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AMMUNITION: A VITAL INGREDIENT IN STRATEGIC LOGISTICS

BY

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The deployment of United States forces to an unimproved theater in the Middle East for Operation Desert Storm was the most extensive endeavor our country has undertaken in many years. The demands placed on the logistics system were enormous; they came from massive usage rates, long lines of communication from the United States to the battlefield, and an incredible requirement for all types of transportation. Operation Desert Storm tested two primary strategic capabilities: projection of power, which involves rapid strategic movement of forces and materiel to the battlefield, and sustainment of the military forces, which provides the projected force with the means to fight. One of the greatest concerns was ammunition sustainability. Five battalion commanders participating in Desert Storm were interviewed about ammunition support during Operation Desert Storm. Analysis of Operation Desert Storm, including these commanders' perceptions of ammunition support experienced during the operation, provides insight for support in future battles. The success of Operation Desert Storm relied heavily on allied support, but the actual use of force depended on the United

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States' capability to project power and sustain that power on the battlefield. The ability to produce, transport, and maintain a continuous flow of ammunition proved instrumental to providing that capability and will continue to be a vital ingredient during future conflicts.

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AMMUNITION: A VITAL INGREDIENT IN STRATEGIC LOGISTICS

AN INDIVIDUAL STUDY PROJECT

by

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ABSTRACT

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The deployment of United States forces to an unimproved theater in the Middle East for Operation Desert Storm was the most extensive endeavor our country has undertaken in many years. The demands placed on the logistics system were enormous; they came from massive usage rates, long lines of communication from the United States to the battlefield, and an incredible requirement for all types of transportation. Operation Desert Storm tested two primary strategic capabilities: projection of power, which involves rapid strategic movement of forces and materiel to the battlefield, and sustainment of the military force, which provides the projected force with the means to fight. One of the greatest concerns was ammunition sustainability. Five battalion commanders participating in Desert Storm were interviewed about ammunition support during Operation Desert Storm. Analysis of Operation Desert Storm, including these commanders' perceptions of ammunition support experienced during the operation, provides insight for support in future battles. The success of Operation Desert Storm relied heavily on allied support, but the actual use of force depended on the United States' capability to project power and sustain that power on the battlefield. The ability to produce, transport, and maintain a continuous flow of ammunition proved instrumental to providing that capability and will continue to be a vital ingredient during future conflicts.

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"Once again the logistic tail wags the fighting dog," observed General Norman Schwartzkopf during Desert Storm. He was quick to acknowledge the impact of logistics on battle planning.[1] The deployment of United States forces to an unimproved theater in the Middle East for Operation Desert Storm was the most extensive endeavor our country has undertaken in many years. The demands on the logistics system came from massive usage rates, long lines of communication from the United States to the battlefield, and an incredible requirement for all types of transportation assets. Operation Desert Storm tested two primary strategic capabilities: projection of power and sustainment of the military force. Projection of power calls for rapid strategic movement of forces and materiel to the battlefield. Sustainment provides the projected force with the means to fight; it is vital to success on the battlefield. Ammunition sustainability is one of the greatest logistic concerns of our warfighting commanders-in-chief (CINC).[2] Analysis of Operation Desert Storm, including battalion commanders' perceptions of ammunition support experienced during the operation, provides insight for support in future battles, especially regarding strategic logistics.

As defined by the Sustainability Assessment Task Force, sustainment is:

> the ability [of forces] to maintain the necessary levels and duration of operational activity to achieve military objectives . . . a function of providing for and maintaining those levels of ready forces, materiel, and consumable necessary to support military effort.[3]

Sustainment includes materiel, facilities, fuel, trained and equipped manpower, mobility, and resupply. Simply put, ammunition sustainment involves providing a continuous supply (in the proper amount) of ammunition to a using unit, thereby assuring uninterrupted support throughout a battle. The

ammunition moves from a storage facility in the continental United States or supporting theater across the sea through a theater port, corps support area, to an ammunition supply point or to a divisional/brigade support area. Since transportation and distribution are critical to the ammunition support system, plans must include rapid resupply over extended distances. The burden placed on the transportation system to safely transport, store and handle ammunition is indeed formidable.

