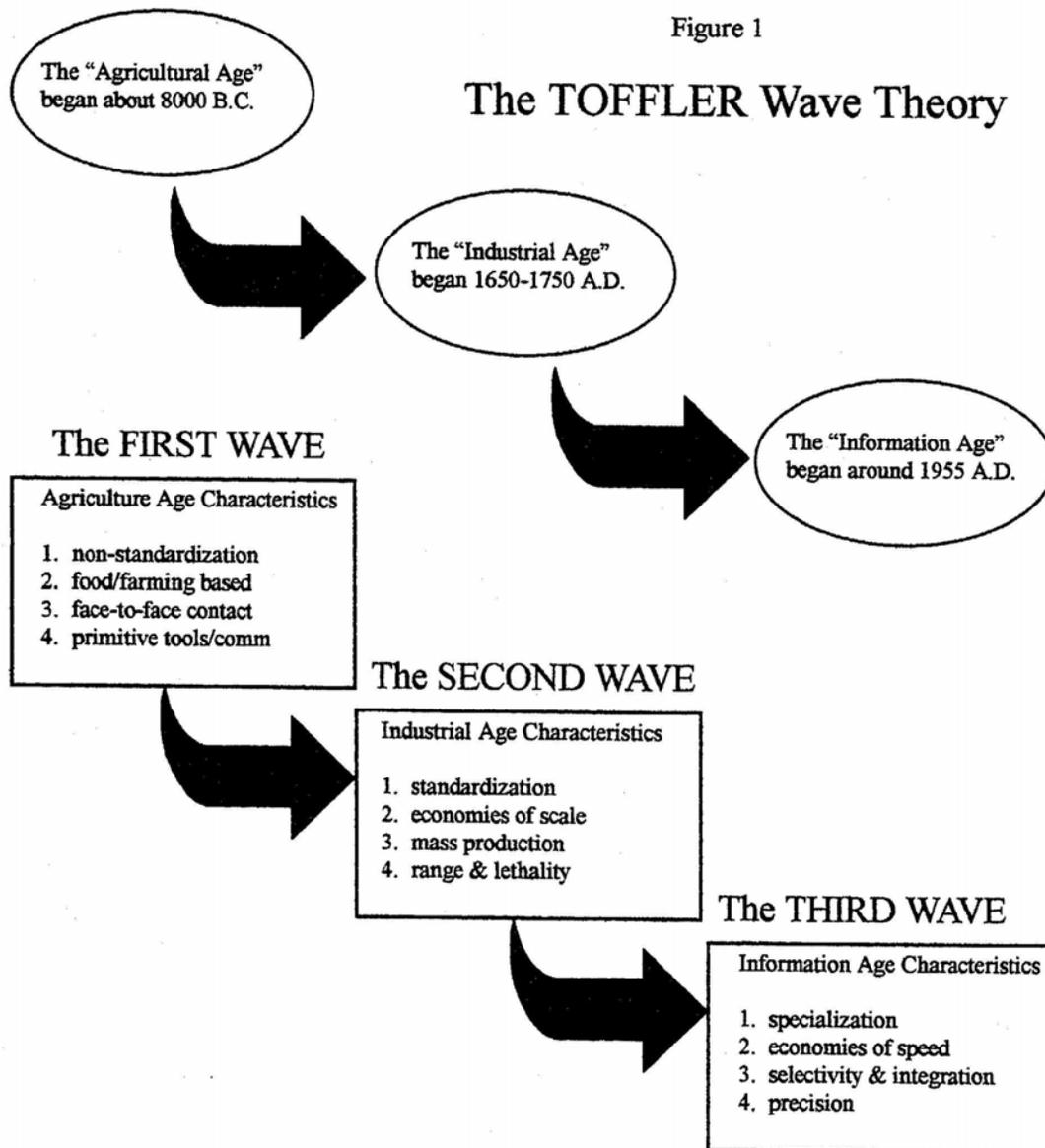
<sup>6</sup> Ibid., 84.

<sup>7</sup> Alvin & Heidi Toffler, Creating A New Civilization: The Politics of the Third Wave (Atlanta: Turner Publishing, Inc., 1994), 24.

<sup>8</sup> Alvin Toffler, The Third Wave (New York: Bantam Books, 1980), 10.

operational inefficiency and will prevent full exploitation of potential capabilities. One of the areas requiring synchronization that will experience the greatest change will be the field of logistics. The next chapter will examine the implications of the Information Age that will cause those changes.

Figure 1



## CHAPTER 3

### **LOGISTICS IMPLICATIONS OF THE WAVE THEORY**

The Third Wave is redefining every aspect of society. Military success in the Information Age will depend on the ability of the Defense establishment to recognize the impact the new environment will have on logistics so it can fully support emerging Third Wave capabilities. Third Wave logistics will be driven by improvements in information, communications and transportation and will be characterized by integration, specialization, consolidation, reduction, mobility and agility. As with all aspects of the Information Age, the starting point for logistics implications is information.

The foundations of the Third Wave military environment are information and knowledge which, in this context, are based primarily on the integration of multiple highly sophisticated or emerging technologies. Integration of technologies and databases should improve data accuracy and asset visibility and may allow consolidation of manpower tasks. However, these technology integrations also complicate manning requirements. Logistics force structure specialists will discover or demand manpower efficiencies. They will be tempted to consolidate tasks and subsequently cut structure. They must balance these opportunities against the dangers that will result from overdilution of the technical skills of individual Third Wave logisticians. Consequently, Third Wave logistics force structure specialists must accommodate three competing challenges: the specialization required by new systems and missions, the generalization allowed by simplification and consolidation of old tasks, and the depth and flexibility required to react to First, Second and Third Wave crises. In addition to looking inside the logistics community, Third Wave force structure specialists must also consider the ratio of logisticians to other warriors.

