

**OPENING PANDORA'S BOX: IS THE  
ARMY AFTER NEXT MAINTENANCE  
CONCEPT VALID?**

**A MONOGRAPH  
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## ABSTRACT

OPENING PANDORA'S BOX: IS THE ARMY AFTER NEXT MAINTENANCE CONCEPT VALID? by MAJ Dale A. Jones, USA, 45 pages.

The United States Army's Army After Next (AAN) Battle Force (BF) maintenance support concept reduces maintenance personnel to cut the BF from its logistical tail. As this concept evolves over the coming years the question is can the maintenance support to the AAN BF remain functional and effective as in the TRADOC AAN support concept? As the Army begins to analyze and possibly implement organizational structures and procure equipment to support this concept it enters into an area of high risk. In view of the dollar cost and long range consequences for future army readiness it is appropriate that the Army take a critical look at the maintenance support concept for the AAN today.

The AAN maintenance support concept is critically analyzed against the seven logistics principles of responsiveness, simplicity, flexibility, economy, attainability, sustainability and survivability contained in Joint Pub 4.0. This concept is examined against these principles to determine its compatibility with each. These principles are recognized Army wide as the keystone to logistical operations.

Analysis reveals that the maintenance support concept for the AAN BF does not support the seven logistics principles. This monograph comes to four basic conclusions. First, the concept's inherent cost may be too prohibitive for its total implementation. Second, the technology described in the concept may not be available by the year 2025. Third, the concept's technological advantages may be too short lived, or even illusionary, to warrant it's cost. Lastly the reliance on technology may limit its use and over expose its vulnerabilities.

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## **RELEVANCE OF STUDY: LOOKING BACK 40 YEARS AGO**

The last attempt the United States made at leap-ahead doctrine and technology was over 40 years ago. The Pentomic Division and its requisite logistic support concept were the Army's attempt to capture the technological advances of the 1950s. Like today's vision of information technologies and dominance, the 1950s nuclear era promised a new type of warfighting that would render everything before it obsolete. The Army sought to capitalize upon this leap of technology while the United States still possessed a nuclear monopoly. This is eerily similar to today's Army view of going forward with the Army After Next concept.

The Pentomic Division, like the AAN, did not view future battle as a divisional action as such. The Division consisted of five Battle Groups which operated independent from one another.<sup>1</sup> The Battle Groups consisted of approximately 2,200 soldiers organized into five companies (infantry or armor), a 107mm mortar battery, a 155mm howitzer battery, and a Headquarters and Service Company consisting of reconnaissance, signal, supply, maintenance and medical.<sup>2</sup> The Pentomic Divisions overall personnel strength of 11,486 was significantly lower than the previous U.S. Army divisional strength of about 17,000.<sup>3</sup> This decrease in personnel throughout the division was due to a reduction in logistical structure.

At the time the Army recognized that the logistical base in the division was too weak. However, while the Army recognized this potential weakness it stipulated that new logistical support systems and procedures would make up for the shortfall in logistics capability.<sup>4</sup>

The concept of employment of the Pentomic Division was for its Battle Groups to seize key terrain and essentially fight independent battles from non-mutually supporting positions. Theoretically, the Pentomic Division could fight in any direction at any given time. This non-linear approach to war required a new support concept called the "support island concept"<sup>5</sup>. Because this new doctrinal way of fighting advocated that enemy units would come between the Battle Groups, sustaining a line of communications became impracticable. Therefore, aerial re-supply and support via helicopter was deemed as the answer to the problem. However, this aerial line of communication was too futuristic for its time. The Division, in short, did not possess the required numbers of helicopters to provide such a large-scale lift for support. Thus, with enemy units infiltrating between the Battle Groups the logistical support structure would soon disintegrate and cease to exist.<sup>6</sup>

Due to the devastating effects on the nuclear battlefield the Battle Groups required dispersion, tight control, and the ability to move rapidly. In an attempt to accomplish this the Army wanted maneuver units to be self-contained and self-sustaining.<sup>7</sup> This necessitated the Pentomic Division ridding itself most of its heavy equipment in large numbers (to include tanks and APCs) to meet the strict criteria for air transportability.<sup>8</sup> In doing so the Division also took away much of the wheeled vehicles for logistical support.

Over time, it became apparent that the Pentomic Division could not operate as designed - - command and control was profoundly flawed. Additionally, the logistical support structure, to include maintenance, proved it could not sustain the division during continuous combat operations. Through a variety of factors that included a lack

of funding and unachievable technological applications, the Pentomic Division and its logistical support system never fulfilled its promise.

With the Army looking at the future of war and potential threats well into the next quarter century it is critical that it re-examine the past so it does not replicate its failures of the 1950s. The impact and effect of doctrinal changes based on unproven futuristic technological advances may cause irreparable harm to future generations of soldiers. It is they who will reap the benefits of sound planning done today or pay its penalties if it is flawed. The application of future technologies is susceptible to many factors that the Army has little or no control over that could serve to introduce an unnecessary element of risk if those technologies fail.

### **PROBLEM STATEMENT**

The decisions made today about the future organization, equipment and doctrine of the Army will have a profound impact upon its capabilities, strengths and weaknesses. The AANs maintenance support concept depends heavily upon a Revolution in Military Logistics (RML). Chief of Staff of the Army, General Dennis Reimer has stated that "you cannot have a revolution in military affairs without a revolution in military logistics." The ability for the army to have this RML will have direct consequences upon the AAN. Indeed, if the RML does not occur the AAN will become just another unrealized vision. The AAN would become anything but what it is envisioned to be given its present configuration, capabilities and employment.

The maintenance or fix function of the AAN relies heavily on ultra reliable engineering concepts. In other words, it is based upon "vehicles that do not break down and operate with super efficient Proton Exchange Membrane fuel cells that

power electric drive motors.<sup>9</sup> As the Army begins to analyze and possibly implement organizational structures to support this premise it enters into an area of high risk. Will information technologies exist in 2025 to give the army the ability to do sensor-based forecasting in the areas of diagnostics, predicted failures and status reporting? Will potential enemies allow the Army the freedom to electronically transmit such information so it can maintain situational awareness? Can the Army really expect to have ultra reliable vehicles by 2025? If this technology does exist at that time, will it be readily available at a reasonable cost and will there be appropriate funding available to procure this technology? What will be the effect on operations with the reliance on large numbers of commercial and civilian contractors as outlined in the AAN maintenance concept? These questions will have significant impacts on both organizations and training. In summation, how far can the Army reduce maintenance support for the AANs BF?

#### **RESEARCH QUESTION**

Can maintenance support to the AANs BF remain functional and effective as explained in the TRADOC AAN Support Concept? This concept envisions a battle rhythm of alternating combat and logistics pulses for the BF with its support unit called the Battle Unit Support Element, physically separated from the maneuver elements of the BF. This concept is similar to present day Ranger and SOF support operations.<sup>10</sup>

As the coming years pass, new unforeseen technologies will become available. Some will present new opportunities while others will likely prove to be ineffective, unreliable, too costly or just will not work as promised. Thus the AANs maintenance concept must remain flexible to absorb changes as they happen. As a

result, this concept needs constant review and analysis to determine its applicability at any given time in the future. If it becomes too far removed from reality it will need revision to keep it applicable. This could have a detrimental impact on AANs mobility if further personnel or Class IX are required to support the AAN.

Along with the other functional areas of logistics, maintenance concepts for AAN are in development. In view of the dollar cost and long range consequences for future army readiness it is appropriate for the army to take a critical look at the maintenance support concept for the AAN. Like all other previous changes to Army doctrine, equipment, organizations and training systems, a healthy unbiased discussion on AANs maintenance concept is warranted. It is with this view in mind that this paper is written.