Ammunition presents considerations not characteristic of other classes of supply. Its high volume, weight, volatility, transportability, compatibility, security, safety, and high cost require intensive management. Even in peacetime, high cost items such as the new "smart" ammunition are in short supply and must be carefully managed. Movement of ammunition requires extensive planning. Transferral from a seaport to the tactical area involves an accurate count, identification by lot number, and separation by hazard classification and quantity. Further, it must be blocked and braced to minimize the danger to personnel. The ammunition is then prepositioned at an ammunition supply point or trailer transfer point in the divisional area for transportation to the forward area by the using units.

Because ammunition is hazardous, it requires additional safety precautions. Each type of ammunition has a different degree of sensitivity and is divided into explosive categories and separated by category to reduce the hazard of sympathetic detonation, should an accident occur. Additionally, some explosives and propellants are sensitive to heat; improper storage can cause erratic performance, malfunctions, and premature detonations.

Ammunition is a prime target for the enemy, so separation distances required for safety present security problems. These separation distances

expand the area which must be secured. Additionally, ammunition units do not have the capability to protect large quantities of ammunition when stored in bulk at field locations. This situation diverts combat or combat-support units to assist in securing ammunition supply points.

In Operation Desert Shield/Desert Storm, responsibility for theaterwide logistic support of U.S. soldiers and their equipment was assigned to the 22d Support Command (Theater Army Area). The 22d Support Command (SUPCOM), along with the 1st Corps Support Command from the XVIII Airborne Corps and 2d Corps Support Command from VII Corps, sustained more than 300,000 soldiers, 12,400 tracked combat vehicles, and 114,000 wheeled vehicles.[4]

Seaports of debarkation were established at Ad Damman and Al Jubayl; the aerial port of debarkation was at Dhahran. A critical challenge in Saudi Arabia was getting heavy tonnage of ammunition from the sea port of debarkation to the using units. Existing roads consisted mostly of crushed rock and sand. With heavy tonnage and high usage, these roads quickly deteriorated.[5]

Initial prepositioning of support bases involved movement of SUPCOM units and supplies form Dhahran and Al Jubayl north to main supply route (MSR) Dodge. Logistics bases were built along MSR Dodge near King Khalid Military City (KKMC) and along MSR Sultan, south of KKMC. These logistics bases were designated Alpha, Bravo, and Delta; they contained all classes of supplies supporting both U.S. Army Corps and echelons above corps. A forward line of communication was established at KKMC. Supplies from corps level were transported primarily on tractor trailers. Given the projected consumption rates and extended lines of communication, it was anticipated that supplies would be consumed faster than they could be replenished. Thus, to provide

support for deep penetration during the ground offensive, additional support bases would be required.[5] As the two Corps moved to their attack positions, plans for support and sustainment of the ground offensive called for the establishment of two provisional logistics bases to support both corps. Logistics bases Charlie and Echo were established ninety miles forward from existing logistics bases. Due to the deep penetration into enemy territory and the shortness of the battle, the logistics bases were never fully established. Instead, trailer transfer points were used to move supplies forward.

The positioning of supplies at logistical bases was critical to the ground offensive. Ammunition was broken down into combat-configured loads at the ammunition supply point (ASP) to facilitate distribution.[8] Anticipation of requirements and planning for the establishment of essential ASPs were necessary. Forty-five days of supply of class V (all ammunition) were prepositioned by the beginning of the ground offensive on 24 February. Computation of the daily supply projected 450 truckloads (or 9,000 tons) of ammunition for VII Corps and 400 truckloads (or 5,000 tons) for XVIII Airborne Corps.[9] The largest movement requirement, accounting for over half of the transportation requirements, was ammunition. Since United States truck assets were insufficient to meet all lift requirements, Saudi Arabian and Egyptian military truck units and commercial vehicles were used to make up some of the short-fall. Also, trucks donated by German, Italian, and Czechoslovakian governments were used. Commercial vehicles were driven by U.S. military volunteers, Saudi, Pakistani, Indian, Filipino, Korean, and Turkish contract drivers. Heavy truck operators became the most critical logistic skill in the theater.[10]