Just as Third Wave economies produce a shift in the labor ratio from direct labor to indirect labor, Third Wave military organizations will see a shift in the tooth-to-tail ratio.<sup>9</sup> By increasing support teams (the tail) including logisticians and information warriors, the effectiveness of the gunfighters (the tooth) will be improved allowing the number of "trigger pullers" to be reduced. This new force can then gain even more effectiveness due to its size. A smaller force carries less friction and is likely to be more nimble, flexible, and agile.<sup>10</sup>

Improvements in information will affect Third Wave logistics in ways other than force structure. Better information will allow more precise force packages to be developed to respond to threats. Better information and more precise munitions may also allow fewer weapons to achieve desired results. Fewer forces and weapons require less transportation and support. Reduced transportation and support infrastructure decreases the rear echelon vulnerability of the force by creating a smaller target thereby freeing security forces for combat missions.<sup>11</sup> Furthermore, by having enough information about the threat to know what to leave behind, support stockpiling can be reduced.<sup>12</sup>

Although information is the key to the Third Wave, it is not the only Third Wave factor that will help reduce stockpiles. Several other Third Wave improvements will liberate the military from its Second Wave dependence on forward bases, prepositioned supplies and a gigantic logistics tail. Improvements in the speed and reliability of transportation and communication will allow supplies to be reduced and held outside of areas of operation. Furthermore, improvements in the visibility of inventory that is

---

<sup>9</sup> Alvin & Heidi Toffler, War and Anti-War (New York: Warner Books, Inc., 1995), 87.

<sup>10</sup> Jim Blaker, "The Owens Legacy," Armed Forces Journal (July 1996): 21.

<sup>11</sup> *Ibid.*, 21.

<sup>12</sup> Robert H. Scales Jr., MajGen/USA, "Cycles of War," Armed Forces Journal (July 1997): 41.

on-hand, in-transit or available from the source will allow stocks to be ordered as required without the need for expensive safety levels. Finally, exploitation of technology that allows objects to be built according to specifications transmitted from sites thousands of miles away will allow further reductions in prepositioned stocks. All of these factors will encourage decentralization of logistics control and will reduce the need for permanent foreign bases or supply depots.<sup>13</sup>

Third Wave changes will also affect the infrastructure on the home front. Current contingency planning is based on assumptions that future conflicts will be short and "come as you are" operations. A review of military history reveals that we cannot always count on the expected "short war." In his book which examined America's mobilization success in World War II, Alan Gropman suggested that planning to mobilize the tools of war is essential. He went on to say:

...this analysis certainly does not call for resurrecting smoke stacks. If the next war is to be a 'Third Wave' war, however, then attention must be paid to ensuring that 'Third Wave' industries can be mobilized to support the combat effort.<sup>14</sup>

Third Wave logistics will require agile infrastructure that is capable of supporting rapid mobilization and rapidly changing demands, Furthermore, it will require changes in the national industrial infrastructure since national power will be derived from access to information instead of access to natural resources and plant investment which are Second Wave power sources.<sup>15</sup> Third Wave logistics will also drive the disappearance of most special-purpose military technology companies or cause them to fuse with non-military

---

<sup>13</sup> Alvin & Heidi Toffler, War and Anti-War (New York: Warner Books, Inc., 1995), 222.

<sup>14</sup> Gropman., Alan L, Mobilizing U.S. Industry in World War II: Myth and Reality (Institute for National Strategic Studies, National Defense University, Washington D.C., August 1996), 140.

<sup>15</sup> Alvin & Heidi Toffler, War and Anti-War (New York: Warner Books, Inc., 1995), 240.

commercial organizations.<sup>16</sup> During the transition, the challenge will be to bridge the gap between commercial capabilities and military requirements to perfect integration technologies and procedures.<sup>17</sup>

A vulnerability of the Third Wave environment is our reliance on information and numerous satellite and communications networks. Air Force visionaries acknowledge that "the domain of conflict is moving from earth into space and even into cyberspace."<sup>18</sup> Then Deputy U.S. Attorney General Jamie Gorelick told a Senate subcommittee in 1996 that the possibility of "an electronic pearl harbor" is a real danger for the U.S.<sup>19</sup> Logistics information systems must be designed for survivability against this threat.

Third Wave logistics must also be able to support simultaneous multi-level operations throughout the spectrum of conflict, The need for this capability has two sources. First, it may be required because the US could have multiple enemies with each functioning at a different level of civilization and each requiring a different level of military response. The Tofflers provide an example of a Third Wave response to a Second Wave enemy:

In the Gulf War two military modes, Second Wave and Third Wave, were employed. The Iraqi forces, especially after most of their radar and surveillance were excised, were a conventional 'military machine.' Machines are the brute technology of the Second Wave era, powerful but stupid. By contrast, the allied force was not a machine, but a system with far greater internal feedback, communication, and self-regulatory adjustment capability. It was, in fact, in part at least, a Third Wave 'thinking system'.<sup>20</sup>

---

<sup>16</sup> Ibid., 221.

<sup>17</sup> David Silverberg, "Computing Currents," Armed Forces Journal (July 1996): 27.

<sup>18</sup> Ibid., 26.

<sup>19</sup> "U.S. Official Warns of 'Electronic Pearl Harbor'." BNA Daily Reports for Executives, 17 July 1996, A22.

<sup>20</sup> Alvin & Heidi Toffler, War and Anti-War (New York: Warner Books, Inc., 1995), 93.

In the Gulf War, the US was fortunate to be able to focus its military energy on a single Second Wave force in a single theater. Future conflicts will likely be against multiple enemies in different theaters. Furthermore, because those enemies will improve their military capabilities at different speeds, the enemy forces in the different theaters will likely be operating at different levels. For example, one enemy in one theater could be a Third Wave force while another enemy in a different theater could be a Second (or First) Wave force. The US must be capable of coping operationally and logistically with all enemies at all levels at the same time.

Second, the ability to support simultaneous multi-level operations may be required due to asymmetric advancement of emerging technologies. If multiple interrelated logistics or operational Third Wave technologies develop at different paces, parallel support will be required. For example, if technologies improve maneuver speed without improving fuel efficiency or without finding alternative power sources, the resultant wider maneuver capability will require more bulk fuel and a massive global logistics support infrastructure.<sup>21</sup> As another example, if digital communications capabilities are fielded to augment rather than replace radio systems, technical and logistics support to field units will increase.<sup>22</sup> Consequently, logistics must be capable of sustaining both emerging and legacy weapon and support systems. These are complex conditions that will require highly trained people and flexible organizations as well as adaptive policies and procedures.

As outlined above, being swept up in the Third Wave has a number of logistics implications. It complicates force structure considerations, it affects traditional

---

<sup>21</sup> Antulio J. Echevarria II, Maj/USA, "Dynamic Inter-Dimensionality: A Revolution in Military Theory," *Joint Force Quarterly* (Spring 97): 32.