### **SELECTION CRITERIA**

The criteria for analysis of the AAN Maintenance Support Concept will be the seven Principles of Logistics defined in Chapter II of the Joint Publication 4.0, Doctrine for Logistics Support of Joint Operations, dated 27 January 1995. The principles are as follows:

- a. Responsiveness
- b. Simplicity
- c. Flexibility
- d. Economy
- e. Attainability
- f. Sustainability
- g. Survivability

The reasoning for selecting these principles as criteria for analysis is four fold. First, they provide for an accepted view of all logistics operations, to include maintenance. The Joint Publications series (including 4.0) is viewed as authoritative

and directive in nature, i.e. a legitimate underpinning of criterion. Second, these principles are current in today's environment and take into account new and evolving technology, doctrine and training. Third, they provide for a common understanding of logistics/maintenance functions and serve as a solid basis from which to start from when analyzing any logistical function. Lastly, since the Army most likely will be employed and fight in a joint environment it is valid to analyze any change to the Army maintenance from a joint perspective.

### **CRITERIA EXPLAINED**

Responsiveness is defined as:

“the right support in the right place at the right time. Among the logistics principles, responsiveness is the keystone; all else becomes irrelevant if the logistic system cannot support the concept of operations of the supported commander”<sup>11</sup>

Responsiveness allows the commander to retain his options and maintain the initiative in his operations. If the maintenance concept does not allow for timely repairs of combat systems at the correct location on the battlefield then the operation slowly grinds to a halt. For example, if a maintenance concept does not allow for a robust capability to fix as forward as possible on the battlefield then the timeline to repair equipment will increase. Additionally the requirement for transportation and recovery assets to backhaul equipment for repair will also increase. Such a maintenance system of support is not responsive to meet the commanders' operational objectives.

Proposed AAN operations will place a high demand upon the responsiveness of the maintenance support provided to the BF. This is due to the anticipated speed of the operations, increased span of distances involved and the non-linearity nature of the

operations. If the maintenance concept of support is not responsive to the needs of the AAN BF then the BF will slowly attrite itself through maintenance-related problems alone. Because the BF will deploy in a “come as you are” state with no replacement equipment close at hand the responsiveness of maintainers to be force multipliers will become critical.

The non-linearity of the AAN battlefield promotes operations that will be intricate and complex. Simultaneous takedowns of non-mutually supported positions dictate this complexity. However, the Army will want to retain simplicity in its maintenance support for these operations. Simplicity is defined as

“the avoidance of complexity and often fosters efficiency in planning and execution of national or theater logistics operations. Mission-type orders and standardized procedures contribute to simplicity. Establishment of priorities and preallocation of supplies and services by the supported unit can simplify logistic support operations.”<sup>12</sup>

If maintenance support becomes too complex and intricate they will become more vulnerable to unforeseen events, i.e. friction, and susceptible to failure. The more the system depends upon different individual pieces (or variables) the more complex it becomes. If just one part of the system fails it can lead to a domino effect, which could lead to a complete maintenance system failure or greatly reduce the capability of the system.

Standardization of procedures that leads to simplicity is also a key factor for the AAN maintenance concept. If the AAN is a stand alone force with its own logistical features and procedures the implications of its integration with the conventional forces will be many. For example, there may have to be a special supply system for AAN apart from regular supply channels in order for it to receive Class IX repair parts. This

could lead to inefficiencies in the execution of national logistics operations and require even greater transportation assets.

Simplicity also fosters the ability to better support the changing requirements of the BF. If the system is too complex, with too many working pieces, it will not be able to change focus quickly enough to meet changing demands.

This leads to the next principle, flexibility. Flexibility is defined as:

“the ability to adapt logistic structures and procedures to changing situations, missions, and concepts of operations. Logistics plans and operations must be flexible to achieve both responsiveness and economy. The commander must retain positive C2 over subordinate organizations to maintain flexibility. The principle of flexibility also includes the concepts of alternative planning, anticipation, reserve assets, redundancy, forward support of phased logistics, and centralized control with decentralized operations.”<sup>13</sup>

The fluid nature of AAN operations demands the maintenance support system retain a high degree of flexibility. This implies the maintenance elements of the BF have situational awareness of the deployed force and its operational status. If the operational situation changes from one of the quick short term decisive operations to one of protracted operations will the maintenance support be able to meet this changing requirement?

The ability to retain flexibility in the maintenance support concept means that the operational commander will have more options open to him on how to employ and utilize his force. If the support does not lend itself to changing environments/requirements then the commander may have a stand alone force which could only be used in limited situations and not be able to operate across the spectrum

of warfighting operations. The capability to retain flexibility has long been a factor in the Army's ability to conduct effective maintenance operations.

Economy may well become a more critical principle in the future. With declining budget appropriations the requirement to have dollars go further will increase. Economy is defined as:

“the provision of support at the least cost. At some level and to some degree, resources are always limited. When prioritizing and allocating resources, the commander must continuously consider economy”.<sup>14</sup>

While a maintenance system of support may be the most effective it may also be too costly. The Army has a finite amount of financial resources to apply to any logistical system, which may preclude the use of the best system. Instead it may only get the best system that the amount of financial resources can procure. Another mitigating factor has been the propensity of the Army to spend large amounts of money on combat systems as opposed to support systems. Thus the ability of the Army to fund the AAN maintenance support concept requires analysis.

Attainability is defined as

“the ability to provide the minimum essential supplies and services required to begin combat operations. An operation should not begin until minimum essential levels of support are on hand”.<sup>15</sup>

The attainability principle is important in that if the AAN BF moves too quickly for the maintenance support (specifically its ability to provide Class IX) then the ability to effectively support it is diminished. Again, the ability of the maintenance support to act as a force multiplier is greatly reduced and the BF becomes too vulnerable. Though AAN operations call for a quick decisive operations, if they are not and adequate levels

of support are not available the BF elements will be over extended. Thus the attainability principle is a valid criteria to examine the AAN maintenance support concept.

Sustainability is also a valid principle by which to analyze the maintenance support concept of AAN. The ability to maintain support during the duration of an operation is key to its success. Sustainability is:

“a ability to maintain logistic support to all users throughout the theatre for the duration of the operation. Sustainability focuses the supporting commander’s attention on long-term objectives and capabilities of the supported forces”.<sup>16</sup>

The ability to sustain operations for a prolonged period of time gives the commander staying power and the ability to stay decisively engaged in order to achieve victory. If this ability is insufficient then the commander will have reduced options in which to achieve his objectives. The ability to conduct prolonged continuous operations has been a strength of the U.S. Army and has given it an inherent advantage over most, if not all, of its potential adversaries.

Survivability is the last principle that will be used to analyze the maintenance support structure of AAN. Survivability is defined as

“the ability of the organization to prevail in the face of potential destruction”.<sup>17</sup>

The more mobile and tactical the maintenance support structure is the less vulnerable it is. If it is habitually tied to APODs and SPODs then it can become a target of weapons of mass destruction (WMD) and potential terrorist/guerilla warfare. With the non-linear nature of the AAN battlefield the vulnerability of the BFs maintenance structure will become of prime importance. Indeed, the

maintenance/logistics vulnerability may become even more valuable a target to potential enemies because the BF may be very well be operating from non-mutually supported positions or areas.

### **IMPORTANCE OF CRITERIA**

Many of the above principles are inter-related to one another. They have all been utilized over previous decades in one form of another to evaluate logistical operations and concepts. Because they are tried and proven over time they serve as a solid framework with which to view logistical operations. Therefore these principles serve as valid criteria in which to analyze the implications of the proposed AAN BF maintenance support concept. If these principles are ignored then the implications could have catastrophic consequences for the AAN BF in the future where ever it may be employed.