Logisticians must view ammunition support from the using unit's perspective. Commanders must have confidence in the quality and availability of ammunition to concentrate on their mission. Five battalion commanders participating in Desert Storm were interviewed about ammunition support during this operation: two armor battalion commanders from the 1st Infantry Division and the 1st Armor Division, an artillery battalion commander from 1st Infantry Division, a forward support battalion commander from the 3d Armor Division, and an ammunition battalion commander assigned to a corps support group.

While ammunition was handled differently in each division, all battalion commanders interviewed contended they had sufficient ammunition available to support their operations. The general perception of the using units was that ammunition availability was not a problem; however, they encountered some difficulties with distribution and transportation. Since the conflict was relatively short, sustainment of the ammunition system did not become an issue.

One armor battalion commander stated he had enough ammunition, but he felt the distribution system above division was unacceptable. On its arrival in Saudi Arabia, this particular battalion was authorized an additional forty Heavy Expanded Mobility Tactical Trucks (HEMTT) to transport ammunition and fuel. These additional HEMTTs proved indispensable in meeting the battalion's transportation requirements. Ammunition was picked up at division (approximately two hours each way) and brought back for distribution within the battalion. Ammunition was not always available at the division's ASP as promised. The brigade to which this armor battalion was assigned was the only one using 105mm tank ammunition, yet it was difficult to obtain at the supply point. In some instances, battalion personnel traveled to other ammunition

supply points or to the port for ammunition. In addition, it took two weeks to get the ammunition basic loads in each company properly distributed after they arrived in Saudi Arabia. This armor battalion commander did not believe it was necessary to use peacetime accounting procedures for ammunition, which were manpower-intensive. He was required to inventory ammunition every night, at the expense of other, combat-critical tasks. Ammunition was stored primarily on the pallets in the HEMTTs to minimize handling and provide rapid movement. There were insufficient quantities of newer tank ammunition to use the same ammunition against all enemy tanks. As a result, the different series of tank ammunition had to be cross-leveled between the three armor battalions. The battalion was issued 700, 800, and 900 series ammunition for its 105mm main guns. Initially, the 700 and 800 series were used against enemy T55 and T62 tanks during the breaching operation. On the second day of the breaching operation, it was necessary to off-load the 700 series and load the 900 series for use against the T72 tanks of the Republican Guard.[11]

The second armor battalion commander also indicated he had sufficient ammunition. In his battalion, the basic load of ammunition was up-loaded on each weapon system and additional ammunition was loaded in all available space on organic support vehicles. Every company loaded as much ammunition as it could carry into battle. There was enough ammunition for the initial stages of the battle, but this commander was concerned with sustainment if the battle had continued. Since the forward support battalion did not have enough transportation assets to ship ammunition to the armor battalion, the armor battalion commander anticipated sending vehicles back to division for resupply. Due to the extended lines of communication, this trip was a considerable distance. When the unit was not moving, ammunition was

down-loaded from support vehicles to allow for transportation of repair parts, tank engines, and other supplies. During the ground campaign this battalion established logistic support teams for each company; the unit's first sergeant assured that ammunition and fuel was brought forward to support each company.[12]

The artillery battalion commander said he had more ammunition than he could move with organic vehicles. Every HEMTT held one and a half times what it would normally transport. The artillery batteries carried basic loads with each weapon system and hauled duplicate quantities (more than 6000 rounds) on organic vehicles. Ammunition was not delivered. But when the battalion ammunition officer went to pick up ammunition, it was never located where it was reported to be. After the enemy lines were breached, the battalion ammunition officer was required to resupply from the original ammunition supply point, which had not relocated after the breaching operation. The battalion supply truck, loaded with fifteen days of supply, was not sufficient for all transportation requirements; however, other than the supply truck, the only vehicles available were the ammunition vehicles. The batteries' HEMTTs, approximately twenty of them, were consolidated in the battalion. The ammunition was off-loaded, then they were used for resupply of other assets, such as repair parts and rations. Due to the long distances, turn-around time stretched transportation assets even more. If Operation Desert Storm had continued, the artillery battalion commander did not believe he had adequate transportation to meet his resupply requirements.[13]