<sup>22</sup> James K. Morningstar, Maj/USA, "Technologies, Doctrine, and Organization for RMA," *Joint Force Quarterly* (Spring 97): 39.

tooth-to-tail calculations, it enables stock reductions, it allows decentralization of logistics control, and it reduces the need for prepositioned supplies and equipment. At the same time, it requires new emphasis on mobilization planning for a new set of industries, a shift in the national industrial infrastructure, and a fusion of military and commercial technology enterprises. Furthermore, Information Age logistics is complicated by several major challenges. First, the Third Wave military reliance on information is both a strength and a weakness. Additionally, a Third Wave global military power must be able to operate in First, Second AND Third Wave environments simultaneously due to the multiplicity of its enemies and the asymmetry of its own technologies and systems. Figure 2 below summarizes the logistics implications of the Third Wave as discussed in this chapter.

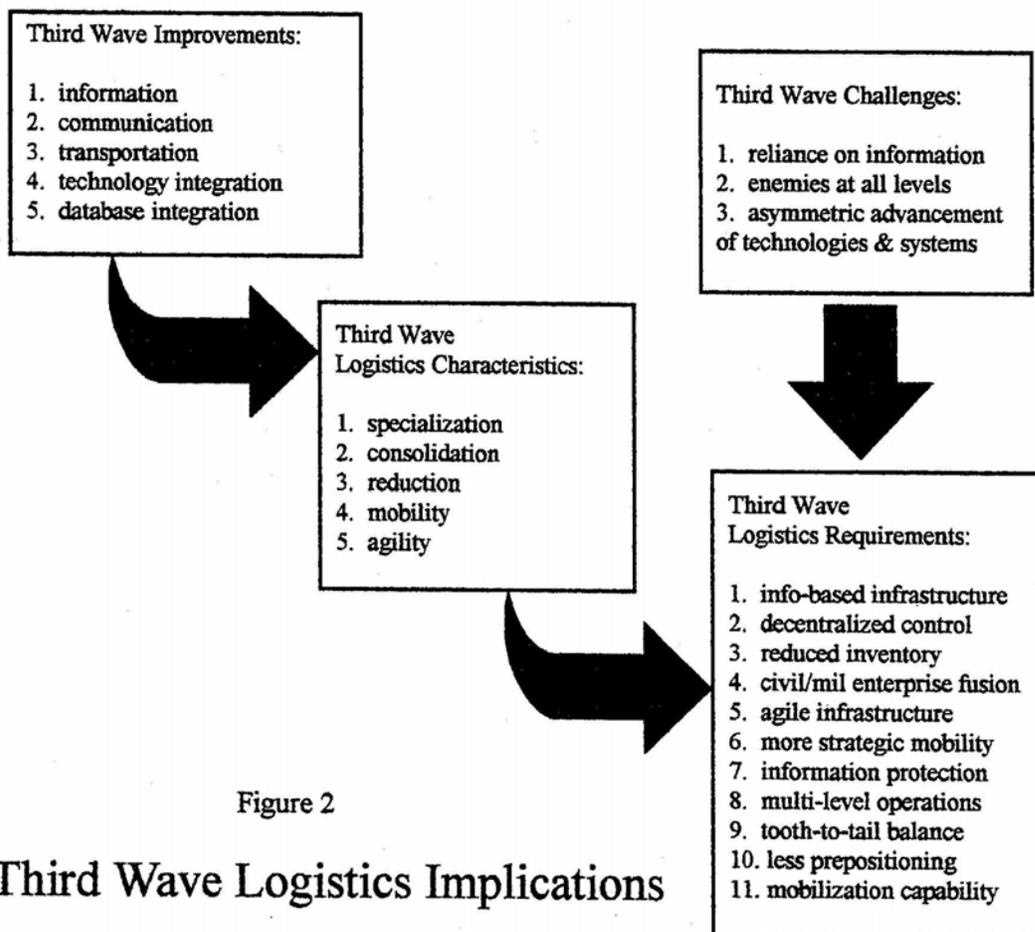


Figure 2

## Third Wave Logistics Implications

Having outlined the logistics implications we can expect to see as we move farther into the Information Age, we must next determine if the QDR adequately addressed those implications in its plans for future defense programs. The next chapter will examine the logistics guidance provided in the Report of the QDR.

## CHAPTER 4

### HOW THE QDR SEES THE FUTURE OF LOGISTICS

Although there is some overlap between the concepts, the QDR addresses logistics in five broad conceptual categories: Focused Logistics, strategic mobility, the Revolution in Business Affairs (RBA), tooth-to-tail ratio, and the Army National Guard Division Redesign Program. Additionally, the QDR indirectly addresses elements of the following two Third Wave logistics concepts: simultaneous multi-level operations and mobilization of Third Wave industry. Each will be discussed below.

#### **Focused Logistics**

One of the key elements of logistics in the QDR is the concept of "Focused Logistics" which originated as one of four new operational concepts described in *Joint Vision 2010*, the plan established by the Chairman of the Joint Chiefs of Staff (CJCS) for future military operations. *Joint Vision 2010* is designed to exploit technologies emerging in the information revolution which is creating a Revolution in Military Affairs (RMA).

Focused Logistics is defined as:

the fusion of information, logistics, and transportation technologies to provide rapid crisis response, to track and shift assets even while enroute, and to deliver tailored logistics packages and sustainment directly at the strategic, operational, and tactical level of operations.<sup>23</sup>

The QDR does little more than restate the concept of Focused Logistics as described in the joint vision, stating that it "will reduce the overall size of logistics support while helping to provide more agile, leaner combat forces that can be rapidly deployed and sustained around the globe." The QDR also lists a few examples of joint and service information systems under development that "should continue to result in more responsive

---

<sup>23</sup> John M. Shalikashvili, Gen/USA, Joint Vision 2010 (CJCS, Washington D.C.), 24.

logistics at lower cost."<sup>24</sup> The reason the QDR frequently defers to the details of the Focused Logistics initiative is that, like many of the concepts discussed in the QDR, Focused Logistics is a well defined program with ties into many sources including the Joint Warfighting Capabilities Assessment (JWCA), the Joint Monthly Readiness Review (JMRR), the National Military Strategy (NMS), the Joint Strategy Review (JSR), Service vision statements, and strategic logistics plans of the CINC's, the Services and the Office of the Secretary of Defense (OSD).<sup>25</sup> These ties ensure a broad base of knowledge and support and ensure integration of the concepts with the existing processes of strategy, planning, programming, budgeting, acquisition and review.