### **CRITERIA ANALYZED**

The responsiveness of any maintenance support system can greatly dictate what actions a commander can and cannot take. For example, the task force that crossed the Sava River into Bosnia in December 1995 came without the majority of its combat service support assets, to include maintenance support, and Class IX stocks. If this task force had transitioned into full combat operations early on it would have found itself with reduced combat power and little staying power.<sup>18</sup> One could surmise that the concept of maintenance support was not responsive to the requirements of the operation or the needs of the commander.

The bulk of AAN maintenance operations are proposed to be conducted during the staging and logistics pulse phase. During the combat pulse, a period of up to eight

hours, there will not be maintenance conducted except by that of the vehicle crew itself.<sup>19</sup> Thus during the eight hour phase of combat operations the combat soldier will be left on his own to repair any equipment failures. Combat elements will go forward with only limited external maintenance capability from its Advanced Maintenance and Recover Vehicles (AMRVs) crews and not a dedicated maintenance contact team. Two key subsets arrive from not applying the appropriate level of fix resources forward on the AAN battlefield.

First, what consequences will result if the BF is unable to extract itself after eight hours of combat. While the AAN equipment is designed to be ultra-reliable, meaning an increased mean time between failures and non-essential function failures<sup>20</sup>, it is bound to fail at sometime under the arduous conditions of combat<sup>21</sup>. While combat crews will be trained to do modular replacement tasks of components and receive assistance via “tele-maintenance” from an intermediate staging base or CONUS they will not be mechanics.<sup>22</sup> Despite the back-up system of tele-maintenance what happens if the vehicle is out of communications and better yet what is the combat crew doing, protecting themselves during combat operations or repairing vehicle failures?

The next issue to arise from the combat phase operations which is somewhat a subset of the above is the question of Battle Damage Assessment and Repair (BDAR). Because there will be no qualified maintenance personnel on the scene to conduct hasty improvised repairs the combat vehicle will just sit there immobile. Combat crews will only be able to conduct modular component replacements. Thus the combat multiplier effects of forward maintenance teams that have the ability to conduct quick unorthodox repairs to get equipment moving again is lost. Thus these vehicles will have to be

recovered by the BF support personnel. The loss of this on-site repair capability is already depicted in the AAN BF listing of personnel and equipment. The current BF structure, which is slightly larger to a current heavy brigade structure by number of personnel and equipment, calls for 59 AMRVs.<sup>23</sup> Meanwhile the current heavy brigade in the army has 23 M88 recovery vehicles organic to it.<sup>24</sup> This more than doubling of recovery assets over current force structure levels is an indication that there will be an increased demand upon recovery assets due to this loss of maintenance capability on the battlefield.

Thus the combat pulse/logistics pulse system along with the BF maintenance structure lends the concept unresponsive to battlefield requirements.

Another area effecting the responsiveness of the AAN maintenance concept is the use of civilian contractors. The concept calls for a high density of contractors, both private and government, to offset the reduction of skilled army mechanics in the BF. The concept makes the assumption that these contractors will be “available for immediate deployment”<sup>25</sup>. However will they be or is this just another idea that is unlikely to be realized?

History has shown that getting contractors to a distant theater of operations is time consuming, expensive, and problem-ridden. Under current policies and during Operation Desert Storm (ODS), the Army Material Command Logistic Support Element (LSE) deployment first goes to Aberdeen Proving Grounds for training, administrative processing (passport, visa, pay, legal, insurance) and medical (immunizations and physicals) processing prior to deployment.<sup>26</sup> This process will always require time for completion and the arrival of contract personnel may be

delayed until well after the initial logistic pulses are completed. The only way this process can be speeded up is to identify personnel against LSE slots prior to any operation occurring and being on a 24 hours notice to move status. However, how civilians and better yet their union react to such a program remains open to question. During ODS the General Accounting Office (GAO) found that putting names to spaces for the LSE encountered real problems which led to delays and an incomplete LSE being deployed. GAO found that even if a person was slotted against a particular position they might not be deployable due to physical problems or family reasons.<sup>27</sup>

This aspect of civilian readiness is also applicable to the Logistics Civil Augmentation Program (LOGCAP). In Bosnia, for example, Brown & Root has filled the LOGCAP role for the Army for logistical support, to include maintenance. One after action review found that the 3<sup>rd</sup> party contractor lacked cohesiveness with and was poorly integrated into the military logistical process. Some of the recommendations given to remedy the problem were earlier involvement in the military planning process and participation in both training and exercises.<sup>28</sup> These findings were evident in the way that Brown & Root support was developed in late 1995. Brown & Root activated its operations cell at Kaspovar and Taszar Hungary on 26 November 1995. While Brown & Root representatives deployed into Bosnia on 1 December 1995 with the 1<sup>st</sup> Armored Division they did not begin awarding sub-contracts and conducting operations until 5 December 1995.<sup>29</sup> This nine-day lapse between activation and of the Brown & Root process and operational status would not have supported AAN logistical operations in time. The current description of the availability of LOGCAP

support to military operations of on a “short notice basis”<sup>30</sup> will have to be refined if LOGCAP is to support AAN operations effectively.

Another issue regarding contractors is their ability to function on a non-linear battlefield as outlined by AAN. Civilians have traditionally been deployed in support of linear operations with fixed and secure rear areas. While operations in Bosnia, for example, are non-linear in nature they are more benign and static as opposed to proposed AAN operations. This may not be so in AAN operations. The non-linear nature of AAN operations increases the risk factor as well as the physical and stress elements to personnel in the AAN. This evolutionary change will take place due to the blending of previously well defined rear and forward areas and the overall proximity to threat forces to what were once relatively safe rear area functions such as DS/GS maintenance. Many service leaders currently believe the proper place for civilians on the battlefield is at echelons above corps and not lower, such as the BF.<sup>31</sup> Again during ODS there was no evidence that contractors, other than some unit Logistics Assistance Representatives, ever went forward with combat units. Thus there should be a legitimate concern on the staying power of civilians in support of the AAN BF due to the higher risk of actually being involved combat operations. This concern is exacerbated by the fact that many of these contract personnel are ex-military and are generally older in nature.<sup>32</sup>

The next area to examine is the AANs maintenance personnel’s ability to actually provide maintenance support during the logistics pulse. As defined, the logistics pulse will not last over a period of 12 hours and the AAN BF will bring nothing with them to assist with the operation.<sup>33</sup> A key factor will be maintenance

personnel's ability to arrive at the designated location for the logistics pulse as branches and sequels develop over the life of the operation.<sup>34</sup> This speed of mobility for forces operating in the AAN environment is critical as proven during the AAN Winter War games of 1997.<sup>35</sup> This will require the maintenance elements to have ground and aviation systems comparable to the BF maneuver forces to provide support.<sup>36</sup> Historically, U.S. Army logistic support elements have always had to rely on wheeled vehicles which offer less mobility over rough terrain than tracked vehicles or aircraft. Since it is only a 12 hour operation a delay of just one or two hours in arrival by maintenance personnel could have a significant impact on the BF, a brigade-sized element, being returned to the desired level of readiness. One only has to remember that the Army's armored cavalry regiments in Europe during the Cold War were planned to be reconstituted for at least a 24-hour period after their initial screening missions prior to being employed again in operations. Anything a potential enemy could do to disrupt this 12-hour phase, symmetrically or asymmetrically, will have a great impact on maintenance operations.

Another aspect of the logistics pulse is the ability to provide Class IX repair parts during the pulse. Given that the combat pulse is eight hours and the logistics pulse is 12-hours this leaves approximately 20-hours to get critical repair parts from CONUS to the logistics pulse location. This is also based on the on-board sensors which provide information that is accurate and timely to logistics planners to allow them to determine requirements for the logistics pulse. Since the AAN will have limited Class IX to reduce the logistics tail<sup>37</sup> most of the Class IX will have to come from CONUS. Currently the Defense Logistics Agency has a premium delivery

service for high-value critical items that are urgently required with a delivery time of 48 hours.<sup>38</sup> Even if this capability/service time can be cut in half this is still a 24-hour period which is beyond the 20-hour window of opportunity envisioned by the AAN support concept.