The commander of the forward support battalion for an armor brigade indicated they had plenty of ammunition. Every supported unit had its weapon systems up-loaded with an equal amount of ammunition loaded on organic HEMTTs

in each battalion. This amount of ammunition was defined as Tier 1 ammunition. Tier 2 ammunition was located at the division support command in brigade support packages. A support package of ammunition was received by the support bat ion prior to the ground war, but was not required. An additional twenty HEMTTs were obtained just prior to the ground war. The forward support battalion commander believed he needed an additional transportation platoon in the supply and services company to handle transportation requirements. Supplies had to move over long distances, and only as transportation became available could a convoy return to the ASP to pick up ammunition. Occasionally, the convoys travelled all the way to the port before they found certain types of ammunition.[14]

The ordnance battalion commander suspected there was sufficient ammunition to sustain the battle, but he did not have visibility of the supported units or the theater level stockage. Usually he did not know what ammunition would be received at the ammunition supply point until it arrived. The support units, which would normally have information about ammunition flow and distribution, reached Saudi Arabia after the combat units. Due to storage limits at the port, ammunition went out to combat units or ammunition storage points almost immediately to get it as close as possible to the using units. As a result, inventory at the theater and corps level of the amounts of ammunition in the hands of particular units was uncertain. Once the support units arrived in Saudi Arabia, accounting and tracking of ammunition to the using units was established as the ammunition units became operational. An ammunition battalion is approximately fifty percent mobile through organic transportation, which requires additional transportation or two trips to move personnel and equipment. Regardless, corps transportation is responsible to

move ammunition in the theater. At the start of the ground war in the Middle East, ammunition went forward on corps stake and platform trailers. The tractors and trailers did not return until after the ground war ended, about ten days later.[15]

Apparently, each unit used different ways of determining the amount of ammunition to be carried into battle. Some referred to it as the unit basic load; others, as Tier 1 and Tier 2. There did not appear to be a common means for determining what was to be carried by each unit. Actually, the units carried all the ammunition they could transport with organic vehicles, less the requirements for rations, water, and fuel. At least one commander noted overloading the ammunition trucks.

A common concern among commanders during a conflict is the availability of ammunition. In some cases, delivery of an uninterrupted supply of sophisticated ammunition to brigade trains did not meet the combat battalion commanders' expectations. Occasionally, the unit would travel as far as the port to pick up ammunition. Using units stored ammunition on vehicles, to the maximum extent possible, to facilitate rapid movement. In several instances, units exceeded their normal combat-configured loads to carry as much ammunition as possible into battle. When the units were in a static position for several days, or when transportation was needed for other purposes, some of the ammunition vehicles would be down-loaded. Due to the distances involved and long turn-around time, sometimes additional vehicles were needed. The commanders indicated they could move their units with organic vehicles, but they had to off-load ammunition to accomplish resupply of other commodities.

Doctrinally, corps transportation moves ammunition, usually on stake and

platform trailers, over improved roads to a corps ASP or an ammunition transfer point (ATP) in the brigade support area. The user picks up ammunition from the ASP or ATP to replenish ammunition used on the battlefield. During Operation Desert Storm, the infrastructure frequently consisted of unimproved roads, and resupply demanded movement over extended distances. In some cases, requirements exceeded United States transportation assets. Contract, host nation support transportation, and pre-stockage points were used to overcome this shortfall. An apparent disconnect between exists between combat unit expectations and planning doctrine. This difficulty may be mitigated by ongoing efforts to modernize transportation units to keep pace with the highly mobile combat forces. However, a change may be necessary either to lower the expectations of combat units through realistic ammunition training or to increase the capability of transportation units.