### **Strategic Mobility**

The second element of logistics that received emphasis in the QDR is the area of strategic mobility. Although strategic mobility is a sub-element of Focused Logistics, it was addressed separately in the QDR and therefore will be addressed separately in this paper. The Defense Strategy section of the QDR lists a robust and effective strategic lift capability as a critical enabler for worldwide application of U.S. military power. Preconditions to such a capability include appropriate ships and aircraft, sufficient domestic and en route support infrastructure, strategically prepositioned supplies and equipment, total asset visibility and access to air and sea lines of communication.<sup>26</sup> An example of the criticality of this capability is evident, although not specifically addressed, in the QDR discussion of the need for "swing" capabilities in the event of two nearly simultaneous major theater wars (MTWs). Under those circumstances, certain low

---

<sup>24</sup> Department of Defense, Report of the Quadrennial Defense Review (Washington D.C., May 1997), 41.

<sup>25</sup> John J. Cusick, LtGen/USA & Donald C. Pipp, LtCol/USAF, "In Search of Focused Logistics," Joint Force Quarterly (Spring 97): 126.

<sup>26</sup> Department of Defense, Report of the Quadrennial Defense Review (Washington D.C., May 1997), 17.

density, specialized, high-leverage units or unique assets would have to "swing" or redeploy between theaters.<sup>27</sup> The success of that redeployment will depend on the effectiveness of our strategic lift capability. In support of such a capability, the QDR reaffirmed DoD's baseline requirements for intertheater mobility, as outlined in the 1995 Mobility Requirements Study Bottom-Up Review Update which included requirements for 50 million airlift ton-miles per day, 10 million square feet of surge sealift as well as afloat and land-based prepositioning programs.

### **Revolution in Business Affairs**

A third key element of logistics in the QDR is the concept of the Revolution in Business Affairs (RBA) which is focused on reengineering DoD infrastructure and business practices. The Defense Strategy section of the QDR defines RBA as:

reducing overhead and streamlining infrastructure; taking maximum advantage of acquisition reform; outsourcing and privatizing a wide range of support activities when the necessary competitive conditions exist; leveraging commercial technology, dual-use technology, and open systems; reducing unneeded standards and specifications; utilizing integrated process and product development; and increasing cooperative development programs with allies.<sup>28</sup>

Comments by the CJCS state that RBA is a precondition for realizing the full benefits of RMA.<sup>29</sup> Expected RBA results are numerous: shortened cycle times, enhanced program stability, increased efficiencies, assured management focus on core competencies and increased availability of resources for high-priority programs.

---

<sup>27</sup> Ibid., 31.

<sup>28</sup> Department of Defense, Report of the Quadrennial Defense Review (Washington D.C., May 1997), 15.

<sup>29</sup> Ibid., 67.

## **Tooth-to-Tail Ratio**

The fourth and most disappointing recurring logistics theme in the QDR is that of "tooth-to-tail" ratio. The Secretary's message suggests that the QDR has chosen a path that reallocates resources and priorities that will trim current forces primarily in the "tail" (the support structure) and modestly in the "tooth" (combat power).<sup>30</sup> The Defense Strategy section notes the need to shrink DoD support infrastructure while the Forces and Manpower section states that the QDR's "aim in taking manpower reductions is to preserve the critical combat capabilities of our military forces - 'the tooth' - while reducing infrastructure and support activities - 'the tail' - whenever prudent and possible."<sup>31</sup> Finally, The Chairman's comments include the statement that "the most prudent solution to fulfilling all three parts of the [national security] strategy is to 'preserve the teeth by cutting the tail'."<sup>32</sup>

## **Army National Guard Division Redesign Program**

The final area of logistics that received specific attention (albeit minor attention) in the QDR is the Army National Guard Division Redesign Program. Analysis of Army support requirements for two MTWs revealed a deficiency in combat support/combat service support (CS/CSS) capabilities. To fill the gap, the Army plans to convert twelve National Guard brigades from combat units to CS/CSS units. The QDR not only validated this plan but also accelerated its execution timeline.<sup>33</sup>

---

<sup>30</sup> Department of Defense, Report of the Quadrennial Defense Review (Washington D.C., May 1997), v.

<sup>31</sup> Ibid., 31.

<sup>32</sup> Ibid., 17.

<sup>33</sup> Department of Defense, Report of the Quadrennial Defense Review (Washington D.C., May 1997), 33 & 47.

## **Capability to Support Simultaneous Multi-Level Operations**

This idea was not addressed specifically as a logistics issue; nevertheless, elements of this concept are present within the overall balanced approach of the QDR. The QDR examined three alternative paths for achieving the goals of the defense strategy. One path focused more heavily on near term security issues, one path focused more heavily on long term security issues and a third path focused on a combination of near and long term security issues. Realizing that U.S. interests and responsibilities would not allow a choice between near and long term issues, the balanced approach was selected. Within that framework, it was determined that U.S. forces must be capable of fighting and winning two MTWs nearly simultaneously and that U.S. forces must be prepared to conduct multiple concurrent smaller-scale contingency (SSC) operations worldwide. The QDR also discussed the ever-present requirement for information superiority and the possibility of both offensive and defensive information warfare as an element of all operations.

## **Mobilization of Third Wave Industry**

The QDR does not specifically address planning for mobilization. However, this issue is discussed indirectly within the Agile Infrastructure section of the *Focused Logistics Roadmap*. The Secondary Item War Reserves subsection states that "the ability of the industrial base to accomplish increased wartime production is an important factor in determining war reserves inventory levels." It also states that:

War reserve requirements may be offset by industrial base planning, such as financial investment by DoD to guarantee industrial base response and/or access. The key to war reserve management is accurate identification of total requirements and investment in critical materials where access may be constrained or lead-time is unsatisfactory to meet operational requirements. The ultimate goal in this effort is a reliable requirements determination process within each Service, ensuring that Service-unique criteria (e.g.,

attrition factors, feeding plans, environmental conditions, etc.) are accommodated.<sup>34</sup>

Clearly, the above categories do not cover the gamut of Third Wave logistics requirements as outlined in chapter 3. The next chapter will analyze the content of the QDR logistics discussions, highlight several concepts that were absent, and make recommendations for supplemental guidance regarding future defense programs.

---

<sup>34</sup> Director for Logistics, Focused Logistics: A Joint Logistics Roadmap (The Joint Staff, Washington D.C.), 43-44.

## CHAPTER 5

### CONCLUSIONS & RECOMMENDATIONS

Although the information age is upon us, we are still adjusting to it. Our success in global competition will be determined by how quickly and effectively we complete the Third Wave transformation.<sup>35</sup> The blueprint for transformation of the military is outlined in the QDR. Fortunately, many areas of the QDR logistics discussions are consistent with Third Wave requirements of accelerated and knowledge-based operations, reduced mass, constant innovation and systems integration. However, the QDR inadequately addresses other Third Wave logistics requirements.