Thus it is questionable if the support concept can truly meet the anticipated battle rhythm of the BF. This could start a domino effect by requiring a BF to remain in the logistics pulse longer than planned thus keeping another BF, which it replaces, in the combat pulse longer than eight hours. Thus maintenance failures will increase and readiness of BFs will continually erode over time.

As demonstrated above the AAN support concept for maintenance is not responsive to the BF requirements as currently described. More development of the concept and technologies to support it are required to attain the principle of responsiveness.

The next principle to analyze is simplicity. Of concern to the AAN maintenance concept is its ability to fit within the current/Force XXI system of maintenance. In other words, does it streamline itself with existing and developing maintenance concepts?

The AAN will be a stand alone force apart from Force XXI and legacy forces in 2025. Due to its high tech nature in relation to other forces in the army it will most likely require a separate and distinct maintenance/Class IX system to provide support. The danger the army runs is developing an army of armies. In other words, there would be different forces for each type of operation.<sup>39</sup> For example a force for conventional high intensity conflict, one for peace keeping and one (i.e. AAN) to do

quick decisive intervention operations. While the Army has historically had heavy, light, airborne, air assault and SOF force units they have all operated under the same basic logistical system. AAN will require a separate system of support due to its non-linear application and speed of operations.

This will require the Army to develop different doctrine for AAN logistics, to include maintenance, as well as leader development, organizational structure, soldier training and personnel policies.<sup>40</sup> This could drive the AAN maintenance structure to being too narrowly focused and not integrated into the Army logistical structure as a whole. By developing a separate communications systems for predictive failures by sensors and Class IX requisitions the army may have a system that is incompatible with the other systems that are the mainstay of the Army. The critical factor in using technology with strict limits is not so much the hardware available itself but the way it is put to use and integrated into the overall system.<sup>41</sup> Due to the austere infrastructure in many regions in the world the AAN logistical system could be out of touch with the army support system.<sup>42</sup>

Another aspect of simplicity is the AAN equipment itself could become too complex for not only combat crews to conduct diagnostics and modular component replacement but also for trained mechanics as well. This will be especially true for BDAR and vehicle/equipment damage due to accidents and usage over rough terrain when, for example, there is damage not only modular components but also to the vehicle chassis. One problem is that as it becomes more complex it will become too specialized for the mass of soldiers who are in the army. Only really intelligent people will be able to maintain it and the personnel will require extensive training and

education to acquire the skills necessary to maintain the equipment. History has demonstrated that it is difficult for the army to retain its most technically qualified soldiers from turning to higher paying private sector jobs.<sup>43</sup>

Additionally, as the BF maintenance personnel incur casualties there will most likely be a lack of qualified replacements. Force XXI and legacy force mechanics will have had no prior experience with AAN equipment. Personnel replacements cannot come directly from the rest of the Army. Due to the intensive training and “apprenticeship” program envisioned in the concept few replacements will be available.<sup>44</sup> This long lead time to train these individuals is not conducive for personnel replacement operations in combat. A potential enemy may know this prior to operations and target mechanics/logistical personnel as the AANs center of gravity asymmetrically as opposed to attacking the BF combat elements directly.

As the relationship between the mechanic and his equipment diagnostics and sensors matures the soldier may find himself increasingly dependent upon machines to tell him what is wrong with a piece of equipment. This could lead to erosion of the perishable skill of hands-on diagnostics and assessment by the soldier. Thus the soldier will rely too much on technology to tell him what to do or only think of technological solutions to equipment repair. This brings to mind the infantry company commander in Korea in 1950 who did not have communication wire to run to units to the left and right of his unit. It did not occur to him to use runners to establish communications links.<sup>45</sup> Thus he could not step back from his reliance on technology to solve the problem.

The ability of sensors to adequately communicate exactly what is wrong with a combat system is another issue in simplicity. The limitation of sensors is that they serve as a source/flow of information. They do not necessarily discern what is important or what is exactly wrong with a major assembly (i.e. which sub-component failed).<sup>46</sup> Without trained and skilled eyes actually on the equipment itself you begin to lose the ability to synthesize and analyze exactly what has gone wrong. For example, maybe only a small fitting is required to repair an engine as opposed to an entire engine assembly. This loss of "HUMINT" capability in maintenance could lead to inefficiencies and delays in repairs during the logistics pulse.<sup>47</sup>

Along with the concern over the accuracy capability of sensors is its ability to provide timely data. Will sensors be able to predict failures minutes, hours or days out from the current time? This capability is critical to proper preventative maintenance operations during the logistical pulse. If a sensor cannot predict failure less than eight hours out then equipment could leave the logistics pulse phase and fail during the next eight hour combat pulse phase. The cost to achieve this accuracy level may prohibit the use of sensors on a large scale.

Lastly sensors may serve as a bottleneck for maintenance operations in AAN. The current trend is a growing gap between computer and communications technology and that of sensor technology. Studies have shown that computer/communications capabilities are doubling every two years. Sensor capabilities, though increasing, are not increasing at or near this pace.<sup>48</sup> Thus computer and communications assets may be waiting for information from onboard sensors. Sensors may become inundated with information from the vehicle that it is monitoring.

The AAN maintenance concept will be anything but simple. It is a complex system, which depends upon many variables such as sensors, communications, AAN Strike organizational structures, timing and the human element. A failure by any one of them could lead to failure of the entire maintenance system.

One of the most critical principles to examine is flexibility. If the maintenance support concept for AAN does not possess the flexibility to deal with changing requirements, ability to surge to take advantage of opportunities or if it cannot support forces other than the BF then its utility is limited.

The maintenance support for the AAN BF needs to possess the robustness to meet changing requirements on the battlefield. The AAN battlefield is expected to be more fluid, quicker and non-linear than ever before. This will require an ability to quickly cope with the ever changing requirements and priorities. While the United States has always sought to end conflicts with wars of annihilation it seldom achieves this.<sup>49</sup> The AAN premise is of a quick strike, quick in and out scenario. The AAN maintenance structure is designed for such an operation. However, the Army needs to retain the capability to stay for prolonged periods of time because a potential enemy may see this loss of capability as a weakness. While many see a larger logistical footprint as a hindrance it can also be an advantage by allowing the United States to stay longer and provide more flexibility.

While the United States plans for quick decisive victories, as do most other large countries, second tier and third world nations will prefer longer sustained conflicts. The object of these conflicts is to inflict increasing tolls in both material and manpower on their adversaries.<sup>50</sup> This leads to the development of doctrine and

organizations to meet such a challenge. Divisional and larger sized conflicts that are mid- or high-intensity in nature will be the least likely to occur in the next century. But many experts expect them to happen. However, we cannot discount them due to their less frequent occurrence because they are the most dangerous conflicts and have the greatest implications.<sup>51</sup>

The AAN maintenance support concepts need to have the flexibility and robustness to deal with longer than anticipated operations. While the AAN BF may eventually achieve the ability to deploy to anywhere on the globe in a few hours its dependence upon Force XXI and legacy force units could be its weak link. These forces may take days if not weeks to arrive in a theater of operations. Compounding the problem is that these force's logistical elements, which support the AAN maintenance concept, will be among the last of these more conventional forces to deploy from CONUS. Even our current doctrine warns of the dangers of depending too much on a quick strike victory. The June 1993 version of FM 100-5 alludes to an opposing force attempting to stop the United States from winning too quickly with a minimum of casualties and not allowing a decisive outcome.<sup>52</sup>

The AAN maintenance support would have to receive augmentation to possess the ability to surge. The organizational structure for the Battle Unit Support Element calls for only ten personnel.<sup>53</sup> This gives the BF a total of 60 mechanics in the Battle Elements. If decisively engaged these personnel would quickly become overwhelmed with a maintenance backlog. Conversely, if a real opportunity existed to take advantage of these same 60 personnel would likely not be able to surge their efforts to support the situation.