In wartime, combat units understandably never want to run out of ammunition; so their estimated needs run high to preclude shortage. As a result, some units often have more ammunition than they can safely transport during an attack. Such estimates are thus both inflated and subjective, even though they are constrained by historic usage factors compiled in logistics manuals. Large differences occur between the supply rate estimated by using units and the controlled supply rate determined by ammunition availability. Inflated estimates may cause higher level commanders to doubt an "undersupplied" unit's mission capability. Or a commander in the field whose estimates are not immediately met may begin to doubt the capabilities of his support units. Even if he does not really need as much as he requests, he may get anxious if his perceived needs are unmet. Senior commanders are responsible for allocating available resources and imposing firing discipline

to assure each unit has sufficient ammunition to support its operation.[16] Naturally, commanders want to provide resources their subordinates believe are needed to assure mission success and the safety of soldiers. The underlying theory that it is "better to have too much than too little" predominates most thinking. The inherent uncertainty of battle requirements makes them extremely subjective. Each battle is unique, posing different variables which can be argued, but not proven. Logisticians also want to provide anything within their capability to meet the stated needs of the units they support; however, the constraints are more objective. There is not an unlimited quantity of ammunition, and the use of certain "smart ammunition" must be carefully managed, consistent with the commander's intent, to allocate items in short supply to the units having the greatest need. This is the purpose of the controlled supply rate (CSR) which is approved by the CINC and further allocated through the chain-of-command. Another constraint is the ability to move ammunition and manage its distribution to the user, consistent with the CSR for each unit. The allocation of ammunition is a command function with the logistician acting as the accountant and distributor for the commander. Not all commanders understand this complex system, and they often bypass it to obtain what each believes his unit "needs" to perform the mission. During a battle, commanders address supply discipline when it limits their expectations to accomplish the mission. The realistic allocation and distribution of ammunition must to be planned and practiced in peacetime to allow realistic expectations in wartime. Integration of ammunition planning into operational plans is necessary for sustained ammunition support. Fortunately, due to the brevity of the battle during Operation Desert Storm, there were no critical ammunition shortages.

Operational readiness and ammunition safety requirements are often in conflict in a combat environment. After returning from a field exercise following the ground war, one Operation Desert Shield/Storm unit experienced a fire while performing maintenance on its tracked vehicles. The unit had previously decided that operational necessity outweighed safety concerns and concentrated its entire ammunition basic load on up-loaded vehicles, nearby on the ground, and in MILVANS on their compound. Once the fire reached the up-loaded ammunition, what might have been a $200-thousand combat-vehicle fire erupted into a catastrophe: Fifty-eight personnel were injured. Eighty-four tracked and wheeled vehicles were destroyed. Another seventy-seven vehicles were damaged. Over $40-million worth of supplies, property, and equipment were lost, effectively destroying a battalion size unit's combat readiness.[17] Clearly a balance between combat necessity and safety must be attained to maintain our combat force. Just as movement of ammunition calls for separation of quantities of it, so should it remain separated in a unit's stockpiles. Likewise, unit commanders who understandably seek to arm themselves to the hilt for combat should consider the risk to safety when stockpiling ammunition. Running such risks, if luck fails, can drastically affect combat potential and strategic logistical requirements. In some cases, the shortfalls that arise may not be remediable in time and could be operationally disastrous.

The warfighting CINC's campaign plan must be supported by integrated operational and logistical plans. Early involvement and coordination between operational and logistic planners is essential to success on the battlefield. Logistical forces should be tailored and sequenced to support deployment and sustainability of the force structure, and an equilibrium between combat and

support units must be achieved to assure sustained support of the force. The decision to move combat units to Saudi Arabia prior to combat service support units resulted in a lack of visibility of assets and created distribution problems. In some cases, as noted above, combat units had to go to ports and airfields to get supplies.[18] Transportation of ammunition, as opposed to other classes of supply, was a common problem among the commanders interviewed. Each unit had different transportation assets authorized and available during Desert Storm. Additionally, the consolidation and use of transportation assets was different in each battalion.