#### **Focused Logistics**

The QDR's concept of Focused Logistics is consistent with the requirements of Third Wave logistics in many ways. Focused Logistics is based on information fusion and exploitation of technology to provide improved data accuracy, asset visibility and systems interoperability. Focused Logistics is also based on reducing cycle times and improving responsiveness while reducing inventories and infrastructure. Nevertheless, Focused Logistics is not consistent with the concepts of Third Wave logistics in all areas. For example, the *Focused Logistics Roadmap* states that:

prepositioned equipment remains a cornerstone of our force projection capability and allows us to offset our reduced forward-deployed presence and reduces our strategic lift requirements. Additional force structure reductions will not reduce, and could actually increase, the requirement for prepositioning of material.<sup>36</sup>

---

<sup>35</sup> Alvin & Heidi Toffler, Creating A New Civilization: The Politics of the Third Wave (Atlanta: Turner Publishing, Inc., 1994), 34.

<sup>36</sup> Director for Logistics, Focused Logistics: A Joint Logistics Roadmap (The Joint Staff, Washington D.C.), 42.

The QDR and the *Focused Logistics Roadmap* are over-reliant on land-based prepositioning of supplies and equipment. The Toffler wave theory suggests that prepositioning should be minimized to improve flexibility. While this may not be feasible in the short term, it should be part of long term defense strategy and program initiatives. Increased strategic lift capability is one potential solution.

### **Strategic Mobility**

While Third Wave logistics requirements are based on expected quantum improvements in speed and reliability of transportation, the QDR's handling of strategic mobility is based on optimization and incremental improvement of current technology, doctrine and procedures. In addition to procurement plans, this includes initiatives such as the Navy plan to transfer some combat logistics ships to the Military Sealift Command (MSC) which will allow reductions in crew size and increases in underway time.<sup>37</sup> Joint and Service initiatives are focused on reducing infrastructure and logistics footprint but prepositioning and overseas basing agreements are still large parts of the joint deployment and rapid distribution equations. To its credit, the QDR recognized that the mobility update had not accounted for several emerging Third Wave challenges including increased potential for peacetime engagement, reduced support infrastructure at overseas bases, the likelihood of smaller-scale worldwide contingencies, and the increased possibility of confronting nuclear, biological, and chemical threats.<sup>38</sup> The National Defense Panel also emphasized the challenges associated with expected infrastructure reduction.

U.S. forces may find themselves called upon to project power in areas where no substantial basing structure exists. The QDR,, in our view,

---

<sup>37</sup> Bradley Peniston, "Supply ships crewed by civilians?" Navy Times Marine Corps Edition (8 September 1997), 26.

<sup>38</sup> Department of Defense, Report of the Quadrennial Defense Review (Washington D.C., May 1997), 34.

accorded insufficient attention to our ability to project power under these circumstances.<sup>39</sup>

The recent Gulf crisis provides an excellent example of the potential problems related to over-reliance on propositioned materiel and fixed advanced bases. Saudi Arabian leaders were reluctant to allow U.S. airstrikes from their soil against Iraq. Consequently, extra Navy aircraft carriers had to be brought into the Persian Gulf. It is easy to envision other diplomatic complications with fixed sites that will make mobile assets more useful in carrying out our national policy.

The political problem of getting access to bases overseas is going to become even more difficult," said Andrew Krepinevich, director of the Center for Strategic and Budgetary Assessments in Washington, D.C.. "It is going to be a more difficult problem and, geographically, there is no guarantee that we will fight where we have bases."<sup>40</sup>

One potential solution to this Third Wave power projection challenge is to build mobile offshore bases.<sup>41</sup> A potential military solution to the combined challenge of strategic sealift and power projection is the Marine Corps "Maritime Prepositioning Force 2010 And Beyond" concept.<sup>42</sup> Focusing on the sealift problem, the National Defense Panel recommended greater exploration of emerging commercial concepts.<sup>43</sup> Potential procedural, financial and legislative solutions to the sealift challenge include delinking shipbuilding from ship ownership; inducements to attract investment in US shipping; elimination of restrictions on foreign investment, ownership and operation of US shipping;

---

<sup>39</sup> Defense Panel, Assessment of the May 1997 Quadrennial Defense Review (Arlington, Va., May 15, 1997), 4.

<sup>40</sup> Robert Holzer, "Offshore bases get boost from crisis." Navy Times, Marine Corps Edition. (16 March 98), 36.

<sup>41</sup> Ibid.

<sup>42</sup> John E. Rhodes, LtGen/USMC, "Every Marine an Innovator," Marine Corps Gazette (January 1998): 41.

<sup>43</sup> National Defense Panel, Transforming Defense: National Security in the 21st Century (Arlington, Va., December 1997), 46.

modification of programs that provide access to civilian sealift assets; incorporation of commercial specifications in military equipment to ensure equipment is transportable on a wide range of civilian lift assets; and support and nurturing of the pool of merchant mariners.<sup>44</sup>

In addition to the simple solution of increasing the number of sealift ships, defense leaders must support the exploration of all of the concepts discussed above to ensure survival of the most viable programs and to ensure the creation of a flexible and dynamic sealift capability to accommodate the rapidly approaching Third Wave logistics challenges.

### **Revolution in Business Affairs**

The QDR leads one to believe that the primary role of RBA is to serve as a source of funding for both short term operations and long term investment. Nevertheless, RBA as defined in the QDR is consistent with the requirements of Third Wave logistics. Some RBA initiatives are causing the expected Third Wave blurring of civilian and military technologies and support mechanisms. Furthermore, while RBA discussions addressed only the consolidation and elimination of traditional infrastructure, other sections of the QDR made it apparent that the over-arching trend is a shift from traditional to information related infrastructure (i.e., command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) architecture). Even many of the traditional consolidation projects will result in informational improvements such as increased data control, accuracy and visibility.

---

<sup>44</sup> Sean T. Connaughton, LtCdr/USNR, "Reinventing Sealift," Naval Institute Proceedings (December 1997): 60-61.