As in today's Army divisions the AAN maintenance structure will have to be augmented with maintenance support from non-divisional Direct Support Maintenance Companies from Corps Support Battalions of a Corps Support Groups. The augmentation to the AAN BF will likely increase over the current amounts to a divisional forward support battalion as the speed of operations grows and dispersion increases. With BF elements out of support for up to eight hours the ability to surge during this period will not exist. The commander will lack the flexibility to weight a main effort to influence the outcome at a particular decisive point during the operation. The BF will only have what it has and non BF maintenance support elements will be too busy conducting current logistical pulse operations or planning for the next logistical pulse.

The synchronized timing of the combat and logistical pulses lends the operation to not being able to surge during a particular point in the operation. By their very nature these pulses put everyone, combat as well as support organizations, in the mindset of a schedule or routine. If something throws the schedule out of sync, either by slowing it down or speeding it up, organizations will have a difficult time breaking out of the mental mindset of the eight hour combat pulse and the 12 hour logistical pulse. This will include the maintenance elements of the AAN BF.

In recent history, to include ODS, commanders have often moved time tables/schedules by hours or days to meet and take advantage of opportunities. The army has always been capable to surge to meet these changing requirements. The nature of proposed AAN operations will undoubtedly create even more opportunities to commanders that they will desire to exploit. However the AAN maintenance structure

will not have the inherent robustness capability to meet surge requirements because of its streamlined logistical approach.

The last area of flexibility to analyze is the AANs maintenance structures ability to support non-AAN forces, sister services and allies. The pattern of joint and combined operations is expected to proliferate in the future. The current trend is not just a temporary scene on the operational landscape. Multi-national commitment and joint operations will be key to the successful operational execution and termination in the century to come.<sup>54</sup>

The specialized nature and expense of AAN equipment and technologies will make it incompatible with allied and sister service systems. Indeed, as previously mentioned, it will be exceedingly difficult for the army itself to cross level maintenance support between AAN organizations and other forces in the army structure. Most conflicts will be UN/coalition (e.s. NATO) based. Thus, there is a question of compatibility of forces to include the U.S. CSS/maintenance link to other nations. The Army may be required to provide some maintenance support to these allied forces. As much as the Army does not like it the requirement to provide maintenance support to coalition allies will not just go away. If these nations are to take part in multi-national operations to lend the operations legitimacy then this requirement will only grow.

The current gap between U.S. Army maintenance capabilities and those of other nations will only increase with the procurement of AAN technologies.<sup>55</sup> Not only do most other countries not have the technological capability to field such systems they will most likely not have the funding available to even procure the technology. Thus inter-operability gaps will occur between the AAN and allies of coalition forces.

Again, the AAN maintenance support structure as it exists cannot provide support to sister services let alone allies. This will require the AAN to be augmented with conventional CSS/maintenance capabilities such as a DS maintenance company from a CSB. This will reduce the utility and flexibility of the AAN employment options in the future.

The AAN BF maintenance support concept lacks the flexibility to meet the quickly changing requirements of the AAN environment. It not only lacks a robustness to surge but also interoperability with more conventional force structures.

A key component to the AAN maintenance support concept being successfully implemented is its economy or affordability. The ability for a Revolution in Military Logistics (RML) is what makes the concept work. The enablers such as ultra-reliable vehicles, UAVs dedicated to logistical flow, sensors and assured communications funding directly impacts the concept. The key to the RML is the funding of these and many other systems. If the funding is lacking in development and procurement of the technologies then the army will achieve little or no change over the way it does business today. Currently, with Force XXI many of the enablers are unfunded or lack support throughout the Army.<sup>56</sup>

Since ODS, military budgets have declined from 25% in FY89 to 18% in FY97 of the GNP.<sup>57</sup> Despite this, many Americans still recognize the need to modernize the military. The Luntz Poll of 1,000 people taken in February 1995 showed that 79% felt that it was still important to modernize the military.<sup>58</sup> This has a residual effect of hurting research and development of the key enablers, which the concept depends so heavily upon. This scenario follows the nations trend to cut military budgets and turn

inward after a large conflict. With the end of the Cold War, defense is not seen as a priority and as such military appropriations have been the first to be affected to pay for the peace dividend.<sup>59</sup>

The enablers must be seen as capital investments in the Army over time that will reap benefits in the future. The future of the logistics systems of the next century will depend in large part to the funding they receive. Without the funding the enablers that support the maintenance support concept an RML will not be achieved which will lead to no Revolution in Military Affairs (RMA), i.e. a reduced logistics tail that promotes mobility and deployability, which the AAN depends upon. Finally, no RML will occur without a logistics modernization.<sup>60</sup>

An example of this dilemma is occurring currently in the 4<sup>th</sup> Infantry Division. This division, a Force XXI unit, has had its organizational structure changed to support the Force XXI concept. However, the enablers to support intransit visibility, total asset visibility and the movement transportation system have not been funded or fielded totally. This has a direct impact on the divisions' ability to receive and track critical Class IX from the factory or depot system.<sup>61</sup> This has a direct link to the AAN maintenance support concept in that it to relies heavily on seamless support from the factory or depot system. The loss in speed in receiving Class IX coming to the AAN BF would make the proposed logistical pulse an exercise in frustration.

One method of offsetting the costs of the new technologies to enable the AAN maintenance support concept to work is to use existing or hybrids of current organizations. An example is to take the current non-division DS Maintenance Company and put it in the AAN BF. This unit, modularized to an extent, equipped

with the enablers and trained to use them could perform the maintenance/Class IX functions during the logistics pulse phase. When augmented with the appropriate number of maintenance support teams (MSTs) the unit could send these teams forward with the AAN BF Battle Elements to provide support during the combat pulse phase. These companies with their MSTs could give the AAN BF the maintenance support it requires along with the robustness of structure to support prolonged operations and provide surge capability.

While there would be a cost associated with such an organization such as train up, the cost savings could be immense. Savings could be incurred by not standing up organizations and movement of personnel to them. The use of his unit would also reduce turbulence and change in the army as the units would merely transition into AAN BF maintenance elements. They could still provide the same maintenance support concept as in current doctrine of fix forward.

The last area to examine under economy of the AAN maintenance support concept is the army's ability to pay for a two-tiered maintenance system. As envisioned now the AAN maintenance system is a stand-alone system with little or no interface with the Force XXI or legacy forces. This system of an army of armies is not an effective use of resources which could lead to stovepipe maintenance systems that compete with one another for funding, personnel and roles. With this type of system the army loses the economies of scale. The morale effects of a competition created by an elitist maintenance subset in the Ordnance Corps of the haves and have nots for equipment, training, dollars and facilities could create more problems that it solves.<sup>62</sup>

The creation of another maintenance system to support the AAN will come into direct competition over funding with existing programs and organizations during a period of shrinking resources. The military, not just the Army, is already short \$20 billion to carry out and conduct routine modernization of vehicles, aircraft and other equipment. So developing the technology to support the AAN maintenance concept will only be half the battle. Paying for it will be the other half.<sup>63</sup> In view that the AAN maintenance system is yet another system in addition to an existing one that is being put into the budget the Congress may not react favorably.

Another aspect of the system of an army of armies is the Reserve Component reaction to it. Since the majority of CSS, including maintenance support, resides in the RC, they will have significant input into any system of support for the AAN. Keeping with past history the RC will undoubtedly want their fair share of AAN technology and desire to be on the cutting edge of active component (AC) capabilities. The RCs desire to be fully integrated with the AC could lead to AAN technologies being sent to the RC in conjunction with the ACs AAN BF. This will also drive up the cost of a multi-tiered maintenance system in the Army. While some may dismiss this notion out of hand it is important to remember that the RC, besides having the traditional history of militia service behind them, has one of the strongest lobbies actively working the halls of Congress.