Diversion of transportation assets was a significant problem throughout the theater. Trucks and trailers were not down-loaded quickly and were frequently redirected to supported unit missions. As a result, priority moves were delayed, and resupply within the theater was seriously jeopardized.[19] Commanders naturally trust those assets which they control. If the ability to resupply with organic vehicles without off-loading ammunition is required, then additional transportation assets should be added to the unit's equipment authorization. Otherwise, the unit should anticipate the need to off-load ammunition for resupply. In peacetime field exercises, other commodities--such as fuel, repair parts, and food and water--are routinely transported out of necessity; however, the quantity of training ammunition used during a peacetime exercise does not realistically reflect the quantity and transportation distances required in wartime. Often peacetime support can be provided by transportation units for individual units that could not be realistically supported during wartime when large forces require transportation concurrently. The "train as you fight" doctrine should also apply to realistic peacetime movement of ammunition. This is an important

disconnect between training and operational realities.

The vast number of additional transportation assets that became available during Operation Desert Storm may not be available in the next conflict. In fact, we can safely anticipate fewer resources for future responses in a global environment. Combat planners must recognize the capabilities and limitations of support units. Logistics planners, as always, must understand the organization and mission of combat units. Training, planning, and coordination with combat units in peacetime is vital to success of logistical units during wartime.

Logistics planning is an integral part of strategic planning. The logistic plan must identify mobility, sustainability, and the infrastructure necessary for supporting tactical operations. Activating reserve forces as well as increasing production and procurement of materiel to meet anticipated wartime consumption may be required. One of the major limiting factors in any conflict is the production and sustainment of military power.

The activation of reserve forces and the capability of our industrial base to expand to meet increased wartime requirements were critical to supporting Desert Storm. Deployment for the conflict in the Middle East required mobilization of additional military manpower. Only one-third of Army logisticians are in active duty units; the remainder serve in the Army Reserve and National Guard.[20] Additionally, much of the capability to provide forces a continuous supply of ammunition resides in the reserve forces. Therefore a Presidential call-up of selected reserves was necessary to provide support forces both before and after re-deployment of combat forces. Over 506 Reserve Component logistical units with over 50,000 soldiers deployed into the theater or to Europe, replacing European-based deploying units.[21] The number of

reservists called to active duty and the length of duty influenced the flow of forces to the theater. Activation of reserve units incurs a political risk; it challenges the resolve of our nation to support mobilization. It may be more difficult to activate reserve forces in the future.

The addition of the new M1 Abrams tank, M2/M3 Bradley fighting vehicles, AH-64 Apache attack helicopter, and the Patriot air defense system have made the battlefield both more lethal and more mobile. However, most of the recent modernization efforts have focused on combat units and weapons systems, so the support structure has not fully modernized and expanded to keep pace with highly mobile combat forces. Many non-divisional support units have not been fully updated with communication and transportation equipment. Much of the support units' equipment was manufactured in the 1960s and 1970s; it is both costly and labor-intensive to maintain. With the increased mobility of our modern weapon systems, the ability to provide support over extended distances requires additional assets. The number and size of support forces also affect the ability to provide a continuous supply of ammunition. With limited resources, it is always difficult to determine whether weapon systems or support equipment should be modernized when one can not afford both.

This dilemma has been around for quite a while; in fact, since World War I it has caused heated strategic debate. Commonly called "The Teeth versus Tail" conflict, this debate pits operational commanders, who demand that maximum assets be put into fighting "teeth," against logisticians, who argue that the cost of doing so means less sustainment.[22] To sustain our combat forces, a careful balance of the ratio between combat and support must be attained.