## **Tooth-to-Tail Ratio**

The QDR's repetition of the simplistic statement "preserve the teeth by cutting the tail" focuses attention on the wrong goal. As the Tofflers argue, the concern should NOT be on lowering or raising the tooth-to-tail ratio. Rather, the concern should be on achieving whatever balance of tooth-to-tail is required to produce the greatest military effectiveness. There are some dangers with the QDR approach. First, viable reallocation and reengineering alternatives might be missed or discarded if they do not fit the mold of "preserve tooth while cutting tail." Second, future planners might erroneously "learn" that the rule for force reallocation is ALWAYS to "preserve the teeth while cutting the tail," Although there will be times that cutting the tail may be appropriate, we should remember that the ratio itself is irrelevant. The relevant factor is the ultimate military effectiveness of the force. This point is reinforced in the National Defense Panel's May 1997 assessment of the QDR where the Panel noted that exploiting advanced technology and operational concepts (which can include advances in logistics technology and concepts) "may permit us to be successful with smaller but far more lethal and effective forces."<sup>45</sup>

The US National Security leadership must transform the defense establishment into a Third Wave force with the understanding that a tooth-to-tail ratio is irrelevant. The "right" ratio is the one that achieves maximum operational effectiveness of the force. Defense leadership guidance in this area should shift its focus from the concept of "reducing the tail" to the goal of "improving effectiveness" with effectiveness being defined by the defense capability to be achieved.

---

<sup>45</sup> National Defense Panel, Assessment of the May 1997 Quadrennial Defense Review (Arlington, Va., May 15, 1997), 3.

## **Army National Guard Division Redesign Program**

This program was discussed in the context of Army force structure realignments made possible by changes in the global strategic environment. During the Cold War and in the period immediately following the Cold War when relations with countries of the former Soviet Union were uncertain, the National Guard served as a "strategic reserve." Today, the need for that capability has declined thereby making some National Guard force structure available for realignment from unneeded combat units to needed CS/CSS units. This is an example of a shift in the tooth-to-tail ratio where tooth is turned into tail. This is consistent with the concepts of Third Wave logistics and runs counter to the oversimplified statements in the QDR regarding "preserving teeth while cutting tail" thereby strengthening my earlier argument.

## **Vulnerability of Logistics Data**

Although not specifically addressed in the Focused Logistics discussions in the QDR, protection of logistics data and logistics information networks is covered in two other areas. First, because logistics systems are carried on standard Defense communications networks, some protection is provided under the umbrella of information assurance initiatives outlined in other parts of the QDR. Furthermore, the *Focused Logistics Roadmap* briefly discusses data security alternatives being developed to prevent unauthorized access.<sup>46</sup>

Because information is not only the key to success but also a critical vulnerability in the Third Wave, protection of logistics data cannot be overstated. Consequently, both general defense guidance and specific logistics guidance regarding future programs should

---

<sup>46</sup> Director for Logistics, Focused Logistics: A Joint Logistics Roadmap (The Joint Staff, Washington D.C.), 22.

include expanded discussions on vulnerability of logistics data and plans for potential solutions.

### **Capability to Support Simultaneous Multi-Level Operations**

Neither the QDR nor the *Focused Logistics Roadmap* specifically addressed a need for this capability. However, the *Focused Logistics Roadmap* acknowledges the challenges of uncertain conditions stating that "Logisticians must now demonstrate the capability to tailor forces and resources by both expanding and contracting as the nature of our threats change from large scale MTW to SSCs. Effective execution of these missions requires an adaptive, responsive and reliable logistics system to make it happen."<sup>47</sup> While this does not discuss the issue in terms of the Tofflers' levels of war, if logistics support can achieve the stated goals, it will be sufficiently resilient to handle First, Second and Third Wave logistics requirements. Nevertheless, follow-on versions of general defense guidance and specific logistics guidance regarding future programs must be expanded to clearly address the Third Wave requirement for simultaneous multi-level operations. Lesser powers can afford to operate in one dimension. As a global power, the US must be able to operate successfully in all.

### **Mobilization of Third Wave Industry**

Future conflicts will require an industrial mobilization capability that can support operations of all sizes and durations. While the concept of industrial mobilization falls under the umbrella of Focused Logistics, it is clear that the direction of potential industrial mobilization is being left to the Services using existing procedures. Neither the QDR nor the *Focused Logistics Roadmap* discussed a need for modification of the approach to accommodate the changing environment.

---

<sup>47</sup> Director for Logistics, Focused Logistics: A Joint Logistics Roadmap (The Joint Staff, Washington D.C.), ii.

The National Defense Panel criticized the existing mobilization approach as inappropriate and suggested the criteria of balance, timeliness, relevance and synchronization as characteristics for a new approach.<sup>48</sup> Nevertheless, the competing nature of balance and relevance complicates the search for a solution. First, the new approach must balance current and future warfighting capabilities. Second, although short-war scenarios place a premium on adequate stocks of on-hand weapons, neither stored weapons, materials, parts, nor manpower are necessarily relevant to the mobilization needs of future warfare in these times of rapid technological advancement.<sup>49</sup> One solution to this dilemma is the concept of *agile manufacturing*.

Agile manufacturing is a generic term for a number of competition-enhancing initiatives that include lean and flexible factories, networked information systems, and cross-boundary communications throughout and among various value chains.<sup>50</sup>

The goal of agile manufacturing is to be able to react quickly to changing customization requirements by maintaining production processes that are rapidly configurable:

Agile manufacturing seeks to reduce response time and increase manufacturing flexibility so that every customer order can be satisfied. Ultimately it would mean that the industrial base would never have to be mobilized.<sup>51</sup>

Future defense guidance must address mobilization of Third Wave industries. Furthermore, while the concept of agile manufacturing may not be relevant in the short-term, the defense establishment must understand and embrace this concept to ensure

---

<sup>48</sup> National Defense Panel, Transforming Defense: National Security in the 21st Century (Arlington, Va., December 1997), 77.

<sup>49</sup> *Ibid.*, 77.

<sup>50</sup> Ivars Gutmanis & John F. Starns, "Whatever Happened to Defense Industrial Preparedness," Joint Force Quarterly (Summer 97): 31.

<sup>51</sup> *Ibid.*, 33.

it reaches its full potential as a support mechanism for industrial mobilization. This is especially true since the QDR paid so much attention to reduction of infrastructure.

### **Summary**

Many areas of QDR logistics discussions are consistent with Third Wave requirements. Focused Logistics is based on information fusion, exploitation of technology, reduced cycle times and improving responsiveness while reducing inventories and infrastructure. RBA initiatives are designed to reduce overhead, streamline infrastructure, leverage commercial technology, reduce standards and integrate process and product development. The Army National Guard Division Redesign Program is an example of force structure realignment from "tooth" to "tail" to achieve better balance.