The funding of the AAN maintenance system may be one of the most difficult roadblocks the concept faces. The army needs to overcome the traditional roadblocks of under funding and fielding of military hardware to fully develop and implement any maintenance support system to the AAN BF.<sup>64</sup> At this point in time it may be

unrealistic to expect the current maintenance support concept, and its inherent enablers, to be fully integrated by the year 2025 as outlined in the AAN support concept. Unless a clearly defined new threat appears and doctrine has to be adjusted to meet it then the technologies required for real change will not be funded to the extent required.

The next principle to examine is attainability. Indeed, can the Army even achieve the technological breakthroughs (never mind the funding issue) to fully develop the maintenance support concept for the AAN BF by 2025. This is a reasonable question to ask because history is full of great ideas that never reached reality. An example is the concept of maintenance free trucks for the Pentomic Division of the 1950s. These vehicles were to have a range of 1,000 miles before a failure in support of the non-linear operations with minimum CSS support that the division was to execute. The concept of these vehicles was determined to be unfeasible eventually.<sup>65</sup>

In general predictions of technological advances has been spotty at best. A review conducted by the staff of The Futurist, conducted in 1997, of scientific/technological predictions revealed some surprising results. Of the 34 predictions made in 1967 only 23 were proven to be substantially or totally correct. Thus predictions were correct only 68% of the time. A deeper analysis of the purely technological predictions reveals an even starker reality. There were 17 technological predictions made in 1967 and only nine came to fruition. This yielded a 53%, or little better than half, success rate for predicted technological advances.<sup>66</sup> There are several reasons for the abysmal failure to predict technological advances 30 years into the future. First, there is an inability to anticipate the underlying factors that effect

scientific trends. An example is the reduced funding for the space program over time that retarded the advances to be made from such a program. One can equate this to reduced funding to army R&D programs. There is also a tendency to be over optimistic about the rate of change. Many forecasters anticipate revolutionary exponential advances in technology when in reality it is more sequential and evolutionary in nature.<sup>67</sup> Lastly, forecasters generally have a difficult time giving exact dates or timeframes for advances in technological change. Many social and political factors can influence technological change so it relies to a certain degree on luck as much as any other thing.

A current example of this, though not maintenance related, for AAN is the change in propellants and caseless munitions by 2025. This is a key concept to the AAN in reducing supply tonnage and thus its inherent transportation requirement to achieve mobility. Experts have analyzed the possibility of magnetic guns and lasers and have come to the conclusion that this will not be possible by 2025.<sup>68</sup> The savings brought on by caseless munitions in transportation, personnel and material handling equipment will most likely not be realized by 2025. If this is not possible then what is the future for on-board sensors, tele-maintenance links with heads-up displays for mechanics, re-supply UAVs and ultra-reliable vehicles?

Another part of attainability to discuss is industries ability to gear up and quickly meet Class IX requirements and put the support in the factory to foxhole pipeline prior to or in conjunction with the beginning of operations with little or no notice. Industry it should be remembered achieves its profits through economies of scale. In other words a steady flow coming off the production line. The surge that is

created for military operations will create diseconomies.<sup>69</sup> If a firm is also producing goods for the private sector this will inhibit the organization from gearing up largely or exclusively to support military operations.

This could have a domino effect that leads to implications in the private sector economy growth that could impact public support for any military operation the AAN is involved with. Besides the public ramifications this could cause there may also be legal considerations for these firms that produce AAN Class IX when they cut off supplies to civilian customers on short notice.

Other issues involving the civilian sector providing Class IX to the AAN BF is the technical nature of the equipment it supports. This will lead to more technically precise repair parts that may require longer lead times to produce. This could prohibit the supplier from effectively supporting the BF. Also there will likely be fewer producers of these highly technical repair parts and there will be a continual shrinking of the industrial base to support the AAN. Instead of three or four suppliers for repair parts there may be only one in the future. In addition to this smaller industrial base that provides the Class IX from the factory there will be a corresponding drop in the depot system to serve as a safety net for 30, 45 or 60 days.

As seen, the problems of applying civilian sector practices to military operations are immense. Perhaps John F. Phillips, Deputy Defense Undersecretary for Logistics, sums it up best by stating “not everything in the private sector is adaptable to our way of doing business (because) we are first and foremost in the business of war”<sup>70</sup>.

The last area under attainability to address is one that has previously been alluded to. That is the question of if civilian contractors can arrive in time and be integrated into the AAN in time to serve as a force multiplier.

Aside from the problems of preparing civilian contractors to enter a theater of operations is the actual process of providing transportation assets for them and their equipment to physically move them. These organizations will not come with their own strategic lift so they will become another customer for USTRANSCOM strategic lift. Compounding this problem is that transportation planners will need detailed figures for passengers and cargo early on or prior to operations to compute requirements.<sup>71</sup> In the short/no notice world of contingency operations, by the AAN these planners may not have time to wait on civilian contractors to provide this information. This delay will likely effect the contractors ability to conduct maintenance support operations in a timely fashion.

Integration of civilian contractors into the AAN will also be a challenge. Often these organizations lack a clear structure for command and control. The people who are part of this civilian force may be unfamiliar with one another much less the AANs chain of command. This can lead to confusion on mission, priorities, procedures and chain of command that lead to inefficiencies that degrade the contractors ability to support the AAN operation.<sup>72</sup> An example of this during ODS was that civilian contractors expedited and received Class IX quicker than the established army procedures. However in the process of doing this they circumvented the army system which was a contributing factor to the systems eventual breakdown.<sup>73</sup>

The ability for the army to attain the concept of maintenance support is questionable at best at this point in time. As shown above its eventual success will depend upon many factors over the next 25 years.

In the area of sustainability the AAN BF maintenance structure needs to support long term operations. Spinning off of this are the effects of operating out of support for periods of time as well as the swarm or pulse logistics concepts impact on sustainability.

One of the paradoxes of future battle is that as combat forces draw down or become smaller the requirement for logistical support becomes greater. The decreases in combat units mean that they will be deployed more times and for longer periods of time due to a lack of reserves or redundancy in force structure.<sup>74</sup> As the AAN BF fits this trend it will become a more valuable national asset. As a result it will have to be kept at a higher state of readiness and will require more intensive logistical (i.e. maintenance) support when it is deployed. Therefore there will be a need for a robust maintenance capability to support the AAN BF.

During AAN wargaming the opposing force (OPFOR) could not match the AAN BF's firepower in a symmetrical method. The OPFOR came to recognize that the advantage in firepower the AAN BF had eroded over time. Thus the OPFOR moved to complex terrain in urban, suburban and forests/mountains environments to prolong the battle.<sup>75</sup> Maneuver became secondary and the operations began to take more time and effort to complete. The net result was that the AAN BF became involved in protracted and expensive warfare. As this combat in complex terrain occurs it increases the maintenance requirement due to higher attrition caused by the difficult terrain.

The requirement for the AAN BF to possess a robust maintenance capability is evident. Without augmentation from traditional CSBs/CSGs the present structure lacks the ability to conduct support in prolonged operations. The lack of robustness to return combat systems quickly to the force over an extended period of time will play into the hands of a potential enemy who seeks to prolong the conflict as long as possible.

Having the BF maintenance elements out of support for periods of time will accelerate this erosion process. The proposed outsourcing of maintenance capabilities to civilians leads to a loss in a core competency of the U.S. Army. The Army's ability to conduct continuous long term operations is dependent in part upon its core competency in repairing and returning combat systems to the maneuver commanders.<sup>76</sup> This capability has long given the army an advantage over potential enemies. If this core competency is lost or diminished it could lead to a loss in utility of the AAN BF.