Industry's capability to meet surge production is vital to continuous

sustainment of the force during any conflict, even though it is probable less resources will be available in the future than were available pre-Desert Storm. Strategic planning for the production and distribution of ammunition is necessary due to the long lead-time and cost to manufacture large quantities. Replacement of precision ammunition used during Desert Storm will prove expensive. With current, constrained resources, the industrial base could reduce our capability to equip and maintain our forces in combat. Nevertheless, an improved industrial base surge capability will be required to meet future contingencies.

Industrial surge and mobilization pre-planning contribute to a modernized and efficient industrial base. A warm industrial base may be needed to meet wartime ammunition availability requirements; however, with reductions in funding, the industrial base may be diverted to other commercial activities and, thus, become less able to respond in a crisis. Most contractors view limited or low-quantity contracts as not worth the effort of re-tooling, start-up costs, and training of the work force. Accordingly, they generally seek long-term contracts, which provide a steady income, stable work force, and reduced materiel costs to maximize productivity and profits. Maintaining a warm industrial base requires allocation of scarce dollars to long-term contracts to ensure the capability to increase production in wartime. A warm industrial base likewise provides secondary benefits of continued employment and technological improvements emerging from weapons research and production. The advantage of advanced technology also aids in maintaining competition in the world market. With rapid improvements in technology, it may appear to be more cost-effective to invest in research and development and the ability to rapidly mobilize the industrial base. However,

the quantity of ammunition on hand must be sufficient to sustain the force until resupply can be effected. So, if the industrial base is not maintained, then rapid response capability will be lost.

The industrial base is crucial to fielding a smaller, more lethal Army and sustaining it in the future. However, if resources are spent on keeping the industrial base warm, less funding will be available for essential combat force structure. Keeping the industrial base warm may also divert resources from research and development for advanced-technology equipment. The decision will be a difficult one, but conventional forces must be well-equipped and sustained to preclude resorting to nuclear weapons to win a war.

Just as our operational transportation was challenged during Desert Shield/Storm, so also was our strategic mobility. Strategic mobility facilitates the movement of ammunition support personnel and ammunition from the point of departure in the United States and supporting theaters to the reception ports in the theater of operation. Projection of military power is limited by our strategic sealift capability to sustain the force. Ammunition, due to the high tonnages involved, was moved primarily by ship. Never before in the history of the United States was more cargo moved further and faster than in support of Operation Desert Shield/Storm.[23] Over 86 percent of all equipment and supplies were moved to the theater by sea. Over 500 ships, carrying over 5.7 million metric tons of cargo over an 8,700 mile supply line carried out this enormous task.[24] More than 434,000 short tons of ammunition were sent to the Middle East; it would take approximately 22,000 semi-trucks to carry this load. To accomplish this, the Military Sealift Command reactivated sixty-seven Ready Reserve Force Ships because of the shortfall of fast transit ships. Of these, only fifty-nine actually sailed. Manning these

older ships with steam plants became a problem, so it was necessary to use the retiree list to crew them. The average crewman was fifty-five years old. Some of these ships had boiler problems, and it was necessary to charter an additional nine United States ships and ten foreign ships.[25] With the decline of merchant fleets in industrialized Western nations, control of critical sea lines of communication may fall to Third World nations. Operation Desert Storm enjoyed the advantage of substantial support from many Arabic nations. However, considering the potential for future operations in the Middle East, this general consensus and support by Arabic nations may not be present in future operations. Without the same level of support, our strategic air and sealift capability may be in jeopardy during future conflicts.

Distances from the United States, conditions of the Ready Reserve Fleet, primitive road structure, and other support issues must be addressed if we are to maintain the ability to project military power in a global environment. We must continue to pre-position supplies and equipment and enhance strategic mobility through improving airlift and sealift capabilities. Continued modernization of support forces and equipment to keep pace with highly mobile combat forces is necessary.

While the success of Operation Desert Storm depended on substantial allied support and clearly defined command and control of coalition forces, the actual use of military force relied heavily on the United States' capability to project power and sustain that power on the battlefield. The ability to produce, transport, and maintain a continuous flow of ammunition proved instrumental to providing that capability. It will continue to be a vital ingredient during future conflicts.

ENDNOTES

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