Other areas of QDR logistics discussions fall short of Third Wave requirements. First, instead of trying to become free of fixed bases, existing strategic mobility plans rely heavily on prepositioning to reduce lift requirements. While this solves problems in some geographic areas, it reduces flexibility and ties US forces to prepositioning sites.. The future focus must be on power projection without reliance on forward basing of people or equipment. Second, the QDR is littered with statements about "preserving teeth while cutting the tail." While this is a great sound bite, it is overly simplistic and can be misinterpreted. Third, the QDR inadequately addresses the vulnerability of logistics data, simultaneous multi-level support and industrial mobilization requirements.

Figure 3 below graphically depicts the adequacy of the QDR in addressing the Third Wave logistics requirements extrapolated from the Toffler Wave Theory. The requirements are listed in the column on the left side of the table. Logistics topics discussed in the QDR are listed across the top of the table. How well those topics

addressed the Toffler's Third Wave logistics requirements is indicated by the color of the ball below the topic and to the right of the requirement. (see key)

Figure 3

### ASSESSMENT of QDR LOGISTICS DISCUSSIONS

Overall Assessment	Third Wave Logistics Requirements	QDR Logistics Topics				
	↓	Focused Logistics	Strategic Mobility	RBA	Tooth-to-Tail Ratio	Nat'l Guard Redesign
●	Info Based Infrastructure	●		●		
●	Decentralized Control	●		●		
●	Reduced Inventory	●		●		
●	Civil/Military Fusion			●		
○	Agile Infrastructure	○		●		
○	More Strat Mobility		○			
○	Information Protection	○				
○	Multi-level Operations	○				
◐	Tooth-to-Tail Balance				◐	●
◐	Less Prepositioning	◐	◐			
◐	Third Wave Mobilization	◐				

<b>KEY:</b>	●	QDR adequately addressed this Third Wave Logistics Requirement
	○	QDR partially/inadequately addressed this Third Wave Logistics Requirement
	◐	QDR failed to address or contradicted this Third Wave Logistics Requirement

Due to shortcomings in the QDR logistics discussions, US defense leadership should provide supplemental guidance to address the following issues as the US military transforms into a Third Wave force. The transformation guidance should emphasize power projection in areas without forward support bases. The guidance should direct the examination of long term initiatives to reduce equipment propositioning and to exploit improvements in speed and reliability of strategic mobility. The guidance should direct the examination of the full range of military, commercial, legal, financial and procedural options to improve strategic sealift capabilities. The transformation guidance must acknowledge the shift in importance from traditional to information based infrastructure. The transformation guidance should explain that a tooth-to-tail ratio is irrelevant and that the "right" ratio is the one that achieves maximum operational effectiveness of the force. This future supplemental planning guidance should also emphasize the vulnerability of logistics data, the need to be able to conduct simultaneous multi-level operations, the need for an improved industrial mobilization approach and the need to develop and exploit agile manufacturing capabilities.

By implementing these logistics recommendations, future US forces will be more capable of meeting the criteria for Third Wave military success.

## BIBLIOGRAPHY

Alberts, David S. The Unintended Consequences of Information Age Technologies. Institute for National Strategic Studies, National Defense University, Washington D.C., April 1996.

Albert, David S. and Papp, Daniel S., ed. The Information Age: An Anthology on Its Impacts and Consequences. 4 parts. Institute for National Strategic Studies, National Defense University, Washington D.C., June 1997.

Aldana,, Arturo, LTC/USA Lawson, Joseph H., III, CPT/USA; Namangale, Clement A., CPT/USA; Thompson, Mark A., CPT/USA and Worden, Donald R., CPT/USA. "Force XXI: Forward Support Battalion Redesign." Quartermaster Professional Bulletin. Autumn 1997, pp. 5-10.

Anderson, David A., Major/USMC. "Stretched Too Thin." Naval Institute Proceedings, July 1996, pp. 48-50.

Barnett, Roger W. "Grasping 2010 with Naval Forces." Joint Force Quarterly, Autumn 97/Winter 98, pp. 25-31.

Black, Richard A., BGen/USA. "Lessons From Acquisition Reform: Innovation, Integration and Education." Logistics Spectrum. Jan-Feb 1998, pp. 7-9.

Blaker, Jim. "The Owens Legacy." Armed Forces Journal July 1996, pp. 20-22.

Cebrowski, Arthur K., Vice Admiral/USN and Garstka, John J. "Network-Centric Warfare - Its Origin and Future." Naval Institute Proceedings, January 1998, pp. 28-35.

Clauer, John A., Col/USMC. "In Defense of the 'Joint Vision'." Marine Corps Gazette, March 1998, pp. 50-54.

Clemins, Archie, Admiral/USN. "IT21: Moving to the 3rd Stage." Naval Institute Proceedings, May 1997, pp.51-54.

Connaughton, Sean T., LtCmdr/USNR. "Reinventing Sealift." Naval Institute Proceedings, December 1997, pp.59-61.

Cusick, John J., LtGen/USA and Pipp, Donald C., LtCol/USAF. "In Search of Focused Logistics." Joint Force Quarterly, Spring 97, pp. 125-127.

Department of Defense. Report of the Quadrennial Defense Review. Washington D.C., May 1997.

Director for C4 Systems. Information Warfare: Legal Regulatory Policy and Organizational Considerations for Assurance. The Joint Staff. Washington, D.C., 4 July 1996.

Director for Logistics. Focused Logistics: A Joint Logistics Roadmap. The Joint Staff Washington, D.C., undated.

Echevarria, Antullo J., II, Maj/USA. "Dynamic Inter-Dimensionality: A Revolution in Military Theory." Joint Force Quarterly, Spring 97, pp. 29-36.

Fogleman, Ronald R., Gen/USAF. "The Air Force and Joint Vision 2010." Joint Force Quarterly, Winter 96/97, pp. 24-28.

Gibson, Andrew E. "U.S. Maritime Industry Is Out of Step." Naval Institute Proceedings, January 1998, pp. 67-69.

Goodman, Glenn W., Jr. "Redesigning the Navy." Armed Forces Journal, March 1998, pp. 28-34.

Graham, Bradley. "Experts Urge Upgraded Defense of U.S. Territory." The Washington Post, 2 December 1997, pp. A15.

Gray, Chris Hables. Postmodern War: The New Politics of Conflict. New York: Guilford Press, 1997.

Gropman, Alan L. Mobilizing U.S. Industry in World War II: Myth and Reality. Institute for National Strategic Studies, National Defense University, Washington D.C., August 1996,

Gutmanis, Ivars & Starns, John F. "Whatever Happened to Defense Industrial Preparedness?" Joint Force Quarterly Summer 97, pp. 27-33.

Hammer, Michael and Champy, James. Reengineering the Corporation. New York: HarperBusiness, 1993.