Again during AAN wargaming the OPFOR capitalized on this loss of core competency in the AAN BF by using cheap weapons of mass destruction against APODs and SPODs. This achieved the effects of slowing down or interdicting the arrival of follow on Force XXI and legacy units which could provide, in addition to many other logistical functions, such as maintenance support.<sup>77</sup> By slowing down these follow-on forces the OPFOR neutralized these unit's ability to affect the outcome of the conflict. In the end, the AAN BF suffered greater casualties, equipment losses and spent more time to achieve mission success. However, the operations were far from decisive in nature and better reflected traditional attrition warfare.

The AAN BF maintenance support concept needs to address this weakness of being out of support from CONUS or an intermediate staging base. By relying on its

machines and technology to solve problems in maintenance support it is also bound by them.<sup>78</sup> Thus, there needs to be something more to alleviate the shortfalls in technology or the doctrine that supports it. AAN wargaming demonstrated this weakness in being out of support.

The loss of secure lines of communications means the Army cannot depend upon transportation alone to solve the problem. The success of the army in past operations has been its ability to pre-position logistical assets and stocks to conduct continuous operations.<sup>79</sup> The AAN wargame has shown that much needed supplies and logistical assets may not always arrive to the BF. The out of support concept impacts on maintenance support which will have far reaching implications for the AAN commander.

The effect of the logistics pulse on AAN operations could be immense. If the AAN BF leaves the combat pulse where it has been out of support the task to repair equipment in a 12-hour period may not be feasible. The maintenance efforts during the logistics pulse could become more of a band aid approach as opposed to a force multiplier effort. By compacting significant maintenance operations to a 12-hour period of time the ability of maintainers to effect the outcome of operations is limited. Instead of a continual process of constant repair and return the system of repair will be one of starting and stopping points. There is a loss of continual sustainment. Potential enemies will see a force that is continually growing weaker over eight hours of combat operations. Thus, the AAN BF loses its ability to be a self-organizing force during the combat pulse. In short it only grows weaker and can never hope to maintain momentum.

By its very nature the AAN BF maintenance support structure does not support sustainability. Its logistics pulse concept in addition to the out of support periods contradicts the sustainability principle to provide support on a constant basis with an emphasis on long term support.

The last criteria to analyze is survivability. If the AAN BF maintenance structure cannot withstand the rigors of combat over an extended period of time then the commander will lose his combat multiplier effect. Force readiness will erode over time as previously alluded to. Determination of the maintenance structures center of gravity and its inherent vulnerabilities reflects the concepts survivability and the risk associated with it. If an opposing force cannot defeat the AAN BF in a direct method what will the impacts be upon the maintenance support concept if the AAN BF is attacked asymmetrically? A thorough understanding of these points can help determine the AAN maintenance support concepts survivability.

With its reliance on aerial delivery and pick-up the AAN maintenance structure has an inherent weakness to its survivability. If the aerial component is unavailable for pick-up of non-operational equipment or the equipment cannot be recovered to the pick-up location in time this equipment will likely have to be left behind. The absence of secure ground lines of communications by which to recover inoperable equipment may lead to a further erosion of combat power over time as combat systems are left behind due to a lack of recoverability.

The AAN concept makes the assumption of a prepared theater with a prepared infrastructure.<sup>80</sup> As a result the AAN BF maintenance structure is dependent upon APODs and SPODs. This dependence is illustrated by its requirement to receive Class

IX supplies as well as preparation for the logistical pulse phase. Additionally the AAN maintenance structure is highly dependent upon communications for two reasons. They are the transmissions from vehicle sensors to planners/maintainers and the requisition of Class IX from an ISB or CONUS. Thus, two decisive points exist for the maintenance concept center of gravity: APOD/SPODs and communications links.

Through conventional means or not the army can expect asymmetrical attacks against the AAN in the future.<sup>81</sup> If an enemy can adequately disrupt operations at an APOD or SPOD or disrupt communications links then the maintenance support concept will begin to fail. By effectively attacking these DPs then an enemy can gain the upper hand despite not possessing the capability to fight force on force. Methods he may employ against APODs/SPODs are chemical munitions, precision guided munitions, extensive air defense artillery fires, special forces, terrorists and possibly cruise type missiles.<sup>82</sup>

One cannot take for granted that the United States will continue to enjoy its current advantage in information operations into the future. Nations, such as Russia, are already beginning to develop and experiment with "Trojan Horse viruses"<sup>83</sup> to disrupt or deny communications and information systems capabilities. These viruses can attack not only ground-based systems but also those in space as well. The development of these latent viruses that lay dormant and undetected in computers and satellite systems for years and then activate when needed in time of conflict could have a devastating effect upon the AAN BF maintenance support concept. AAN BF planners/maintainers could lose visibility of force readiness during the combat pulse and therefore enter the logistics pulse with a blind eye towards the actual requirement.

If they cannot pass back Class IX requisitions to the ISB or CONUS the maintenance systems effectiveness will quickly diminish. The ability of the maintenance system to compensate for this loss of communications will be degraded because there will be no large stockage of repair parts in theater.

An example of this potential threat was apparent in army wargames depicting battle in the year 2020. In this wargame the Army's reliance upon satellite communications became a definite liability. According to the Defense Information Systems Agency over 95% of all defense communications and computer links travel over the relatively unprotected Public Services Network (PSN). In 1994 alone there were over 231,000 penetrations of the PSN.<sup>84</sup>

Even if the communications and information links are not effectively disrupted the closure of APODs and SPODs would have a detrimental impact because there would be little or no Class IX supplies arriving. Again the minimal amount of stocks on the ground would not suffice to support the force.

The DPs of the AAN maintenance support concept, APODs/SPODs and communications links, can be adequately addressed by a potential foe with little or no risk to himself. These COGs will present an enemy with lucrative low risk targets to address with high payoffs when in conflict with the AAN BF.

Again, the area of risk acceptance by the AAN BF commander comes into play in regards to the maintenance support concept. Due to the aforementioned movement of an enemy into urban areas in order to avoid the effects of direct conflict with the AAN BF the battles will become more protracted and costly than is currently anticipated.<sup>85</sup> This will result in a greater CSS capability to support the operations.

Due to the increased length of the operations when the BF is out of support and coupled with reduced maintenance assets to support the BF when it completes its combat pulse there will be an increased emphasis on the transportation system.

If the space UAVs for logistical support are not funded or developed the Army will still rely upon a fleet of surface ships for the bulk of Class IX shipments and complimented by U.S. Air Force aircraft. While there is development underway to increase the speed of the faster ships from 30 to 75 knots this will simply mean that the time in transit will roughly be cut in half.<sup>86</sup> Thus a two week sail time will only be reduced to about five or six days. Though this is a substantial savings in terms of today's standard for shipments it will not suffice for the AAN BF operational tempo of eight hour combat pulses and 12 hour logistical pulses. This future transportation system would not be able to impact future battles much less the current battle. In other words if the transportation system that supplies Class IX cannot keep pace with the AAN BF operations pace the risk to out of maintenance support operations may become too high.

Lastly, in regards to survivability, is the ability to develop the technology that supports the maintenance concept to a degree that it is hardened against the rigors of battle in 2025. Potential enemies like the Russians "Trojan Horse" virus can be expected to close the technological gap that the United States currently enjoys. By the year 2020 the ever increasing availability of computer chips at lower prices will allow even relatively poor nations the ability to deal with the AAN BF.<sup>87</sup> Therefore it would be faulty to assume that the armies technological devices that support the AAN BF maintenance concept will be immune from effective attacks. While some measures

may be taken to alleviate this threat the army will sustain some degree of “technology casualties” in the future. These casualties will undoubtedly effect logistics, to include maintenance, from the start of operations in the future.<sup>88</sup>

The evidence suggests that the maintenance support system concept for the AAN BF has vulnerabilities that reduce its survivability. The systems soft skin DPs of APODs/SPODs and communications links will be difficult to protect against a motivated and aggressive foe. The risks associated with the survivability of the AAN BF maintenance structure could become too high and thus lead to a reluctance to employ the BF to any situation where the Army could face a competent enemy.