Hoffman, F.G., LtCol/USMCR. "JV 2010: A Different Perspective." Marine Corps Gazette, December 1997, pp. 31-33.

Hoffman, F.G., LtCol/USMCR. "Joint Vision 2010 - A Marine Perspective." Joint Force Quarterly, Autumn 97/Winter 98, pp. 32-38.

Hoffman, F.G., LtCol/USMCR. "Transforming Defense: The Report of the National Defense Panel." Marine Corps Gazette. January 1998, pp. 47-49.

Holzer, Robert. "Offshore bases get boost from crisis." Navy Time & Marine Corps Edition, 16 March 1998, pp. 36.

Hull, Jonathan, Major/USMC. "Sell It to the Marines." Naval Institute Proceedings, October 1997, pp. 67-69.

Johnson, Jay L., Admiral/USN. "The Navy in 2010: A Joint Vision." Joint Force Quarterly, Winter 96/97, pp.17-19.

Johnson, Stuart E. and Libicki, Martin C., ed. Dominant Battlespace Knowledge. Institute for National Strategic Studies, National Defense University, Washington D.C., April 1996.

Kimminau, Jon A., Maj/USAF. "'Joint Vision 2010': Hale or Hollow." Naval Institute Proceedings, September 1997, pp. 78-81.

Krulak, C. C., Gen/USMC. "Not Like Yesterday." Navy Times, Marine Corps Edition, 19 January 1998, pp. 12-14.

Leebaert, Derek. Technology 2001. Cambridge, Mass: The MIT Press, 1991.

Leebaert, Derek. The Future of Software. Cambridge, Mass: The MIT Press, 1995.

Lucas, William R. "Down the road: Industry leaders look at 21st century transportation." The New TRANSLOG: Transportation Magazine of the Military Traffic Management Command. Fall 1997, pp.10-11.

Mazarr, Michael J. The Revolution in Military Affairs: A Framework for Defense Planning. Strategic Studies Institute, U.S. Army War College, Carlisle Barracks, Pa., 10 June 1994.

Morningstar, James K., Maj/USA. "Technologies, Doctrine, and Organization for RMA." Joint Force Quarterly, Spring 97, pp. 37-43.

Morris, Michael F., Maj/USMC. "Flying Columns and OMFTS." Marine Corps Gazette March 1998, pp. 27-29.

National Defense Panel. Assessment of the May 1997 Quadrennial Defense Review. Arlington, Va., May 15, 1997.

National Defense Panel. Transforming Defense: National Security in the 21st Century. Arlington, Va., December 1997.

Ormerod, Gerald J., Jr., Capt/U'SMC. "Outsourced Logistics: Maximizing External Support." Marine Corps Gazette December 1997, pp. 46-50.

Peniston, Bradley. "Supply ships crewed by civilians?" Navy Times Marine Corps Edition, 8 September 1997, pp. 26.

Pexton, Patrick. "High-tech military will come at high cost." Navy Times Marine Corps Edition, 10 February 1997, pp. 21.

Pincus, Walter. "From Tiny Aircraft to Robots and Radars, Pentagon Pursues New Tools." The Washington Post, 29 March 1998, pp. A2.

Reimer, Dennis J., Gen/USA. "Leaping Ahead to the 21st Century." Joint Force Quarterly, Autumn 97/Winter 98, pp. 20-24.

Rhodes, John E., LtGen/USMC. "Every Marine an Innovator." Marine Corps Gazette January 1998, pp. 40-43.

Scales, Robert H., Jr., MajGen/USA. "Cycles of War." Armed Forces Journal, July 1997, pp. 38-42.

Schade, John W. and Christensen, Col/USAF. "The Forward Supply Support (FSS) System - The Gulf War and Beyond: Why the FSS System Is a Success Story." Air Force Journal of Logistics. Spring 1997, pp. 1-5.

Schneider, James J., "Black Lights: Chaos, Complexity and the Promise of Information Warfare." Joint Force Quarterly, Spring 97, pp. 21-28.

Schwartau, Winn, Information Warfare. New York: Thunder's Mouth Press, 1994.

Shalikashvili, John M., Gen/USA. Joint Vision 2010. CJCS, Washington D.C.

Shalikashvili, John M., Gen/USA. "Joint Vision 2010." Defense 96, Issue 4, pp. 6-21.

Shalikashvili, John M., Gen/USA. National Military Strategy of the United States of America. Shape, Respond, Prepare Now: A Military Strategy for a New Era. CJCS. Washington, DC: GPO, 1997.

Shelton, Henry H., Gen/USA. "From the Chairman: The US Military and Foreign Policy." Harvard International Review. Winter 1997/1998, pp.77-78.

Sherman, Jason. "INFOWAR: What Kind of a Defense?" Armed Forces Journal, August 1997, pp. 28-33.

Sherman, Jason. "The Depot Dilemma." Armed Forces Journal, October 1997, pp. 8-10.

Silverberg, David. "Computing Currents." Armed Forces Journal, July 1996, pp. 26-29.

Stokes, Geoffery W., Maj/USMC. "Sea-Based Logistics: A Concept Just Over the Horizon." Marine Corps Gazette April 1998, pp. 60-65.

Summers, Harry G., Jr., Col/USA. The New World Strategy. New York: Simon & Schuster Inc., 1995.

Suplee, Curt. "Robot Revolution." National Geographic, July 1997, pp. 76-95.

Toffler, Alvin. The Third Wave. New York: Bantam Books, 1980.

Toffler, Alvin and Heidi. Creating a New Civilization: The Politics of the Third Wave. Atlanta: Turner Publishing, Inc., 1994.

Toffler, Alvin and Heidi. War and Anti-War. New York: Warner Books, Inc., 1995.

"U.S. Official Warns of 'Electronic Pearl Harbor'." BNA Daily Report for Executives. 17 July 1996, A22.

Van Riper, Paul K., LtGen/USMC. "Information Superiority." Marine Corps Gazette, June 1997, pp. 54-62.

Van Riper, Paul K., LtGen/USMC(Ret). "More on Innovations and Jointness." Marine Corps Gazette, March 1998, pp. 55-57.

Weible, Jack. "Cohen's plan to streamline the Pentagon." Navy Times, Marine Corps Edition, 24 November 1997, pp. 6.

Weinberger, Casper and Schweizer, Peter. The Next War. Washington, D.C.: Regnery Publishing, Inc., 1998.

Wilson, George C. "Clinging to past victories won't work." Navy Times, Marine Corps Edition, 19 January 1998, pp. 10.