### **SUMMARY OF FINDINGS**

The AAN BF maintenance support concept does not truly support the seven Principles of Logistics outlined in Joint Publication 4.0. By varying degrees the concept misses the mark in relation to responsiveness, simplicity, flexibility, economy, attainability, sustainability and survivability. Enough evidence is present to indicate that the maintenance support concept will require more refining in the future. Fortunately the army still has a quarter of a century to refine this support concept so that it will better support the AAN BF.

One of the principle reasons why the shortfalls to the seven Logistics Principles have not been apparent to date is simple. The maintenance support concept has not been played during the AAN wargames. During the Winter Wargames of 1997<sup>89</sup> and the Spring Wargames of 1998<sup>90</sup> the maintenance support concept was not part of the simulation. One reason given why the concept was not wargamed was due to the short

duration of the proposed operation. However as demonstrated here that could be a highly questionable assumption. Despite not being part of the simulations the need to examine the maintenance support concept has been recognized by most of the players who have taken part in these wargames.<sup>91</sup> Without actually having maintenance as a part of the wargaming process during this concept phase of AAN development the army runs the risk of continuing down this path only to find out in 10 or 20 years that the AAN BF cannot be sustained by its proposed maintenance structure. By not examining the maintenance support structure concept honestly and with a critical eye the concept developers could be putting the army in an unenviable position in the future. In order for this not to happen the army must implement the maintenance function in any future AAN wargames.

### **PRINCIPLE CONCLUSIONS**

There are four basic conclusions from this analysis of the AAN BF maintenance support concept. These are its inherent cost, availability of technology, perceived advantage of AAN technology and the reliance upon by technology by the AAN BF maintenance structure.

The cost associated to procure all the technology that the proposed AAN BF maintenance support concept will require may become too prohibitive. While the AAN will only constitute a small part of the active army its costs may very well be disproportional to its size. It is not inconceivable that parts of the AAN BF support structure may not be funded entirely. Historically, the CSS elements have been the bill payer for this shortfall in funding in the past (e.g. Pentomic era). This shortfall then is usually accomplished by passing back divisional requirements to non-divisional (i.e.

Corps level) units or possibly to the reserve component. An example of this is the current dependence on the RC for CSS assets for large scale operations. With the current deployment time for Force XXI and legacy force brigades of C+4 and C+12 for divisions this will not adequately support the AAN BF in time.<sup>92</sup> If this happens to the AAN BF maintenance support concept then there will be large gaps in capabilities to provide support to the AAN BF.

While technology continues to advance as we enter into the 21<sup>st</sup> Century it may not move quickly or far enough to provide the enablers for the maintenance support concept by 2025. Even if the technology is developed by 2015, just 17 years into the future, to support the concept it may not be available to the army by 2020 or 2025. Additionally, this first generation of new technology may very well not function with as much reliability as envisioned.

The perceived advantage given to the AAN maintenance support concept could prove only temporary or even illusionary in the future with the advent of new technologies. With the proliferation of newer and cheaper technology worldwide in countries both rich and poor the costly advantage, if there is one, of the AAN BF may only last just a few short years if that long. Nation states as well as non-nation state actors with sufficient amounts of capital will most likely be able to procure technologies that will counter the AAN BF and its maintenance support concept. Indeed countries such as Russia and China have already begun to do so as depicted earlier. Minimal disruption of the maintenance support concept technologies for even a short period of time could lead to an erosion of combat readiness of the AAN BF in war time.

This leads to the last conclusion of the maintenance support concept's over reliance on technology. The lesson of the Pentomic Division of the 1950s is as relevant today as it was 40 years ago. Any concept that has an over reliance on technologies to solve complex problems in a combat environment should be viewed with caution. These concepts usually ignore or downplay the efforts of men and the human factors that determine the qualitative difference in battle.<sup>93</sup> The streamlined maintenance support structure for the AAN BF depends heavily on technology to perform the fix function. No longer will there exist the number of maintainers or Class IX supplies to provide surge capability or compensate for disruptions in supply flow. If an enemy can kill the maintenance support technology then the AAN BF will quickly become non-combat effective.

### **RECOMMENDATIONS**

This analysis is important to today's Army for one reason. The Army has been down this path previously. The Pentomic Division's concept and design were very similar to the AAN concept.

The Army was able to recover from the Pentomic Division because the equipment and technology used to support it were basically already in place upon its inception. Therefore, the overall cost in equipment procurement was negligible in comparison to what it will be for AAN.

However, recovery from a poor leap ahead in technology and doctrine development for AAN will not be so easy due to its high cost of completely new equipment. Doctrinally the Army needs to examine five possible additions to implement to the existing AAN maintenance support concept.

First, there should be a development of a viable robust back-up maintenance system for the AAN. Perhaps this function could be given to the RC so they will be more fully integrated into the concept of support and become a player in its development. This will reduce the tension that could develop between the elite AAN BF and the rest of the Army culture. A subsidiary effect would be that the RC could give strong support for AAN funding with its strong lobby in Congress. Doing this will allow the AAN BF commander greater flexibility in operations with the BF and add redundancy to deal with extended operations.

Next there should be some allowance for maintenance operations (other than vehicle crew capabilities) during the combat pulse. This could include dedicated maintenance contact teams with appropriate transportation system assigned to each Battle Element to allow it to keep up with the BF's maneuver elements. A contact team, besides re-emphasizing the fix forward concept, would serve as the combat multiplier by conducting BDAR to repair combat systems immediately. This would again allow for more sustained operations over time, higher equipment availability, reduced requirements for recovery assets, and a more manageable logistics pulse.

While the importance of specialized skills and training required by personnel serving with the AAN BF is understood, attempts should be made to integrate more of the Army population. By conducting training courses for regular force maintainers the Army could have a ready supply of replacements that could easily transition from Force XXI or legacy forces during time of war for replacement purposes to offset casualties. Training could be conducted on a recurring basis for personnel with appropriate proficiency exams or evaluations and specific skill identifiers awarded to

those maintainers meeting the required level of skills. The apprentice program envisioned in the concept of support for the AAN BF should not be done away with but rather enhanced with this additional recommendation.

Fourth, since civilians, both private sector and government employees, will play a large role in the maintenance of AAN equipment a full-time organization should be dedicated to the AAN BF. This organization, similar to the present day LSE, would be an active organization that is stood up all the time. It could be co-located with the AAN BF at its CONUS station. This civilian organization could either be from the Army Material Command or through a government contract with a private firm. This organization could train and exercise with the AAN BF during peacetime, be an active participant in mission planning, develop command relationships and trust without the friction and stress of battle, and be alerted in conjunction with the BF.

Lastly, there should be a concentrated effort to reduce the reliance of aerial re-supply for Class IX items. The cost to deliver all Class IX items may prove to be too prohibitive in the future. Reducing this reliance will make this concept less vulnerable by expanding the modes and methods by which to receive Class IX.

Due to the long-term implications in equipment procurement, personnel turbulence, training and organizational structures the Army will need to continue to refine the maintenance support concept for the AAN BF. The Army must be careful not to repeat the mistakes of the past and pass them onto future leaders and soldiers. The costs for such present day non-vigilance could prove catastrophic to the army in the future. Our experiences will be the most important asset we may leave to future generations of soldiers.<sup>94</sup>

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